INFLATION TARGETING AND EXCHANGE RATE UNCERTAINTY

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(Philippines)

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Veronica Bayangos
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Abbreviations

AC	Advisory Board (BSP)
AR	Autoregressive term
ARMA	Autoregressive moving average (error)
BAP	Bankers Association of the Philippines
BES	Business Expectations Survey
BOP	Balance of payments
BSP	Bangko Sentral ng Pilipinas
BTr	Bureau of Treasury
CBP	Central Bank of the Philippines
CIRP	Covered interest rate parity
CPI	Consumer price index
CV	Coefficient of variation
DCC	Dynamic conditional correlation
DMB	Deposit money bank
DoF	Department of Finance
EDF	Exporters dollar facility
EDYRF	Exporters dollar and yen rediscount facility
FDI	Foreign direct investment
GARCH	Generalized autoregressive conditional heteroscedastic models
GDP	Gross domestic product
GNP	Gross national product
GOCCs	Government-owned controlled corporations
HP	Hodrick-Prescott filter
IMF	International Monetary Fund
IT	Inflation targeting
ITL	Inflation targeting lite
LOP	Law of one price
MAPE	Mean absolute percent error
MB	Monetary Board (BSP)
M3	Total domestic liquidity
NAIRU	Non-accelerating inflation rate of unemployment
NPLs	Non-performing loans
NPAs	Non-performing assets
NSO	National Statistics Office
OLS	Ordinary least squares

OMOs	Open market operations
OPSF	Oil price stabilization fund
PDS	Philippine Dealing System
PIDS	Philippine Institute for Development Studies
PPP	Purchasing power parity
PSBR	Public sector borrowing requirement
PSE	Philippine Stock Exchange
RA	Republic Act
REER	Real effective exchange rate
RESET	Regression specification error test
ROPOA	Real and other properties owned or acquired
RP	Overnight repurchase rate
RRP	Overnight reverse repurchase rate
R^2	Coefficient of determination
SMEs	Small and medium-scale industries
TFP	Total factor productivity
UIP	Uncovered interest parity
WTO	World Trade Organization

Abstract

Inflation Targeting and Exchange Rate Uncertainty argues that a crucial issue in understanding the outcomes of inflation targeting (IT) in developing countries is the apparently unstable link between the interest rate and the exchange rate and the way uncertainty regarding the exchange rate figures into monetary policymaking.

It further contends that a policy without a clear mechanism for containing exchange rate instability and its implications for the real sector is not generally consistent with economic growth objectives. The direct assertion is that "intermediate" rather than corner solutions in exchange rate policymaking are perhaps necessary for developing economies. This is argued as crucial to the IT framework, especially when the nominal exchange rate serves as a focal point for inflation expectations.

An inflation target is an example of a "targeting rule", the distinguishing feature of which is a pre-commitment of the central bank to the optimization of a particular objective function. Thus, in IT, central banks commit to minimizing the deviation of inflation from the targeted rate.

The study looks at the Philippine case. The Philippines adopted IT in 2002 with the aim of achieving its primary objective of price stability conducive to sustainable economic growth. However, Philippine inflation has been historically high and variable compared to its Southeast Asian neighbours, notably due to fluctuations and shocks on the exchange rate. This has made monetary policy difficult. In fact, studies have argued that the Philippines adopts multiple targets, such as growth, output stabilization and stability of the exchange rate and the financial market, with one policy instrument. Arguably, this practice weakens the commitment to IT and support for central bank independence.

Against this background, this study focuses on the dynamics of uncertainty in monetary policymaking. Uncertainty emerges when there is ambiguity about the current description of the economy, mainly as a result of uncertainty regarding the equilibrium level of the exchange rate. The risk stems from the perception of international financial markets through exchange rate expectations. As the Bangko Sentral ng Pilipinas (BSP) worries about impacts on inflation, this likely leads to a more activist stabilization policy.

Three research questions guide this study: (i) Are interest rates, the exchange rate and inflation expectations relevant transmission mechanisms of monetary policy? (ii) Does the IT framework entail larger volatility of the exchange rate and other key macroeconomic indicators? (iii) Does exchange rate uncertainty undermine the credibility of the BSP?

The study critically regards the theoretical foundation of the model of IT in Chapter 3. It stresses that IT's part in dampening time inconsistency and credibility issues is limited. In addition, delinking inflation expectations from actual inflation is complicated for developing and emerging markets. The role of the exchange rate in these theoretical issues is arguably crucial.

Chapter 4 continues with the theoretical analysis of the sources of exchange rate uncertainties in an open macroeconomy. Uncertainty in the behaviour of the exchange rate is seen from the poor empirical evidence of the uncovered interest parity (UIP) condition, that is, that exchange rate changes are predictably related to interest rate differentials. This implies that the exchange rate is not only treated as an endogenous variable, but also as an important source of shocks which is likely to provoke a tight monetary response. This further implies that the relationship between interest rates and the exchange rate is unpredictable.

The main contribution of this study is the empirical investigation of exchange rate uncertainty and its impact on IT in the Philippine economy. In fact, there is no robust quantitative work that addresses this issue, especially after the peso was allowed to float in 1997. To this end, the empirical design of our study starts in Chapter 5 with a dynamic, quarterly, macroeconometric model built for the Philippines. The model traces the linkages among the economic sectors, especially between the monetary and real sectors and between monetary sector variables and the exchange rate.

Three crucial elements in the economic structure of the Philippines are adequately captured.

For one, the policy interest rate of the BSP indeed responds to inflationary, output gap and exchange rate pressures. However, the impact of the policy rate on market interest rates is moderate, suggesting that the elasticity of the interest rate to macroeconomic equilibrium is modest. This could be attributed to certain interventions in the financial sector which weaken the transmission from benchmark interest rates to other market rates.

A second element is that changes in the BSP policy rate affect changes in the nominal exchange rate based on the UIP condition. However, the empirical estimate shows that the degree of risk premium in the nominal peso-dollar rate behaviour is higher than the UIP. The risk premium is oftentimes the source of higher volatility in the behaviour of the exchange rate, suggesting that its behaviour is relatively unstable.

The third element is the fact that the nominal peso-dollar rate is an effective transmission mechanism, as both direct and indirect pass-through effects to inflation are relatively above average.

Chapter 6 extends results of the macro model to determine whether the IT framework entails larger volatility for the exchange rate and other key macroeconomic indicators and whether exchange rate uncertainty undermines BSP credibility.

Results show that when the BSP reacts to exchange rate pressure, inflation, the inflation forecast and long-run inflation expectations would follow a decelerating trend, albeit marginal. The opposite is true when the monetary policy stance becomes accommodative. However, when the BSP raises its policy rate significantly to achieve the inflation target, macroeconomic variables, especially the nominal peso-dollar rate, are more volatile. Moreover, there is a negative relationship between inflation and output variability.

This study reveals that when the BSP includes reaction to nominal exchange rate pressure, it is rather easy to build credibility, compared to the reaction that includes only inflationary pressures. However, when exchange rate determination becomes uncertain and the BSP adopts another model of exchange rate determination, its policy rate increases significantly. Results show that such a strategy leads to lower inflation and inflation expectations, but at the expense of more a volatile policy rate and inflation, and stronger appreciation of the nominal exchange rate. Under these con-

ditions, it is difficult to build credibility, as these do not work much better in stabilizing inflation and real output.

The study offers some concluding thoughts in Chapter 7. It stresses that the effectiveness of IT hinges not only on the mechanism to contain exchange rate instability, but on continuous assessment of how to improve the central bank's conduct of monetary policy and reforms in the financial sector.

1 The Task Ahead: Introduction

1.1 The context

The financial crisis in Latin America in 1994-95, in East Asia and Russia in 1997-98, in Brazil in 1999, in Turkey in 2001 and in Argentina in 2001-02 changed the way that developing countries, like the Philippines, relate to the global economy. These crises confirmed, once again, that developing economies are now exposed to fluctuations in capital flows, exchange rates and international interest rates largely determined by factors outside of their control. [1]

While fiscal policy has in recent years become less manageable, an important task for monetary policy is now to stabilise the economy and to steer development in the face of such uncertainties.[2]

Some developing countries, including the Philippines, have adopted inflation targeting (IT) in the conduct of monetary policy. An IT framework is an example of a "targeting rule", the distinguishing feature of which is a pre-commitment of the central bank to optimization of a particular objective function (Dakila 2001). Thus, in IT, central banks commit to minimizing the deviation of inflation from the targeted rate.

Central to the recent debate on IT are uncertainties that developing economies face that could undermine IT effectiveness. In this respect, the literature has exhibited increasing interest in three areas in recent years: fiscal dominance, domestic asset prices and the exchange rate. While fiscal dominance[3] and domestic asset prices[4] have been adequately discussed, the literature continues to lack definite conclusions on how to deal with exchange rate uncertainty (Eichengreen 2002; Mishkin 2000; Agenor 2000).

Standard monetary theory views the exchange rate as an important transmission mechanism for monetary policy. Changes in the policy instrument, the interest rate, are assumed to have predictable impacts on the exchange

rate. This underlies the textbook assertion of the effectiveness of monetary policy under a flexible exchange rate regime. Changes in the exchange rate impact import prices, leading to consumer price inflation, shifts in demand for domestic goods (competing imports and exports) and changes in households' and firms' balance sheets.

However, two factors complicate the behaviour of the exchange rate. First, determination of the exchange rate is uncertain and, second, central banks may have exchange rate targets. Given the long lags in monetary policy, these two complications introduce a fundamental uncertainty in monetary policy, as one of the main transmission mechanisms is not well understood.

Along these lines, this study basically argues that instability in the behaviour of the exchange rate renders IT ineffective as a monetary policy regime. Developing economies may believe that by adopting IT, they are making themselves less vulnerable to speculative attacks and shocks on the exchange rate. However, the IT process could require volatile and distortionary adjustments that have negative and disruptive effects on growth and employment.

This study argues further that the effectiveness of IT hinges on mechanisms to contain exchange rate instability. Put simply, an "intermediate" rather than a corner solution in macroeconomic policymaking is perhaps necessary for developing economies. A clear transmission mechanism is necessary to understand the dynamics behind the instability of the exchange rate. This is argued as being crucial to the IT framework, especially when the nominal exchange rate serves as a focal point for inflation expectations.

1.2 The need to switch monetary policy targets

Masson et al. (1997) identified major prerequisites for adopting an IT framework.[5] From these, the IT could be defined as including four elements that are equally crucial in monetary management. One is the institutional commitment to price stability as the primary goal of monetary policy. This commitment ensures credibility of the ultimate objective of monetary policy and gives the central bank the independence to pursue it. Another is the framework through which the central bank could be accountable for attaining its ultimate goal. How this framework is set up and determined, suggesting an encompassing approach in setting the policy instruments, is the third element. How this framework is finally

operationalized is the fourth element. Part of this element is the public announcement of targets for inflation and a policy for communicating to the public and to markets the rationale for decisions taken by the central bank. These four elements imply that the IT is all about the central bank's objective and policy reaction function, or how central banks could best conduct monetary policy using the instruments at its disposal.

The Bangko Sentral ng Pilipinas (BSP) formally shifted to IT in January 2002. The modification in monetary policy regime appeared to be the only credible response to the new challenges posed by globalization. IT was deemed as reducing the risk involved in reaching policy decisions, as shifts in money demand and money supply no longer appeared to be the main drivers of inflationary pressure.

Guinigundo (2000) laid out the broad reasons for the switch in monetary targets. Formal adoption of an IT framework was expected to strengthen the focus of monetary policy on price stability as the ultimate goal. This is based on the empirical finding that countries adopting this framework perform better in terms of lower and more stable inflation rates. Viewed over the longer run, the inflation performance of the Philippines has been relatively high and variable.

Another reason for the switch was that successful IT requires the central bank to be insulated from fiscal processes. Thus, the pursuit of an inflation target would enhance justification for BSP independence and autonomy. Another reason was that IT was viewed as having the greatest chance of success of the alternative nominal anchors.

IT was adopted during a period in which a steady deceleration in inflation and modest growth in real gross domestic product (GDP) were observed. However, the relatively stable inflation rate was not unusual, and a fiscal deficit and relatively high level of non-performing assets within the banking system continue to linger, while the volatility of the exchange rate due to domestic and external risks has intensified in recent years. All of these aspects pose crucial challenges to the BSP as it may be called on for a monetary policy response so as not to forestall growth momentum and not to exacerbate the economy's weaknesses.

1.3 The actual behaviour of central banks

How to go about doing the IT is typically left to the discretion of the monetary authorities. It is they who must respond to what they feel are major disturbances affecting the inflation target. In practice, authorities are not

observed reacting to inflation and the output gap, and central banks' behaviour has reflected a preference for responses to inflation and exchange rate variability. Hence, there is "fear of floating". This means that in practice, countries pursue "intermediate" rather than corner solution in monetary policymaking; that is, the central bank controls the exchange rate and manages the money supply under a rather free capital mobility.

An array of literature criticises current thinking about the choice of exchange rate regimes as being dominated by the paradigm of the "impossible trinity". In the literature, the impossible trinity postulates that a country cannot have a fixed exchange rate, free capital movement and an independent monetary policy. A country must pick two out of the three, not all. For instance, a country can leave capital movement free but retain monetary autonomy, but only by letting the exchange rate fluctuate. Or a country might choose to leave capital free and stabilize the currency, but only by abandoning any ability to adjust interest rates to fight inflation or recession.

However, the major flaw of this paradigm is that it says nothing about the possibility of adopting an intermediate regime (Wollmershauser 2003). Nothing in existing theory, for example, prevents a country from pursuing a managed float in which half of every fluctuation in demand for its currency is accommodated by intervention and half is allowed to be reflected in the exchange rate.

As implied earlier on, a flexible exchange rate can act as a shock absorber when shocks originate from the real side. This is even compounded when prices and wages are sticky. However, the empirical evidence shows that nominal exchange rates react very little to shocks from the real side. Instead most changes in exchange rates emanate from the financial side. There are also instances when shocks do not emanate from macroeconomic fundamentals (Goodhart 1989; Goodhart and Figliuoli 1991; Frenkel and Rose 1996; Obstfeld and Rogoff 2000). In these cases, exchange rate movements are an independent source of volatility. This increases the fragility of the balance sheets of local businesses and banks and creates uncertainty in monetary management.

Given this backdrop, an important development is the apparent change in the conduct of monetary-exchange rate policy in many emerging markets, that is, that interest rate policy has become more prominent as a replacement of foreign exchange intervention as the preferred means of smoothing exchange rate fluctuations (Calvo and Reinhart 2002). In this situation, the interest rate is entirely policy-driven, and the central bank changes only one fundamental determinant of the exchange rate, leaving

the market to map this "new" information on the exchange rate. Hence, it is clear that the central bank can only gain by responding to all information that helps it to meet its final target and achieve better outcomes. This type of behaviour of central banks to indirectly influence the exchange rate through interest rate adjustments has been largely confirmed (even for developed countries) by empirical work on monetary policy rules.

It should be noted that responding to exchange rate movements is very different from targeting the exchange rate. While the latter makes the exchange rate an intermediate target, responding to exchange rate movements treats the exchange rate as one further piece of information to be considered when setting interest rates. Expressed in this manner, a central bank can only expect to gain by responding to all information that helps it to meet its final target and achieve economic outcomes.

The strong reaction of central banks to the exchange rate reveals its importance for developing economies (and some emerging countries as well) following evidence of a high degree of pass-through of the exchange rate to inflation, ensuring competitiveness of the tradable sector and maintaining financial stability.

In the Philippines, the BSP does not follow an established policy reaction function (Mariano and Villanueva 2006). It would seem though that the BSP looks at inflation and the output gap in determining any potential response. However, the most significant observation so far is that Philippine monetary policy does not appear to be moving away from attempts to control two objectives, inflation and exchange rate, with one policy instrument, the BSP policy interest rate.

In fact, Stone (2003) classified the Philippines as an "inflation targeting lite" country,[6] as it adopts multiple targets (such as growth, output stabilization and stability of the exchange rate and the financial market). Arguably, this practice weakens the commitment to IT and support for central bank independence.[7]

1.4 Central research hypothesis and questions

For a small open economy like the Philippines exchange rate instability appears to be a crucial dilemma, especially during currency crises, as it has destabilizing effects on the real economy – that is, on production, investment, wages and social services.

If large exchange rate fluctuations can occur in deep, well-developed financial markets with a long history of flexible rates and clear ideas of how

the price discovery process works, then it is certainly more difficult for developing countries with relatively undeveloped financial institutions and very few players (at home or abroad) who are prepared to "take a position" on the exchange rate. How these uncertainties are incorporated into the IT framework is central.

In the Philippines, concern about the appropriate monetary policy transmission mechanism arguably remains at the crux of monetary policymaking under uncertainty. This leads to this study's several hypothesis. Firstly, the link between the nominal interest rate and the exchange rate is highly unpredictable. Secondly, the impact of changes in the nominal exchange rate on inflation has become relatively high in recent years. Thirdly, the nominal exchange rate itself can be a source of shocks. These shocks can arise from the instability of global markets (that is, the shifts of the major global currencies) and from shifts in capital flows. For these reasons, the nominal exchange rate is a rather unpredictable and ineffective transmission mechanism. In this situation, it is difficult for the BSP to build credibility.

This thesis focuses on three research questions: (i) Are interest rates, exchange rate and inflation expectations relevant indicators of monetary transmission? (ii) Does the IT process make the exchange rate more volatile? (iii) Does exchange rate uncertainty undermine the credibility of the BSP?

To reinforce the hypotheses and research questions, the study aims (i) to provide a solid understanding of the economics and the operational framework of IT; (ii) to critically analyse issues involved in the adoption of IT for the purpose of extracting insights and lessons for the Philippine monetary framework; (iii) to provide a clear understanding of the Philippine framework – its objectives, targets (intermediate and operating targets) and instruments under the IT; (iv) to construct a structural quarterly macroeconometric model of the Philippines that will serve as a quantitative tool for the BSP to use to forecast headline inflation one to two years into the future, to specify the linkages among the sectors, especially between the monetary sector and the real sector; and (v) to derive short- and medium-term policy implications for monetary policy management and propose policy measures regarding policy operation.

1.5 Analytical framework and methodology

Setting up the analytical framework has two assumptions. One, the study deals with the dynamics of uncertainty in monetary policymaking. Uncertainty in monetary policy occurs when there is ambiguity about the current description of the economy, mainly as the result of model and data uncertainty.[8] This study focuses on the case in which the equilibrium level of the exchange rate becomes uncertain. The risk stems from the perception of international financial markets through exchange rate expectations. As central banks worry about the true equilibrium level of the exchange rate, uncertainty in the transmission mechanism ensues.

This study shares Wollmershauser's (2006) view that uncertainty in monetary policy emanates from the risk and that, instead of the standard uncovered interest parity (UIP) condition, another exchange rate model would provide a better description of exchange rate behaviour at a certain moment in time.

Second, the analysis focuses on short-term policies. Stable inflation expectations are argued to eliminate an important source of macroeconomic instability, namely, the possibility that economic shocks affecting inflation in the short term become amplified through a corresponding adjustment in inflation expectations. In turn, the stability of these expectations contributes to economic welfare. By ensuring price stability, monetary policy can thus make an important contribution to macroeconomic stability.

A large body of theoretical literature addresses uncertainties in the determination of the exchange rate and the impact of exchange rate changes on the monetary policy transmission mechanism. The New Keynesian open economy models made a significant contribution on this theoretical front. Works by Leitemo and Soderstrom (2004) and Wollmershauser (2006) delve specifically into this issue, but their analyses are limited to calibrated and reduced-form open economy macroeconometric models.

The current study intends to capture the impact of exchange rate uncertainty on IT in a more comprehensive and detailed manner. The IT process involves close tracking of the economy and explicit inflation forecasts by the central bank. This task requires economy-wide models for projections and policy simulations.

This study builds and estimates a structural, dynamic macroeconometric model for the Philippine economy. To a large extent, our macroeconometric model shares features with the New Keynesian model of Ball (1999). The Ball (1999) model assumes that inflation and output are

backward-looking, thus it deliberately abstains from any optimizing foundation. Central to this model are important nominal rigidities in describing the macroeconomy. In addition, there are lag effects in the transmission mechanism.

We assume there is excess supply in the economy; hence, aggregate output is demand-determined in the short to medium run.[9] However, the goods markets are monopolistically competitive (Blanchard and Kiyotaki 1987),[10] leading to profits for firms that charge non-competitive sticky prices (Calvo 1983), which clear all of domestic production to satisfy demand (net of imports) for consumption, investment, government spending and exports. Firms make a mark-up when setting prices which is responsive to demand and monetary conditions. Meanwhile, households and firms negotiate a non-competitive real wage, engaging in sticky nominal contracts (Calvo 1983).

Nevertheless, asset markets are imperfect. The nominal exchange rate is allowed to transitorily deviate from purchasing power parity (PPP) so that movements occur in the real exchange rate. In addition, the nominal short-term interest rates play the leading role as the instrument of monetary policy, with the money supply having a limited role in describing the monetary stance.

Such a combination of the underpinnings of the macroeconometric model stem from a desire to reflect the realities of the Philippine economy. In general, they are consistent with the nature of the Philippine economy, in which there are institutional constraints (such as a goods market that is monopolistically competitive). Hence, firms resorting to price mark-ups and imported intermediate inputs are very evident in industrial production (Cororaton and Reyes 1997).

Yap (1996) and Gochoco-Bautista (2000) argued further that the economic structure of the Philippines has changed very little over the past years. The present industrial structure of the Philippines remains dualistic. The manufacturing sector employs only a small proportion of the labour force. The bulk of workers is employed either in the backward agricultural sector or in the urban sector in low-productivity jobs (Cororaton and Reyes 1997).

There has been a continuous struggle to maintain macroeconomic stability, with growth being alternately limited by a foreign exchange constraint, a savings constraint and a fiscal constraint (Vos and Yap 1996). Chronic budget deficits and other macroeconomic imbalances have also been corrected with fiscal and monetary policies.

The impact of exchange rate uncertainty on IT cannot be adequately assessed without considering three important elements. The first is the model of monetary policy transmission mechanism drawn. Our model partitions the Philippine economy into six major blocs: the monetary and external sector, the public sector, prices, expenditures, production and employment. The transmission mechanism starts from the central bank to money and asset markets, the goods market, sector prices, aggregate output and prices, before the central bank reacts to the mechanism. This model traces how the policy rate of the BSP could affect important variables such as inflation and economic growth through three mechanisms: (i) the 91-day treasury bill rate, deposit rates and lending rates (market interest rates), which are argued to impact on money supply and investment; (ii) exchange rates, which are expected to have effects on investment and international trade; and (iii) inflation expectations, which impact on consumption and investment.

The second element is an explicit specification of the BSP policy rate, as indicated by the overnight reverse repurchase rate (RRP), that reacts not only to inflationary and output gap pressures, but also to exchange rate uncertainties. Meanwhile, exchange rates, proxied by the nominal peso-dollar rate, reflects not only the UIP condition, but also the risk premium. The risk premium is usually associated with macroeconomic fundamentals and a number of subjective factors that are not easily anticipated. This is oftentimes a source of higher volatility in the behaviour of the exchange rate. In such a situation, monetary policy transmission becomes uncertain.

The third element is a two-way linkage between the monetary sector and the other components of the economy. As such, the feedback linkages between the monetary sector and the price sector are essential to the complete model. The impacts of monetary policy are indirect through money supply and through import prices. The 91-day treasury bill rate and the average lending rate directly affect consumption and investment expenditures. Meanwhile, the savings deposit rate affects the money supply. The money supply similarly affects consumption spending and the output gap. The output gap and inflation expectations directly affect the RRP; and the RRP and inflation expectations affect the 91-day treasury bill rate. Merchandise exports and imports affect the trade balance accounts, while the peso-dollar rate affects exports and imports of merchandise as well as durable equipment.

Our macroeconometric model is a first attempt to uncover the impact of exchange rate uncertainties on IT in a more comprehensive manner in

the Philippines. This study attempts to provide a better analytical framework for the Philippine case.

Using weekly Philippine data from 1988 to 2000, Bautista (2003) examined the interest rate-exchange rate interaction using dynamic conditional correlation (DCC) analysis, a multivariate generalized autoregressive conditional heteroscedastic (GARCH) method. The results show that the correlation between these variables is far from constant.[11]

Using monthly data from 1990 to 2000, Bautista and Gochoco-Bautista (2005) examined how monetary authorities respond to exchange rate market pressure,[12] including the traditional prescription of contracting money (or raising interest rates) to defend the currency. That study found that contracting domestic credit growth and raising the interest rate differential both reduce exchange rate market pressure. However, during a crisis period, the response is different, as monetary authorities do not sterilize; instead they contract domestic credit growth. Indeed, that study assumes a rather unpredictable relationship between the interest rate and exchange rate across periods. However, these authors are silent on what to do with the findings.

Meanwhile, the BSP uses a single-equation monthly inflation forecasting model in tandem with a small multiple equation model that was estimated with quarterly data. The BSP is also developing an annual macroeconometric model that captures the various channels of transmission of monetary policy, but a more formal reaction is yet to be estimated in the context of exchange rate uncertainty. In addition, in these models the exchange rate is exogenous and thus, the BSP is implicitly silent about exchange rate policy.

To the extent that a policy reaction is computed, our model provides a rather complete representation of monetary policymaking under IT, compared with that of the Central Bank of Brazil or the Central Bank of Chile. The Central Bank of Brazil and Central Bank of Chile have built New Keynesian models similar to ours. Brazil's model is quarterly. However, the policy objective function is estimated without the exchange rate. Meanwhile, the Central Bank of Chile's quarterly model assumes that the central bank can assert a rather predictable impact via changes in its policy rate on the exchange rate, without explicitly including exchange rate movements in its policy objective.

Implementation of the analytical framework yields a system of simultaneous equations. Our model is quarterly and starts in March 1988 (when liberalization of the economy and globalization of financial markets were

introduced). It extends through to December 2003, a period spanning 64 quarters.

The macroeconometric model, along with the simulations and cases, will be used to determine the impact of exchange rate instability on the target variables and policy loss function. The estimated central bank policy loss function, an indication of the central bank's credibility, will be used as its basis. A higher value of the policy loss function indicates a loss of credibility of the central bank, while a lower value indicates credibility gain.

We use the macroeconometric model to generate the baseline structure of the forecasts, simulations and cases. The forecast values based on *ex post* forecast are important for the historical analysis. Under the *ex post* forecast, predictions are generated beginning from the end of the estimation period and then extending to the present and the results compared with actual data available. The analysis includes three sub-periods: pre-IT (first quarter 1994 to fourth quarter 2000), the IT period (first quarter 2001 to first quarter 2003) and forecast IT period (second quarter 2003 to fourth quarter 2006). Meanwhile, the forecast values are examined using the mean absolute percent error (MAPE) to determine the robustness of the results.

The elasticity values from partial equilibrium equations and the coefficient of variation will be used to indicate the magnitude of the impact of the simulations and volatility, respectively. Secondary data are used to understand key stylized facts of the economy and estimate elasticity values.

The isolated performance of monetary policy is used to analyse results of the simulations and cases at two levels. The first level compares the baseline policy reaction of the central bank with and without the exchange rate. Part of this exercise is an analysis of the baseline policy reaction with and without the inflation target. To capture the impact of a more aggressive stance of the central bank on exchange rate pressure, different weights for the exchange rate are simulated in the baseline reaction function.

The second level uses alternative exchange rate specifications, which are called "cases". In the base run of the model the exchange rate is determined by UIP condition and a risk premium. But the actual exchange rate is subject to considerable shocks and this raises uncertainty whether UIP is the best approach. Thus, the cases present alternative exchange rate models as a tentative approach to introduce an element of uncertainty. Tentative in our study means that these cases do not yet provide a satisfactory and full-fledged model of exchange rate determination. These "cases" will be assessed and fed into the BSP policy rate. This analysis deals with the issue of whether exchange rate uncertainty undermines BSP credibility. The

baseline policy loss function is compared across different cases, the idea being to assess whether the baseline model yields reasonably good outcomes over different exchange rate specifications.

1.6 Contributions of the study

Within the context of quantitative analysis of monetary policy under an IT regime, study of the role of exchange rate uncertainty on IT is mostly confined to industrialized and a few emerging economies. For small, open developing economies this topic has not been well discussed. In fact, for the Philippines, no robust quantitative work addresses this issue, especially after the peso was allowed to float in 1997. The main contribution of this study is the empirical investigation of exchange rate uncertainty and its impact on IT in the case of the Philippines.

A fairly recent literature, however, has started to argue in favour of managing the movements of the exchange rate as part of the IT regime (Bofinger and Wollmershaeuser 2001, 2002). By implementing an appropriate volume of foreign exchange intervention, the central bank should be able to achieve its foreign exchange target, assuming it has sufficient reserves. This strand was extended in Bofinger and Wollmershauser (2003), which classified foreign exchange market interventions according to central bank objectives, such as exchange rate smoothing and exchange rate targeting (Jurgensen 1983).[13]

Ball (1999) and Svensson (2000) presented important models with policy rules for open economies. Both models emphasize the importance of pure floating and independent monetary policy management in which the central bank targets a short-term interest rate. A significant assumption is a stable relationship between the short-term interest rate and the exchange rate. In particular, Svensson (2000) assumed that the exchange rate is determined by the market according to the UIP hypothesis. Ball (1999) used a simpler structure for the international linkages of an open economy which assumes a static and positive relationship between the real exchange rate and the domestic real interest rate.

The simulations and cases in the current study can significantly contribute to policymaking in the Philippines and other central banks. This study attempts to shed more light on various dimensions of the effects of IT on central banks' credibility which have not yet been sufficiently addressed. To achieve this, the existing modelling techniques for approaching the issue are not only complemented but also improved and adapted to the Philippine

context. This study also attempts to draw policy conclusions that may be relevant to other countries with a similar development level and which have implemented or are about to implement IT. Lessons are drawn as to how the implementation of IT may potentially affect inflation and economic growth and central bank credibility.

The study also produces contributions in more practical terms. The way in which the macroeconometric model is carried out and completed by simulations may provide a useful example for analysis of IT in other developing and emerging countries.

As emphasized in Section 1.5, our model estimates a policy reaction function that is an intrinsic part of IT. This policy reaction that includes the exchange rate provides an innovative part compared with that of Central Bank of Brazil and Central Bank of Chile.

The policy implications of exchange rate uncertainty for the monetary policy transmission mechanism, if adequately understood, would help monetary authorities ensure the continued effectiveness of their monetary policy in influencing economic sustainability and development. The attainment of these objectives would certainly benefit other central banks in Southeast Asian countries that were affected by the currency and financial crisis in 1997, namely, the Bank of Thailand, the Bank of Indonesia, the Bank Negara Malaysia and the Central Bank of Korea. Specifically, results and findings, along with policy measures suggested in the thesis may be considered as offering guidance, with the end view of deriving an improved and more effective monetary and financial policy strategy in the face of globalizing financial markets.

Meanwhile, an understanding of the factors and channels affecting the monetary policy transmission mechanism in a more globalized financial market could lead to formulation of improved macroeconomic and monetary policy prescriptions within the BSP. As implied by open macroeconomics, the exchange rate certainly plays a role in affecting policies that influence the transmission mechanism, and it would thus seem to necessitate a proactive response from monetary authorities.

Improved understanding would also provide direction for monetary and financial policies, especially as they affect the boom-bust cycle that has characterized the Philippine economy. This would particularly benefit the BSP, which is tasked with provision of policy directions in the areas of money, banking and credit with the end goal being to come up with an improved and more effective monetary policy strategy.

1.7 Structure of the thesis

The body of this thesis comprises seven chapters. Chapter 2 reviews what has transpired in the Philippine economy during the past twenty-five years. This chapter sets out the challenges faced by monetary authorities in the form of increasing domestic uncertainties and global imbalances and adjustment policies for monetary and financial developments.

Chapter 3 looks closely at the theoretical foundation of the IT model.

Chapter 4 discusses the role of the exchange rate in inflation and the level of economic activity as well as the implications for aggregate demand and supply. This chapter stresses the prediction for an open economy that, when under a flexible exchange rate, the interest and exchange rates apart from being a transmission mechanism can also change as a result of exogenous shocks thereby exerting disturbances on the economy. This exchange rate behaviour increases the uncertainty and complexity of the monetary policy transmission mechanism. Chapter 4 also highlights the various types of exchange rate uncertainty and how these have affected the performance of monetary policy. All of these imply an indeterminate transmission mechanism to aggregate demand (and to some extent aggregate supply) and finally to the rate of inflation.

Chapter 5 presents and analyses the complete macroeconometric model estimated for the Philippines. The relationship between instruments of monetary policy (the interest rate) and the exchange rate, real output and inflation are seen in the detailed estimation of the transmission mechanism from the BSP to money markets, the goods market, sector prices, aggregate output and prices.

Chapter 6 extends the baseline model to determine whether the IT framework entails greater volatility of the exchange rate and other key macroeconomic indicators and whether exchange rate uncertainty renders IT ineffective.

Chapter 7 ends the study with key general conclusions, policy implications in light of the IT framework and remaining issues and areas for further research and improvement.

Notes

1. Jansen (2003) also argued that apart from these fluctuations, developing countries are vulnerable to the usual shocks to output and income due, for example, to weather and terms of trade.

2. See the draft paper by Ocampo and Vos (2006).

3. See Mishkin (2000) and Kumhof (2001).

4. See Borio and Lowe (2003).

5. Similar discussions on major prerequisites for IT are also found in Bernanke et al. (1999), Agenor (2000) and Mishkin (2000).

6. Stone (2003) argued that there are 19 emerging countries that float their exchange rates and announce an inflation target (called ITLs) but are unable to maintain the inflation target as the foremost policy objective while they focus on simply bringing inflation into the single digits and maintaining financial stability.

7. Stone (2003) classified South Korea and Thailand as emerging countries with a clear commitment as of late 2001. South Korea has an inflation target of 2.5% while Thailand's core inflation target ranges from 0% to 3.5%. Meanwhile, Indonesia has been classified as ITL country.

8. In general, uncertainty in monetary policy occurs in two aspects: uncertainty about what will happen in the future and uncertainty about the current description of the economy, mainly as the result of model and data uncertainty. The latter aspect can be further divided into two categories: uncertainty about the model used by the monetary policymaker and uncertainty about the data on which decisions are based (Batini and Haldane 1999; Goodhart 1999; Poole 1999). In that last category, the formulation of monetary policy is affected by the degree and type of uncertainty with which the central banks are confronted.

9. This is a typical Keynesian approach in describing an economy.

10. Also assumed for the Philippine quarterly macro model in Bautista et al. (2004).

11. Structural changes in the correlation structure are seen largely as the effects of policies or policy responses to exogenous events. The shift in the direction of correlation, observed after the liberalization of the capital markets in 1993, is cited as evidence. Strong positive correlations observed during the two crisis episodes covered by this study suggest ineffective interest rate defense of the currency.

12. Exchange rate pressure is computed as the sum of exchange rate depreciation and reserve outflows, scaled by base money.

13. According to the smoothing objective, interventions are undertaken to dampen the erratic short-term (day-to-day) exchange rate movements but not to alter the market-determined trend. The changes in foreign exchange reserves related to this objective should be randomly distributed around zero.

Interventions under the targeting objective are undertaken to establish a level or path for the exchange rate. Changes in foreign exchange reserves are expected to exhibit a high degree of persistence, that is, a purchase of foreign exchange followed by several successive purchases and vice versa, to defy an existing market trend.

2 Rebalancing Macroeconomic Imbalances in the Philippines

2.1 Introduction

This chapter reviews how monetary policy has undermined Philippine economic growth during the past twenty-five years. The Philippine economy showed buoyancy in markedly deteriorating conditions; but long-term growth has been relatively modest considering the pace of economic growth of its Southeast Asian neighbours. The chapter argues that the challenge and the fundamental problem of the Philippines' modest growth continues to be the low rate of national savings and investment, stagnant capital formation and low productivity.

Central to these observations on economic growth are two major policy strategies which have become salient over the past twenty-five years or so. These are enhancing revenue and fiscal balance and restructuring and liberalizing the economy. The low ratio of tax revenue to GDP in most years means that the government has never invested adequately in physical and social infrastructure. This has generated serious bottlenecks in mobilizing the Philippines' considerable resources. The situation has been exacerbated by the primacy accorded to achieving fiscal equilibrium, with the spending side bearing the burden of making up revenue shortfalls.

This chapter also claims that Philippine inflation performance has historically been high and more variable compared to that of its Southeast Asian neighbours due to a convolution of shocks and disturbances in various areas of the economy, notably the external sector (relating to the balance of payments), the real sector (relating to output and production) and the monetary sector.

These two policy strategies have contributed to a "boom-bust cycle" of economic episodes, especially after the authorities embraced various measures of liberalization and globalization of financial markets. This

boom-bust cycle reflects the stop-and-go measures implemented by the authorities, rather than maintaining a sustained and efficient rate of investment and savings which is critical for macroeconomic stability.

Indeed, the conduct of monetary policy over these years was difficult and often ineffective. Apart from the structural and institutional limitations, a rather crucial observation is that throughout the decades, Philippine monetary policy, in practice, appears not to have moved away from attempts to control inflation and the exchange rate with one instrument, the interest rate. This approach arguably set real and financial limits on private investment in particular and on long-term economic growth in general.

Against this backdrop, the Philippine authorities switched to IT as a monetary policy framework in early 2002. This was done at a time of steady deceleration of inflation and modest growth, reinforcing somewhat the benefits derived from it. However, with its now globalized financial sector, the Philippines is even more exposed to fluctuations in capital flows, exchange rates and international interest rates that are largely determined by factors outside of its control. Hence, from a broader perspective, macroeconomic management is now even more difficult than before.

Given this situation, the crucial question is whether IT can overcome these complexities. The road map of this chapter is as follows. Developments in growth, savings and investment patterns and inflation are discussed in section 2.2, while the impact of the government's pursuit of fiscal balance is analysed in section 2.3. How inflation behaved over the years is assessed in section 2.4, followed by a description of the Philippine financial system, which is presented in section 2.5. In section 2.6, the conduct of monetary policy from the 1980s to the early 1990s is discussed, and the impact of restructuring and liberalization is analysed in section 2.7. Section 2.8 relates whether the switch to IT really does matter. Section 2.9 offers some concluding thoughts.

2.2 Growth trends

One obvious observation is that in terms of economic development the Philippines has been systematically outperformed over the past twenty-five years by its Southeast Asian neighbours, particularly Malaysia and Thailand (Table 2.1).

As Table 2.1 indicates, the growth record of the Philippines was comparable to that of its neighbours in the 1970s, albeit a percentage or so lower. The 1970s is claimed to have been a decade of continuous expansion, with

GDP growth averaging 6.3% annually. In every year during that decade, GDP and per capita GDP grew, with peaks of the former in excess of 8% twice, in 1974 and 1977. However, this high growth was short-lived. By the late 1970s, real GDP growth was more subdued, at less than 6%.

The really significant divergence occurred during the 1980s when its neighbours averaged about 6.4% annual growth, compared to 1% growth in the Philippines. The differences had narrowed by the 1990s, when most of its neighbours suffered the Asian currency crisis. There was some improvement from 2001 to 2004, but the Philippines continued to fall further behind in average growth.

Unlike its neighbours, the Philippines has not experienced a sustained period of rapid growth, say of more than 7%, since the 1970s. In fact, real GDP growth of the Philippine economy has been uneven (Figure 2.1).

There are competing explanations for the sources of growth in the Philippines during the last two and a half decades. Three major views appear to be significant.

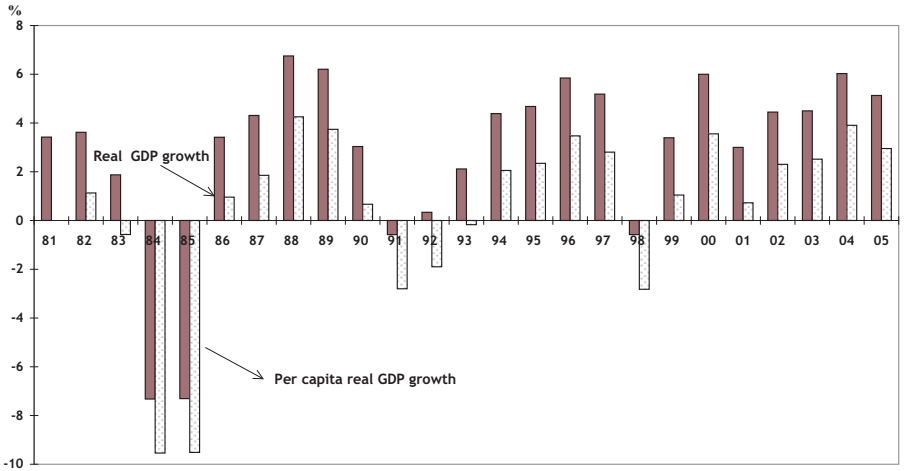
2.2.1 The boom-bust cycle

IMF (2006a) and Balisacan and Hill (2003) shared the view that the rather bumpy trend of economic growth is attributed to the country's large vulnerability to external shocks, such as the terms-of-trade shock in the 1970s, the global interest hikes in the early 1980s that led to the debt crisis in 1983, the power crisis in 1992-93, the currency crisis in 1997, as well as adverse political and natural shocks, including the collapse of the Marcos regime, several coup attempts, the volcanic eruption of Mount Pinatubo in 1991, and droughts caused by El Nino in 1998.

Table 2.1
Average growth of GDP in Southeast Asia, 1970-2004 (% per annum)

Country	1970-80	1980-90	1990-2000	2000-04	Average
Indonesia	7.6	6.1	4.2	4.0	5.5
Malaysia	7.8	5.3	7.0	4.4	6.1
Philippines	6.3	1.0	3.2	4.2	3.7
Singapore	8.5	6.6	7.8	2.8	6.4
Thailand	7.2	7.6	4.2	5.1	6.0

Sources: 1970-2000: Balisacan and Hill (2003:7); 2000-04: own computation based on PIDS database.



Source of basic data: Key indicators of the labor market (KILM) and PIDS database.

Figure 2.1
Real GDP growth and per capita real GDP growth, the Philippines (1970-2005)

These significant interruptions in economic growth (the so-called "boom-bust" cycle) dominated the Philippine economy over the past twenty-five years. In the 1970s, the boom cycle started with a period (1970-1974) of partial adjustment once the foreign exchange constraint was eased and the government felt freer to resort to deficit spending. The boom part has usually been associated with a period in which trade flows are allowed to adjust to relative price changes after a significant adjustment in the exchange rate. This period of adjustment has eventually led to an increase in foreign exchange earnings and improvement in net exports and, hence, output. These periods were also characterized by the country's undertaking a wide range of policy and institutional reforms, thereby gaining credibility with foreign creditors.

The 1980s was a decade of deep economic recession. After a modest average growth of nearly 3% during the first three years, real GDP declined by some 7% in 1984 and 1985 as economic and political shocks set in.

The Dewey Dee scandal in 1981, which marked the start of the crisis in the country's financial sector, was arguably the start of the economic crisis that culminated in a debt and balance-of-payments crisis between 1983 and 1985.[1] This was aggravated by the political crisis of 1986 which deposed Ferdinand Marcos after twenty years. Meanwhile, per capita real GDP fell sharply by an average of 9.5% per annum in 1984 and 1985.

Thereafter, economic recovery got under way but was short-lived. By the early 1990s, GDP growth had slowed, although less precipitously than in the 1980s. Major domestic political and natural shocks, especially the December 1989 coup attempt and a major earthquake in 1990 started a spate of shocks. Other major natural disasters struck the country in 1991, such as the eruption of Mount Pinatubo and the consequent lahar (destructive flood of volcanic ash and water), while the uncertainties in the international oil market resulting from the Gulf War sent an additional adverse external shock to the oil-importing country. As a result, real GDP dropped by almost one per cent in 1991, though recovering in 1993.

Growth resumed briefly from 1994 to 1996. Because the Philippines had been undertaking a wide range of policy and institutional reforms since the latter 1980s, the economic recovery was underpinned by a strengthening of macroeconomic and structural foundations. Real GDP growth averaged about 5% per year from 1994 to 1997.

In 1998, further disruption was caused by the combined impact of the 1997 Asian currency crisis and the severe El Nino drought. The fall was rather brief and subdued in the Philippines compared to its Southeast Asian neighbours, and growth was restored the following year. This growth was sustained until 2005, though at a rather slow pace.

The less dramatic performance of growth and the boom-bust cycle indicate the failure of the Philippine authorities to smooth macroeconomic instability.

2.2.2 Unimpressive growth accounting picture

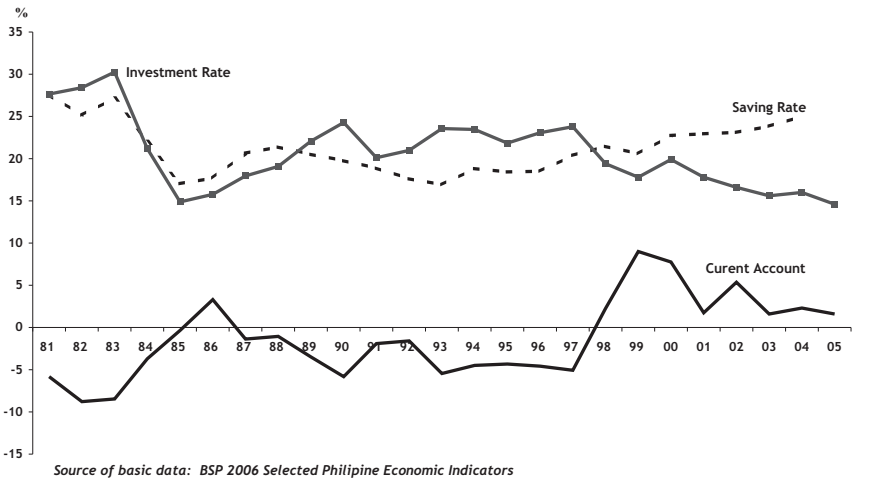
From another viewpoint, the rather modest and uneven real GDP growth trend can be explained by looking at the standard growth accounting picture (IMF 2006a). It attributes the rather low growth in the Philippines largely to sluggish capital formation and low total factor productivity (TFP).[2] In particular, physical capital (investment) grew at a slower pace than in other developing countries in the 1980s and 1990s, while TFP growth was negative or zero. There were some improvements though in the early 2000s, possibly reflecting the rise in services sector productivity.

Stagnant capital formation

The relatively stagnant level of capital is argued to be reflective of, among others, the low level of savings necessary to finance the required level of investment.

The rather modest savings and investment rates are indicated in Figure 2.2 below. During 1981–97, the difference between the savings and investment ratios created a resource gap of around 1.7% of GDP. However, the investment rate slumped in wake of the crisis, from 23.1% in 1996 to 14.6% in 2005. By contrast, the savings rate edged up steadily from 20.6% in 1999 to 24.7% in 2002 and further up to 25.1% in 2004. As a consequence, the Philippines has had a current account surplus since 1998. The average savings-investment deficit of 1.7% of GDP before the crisis in 1996 switched dramatically to a surplus of 2.1% of GDP in 1999, reflecting the adjustments compelled by net capital outflows.

Compared with its Southeast Asian neighbours, the challenge and the fundamental problem of growth continued to be the low rate of gross national savings and investment. The current upturn in the economy has been driven mainly by personal consumption spending (funded mainly by remittances of overseas Filipino workers) rather than investments, which are a more sustainable source of growth but have not made a robust recovery.[3] Personal consumption accounts for more than 70% of total GDP. This figure rose sharply in the first half of the 1980s, to reach 76.5% in 1985, perhaps as a protective strategy during recession. Since then it has failed to decline in response to economic growth.



Source of basic data: BSP 2006 Selected Philipine Economic Indicators

Large statistical discrepancies are evident in personal income inflows recorded particularly in 1987, 1988 and 1999.

Figure 2.2
Savings and investment gap as a percentage of nominal GDP (1981-2005)

The government's share of consumption has been rather low and modest over the long run. Since the debt crisis in 1985, government's share was pegged at little more than 7% until 2001 and declined towards 6.2% in 2005. The improvements in some years reflect recovery in growth and, to a large extent, the role of prudent expenditure pressures.

Meanwhile, the low revenue collection of the government proved to be inadequate to invest sufficiently in physical and social infrastructure. The share of public investment in GDP has declined during the past twenty-five years or so. In particular, public investment in infrastructure averaged only just over three per cent of GDP from the late 1980s to 2005, the lowest compared with its Southeast Asian neighbours.

Meanwhile, movements of net exports correlated closely with the overall level of economic activity. Years of relatively high real GDP growth, such as 1980 and 2000, resulted in a current account deficit, while periods of slower real GDP growth, such as 1985 and 1991, had the opposite effect. But a more unfortunate situation is that trade surpluses are much too rare for the Philippines given the import-dependent nature of its industries. Trade liberalization and tariff reductions implemented after the mid-1980s have further reduced the price of imported commodities. As the economy grows, demand for capital goods, intermediate products and fuel rises, but all of these must be sourced from outside the country thus putting a strain on the trade balance and foreign exchange reserves. Though exports may grow fast, they too rely on imported components.

For all of that, total investment (gross capital formation) as a proportion of GDP has averaged ten percentage points less than in the first years of the 1980s. Currently at less than 16% of GDP, the low investment ratio is due to a number of factors, such as dissaving in the public sector which leads to a generally low level of public sector investment, the poor state of infrastructure due to inadequate public infrastructure spending, the high cost of doing business as exemplified by high power costs and the high cost of capital and the scarcity of available domestic capital caused by the high non-performing loans (NPLs) of banks and more generally by the low level of domestic savings (ADB 2004b).

The Philippines has, on average, lower capital inflows than other Southeast Asian countries. Looking only at portfolio investments,[4] a distinct increase is dated from 1993 following the 1992 liberalization of the capital account and a spate of initial public offerings on the stock market from privatized government firms. By 1999, net portfolio investment (balance of

payments data) had declined to US $3.3 billion or 4.3% of nominal GDP, and further down to US $562 million or 0.7% of nominal GDP in 2003.

As implied earlier on, the Philippines' national savings rate of less than 26% of GDP is far lower than the Southeast Asian average of 30-35% of GDP. Empirical studies attribute this to lower per capita income, the absence of savings vehicles especially for middle and higher income groups, limited attractive investment (as opposed to speculative) opportunities for foreign portfolio investors and the perception that Philippine capital markets are not fair, open and transparent.

Indeed, there were episodes, especially in the late 1980s and early 1990s, when the low savings rate was due to the very low deposit interest rates (from 2% to 6%) and was actually negative when the inflation rate was accounted for, thus removing any incentive to save. There were also episodes when lending rates were relatively high, hence, any savings generated by the private sector were rarely invested in employment-generating projects but rather to earn the more attractive interest rates on government securities.

Yet there is also the claim that higher rates of savings invariably follow a period of sustained growth (Harrigan 1998). This was seen in the Philippines' Southeast Asian neighbours in the 1990s, in particular, in Thailand and Indonesia, which had savings rates closer to the current levels of the Philippines in the early stages of their long economic booms. This suggests that the Philippines never achieved a sufficiently long period of economic growth to encourage higher rates of savings.

Low factor productivity

As indicated earlier on, Philippine TFP growth was negative or zero from the 1980s to the 1990s. There were some improvements though in the early 2000s, possibly reflecting the rise in productivity of the services sector (Balisacan and Hill 2003). This finding is echoed by Collins and Bosworth (1997), who showed that among four Southeast Asian economies – Thailand, Indonesia, Philippines and Malaysia – only the Philippines had a negative TFP from 1960 to 1994.

There seems to be one general conclusion from the various studies on TFP conducted in the Philippines: that TFP growth has not been encouraging (Cororaton and Cuenca 2001; Silva 2001; Austria 1998; Cororaton and Abdula 1997). In fact, estimates seem to suggest negative TFP growth, and therefore ruling this factor out as a source of economic growth.

However, in estimates by Cororaton and Cuenca (2001) of TFP from 1967 to 2000, it is interesting to observe that while TFP growth was mostly

negative in the past thirty-five years, its contribution to economic growth improved from –4.26 percentage points in the middle of the 1980s to +0.93 in 1998-2000. This coincides with a period in which major economic policy reforms were vigorously pursued.

Changes in TFP could be due to a number of factors. In the case of the Philippines, Cororaton (2002) investigated possible determinants of TFP using regression analysis from 1976 to 1999.[5] No formal theorizing was attempted to sort out the possible determining factors. Rather, the study experimented with ad hoc regression specifications using Philippine data. The factors analysed include foreign trade indicators (exports and imports), foreign direct investment, macroeconomic fundamentals and stability (inflation), and expenditure on research and development. These were tested for statistical significance using standard tests in regression analysis.

Trade indicators, exports and imports were found to be positive determinants of TFP growth. Regarding the effect of exports on TFP, a larger export market can bring about economies of scale. It can also expose local producers to international best practice in production. Furthermore, foreign competition in the export market can translate into improved efficiency in the operations of local producers.

Regarding the effect of imports on TFP, imports often imply a transfer of modern technology into local economies since imports are a major vehicle for moving in appropriate foreign technology. Therefore, a higher volume of imports necessarily reduces the technological gap between local and foreign technology in terms of modern equipment, production processes and management.

Foreign direct investment (FDI) lagged one year not only affects TFP growth but is also highly statistically significant. FDI is another major vehicle for transferring foreign technology.

Spill-over effects on TFP from manufacturing (proxied by the share of gross manufacturing value added in total GDP) seemed to be more significant than that from the services and agriculture sectors.[6] However, though this regression analysis did not address the effects of a sectoral shift, these should nonetheless be looked at closely.[7]

Meanwhile, industry's share dropped from a high of 41.1% in the 1980s to 33.1% in 2005.[8] Balisacan and Hill (2003) claim that an appreciating currency in the mid-1990s combined with an urban minimum wage that was appreciably higher than in competitor countries may have impeded growth of this tradeable sector. Protection in this sector broadly has fallen, but its steady growth after 1999 was halted by retrenchment in the information

and technology sector in 2001. Even the employment scenario is evidently poor, as the sector failed to generate more jobs and employ more labour.

The effect of expenditure on research and development lagged two years is positive and statistically significant, indicating that it is also another important factor determining TFP growth.

Price changes, an indicator of economic stability and fundamentals, was found to be negatively related to TFP growth. This means high and unstable prices create economic uncertainties that discourage investors from investing in productivity-improving projects.

2.2.3 Macroeconomic instability and growth

An interesting point to note in the Cororaton (2002) study is the impact of economic instability on TFP growth. In the growth literature, the impact of inflation on growth is contested. However, monetary policy has undoubtedly failed at some point to sustain economic growth. Over the past twenty-five years, there has been a continuous struggle to maintain price stability with economic growth being alternatively limited by a foreign exchange constraint, a savings constraint and a fiscal constraint (Yap and Vos 1996).

The discussions so far imply that sufficiently high inflation rates can slow economic growth in the long term. Mishkin and Posen (1997) cited econometric evidence that every one per cent rise in inflation can cost an economy 0.1 to 0.5 percentage points in rate of growth, depending on the level of inflation.

Moreover, a study by Sarel (1995) found evidence of a threshold value of eight per cent for the inflation rate at which there exists a structural break in the relationship between inflation and economic growth. Below eight per cent, Sarel (1995) argued that inflation has no effect on growth, or may have a slight positive effect. However, beyond that threshold value, inflation acquires a significant and negative impact on growth, with each doubling of the inflation rate reducing the growth rate by about 1.7 percentage points.

Meanwhile, the inflation performance of the Philippines supports Sarel's (1995) findings. As discussed earlier on, the Philippines' highest inflation rate was recorded at 47.1% in 1984 and was halved to 23.2% in 1985. Real GDP declined by around 7% in 1984 and 1985 as economic and political shocks set in. Soon after, a persistent pick-up in inflation started in 1987 and reached 18.5% in 1991. These developments show that Philippine in-

flation is not only high and volatile, but at times beyond the threshold, and it has undermined economic growth.

2.3 Pursuit of higher and sustainable revenue collection

There are two key elements in the fiscal performance of the Philippine economy. The first pertains to the pursuit of higher and more sustainable revenue collection. Section 2.2 implied that the government's strategy to sustain higher revenue collection has failed and consequently weakened the economy's capacity to spend on domestic investment. This has affected the economy's ability to sustain growth.

The strategy to raise the level of budget revenue on a sustainable basis was placed under tight watch after the debt crisis. This was part of the stabilization and structural reform measures implemented with the International Monetary Fund (IMF) and World Bank. The macroeconomic challenges during the 1980s (with the Aquino government) were to maintain a decent level of social and economic services in the face of low tax collection and a large debt that had to be financed.

The government resorted to aggressive collection of non-tax revenues through the sale of public assets. On one hand, this was an obvious recourse. The national government had accumulated a large number of unprofitable (often overvalued) assets owing to guarantees it had extended in the past. The national government's public assets were concentrated in government-owned and controlled corporations (GOCCs).[9] These engaged in provision of special services related to the government's economic and social development policies, such as infrastructure, public utilities and consumer price stabilization services. Their main objective was to give the government a direct market presence to promote price stabilization in essential consumer commodities, such as energy products. After 1992, however, the idea that not only losing enterprises but also profitable ones could be sold off became accepted within government. This was partly due to the exigencies of raising revenues through non-tax means.

While the national government's tax collection had been dismal, the public sector's financial position, as represented by the public sector borrowing requirement (PSBR), was even more bleak. The PSBR includes the combined deficit of the national government, the old Central Bank of the Philippines (CBP), the GOCCs and the Oil Price Stabilization Fund, which required financing through government borrowing.[10] Except in 1994-96, the public sector was in deficit (Figure 2.3), and the amount remained large,

at 4.8% of GDP in 2004. This clearly impacted the national debt, as it had reached 3.8 trillion pesos by the end of 2005, or 79% of GDP, with interest payments absorbing close to 38% of total government revenue.

The poor performance of the GOCCs accounted for much of the dismal performance of the public sector. The reasons for the sluggish performance overlap include inefficiency of operations, overstaffing, lack of true financial autonomy, weak management and political interference. Balisacan and Hill (2003) argued that the GOCCs' failure to achieve their full potential has acted as a break on national economic growth and productivity.

The poor state of public finances resulted in inadequate public spending on critical infrastructure and basic services. For example, government capital expenditures in the Philippines averaged 16% of total government spending in the 1990s, compared with the Southeast Asia average of 25% for the same period. The lack of adequate public infrastructure has impeded the expansion of private investment and therefore dampened the prospects for rapid growth in the economy over the medium term.

The second key element in the fiscal performance of the Philippine economy pertains to the government's relatively dismal performance in sustaining higher levels of revenue collection to maintain the fiscal balance and consequently to uphold monetary policy, management of the debt and stability. Growing fiscal deficits became a significant problem after the late 1970s. At that time, turbulence such as oil shocks and the rise in world interest rates strained the national government's financial balances. The national government incurred large deficits due, to a great extent, to higher expenditures than those programmed by the IMF and, more importantly, shortfalls in revenue. The immediate strategy was to monetize the national government's fiscal deficits. The result was high inflation, a black-market foreign exchange rate and a debt crisis in the early 1980s.

Government resorted to domestic borrowing using short-term instruments. This, however, bloated domestic debt and threatened recovery, since it raised interest rates. More immediately, it also raised the government's servicing of past debt and worsened the deficit in nominal terms. Government was thus caught in a vicious circle of borrowing more in order to repay past loans. In 1990, the Aquino administration addressed the fiscal crisis by drastically cutting public spending and quickly raising resources through indirect taxes.

The Gulf War in 1991 raised oil prices and bloated the trade deficit. This threat created a national crisis that led to calls for austerity measures. Con-

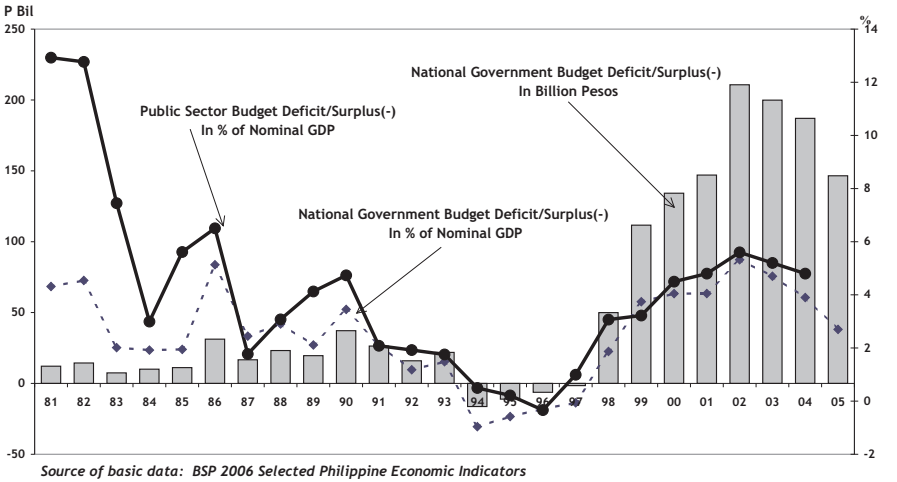
tractionary monetary policy and renewed fiscal austerity were employed. Because of the tight-money policy, interest rates rose and output fell, finally ending the growth episode. The recession ultimately moderated both interest rates and inflation, as well as exerting pressure on the balance of payments. As interest rates fell, the recession also relieved the government's nominal deficit problem as debt servicing on accumulated borrowing fell. In a way, therefore, the 1991 to 1992 recession solved the immediate fiscal problem, but at the cost of falling output and employment.

After the recession in 1991 and with the new administration of Fidel Ramos, the national government managed to maintain a consistent budget surplus. It did this through a combination of means: by keeping the growth of government expenditures in line with the overall growth of the economy, by relying on build-operate-transfer schemes to implement significant infrastructure projects and by active resort to raising non-tax revenues, primarily in the form of proceeds from privatization. The result was a slowing of the growth of the internal debt and a reduction of internal debt servicing (Figure 2.3).

The last element in the return to macroeconomic stability was the rehabilitation of the CBP in 1993. Prior to 1993, the central bank could not function effectively, owing to a negative net worth caused by bad loans extended during the Marcos regime. As a result, the national government had to perform quasi-monetary functions, issuing treasury bills in excess of its own needs for budget financing, bloating the budget in the process with higher payments on internal debt. Under a 1993 law, the government established a new central bank and took over the bad-loans portfolio of the old one. This constituted a large step in allowing independent monetary policy.

The effects of gaining control over the deficit were positive, namely, lower nominal interest rates and a moderation of inflation. As the government's need for new borrowing was reduced, the pressure on interest rates was also lessened, which in turn also reduced servicing on old debt. Falling deficits also tempered people's expectations of future inflation, and as a result actual inflation declined significantly.

At the end of 2005, the fiscal deficit as a percentage of GDP was 2.7% (Figure 2.3). Revenue shortfalls have continued, traced to lower tax effort by collecting agencies, changes in tax policy and to some extent reductions in the tariff duties on imports. Tax revenues fell from a peak of 17.0% of GDP in 1997 to 13.5% of GDP in 2001. By 2003, national government tax revenues as a percentage of GDP had returned to their 1987 level, but dropped significantly to 12.4% in 2004. Poor tax and customs administra-



Source of basic data: BSP 2006 Selected Philippine Economic Indicators

Figure 2.3
National government and public sector deficit/surplus (-) (1981-2005)

tion, together with poor taxpayer compliance are largely responsible for the decline in tax revenue (ADB 2005).

The high budget deficit forced the national government to borrow through bank loans, bonds and treasury bills, pushing interest payments up significantly**.** The government's outstanding debt reached 3.8 trillion pesos at the end of 2004, or 79.0% of GDP and nearly fourteen times higher than its level of 278.4 billion pesos in 1985 and the highest so far (Figure 2.4). Meanwhile, outstanding domestic public debt was already over 70% of GDP in the 1990s, even though the country was less affected by the regional crisis than its neighbours in Southeast Asia. Public debt has since continued to rise, largely through an accumulation of contingent liabilities (associated with guarantees provided for GOCC borrowing, contracts related to electricity generated by private independent power producers, deposit insurance of banks and the public pension system). Outstanding public debt reached 101.5% of GDP by 1999 and rose further to 109.8% in 2004.

In light of the country's weak fiscal position, President Gloria Arroyo in August 2004 announced that the country was in a fiscal crisis. A package of fiscal measures was submitted to Congress, including increases in excise, sin and value-added taxes, a tax on communications, changes in income taxation, rationalization of tax incentives and measures to strengthen tax collection. Although congressional approval and timing of the measures remain uncertain, these measures, taken together, are expected to go some

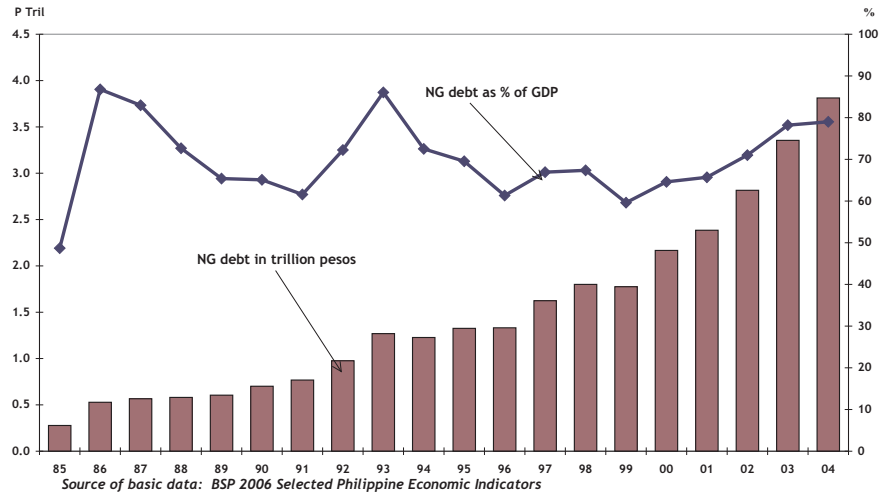


Figure 2.4
National government debt, 1985-2004

way in reducing growth of public deficit and debt, but the country will continue to be an outlier in Southeast Asia with regard to the size of its public sector deficit and debt.

2.4 How did inflation behave over these years?

Figure 2.5 shows that in general, average inflation exhibited a downward trend from 1981 to 2005. The highest inflation rate was recorded at 47.1% in 1984 but was halved to 23.2% in 1985 and subsequently dropped to 0.4% in 1986. A persistent pick-up started in 1987, until inflation reached 18.5% in 1991. There was then a steady decline to less than 10% in 1996. After the currency crisis in 1997, inflation steadily dropped (except in 2001, following the rise in oil prices in late 2000), registering 9.7% in 1998 and 4.4% in 2000. After the adoption of IT in 2001, inflation was benign until its significant pick-up to 7.6% in 2005, the highest figure since 1999.

The claim that the Philippines' historically high and variable inflation is oftentimes linked to demand-pull and cost-push factors is well documented. Yap (1996) surveyed major inflation models and studies that broadly point to demand-pull and cost-push factors as causing persistence of relatively high inflation since the 1980s. The demand-pull factors include changes in money supply and the cost-push factors include growth of nominal wages, exchange rates, import prices and prices of food in the consumer price index. Mohanty and Klau (2001) implied that apart from

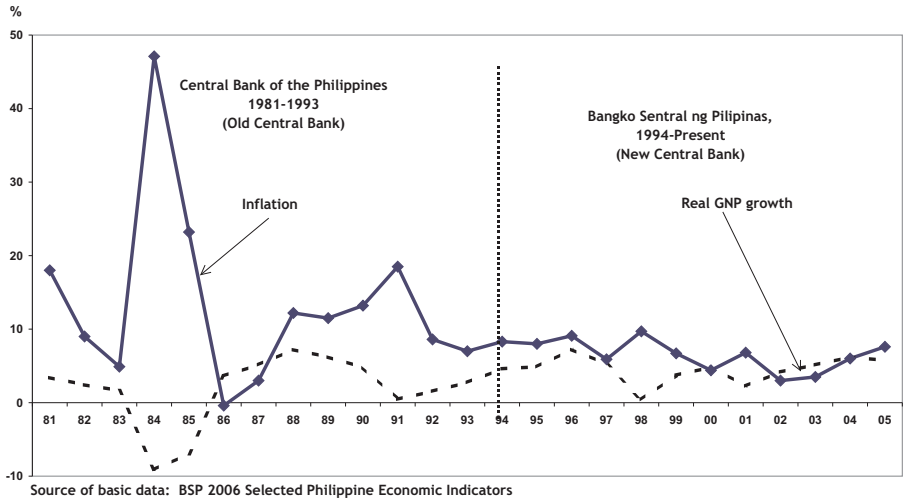


Figure 2.5
Annual inflation and real GNP growth, 1981-2005

the factors indicated by Yap (1996), the output gap and the unemployment rate, as well as oil components in the consumer basket, cause high and persistent inflation especially after emerging countries (including the Philippines) adopt IT. Meanwhile, the BSP's monthly inflation model points to the 91-day treasury bill rate and cumulative fiscal position of the national government as important determinants of Philippine inflation.

Lim (1996) showed that the price of imported goods has the highest elasticity, followed by wages and money supply. Using a monthly inflation model, Reyes (1996) extended Mariano's (1985) model and arrived at findings similar to those of Lim (1996). The price index for imports of non-fuels has the highest elasticity, followed by the liquidity variable and wages. In Mariano's (1985) study, the variables with the largest elasticities are the liquidity variable, the import price index for non-fuels and the wage variable. Mariano's equation, however, shows that food prices are also a significant determinant of inflation.

Mohanty and Klau (2001) and BSP (2005 and 2006) reiterated the significant role of food prices in inflation. In fact, in 2004 and 2005, rising food prices, along with energy and transportation prices, contributed to the significant uptick in inflation. The reasons are obvious. Food prices have much more weight in the consumer price index (CPI) basket, as shown in Table 2.2 below. Food items occupy some half of the CPI basket for both 1994

and 2000 as base years. Another reason is that food prices are greatly influenced by weather conditions.

By estimating a macroeconomic vector autoregression model and applying variance decomposition, Gochoco-Bautista (2001) showed that the forecast error variance of inflation due to exchange rate movements is higher than that of money supply growth. This lends support to the balance-of-payments view of inflation which maintains that the exchange rate is the main cause of price changes.

An interesting study is that of Lim (1987), which is based on the possibility that the working capital cost-push effect may offset the monetarist effect so that inflation may rise even after a reduction in money supply. The increase in inflation is caused by the rise in the interest rate, which raises the cost of borrowing for working capital. The empirical results indicate a positive relation between relevant interest rates and inflation. Lim (1987) further argued that the simple quantity theory of money is oversimplified and hides the full impact of monetarist prescriptions on inflation and that it neglects the transmission mechanism of credit and monetary cutback which may entail a drastic fall in income, investment, personal consumption expenditure and, most likely, government spending.

Mohanty and Klau (2001) analysed the determinants of inflation dynamics among 14 emerging economies, including the Philippines. Their study indicates that from 1990 to 1999, the Philippine average inflation tracked closely increases in food, oil and import prices and broad money ex-

Table 2.2
Philippines: Weights in different commodity groups in CPI

	Base year	
Commodity group	1994	2000
ALL ITEMS	100.0	100.0
Food items [1/]	55.1	50.0
Non-food items	44.9	50.0
Clothing	3.7	3.0
Housing & Repairs	14.7	16.8
Fuel, Light and Water	5.7	7.0
Services	12.3	15.9
Miscellaneous	8.5	7.3

[1/] Includes food, beverage and tobacco.

Source: Bangko Sentral ng Pilipinas

pansion, exchange rate depreciation, the output gap, wage increases and the unemployment rate. While factors such as the peso-dollar exchange rate depreciation and wage increases are significant determinants of inflation, their influence on inflation is modest. Meanwhile, the output gap and the unemployment rate's precise influence on inflation are difficult to establish. Dakila (2001), nevertheless, revealed a rather significant impact of the output gap in the BSP macroeconometric model.

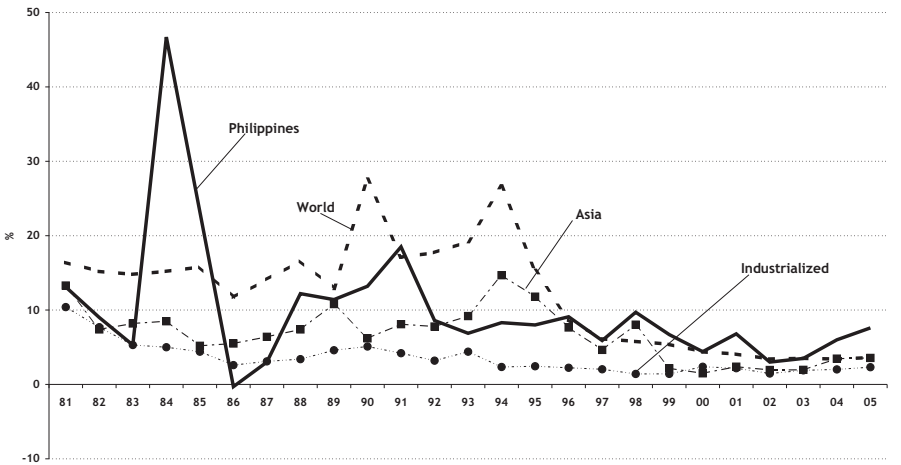
The single-equation monthly inflation forecasting model (Mariano 1998) is a successor of the original model developed by Mariano (1985).[11] The significant variables that affect inflation are the ratio of M4 (domestic liquidity and holdings of foreign currency deposits) to nominal GDP, the legislated nominal minimum wage of the non-agriculture sector, the 91-day treasury bill rate, the weighted average price of domestic petroleum products, the three-month moving average of the price index for non-oil imports and the cumulative fiscal position of the national government.

When Philippine inflation performance is compared with the industrialized countries and its Southeast Asian neighbours, it is evident from Figure 2.6 that, on average, Philippine inflation follows not only the regional but also the global pattern of periods of high and low inflation. Thus, the timing of most major swings in inflation is roughly coincident, reflecting some commonality of shocks, rough correlation of business cycles and broad similarities in stances on monetary policy. A trend of reduction in inflation since the 1990s is common to many countries.

However, Philippine average inflation was consistently higher than the average for the world,[12] for industrialized countries and for Asian[13] countries starting in 1997 until 2005. Until recently, the Philippines' inflation was, on average, higher than that of its neighbours, except for Indonesia. The latest available average inflation figures (2005) are as follows: Philippines (7.6%), Malaysia (3.0%), Thailand (4.5%) and Singapore (0.5%).[14]

Not only is Philippine inflation high by Southeast Asian standards, it is also variable. As such, the late 1990s emerged as a period of unusual stability. Based on the average monthly inflation from 1999 to 2005, the coefficient of variation of inflation in the Philippines was higher than that for Malaysia, Singapore and Thailand, but not for Indonesia.[15]

Debelle and Lim (1998) observed that traditionally, inflation in the Philippines has tended to be consistently higher and more volatile than in other Asian countries due to fluctuations in the peso-dollar rate which feed directly into domestic prices.



Source of basic data: IMF 2006 and 1998 International Financial Statistics Yearbook

Figure 2.6
Average inflation across countries, 1981-2005

In part, this variability is attributed to the monetary authorities' pursuit to maintain a stable and strong (typically overvalued) currency and to have countered depreciation pressures to keep inflation at bay. Given the difficulties of attaining simultaneous monetary and exchange rate targets when capital is internationally mobile, however, the BSP's pursuit of multiple objectives, combined with shifts in money demand, have resulted in more variable inflation rates (Debelle and Lim 1998; Bautista and Gochoco-Bautista 2005).

Mohanty and Klau (2001) analysed the contribution of various factors to the volatility of inflation.[16] Compared with its Southeast Asian neighbours (Malaysia, South Korea and Thailand), the factors that contributed to volatility of Philippine inflation were found to be excess money supply, shocks to oil and import prices and inflation persistence. However, these authors showed that inflation persistence, measured by the coefficient of lagged inflation, was a large contributor to inflation volatility and to average inflation over the sample period. In particular, the lagged inflation in the study was found to reflect backward-looking wage and price expectations. This implies that reducing inflation to low levels is much more costly, in terms of higher volatility.

It is instructive to point out that several key issues surround the relatively modest role of the output gap in some empirical studies. The most important is the technique used to estimate the output gap. Several research

strategies have been employed concerning output gap estimation in the Philippines. According to Yap (2003b), a common weakness runs across these in that the estimates are largely dependent on the sample period. Changing the sample therefore creates large deviations in the estimates.

In some empirical studies, the more variable inflation rate was traced to excess money supply, shocks to oil and import prices, fluctuations in the peso-dollar rate and inflation persistence. However, the monetary authorities' strive to maintain a stable and strong (typically overvalued) currency and to counter depreciation pressures so as to keep inflation at bay, along with their other monetary policy objectives and shifts in money demand, led to a more volatile inflation rate.

2.5 The Philippine financial system

Section 2.2 stressed that the boom-bust cycle of economic episodes may well indicate that monetary authorities employ stop-and-go measures. Since the strategies adopted by monetary authorities form a crucial factor in control of inflation, a closer look at the financial system is presented in this section, before the conduct of monetary policy over the years is assessed in the next section.

The Philippine financial system is defined here as including commercial banks, thrift banks, specialized government banks, rural banks and non-bank financial intermediaries. The system remains underdeveloped, dominated by the banking sector in which 44 commercial banks predominate. These have strengthened in recent years, as a result of a wave of mergers and a push by the government to heighten official supervision. Foreign banks continue to expand their presence. Other non-bank financial institutions, such as pension funds and finance companies, remain small.

Foreign firms tend to access the Philippines' financial markets through foreign banks and the largest universal banks. Because the financial market remains nascent, banks are the most important institutions in the country's financial system. This indicates that monetary policy could be effective.

About 98% of domestic credit, including the purchase and sale of government securities, is channelled through the banking system. The largest lenders are the universal, or expanded, commercial banks. Smaller lenders include the regular commercial banks, and the thrifts, rural and cooperative banks.

As of December 2006, there were 7,672 banking institutions (including branches) in the Philippines, of which 17 were expanded commercial or

universal banks (including 14 domestic and three foreign), 24 were regular commercial banks (nine domestic, four subsidiaries of foreign banks and 11 branches of foreign banks), 85 were thrifts, and 746 were rural and cooperative banks. The banking system includes representative offices of foreign banks and offshore banking units.

In terms of asset accumulation, size of institutions and volume of transactions, the Philippine banking system remains small compared to systems elsewhere in Southeast Asia. Its total assets stood at 4.3 trillion pesos at the end of 2005, according to the BSP. Of this, universal and commercial banks held 89.3%; thrift banks accounted for 8%; and rural and cooperative banks, 2.7%.

There appears to have been some financial disintermediation over the years, as financial depth has steadily declined. Measured by the ratio of broad money (M2) to nominal gross national product (GNP), akin to Williamson and Mahar (1998), financial depth represents the degree to which the economy is monetarized. Accordingly, the larger the ratio, the greater the capacity monetary authorities have to implement monetary policy effectively.

In 1996, the the Philippine financial system was shallow, with a depth of 51.8%, compared with 101.1% in Malaysia and 81.5% in Thailand. This declined to 45.9% in 1999, to 40.0% in 2000 and further to 38.2% in 2005. This implies that monetary authorities' power to effectively bring about changes in the economy has diminished.

Growth in banking credit remained sluggish after the currency crisis, as the general economic downturn reduced demand for loans and their profitability, and the level of non-performing loans and non-performing assets increased steadily. From a high of 51% growth in December 1996, outstanding credit to the private sector had contracted by 1.2% by December 1999 and by a further 3.0% by December 2001, before creeping up a sluggish 1.7% by December 2005. The high levels of non-performing loans and non-performing assets could have limited the effectiveness of monetary policy.

Beyond credit, few formal alternative sources of funding exist. The Philippine Stock Exchange (PSE) is small (there are only 238 listed companies and total market capitalization is estimated at 24% of GDP) and thinly traded (ADB 2004b). Most listed companies float only 10-20% of their shares on the exchange. The corporate debt market is virtually non-existent, but the volume of government debt is substantial, equalling twice the value of PSE market capitalization in 2003. Investors in the debt and equities

markets are predominantly corporations with strategic holdings and institutional investors including pension funds, banks and insurance companies. A surge of capital inflows led to the opening of the derivatives market, but defining a strategy to regulate them has proven to be a major challenge to the monetary authorities.

Meanwhile, the foreign exchange market (or the currency spot market) is smaller than that in many other Asian markets. Commercial banks, acting as foreign exchange brokers, participate in the market conducted through the Philippine Dealing System (PDS).[17] Transactions in the PDS largely reflect movements in the country's balance of payments. The spot market is smaller than that in many other Southeast Asian countries, as the total trading volume of the PDS in 2005 fell to US $29.0 billion from its pre-currency crisis level of US $43.1 billion.

As indicated earlier on, despite the difficulties of the fiscal sector the Philippine authorities pursued the restructuring and liberalisation of the economy starting in 1986 with the broad aim of removing the structural constraints that had distorted development of the economy. A significant part of this overall economic strategy was the financial liberalization programme.

One of the more salient reforms was the restructuring and recapitalization of the CBP into the BSP in 1993. However, the currency crisis in 1997 brought a slant to the government's structural reform measures. As part of the range of structural reforms, the government attempted to develop financial services by liberalizing the sector: the 44-year ban preventing foreign banks (other than the four already present) from operating in the Philippines was lifted in 1995. Full operating licences are now being granted to foreign insurance companies in line with World Trade Organisation (WTO) membership commitments; and legislation in 1997 eased restrictions on foreign investment in finance companies and investment houses.

However, the steady decline in depth of the Philippine financial system mentioned earlier on is reflective of constraints in the banking sector. On the supply side, the deteriorating quality of the loan portfolio led banks to ration credit, despite increased levels of liquidity. On the demand side, credit demand from the corporate sector remained subdued, as many businesses were still restructuring their existing debt with financial institutions. The steady stream of risk-free government securities gave banks some respite to offset the decline in corporate lending and helped the government maintain a low interest rate regime despite its ballooning budget deficit.

2.6 Conduct of monetary policy from the 1980s to early 1990s

The BSP's framework for conducting monetary policy is based on the interplay of a set of policy variables as follows: the ultimate policy objective; instruments of monetary policy; and the operating and intermediate targets. The BSP is also tasked to promote and maintain monetary stability and the convertibility of the Philippine peso. In this respect, the BSP formulates and implements monetary policy to support the objective of price stability.

For most of the 1980s and early 1990s, the BSP adopted monetary targeting. How the authorities formulated monetary targeting stemmed from an understanding of monetary programming. Theoretically, monetary policy affects the price level through the Fisher equation, $MV=PY$, where M is money supply, V is the income velocity of money and PY is nominal income or real income multiplied by the price level. Through this relationship, changes in money supply eventually feed into changes in the general price level.

Using this framework, the BSP took into account output growth and inflation targets, as set by economic planning authorities, and then using given velocities, set about achieving the monetary targets appropriate to the income and price objectives. To attain price stability, the actual movements of monetary aggregates (domestic liquidity or M3, base money and reserve money) had to be maintained within programme targets.

However, detailed regression results show that this relationship broke down. Vital (2003) surveyed demand for money studies in the Philippines. The broad conclusion is that a simple version of the money demand equation would not yield a long-run equilibrium condition. This is due to the impact of financial liberalization and globalization, which have led to a growth of financial innovations.

Beginning in the second half of 1995, it was felt that the effectiveness of monetary policy could be enhanced by complementing monetary aggregate targeting with some form of IT. In this modified approach, monetary authorities place greater emphasis on the price objective and less weight on the intermediate monetary target, however, without any clear justification. The approach essentially allows base money (BM) targets to be adjusted upwards by the amount that international reserves exceed expected levels, as long as inflation stays within a targeted range. Broadly, this appears to be a prudent response to the new challenges posed by globalization, reducing

the risk of reaching policy decisions based on projections using a weakened relationship between money and inflation.

2.7 The impact of restructuring and liberalization

2.7.1 The surge of capital inflows

Apart from the restructuring and recapitalization of the CBP in 1993, another important reform measure was the significant liberalization of the exchange system in August 1992. This reform provided some form of reassurance to potential investors that income and capital could be freely repatriated.

The liberalization of foreign direct investment, along with financial and foreign exchange markets, became major parts of the structural adjustment adopted in 1981. On 24 August 1992, the CBP issued Circular No. 1353 liberalizing foreign exchange regulations throughout the country.

Whereas the 1980s were characterized by large borrowing from abroad by public enterprises, capital flows (largely composed of net direct investments and portfolio investments) in the 1990s were primarily portfolio. Net portfolio investments showed particularly large increases in 1993 and 1994 relative to levels before the capital account liberalization, and they rose steeply in 1996 or just before the currency crisis in 1997. In general, the capital account was larger and more volatile in the 1990s than in the 1980s.

2.7.2 How the monetary authorities responded

The resurgence of capital inflows in the 1990s gradually changed the landscape of the conduct of transactions in the domestic economy, broadened the options for sourcing liquidity and introduced new dimensions to the conduct of monetary policy. The monetary authorities' response led to a quasi-fixed exchange rate regime, as the authorities attempted to control too many variables – money supply through interest rates and the exchange rate – with too few instruments (Gochoco-Bautista and Canlas 2003).

Indeed, the restructuring and liberalization measures led to salient changes in the economy. For one, capital flows came rushing into the economy, (as a proportion of GDP) more than doubling by the end of 1994 to about 5.9%.[18] The 91-day treasury bill rate became a bit sensitive to foreign interest rates (although the gap was substantial at more than 10 percentage points in nominal terms in 1998), while the link between the BSP RRP rate and interbank rate loosened. A trend of appreciation of the peso was

noted, particularly from 1991 to 1996. Banks started to depend on foreign markets for liquidity support instead of the BSP. This was shown in the significant upsurge in monetary foreign liabilities starting in 1995. This period was generally characterized by increasing real interest rates.

The period prior to the currency crisis was accompanied by a surge in capital inflows that were intermediated through banks. These flows caused credit extended to the private sector to jump significantly. In August 1996, year-on-year growth credit extended by banks to the private sector reached more than 56%, the highest since the 1980s. A closer look at the nature of bank loans outstanding by economic activity reveals a notable year-on-year growth of 97.2% by end 1996 to financial institutions, real estate and the business services sector.

These developments alarmed the BSP, which chose the side of caution by siphoning off excess liquidity from the system through the RRP market. The real RRP rate rose from 2.1% in November 1990 to 19.9% in July 1997.

The other avenue is the foreign exchange market. As indicated earlier on, the Philippine foreign exchange market (or currency spot market) is smaller than that of many other Asian markets. Commercial banks, acting as foreign exchange brokers, participate in the market through the PDS. Transactions in the PDS largely reflect movements in the country's balance of payments. The spot market is smaller than that of many Southeast Asian markets, as the total trading volume of the PDS for the whole of 2003 fell to US $29.0 billion from its pre-currency crisis level of US $43.1 billion.[19]

The BSP Treasury maintains an internal benchmark for its foreign reserves as well as for the exchange rate based on the inflation models of the BSP Department of Economic Research. This foreign reserve level includes an amount of foreign exchange that could be used for intervention in the PDS in the face of pressure on the exchange rate.

After the currency crisis in 1997, the peso continued to suffer bouts of weakness. The exchange rate became even more volatile as a result of a confluence of domestic and external factors. Over the long term, the peso has depreciated against the US dollar. However, this depreciation has tended to manifest through sharp one-off corrections after periods when the steadiness of the peso against the dollar had produced an appreciation in real terms due to the large inflation differential. A radical correction occurred during the regional economic crisis of 1997. After the peso was floated in July 1997, it depreciated by 34% against the US dollar within six months, ending the year at P39.98/US$1. The currency then hovered around this level for most of 1998 and into 1999.

However, from early 2000 political factors came into play, culminating in October, when the corruption allegations against former president Joseph Estrada caused the peso to plunge to P51.43/US$1. This brought the depreciation to 24%. The peso then briefly stabilized, though with sharp daily fluctuations in response to every twist in the impeachment proceedings.

Paradoxically, although the current account registered a persistent and rising surplus in 2000, the peso weakened sharply in that year and fell further in 2001 due to market concerns over the economic slowdown in the United States and Japan and the debt crisis in Argentina. Regional currencies, particularly the Japanese yen, the Thai baht, and the Indonesian rupiah, also weakened against the US dollar. The weakness of the peso was also attributed to the difficult law and order situation, the downgrading of growth projections by government due to a contraction of exports and slowdown of industrial output, as well as concerns over the budget deficit. During the last quarter of 2001, the heightened uncertainty after the 11 September event further weighed down the peso. In turn, the peso-dollar rate fluctuated within a narrow band around the P50/US$1 mark and ending the year at P51.4/US$1.

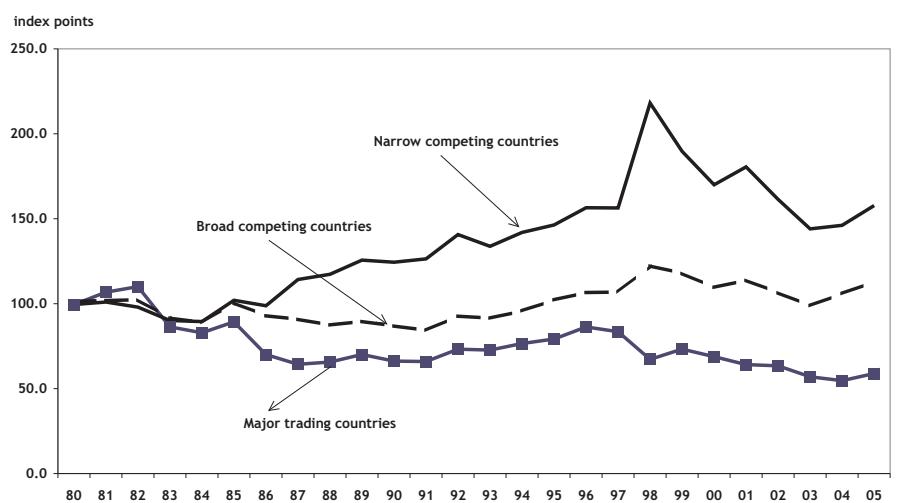
In 2003, the peso depreciated against the US dollar by 4.8% to average P54.20/US$1. The weakening of the peso was traced to war jitters in the Middle East during the first quarter, lingering concerns about the budget deficit and investor reactions to Moody's Investors Service decision to place the country's currency and debt ratings under review. Political and security reasons led to a further bout of peso weakness. The attempted mutiny in July 2003 and the announcement that a populist film star would contest in the 2004 presidential election brought the peso down to P55.7/US$1 by end 2003.

In terms of the peso's external competitiveness, Figure 2.7 shows that from January 1980 to December 2003, on average, the real effective exchange rate (REER) index relative to the currencies of major competitors (Malaysia, Singapore, Thailand, Indonesia, South Korea, Taiwan and Hong Kong) was increasing. This indicates a trend of real appreciation, hence, an overall reduction in the peso's external competitiveness compared to its Asian competitors. To some extent, this trend of real appreciation could be attributed to the relatively tight monetary policy stance of the BSP through the years. However, since 1999 the REER has depreciated (except in 2001) and the peso gained competitiveness, as its steep depreciation relative to the currencies of the Philippines' Asian competitors more than offset the positive gap between domestic and foreign inflation.

Although BSP and IMF pronouncements classify the Philippine exchange rate regime as independently floating, in practice the BSP manages its movements, rather than simply leaving it to be set by the market. This is usually evident when there are speculative attacks on the exchange rate until the BSP enters the market to restore orderly conditions.

One way to quell these speculative attacks on the exchange rate is intervention in the foreign exchange market. Such intervention by the BSP was particularly prevalent in cases where the Philippines experienced pressure of foreign capital; for example, in 1996 the BSP purchased a significant amount of foreign exchange in the market, totalling $6.6 billion for the year as a whole. However, in the face of limitations in a central bank's capacity to sterilize, this would have resulted in a more rapid growth of liquidity and, hence, a higher inflation rate. The BSP's participation in the PDS has been extremely subdued since 2000, with the brunt of intervention to manage the exchange rate being through the BSP's policy levers. This suggests that heavy management of the exchange rate reflects a strong attachment to exchange rate stability.

On some occasions, the BSP has resorted to moral suasion with a few commercial banks to avoid a further dwindling of international reserves. The BSP likewise effected adjustments in the banks' allowable foreign exchange position. During the appreciation episode in 1996, the BSP moved



Source of basic data: BSP (2006), selected Philippine economic indicators.

Figure 2.7
Real effective exchange rate indices, 1985=100

to reduce the maximum allowable oversold foreign exchange position limit of commercial banks from 15% to 5% of unimpaired capital.

This move limited the ability of banks to sell foreign exchange in the market. During the depreciation episode in early 1997, the BSP reduced the allowable overbought position to 20% from 25% and increased the oversold position to 10% from 5%. The tightening in the banks' overbought position limited their capacity to buy dollars from the market while the relaxation in the oversold position increased banks' capacity to sell dollars in the market. The BSP likewise modified the coverage of foreign assets eligible for inclusion in the computation of the bank's overbought position to include import bills and dollar trust receipts. This new definition further reduced banks' ability to speculate by overbuying foreign exchange from the market.

The increase in interest rates put further pressure on the peso to appreciate. However, this real appreciation was matched by BSP purchases on the foreign exchange market to beef up its reserves. As indicated earlier on, BSP purchases amounted to US $6.6 billion in 1996 or about 26% of total purchases (BSP plus commercial banks) at the PDS.

Houben (1997) claimed that apart from the significant rise in capital inflows, the slight real appreciation could also be attributed to one-off factors linked to the general recovery of confidence in the peso, the decline of economic and political uncertainties, the progressive lifting of the exchange restrictions and the upward adjustment of the equilibrium exchange rate itself. Alternatively it could be driven by price increases in the nontradeables sector, which were evident from the growth in loans extended by banks to financial institutions, business services and real estate.

Clearly, as this discussion demonstrates, during financial market liberalization macroeconomic incentives were present in the form of an overvalued exchange rate, which was maintained through direct intervention by the BSP in the foreign exchange market and through open-market operations of government securities. While these strategies indeed kept the country within IMF monetary ceilings and stabilized the pick-up of inflation, the currency crisis in 1997 proved the unwieldiness of monetary authorities' ultimate objectives to control many variables - money supply through interest rates and the exchange rate through direct intervention in the exchange market.

2.7.3 Were the structural constraints eliminated?

Against the backdrop of financial liberalization, section 2.5 noted that financial depth steadily declined. As argued earlier on, this decline in depth of the Philippine financial system is reflective of constraints in the banking sector.

With financial liberalization, interest rates are expected to more closely track global patterns. However, in the Philippines banks seem to charge whatever rate they desire. In general, short-term interest rates tend to cluster within two to five percentage points of the 91-day treasury bill rate. Since May 1998 the Bankers Association of the Philippines has had a standing agreement to keep interest spreads over the 91-day treasury bill rate at no more than 1.5 percentage points for prime customers and at no more than five percentage points for non-prime borrowers. In practice, some banks charge non-prime lending spreads of up to eight percentage points above the benchmark 91-day treasury bill rate. However, the average bank lending rate remained modest and became less volatile starting in 1999 (Figure 2.8).

Even with this agreement, interest rate spreads have historically been high in the Philippines relative to other Southeast Asian countries, due to the combination of limited competition, high intermediation costs generated by high reserve and direct lending requirements which have kept benchmark interest rates high, as well as the relatively high interest rate promulgated by the BSP on which bank lending rates are based (ADB 2004b). In particular, the average lending rates for small and medium-scale industries (SMEs) are higher than this average, with SME average annual lending rates of 11% to 13%. In the absence of usury laws, some finance companies have been known to charge interest rates of over 50%.

A related constraint is the concentrated nature of the banking sector and the propensity of banks to channel funding to preferred clients. This reflects the large concentration of Philippine banks. The commercial banks dominate the sector with an estimated share of 90% of total banking assets. The seven largest commercial banks (out of 43 banks) held an estimated 60% of total banking sector assets as of December 2005. Two of these are large government banks (the Land Bank of the Philippines and the Development Bank of the Philippines), while the remaining five are private. Ownership of banks is a characteristic feature of Philippine corporations and reduces the need for them to seek external financing on the capital markets. Indeed, corporations' reliance on intra-group finance allows owners to

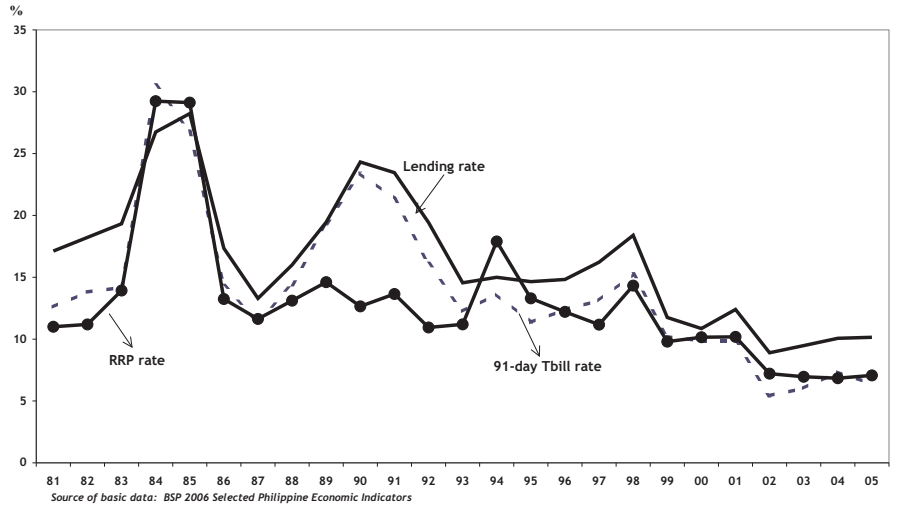


Figure 2.8
Overnight RRP, 91-day treasury bill rate, and average lending rates, 1981-2005

maintain tight control and avoid the disclosure requirements of listed companies.

In a context of a high level of non-performing loans, banks have preferred to place their funds in safe assets, such as treasury bills and bonds offering competitive yields and low risk. The proportion of non-performing loans held by the Philippine banking sector remain among the highest of the crisis-hit countries, estimated at 12.7% of outstanding bank loans at end 2005. If real and other properties owned or acquired (ROPOA) are factored in, total net non-performing assets are estimated at 14% of total banking assets, or 64% of capital and 12% of GDP. Efforts to resolve the non-performing loans have been muted by a general reluctance of bank owners to recognize inherent losses and by an unfavourable legal regime (ADB 2004a). Despite the continuous decline in interest rates, banking activities have remained weak with a simultaneous increase in non-performing loans held by commercial banks. Although output growth of the financial sector rose in 2005, the banking sector continues to be hampered by the stagnation of credit lending to the private sector, fluctuations in the exchange rate and stock market and economic instability.

The banking sector has staged only a slow and incomplete recovery from the currency crisis. The highest concentration of non-performing assets lies in the commercial banking sector, where 42 banks hold 88% of the non-performing assets and the remaining 12% are held by thrift and rural

banks. Commercial banks saw their non-performing loans fall to 9.2% of total loans by end June 2005, nearly seven years after the crisis. The non-performing loan ratio reached a peak of 18.81% in October 2001, but declined steadily in the following years as the BSP encouraged sale of bad assets. The BSP also tightened supervision and promoted mergers, all in effort to strengthen the banking system.

While there were some improvements in financial sector services, it is rather clear that reforms have been inadequate and should therefore be intensified and vigorously sustained to eliminate these constraints. However, since the currency crisis wrought limited damage on the Philippine banking system, there was less pressure on the system to institute much-needed reforms. Philippine banks continue to suffer high levels of related-party lending and weak accounting and disclosure practices, despite efforts by regulators to improve corporate governance. Competition is constrained by limitations on the expansion of foreign banks and cartel-like behaviour of local lenders (EIU 2006).

2.8 Does switching monetary targets matter?

The BSP has stressed that the primary objective of its monetary policy is "to promote price stability conducive to a balanced and sustainable growth of the economy" (Republic Act 7653). The adoption of IT as a framework of monetary policy in January 2002 was aimed at achieving this objective.

However, Guinigundo (2000)[20] noted that at the practical level adopting inflation targets amounts to formalizing a monetary targeting approach that emphasizes the ultimate objective of price stability. This implies that the shift to IT is largely a political decision and that IT will not materially change the manner in which the BSP conducts policy.

At the theoretical level, the main difference between IT and monetary targeting is the role of expectations. Given the long and variable lags of monetary policy and inflation, IT essentially works by conveying expectations to the markets about the future course of monetary policy. It is expected that markets will create their own assessment of the future direction of policy and will try to glean whatever clues they can from policy statements, speeches of policy committee members and the like (Meyer 2001). To the extent that policymakers expect to ease or tighten in the future, conveying an expectation that policy rates will move in a given direction typically immediately changes long-term rates and asset prices in ways that support the objectives of that policy. This indicates that

long-term interest rates may move sooner than would otherwise be the case, in effect reducing lags in the effect of monetary policy on aggregate demand.

The IT regime can be represented by a simple reaction function[21] whose behaviour is affected by central bank preferences – the inflation target, the inflation forecast, the policy instrument and an approximate knowledge of the period it takes for the policy instrument to have its maximum effect on inflation.

The IT approach starts with the monetary authorities announcing to the public an explicit quantitative target that is consistent with the other economic goals of the real, fiscal and external sectors. The BSP then generates inflation forecasts based on its inflation models, which capture the various transmission variables of monetary policy. These forecasts are then compared with the inflation target. If the inflation forecast is in line with the target on a suitable horizon (a two-year horizon), then the monetary stance is appropriate. If the forecast is above (or below) the inflation target, then the monetary stance is too expansionary (or restrictive) and the policy lever (or policy instrument) should be raised (or lowered).

The Monetary Board (MB) of the BSP is responsible for formulating and conducting monetary policy to attain price stability that is conducive to sustainable economic growth. The MB uses CPI inflation (published by the National Statistics Office) as its policy target, expressed in a range for a given year and set by the national government in coordination with the BSP. The overnight repurchase rate (RP) and RRP are used as the MB's key policy variables to signal shifts in the monetary policy stance. There are, however, exemptions (or escape clauses) when targets are breached. Exemptions include those originating from volatility in the prices of agricultural products, natural calamities or events that affect a major part of the economy, and significant government policy changes that directly affect prices, such as changes in the tax structure, incentives and subsidies (BSP 2004).

The conduct of IT is left to the Advisory Committee (AC) of the BSP. The MB created the AC to strengthen the conduct of IT, by advising the MB on issues relating to the formulation and implementation of monetary policy. The AC meets every six weeks to deliberate, discuss and make an in-depth, comprehensive, broad-ranging and balanced assessment of monetary conditions, the economic outlook, inflationary expectations and the forecast inflation path before advising the MB. AC members include the BSP governor, who serves as chairperson; the deputy governor for the banking services sector, research and treasury; the deputy governor for the

supervision and examination sector; the managing director for research or an alternate; the director of the Department of Economic Research; and the director of the Treasury Department.

It is instructive to note that in this framework, money supply remains an important element in deciding the monetary stance but it ceased to be an intermediate target of the BSP in achieving an acceptable inflation rate. This suggests that there is less need to be concerned about protective levels of international reserves, as it also implies abandonment of exchange rate targets and fiscal deficit, as the IT requires an independent central bank.

2.8.1 The instruments of IT

The most significant observation so far is that Philippine monetary policy, in practice, does not seem to be moving away from attempts to control two objectives – inflation and exchange rate – with one instrument. It is implied that the BSP's instruments are limited to the interest rate response, with some form of foreign exchange controls and administrative measures. The past two years showed the limitations of these measures in dampening inflationary risks.

The way the BSP conducts IT starts with a description of the nature of capital inflows since the currency crisis. In every year from 1997 to 2005 there was a marked deterioration in capital flows which fell to a net outflow of US $1.4 billion in 2004 from a net inflow of $11.1 billion in 1996. Trends in investment flows lie at the root of this decline. Direct investment inflows have been relatively low given the size of the economy, generally falling between US $1.5 billion and $2 billion a year in balance of payments terms in recent years. However, inflows fell to just US $319 million in 2003 amid political and security concerns in advance of the recent election. Portfolio investment flows, inherently more volatile, have reflected international and regional economic developments (such as the currency crisis in 1997), trends in the interest rate differential on peso assets and foreign perceptions of political risk. Thus portfolio investment registered a net inflow (net of foreign-currency bonds) of US $6.9 billion in 1999 but a net outflow of $1.4 billion in 2004.

In such an environment, the next concern is what instruments the BSP should employ this time. While open market operations (OMOs) have continued to be vital as the BSP's main instrument of monetary policy, the reserve requirement and rediscounting were redesigned after 1997 to enhance their role in liquidity management rather than credit allocation. This

strategy indicates rather clearly that the BSP's responses to market conditions have even heightened with the floating exchange rate regime.

On a more substantive point, it could be argued that many of the instruments used by the BSP are meant to control liquidity and interest rates.

The role of the reserve requirement was significantly evident in 1990, when the CBP imposed a 25% total reserve requirement on commercial banks (the highest so far since 1986) and a balance of payments crisis emerged, hastened by the rise in oil prices following the Gulf War. To reduce intermediation costs and improve the efficiency of markets, reserve requirements across banks and deposit types were unified and gradually reduced through the years. However, during the past few years, the reserve requirement has frequently been used to arrest price run-up. In 2003, the liquidity reserve ratio was raised to temper undue speculations in the foreign exchange market, bringing the total reserve ratio of banks to 17%.

Until the end of 1985, the rediscounting facility was utilized largely as a facility for credit allocation. Preferred or priority activities were afforded low rediscount rates to ensure an attractive spread between the rediscount rate and the bank's relending rate, so as to encourage fund flows to these priority activities. The rediscount rate was made market-determined to truly reflect the marginal cost of the funds of banks, and ceilings on bank relending rates were lifted in line with the deregulation of interest rates in November 1985.

In a move to refocus the use of the rediscounting window from a selective credit policy instrument to a monetary policy instrument, the BSP liberalized access to regular rediscounting to include all sectors of the economy in 2002.[22] However, the implementation of a market-based pricing mechanism for loans was deferred for one year in order to help promote the development of SMEs. With the rediscounting budget at 20 billion pesos at end 2003, the rate trended downwards from a high of 15.2% in 1992 to 9.2% in 1999 and further down to 4.7% in 2003, except in 2001 and 2003, when rates were raised on several occasions to ease inflationary pressures arising from volatility in the peso-dollar rate.

Apart from the regular rediscounting window, the BSP opened a dollar rediscounting facility known as the Exporters Dollar Facility (EDF). In April 1999, the EDF was expanded to include yen-denominated loans and subsequently renamed the Exporters Dollar and Yen Rediscount Facility (EDYRF). With a current budget of US $500 million, transactions under this facility continue to be modest. EDYRF rates are based on the prevailing three-month London Interbank Bid (LIBID) rate, subject to review every

three months. In line with the declining trend in world interest rates in the past few years, the rediscount rate on dollar loan investments slowed to nearly 1%, while yen loan availments declined to 0.03% by end 2003.

The BSP relied on its traditional instruments, RPs, RRPs, BSP holdings of government securities and the newly created Special Deposit Account (SDAs). There were episodes of significant tightening in response to inflationary pressures and narrowing interest rate differentials, owing to volatility in the foreign exchange market and rising world oil prices. The SDAs provided an alternative for the placement of banks' excess funds after the currency crisis, in view of the Bureau of the Treasury's partial rejection of the high bid rates on treasury bills. Unlike the RRPs and RPs, this instrument is non-collateralized. It is priced at a premium over the RRPs.

On occasion, the BSP offers a tiered borrowing-rate system aimed at encouraging banks to lend to the public and discouraging them from parking their funds in the BSP's overnight facility. Under this system, a bank's 5 billion peso deposit in the BSP's overnight RRP earns 7%, but the next 5 billion pesos yields only 4%, and any amount in excess of 10 billion pesos earns only 1%. However, when the peso sank to new lows in March 2003, the BSP abolished this tiered scheme to reduce funds in circulation that may be used to speculate against the peso. It restored the scheme in June 2003 as the foreign-exchange market stabilized, but abolished it again in late August 2003 when the peso slid sharply against the US dollar.

As mentioned earlier on, interest rates for both the RP and RRP are determined by the BSP based primarily on the outlook for inflation over a two-year horizon (or the estimated length of the lag of monetary policy). The BSP announces these rates and lets the market determine the volume of transactions. Trading for various OMOs runs at different times during the day. Under this system, there is no limit on the amount that banks can place with the BSP. By announcing the specific rate at which it will borrow, the BSP is compelled to accept whatever volume is offered by banks.

Although the BSP and IMF pronouncements classify the Philippine exchange rate regime as independently floating, in practice the BSP manages its movements rather than simply leaving it to be set by the market. This is usually evident when there are speculative attacks on the exchange rate until the BSP enters the market to restore orderly market conditions.

After the currency crisis in 1997, the exchange rate became even more volatile due to a confluence of domestic and external factors. Over the long term the peso has depreciated against the US dollar. However, this depreci-

ation has tended to be realized through sharp one-off corrections after periods when steadiness of the peso against the dollar has produced an appreciation in real terms due to the large inflation differential.

The BSP maintains that the underlying force which determines movements of the peso-dollar rate is the relationship between the amounts of dollars supplied and demanded. Sources of foreign exchange include export of goods and services, net transfers, loans, foreign direct investment and portfolio investments, while foreign currency is used for imports of goods and services, loan repayments (medium- and long-term as well as short-term) and interest payments on direct and portfolio investments. However, risk premium has been a significant factor during the past decade or so in the determination of the nominal peso-dollar rate.

The BSP Treasury maintains an internal benchmark for its foreign reserves as well as the exchange rate based on the inflation models of the BSP Department of Economic Research. Part of this level of foreign reserves includes an amount of foreign exchange that could be used for intervention in the PDS if pressure on the exchange rate ensues. Although the BSP's participation in the PDS has been extremely subdued since 2000, the brunt of intervention to manage the exchange rate has been through the BSP's policy levers, suggesting that heavy management of the exchange rate reveals a strong attachment to exchange rate stability.

On the other hand, banks look at the level of reserves of the BSP as well as the debt and current account sustainability of the country. The relevance of risk perception in the process of exchange rate determination suggests that the BSP must not only monitor expectations but also, through its actions, influence behaviour.

2.8.2 Remaining issues regarding the switch to IT

IT was adopted at a time of steady deceleration in inflation and modest growth in real GDP, somewhat reinforcing IT-derived benefits. However, the relatively stable inflation rate was not unusual, fiscal deficit and a relatively high proportion of non-performing loans within the banking system continued to linger, and domestic and external risks and uncertainties intensified in later years. These factors pose crucial challenges to the BSP, as a monetary policy response may be required so as not to forestall growth momentum and not to exacerbate the economy's weaknesses.

It is implied so far that the BSP does not have goal independence in that the inflation target is set not only by the BSP but also with other government agencies. However, it does have operational and instrument

independence (Mariano and Villanueva 2006). The BSP then has sole discretion regarding its reaction function.

There are issues though that need to be expounded. The issue of fiscal dominance remains, following the huge public sector deficit up until end December 2006. In that scenario, the effectiveness of monetary policy is argued to be limited. Section 2.8.1 stressed that the prerequisites for successful IT include the absence of fiscal dominance.

Republic Act (RA) No. 7653 or the New Central Bank Act provides safeguards against fiscal dominance in the form of prescribed limits on the extent of financial assistance that can be set by the national government. In particular, Section 89 of RA No. 7653 states that the BSP may provide assistance to the national government in the form of provisional advances, but the amount of such advances is limited in terms of both duration and amount.[23]

Another factor is the health of the domestic banking system in which a relatively high proportion of non-performing loans persists and the practice of risk management in commercial banking and in bank oversight is not yet widespread. The implication in such a scenario is that price stability should not be the only target of the BSP. Indeed, the prerequisites of IT are clear on this, but it is unclear what other variables to include in the BSP reaction function.

The inflation targets were breached in 2004, 2005 and 2006. The factors that pushed inflation above the target were predominantly supply-side phenomena, arising in large part from a series of supply-side shocks to the economy, particularly higher prices for food, fuel and transport. The BSP opted to maintain its monetary policy settings, that is, leaving its monetary stance unchanged. However, the liquidity reserve was raised by two percentage points as a pre-emptive measure against the inflationary impact of volatility in the foreign exchange market.

The uncertainties the BSP has faced in the switch to IT have clearly posed difficulties for the central bank, as similar events may demand different responses because overall economic conditions must be taken into account. As implied earlier on, IT was adopted when inflationary pressures were benign. However, serious tests came into play starting in 2003 when, apart from international oil price shocks, volatility in the foreign exchange market became more pronounced due to a weakening of investor confidence and a declining interest rate differential.

2.9 Concluding thoughts

The Philippine economy has shown buoyancy in markedly deteriorating conditions, but long-term growth has been relatively modest considering the pace of economic performance of its Southeast Asian neighbours. Growth performance has not been steady, as periods of swift upturn are regularly interrupted by episodes of macroeconomic instability, highlighting an underlying weakness in the growth process. There have indeed been improvements in recent years but these are far from dramatic.

This chapter claimed that inflation in the Philippines has historically been high and variable compared to its Southeast Asian neighbours, due to a convolution of shocks or disturbances in various areas of the economy, notably the external sector (which relates to the balance of payments), the real sector (which relates to output or production) and the monetary sector.

This chapter maintained that the challenge and the fundamental problem for growth continues to be the low rate of national savings and investment, stagnant capital and low productivity.

The three major economic policy strategies which have become salient during the last three decades or so – enhancing revenue and fiscal balance, restructuring and liberalization of the economy and the switch to IT – have crucial implications for long-term growth. The low ratio of tax revenue to GDP in most years has meant that the government has never invested adequately in physical and social infrastructure, generating serious bottlenecks in mobilizing the Philippines' considerable resources. The situation has been exacerbated by the primacy accorded to achieving fiscal equilibrium, with the spending side bearing the burden of making up revenue shortfalls.

A critical development though is the capital account liberalization that was adopted with the broad view to remove the structural constraints that have distorted the development of the economy. However, the currency crisis in the second half of 1997 clearly proved the painfulness of this strategy to open up the capital account ahead of the trade sector. Output growth slowed and unemployment rose, while significant pressure affected the banking system.

With these two policy strategies serving as backdrop, this chapter laid out three developments that remain crucial. First, the strategies contributed to a boom-bust cycle of economic episodes, especially after the authorities embraced various measures of liberalization and globalization of financial markets.

Second, this boom-bust cycle is argued to reflect stop-and-go measures implemented by the authorities. Yet the measures implemented are critical to achieve a sustained and efficient rate of investment and savings and macroeconomic stability.

Third, apart from the structural and institutional limitations, it seems apparent that through the decades, Philippine monetary policy in practice has not moved away from attempts to control two objectives – inflation and the exchange rate – with one instrument. In particular, the BSP's reaction to exchange rate changes remains unclear, in that it falls on the middle ground between reacting to exchange rate changes as if they are always inflationary (or deflationary) and assuming that exchange rate movements reflect changed fundamentals. This approach clearly sets real and financial limits on private investment in particular and on long-term economic growth in general.

The implication for IT as a monetary policy framework is then significant. With globalized finance markets, the Philippines is even more exposed to fluctuations in capital flows, exchange rates and international interest rates that are largely determined by factors outside of its control. The open links to the international financial markets seriously complicate the management and development of domestic capital markets. Hence, from a broader perspective, macroeconomic management is now even more complex that it was before.

Notes

1. In 1981, businessman Dewey Dee decided to default on debt owed to various financial institutions. This triggered a rash of insolvencies in investment houses and finance companies leading to a financial crisis (Gochoco-Bautista 1999).

2. In the model, total factor productivity (TFP) is measured as a residual, and a change in measured productivity might capture not only the change in technological innovation, but also political and external shocks, changes in government policies and institutions and measurement error.

3. According to the Asian Development Bank (2004a) report *Enhancing the Efficiency of Overseas Workers Remittances*, overseas Filipino workers are officially remitting an average of at least US $7 billion a year, but most of these funds were used for excessive consumption and therefore are unproductive.

4. Includes transactions in equity in which the investor holds less than 10% of the total equity of an enterprise. The amount is net of proceeds from the sale and purchase of debt securities (bills, bonds, notes and money market instruments).

5. In the literature, giving theoretical sense to the residual, Grossman and Helpman (1991), Romer (1990), and Aghion and Howitt (1998) attempted to include the role of technology, i.e., better instructions for combining raw materials into useful products and services. Romer (1986), Lucas (1988) and others tried to incorporate the critical role of externalities, including spillovers, economies of scale and various complementarities in explaining TFP.

6. The share of the agriculture and services sectors were experimented with but turned out to be statistically insignificant.

7. Note that these shifts have been corrected in some studies. The view behind this is that if the manufacturing sector has higher productivity than the agriculture and services sectors, any shift in the composition towards the manufacturing sector is captured as an increase in TFP.

8. Agricultural performance has been affected by a combination of low productivity (following poor agricultural infrastructure and inadequate irrigation systems as well as weather disturbances such as typhoons, earthquakes and the El Nino and La Nina phenomena); inability to maintain, expand and modernize infrastructure due to budgetary constraints; volatile prices for farm outputs; and inequitable land ownership (Balisacan and Hill 2003).

9. The 14 GOCCs include the Philippine Ports Authority and National Irrigation Administration (infrastructure); National Power Corporation (NPC), National Electrification Corporation, Philippine National Oil Company (PNOC), and Manila Glass Corporation (energy); Philippine National Railways, Light Rail Transit, and Metro Manila Transit (transport); Manila Waterworks and Sewerage System (MWSS) and Local Water Utilities Corporation (water); the national postal service and the national telegraph service (communication); and the National Food Authority (food price stabilization).

10. When the other public sector accounts, such as, the social security system, the Government Service Insurance System (GSIS), the BSP, other government financial institutions and local government units, the Consolidated Public Sector Financial Position is derived.

11. This single-equation model, along with the multiple equation model, is currently used by the BSP to produce monthly forecasts of inflation up to 24 months.

12. Refers to the average of the industrialized and developing countries (Africa, Asia, Europe, Middle East and Western Hemisphere).

13. Includes Bangladesh, Bhutan, Cambodia, Chian, Fiji, India, Indonesia, Korea, Lao PDR, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Pakistan, Papua New Guinea, Samoa, Philippines Sri Lanka, Tonga, Vanuatu and Vietnam.

14. For the whole of 2005, average inflation of Indonesia was recorded at 10.5%. (IMF 2006b).

15. The coefficient of variation (defined as the ratio of standard deviation and mean) average monthly inflation from 1999 to 2005 are as follows: Philippines

(3.108), Malaysia (1.572), Singapore (0.696), Thailand (2.911) and Indonesia (20.247).

16. See Table 5 "Contribution of various factors to inflation" in Mohanty and Klau (2001), "Modelling aspects of the inflation process and the monetary transmission mechanism in emerging market countries." Bank for International Settlements.

17. The PDS is an electronic, screen-based interbank trading system with the commercial banks as the major participants. Prior to its establishment, foreign exchange transactions were done on-floor and off-floor by the Bankers Association of the Philippines.

18. It should be noted that worldwide capital flows surged to emerging market economies in the early 1990s, largely driven by supply factors rather than by policies in emerging economies.

19. Based on BSP data on purchases and sales of foreign exchange at the PDS.

20. Also cited in Balisacan and Hill (2003), Chapter 3: Monetary and Exchange Rate Policy.

21. Also discussed by Masson et al. (1997).

22. BSP Circular dated 4 October 2002 revisions to rediscounting policy includes (1) expansion of the rediscounting facility to a more general type of facility that will be available to all sectors, but excluding certain types of loans such as interbank loans, DOSRI, extended/restructured loans, past due loans, unsecured loans (other than the microfinance loans), personal consumption loans, and loans for capital asset acquisition; (2) standardization of eligibility requirements and rediscounting ceilings across all types of banks; and (3) the adjustment of the rediscounting arte to reflect actual market rates on comparable maturities (BSP 2002).

23. Section 89 of RA 7653 states that the BSP may make direct provisional advances with or without interest to NG to finance expenditures authorized in the yearly appropriation, provided that such provisional advances shall not, in their aggregate, exceed 20% of the average annual income of NG for the last three preceding fiscal years. These advances must be repaid before the end of three months, extendable by another three months as maybe allowed by the Monetary Board following the date the NG received such provisional advances.

3 The Macroeconomics of Inflation Targeting

3.1 Introduction

Chapter 2 emphasized that monetary policy in the Philippines has been difficult and ineffective at some points during the past twenty-five years. Over the long run, Philippine average inflation has been high and variable when compared with its Southeast Asian neighbours. Inflation has been worsened by a history of fiscal weakness in some periods, an unstable exchange rate, a small and weak banking system and a loss of control over monetary authorities with the increasing globalization of financial markets.

Central to these findings is the observation that the BSP has worked towards multiple objectives with one instrument in its operational framework. In the context of a new monetary policy framework, IT, Chapter 2 shared some doubts as to whether IT in the Philippines could be associated with an instantaneous adjustment of inflation expectations and an intrinsic persistence of inflation.

These doubts necessitate an understanding of the macroeconomics of IT. This chapter starts with a look at the basic time-inconsistency model of monetary policy in section 3.2 and the issue of credibility in section 3.3. Section 3.4 reviews the costs of inflation. The relationship between monetary policy, employment and output is set out in section 3.5, before the nominal anchors of monetary policy are presented in section 3.6. How theories set up the model of IT is discussed in section 3.7. The monetary policy transmission mechanism is discussed in detail in section 3.8. The relevance of IT to the Philippines is analysed in section 3.9, while section 3.10 presents some concluding thoughts.

3.2 The basic time-inconsistency model of monetary policy

The macroeconomic foundation of IT is derived from the view that private markets, low levels of government intervention, a more open economy, a more liberalized financial system and high levels of foreign direct investment are important and in fact crucial to sustainable economic growth and development. This view hinges on three components. The first is based on the theory of rational expectations, which argues basically that there is an inherent time-inconsistency in monetary policy, resulting in an inflation bias (where the actual inflation is higher than the monetary authorities' target). Hence, some institutional arrangements such as central bank independence and a policy rule such as IT will lead to a lower and more desirable inflation rate. The second component is the argument that there is no long-run trade-off between inflation and unemployment,[1] implying that monetary authorities can achieve a desirable low inflation rate without negatively impacting employment, investment and economic growth. The third component deals with the impact of inflation, that is, the optimal rate of inflation.

Equally crucial in the analysis of IT are issues which stem from the theory of rational expectations and the non-accelerating inflation rate of unemployment (NAIRU) – time-inconsistency and the credibility issue. Time-inconsistency describes situations where, with the passing of time, policies that were determined to be optimal, say, the previous day, are no longer perceived to be optimal today and are not implemented. The more popular theories that have expounded time-inconsistency were those of Kydland and Prescott (1977) and Barro and Gordon (1983). Dennis (2003) noted two salient insights of this model. First, the reason why these policies would not be implemented could also lead to inflationary policies being implemented in their place, indicating that time-inconsistency could generate inflationary pressures. Second, even if central banks know the timing and magnitude of the effects of their actions, discretionary policy or that policy where the central bank is free at any time to alter its instrument setting (Walsh 2003) does not result in the maximization of its objective function. In these situations, time inconsistency would mean that the optimal policy of zero inflation would not be compatible with the objectives of policymakers over time.

Following this model, recent studies have argued that time-inconsistency can affect more than just the average rate of inflation that prevails in the

economy, but also how policymakers respond to shocks and how resources are allocated through time.

Recent studies on time-inconsistency have argued that the model of Kydland and Prescott (1977) in particular embraces not only the phenomenon that produces high inflation rates and the discretionary inflation bias but also how time-inconsistency affects the economy's transition through time and how it affects policymakers' ability to stabilize inflation (Dennis and Soderstrom 2002).

Assuming that a central bank's objective continues to be to keep inflation close to the target rate and the unemployment rate close to the market-clearing level, a typical central bank faces a trade-off. A negative supply shock (say an oil price shock) would raise both unemployment and prices, and would move interest rates to dampen whatever adverse movements in either variable. Given this trade-off, a central bank must take a gradual approach when supply shocks occur to bring inflation to its target rate over a number of periods. This is argued to dampen any unnecessary unemployment. However, it is argued that expectations of households and firms are equally important in this situation. If households (which in this case are assumed to be workers as well) expect inflation to rise in the future, they would negotiate larger wage increases today, while firms would similarly want to raise their prices today.

A central bank would then be left with a higher unemployment rate and inflationary pressure caused by an adverse supply shock. But assuming prices are sticky, a central bank is expected to increase its interest rates and to keep them high for a prolonged period. Higher interest rates would induce households to cut current consumption and save for future consumption instead. Meanwhile, firms, which face lower demand for their products, would decide to temper any price increases so as not to lose profits, in turn moderating inflation in the current period. Moreover, the central bank's promise to keep interest rates high over a longer period allows households and firms to expect that inflation would be lower in the future. At this point, households would then negotiate lower nominal wages, while firms keep price increases on a downward trend. In this case, inflation expectations along with a tight monetary policy over the longer run help to reduce current inflation; and if the promised policy is implemented, future inflation would also be lower.

The above situation is argued to be time-inconsistent and would not be implemented. The critical point is the promise to keep monetary policy tight in the future, which dampens the inflationary impact of the adverse

supply shock. But having given this promise, while lower inflation in the current period is secured, the central bank now has less incentive to implement the promised tight policy in the future. In the meantime, when households realize that the central bank will renege on its promise, households and firms would expect even higher inflation than if the policy was implemented. To dampen the adverse effect of an increase in the oil price, the central bank would then have to raise its interest rates even higher today, which would eventually generate more unemployment. In this scenario, the effect of time-inconsistency leads to a stabilization bias, as it affects the ability of the central bank to stabilize inflation expectations and hence stabilize inflation itself. This stabilization bias is argued to add to inflation's variability, making it more difficult for households, firms and the central bank to predict.

At the theoretical level, the time-inconsistency issue is argued to be encouraging as it attempts to explain the inflationary bias in monetary management. It has contributed to monetary policy analysis by emphasizing the need to treat central banks as responding to the incentives they face. In fact, if there is indeed an incentive towards time-inconsistency and the public has found ways to deal with it when it is significant, this does not necessarily result in a serious policy bias away from the optimum (Drazen 2000). Nevertheless, the general concepts and their implications mean that time-inconsistency warrants careful treatment.

In addition, the concept of time-inconsistency emphasizes the role of institutions and political factors on the one hand and credibility issues on the other hand in influencing policy choices. Both provide crucial insights in the design of the monetary policy framework.

However, the empirical evidence is mixed. Blinder (1997) argued that the time-inconsistency literature is largely irrelevant to the current practices of central banks. The argument is that if central bankers understand that attempts to drive unemployment beyond its natural rate will ultimately be unsuccessful, they will not attempt to pursue it. In another study, Persson and Tabellini (2000) argued that the time-inconsistency approach does not predict that the central banker would want to generate policy surprises in equilibrium. Rather, in an inflationary equilibrium, the central bank's lack of credibility would cause a restrictive policy to produce a recession. This, in turn, would make the central banker cautious in pursuing an anti-inflationary policy.

3.3 The credibility issue

Apart from time-inconsistency, another crucial issue in the analysis of IT is the credibility of the central bank. Credibility of the central bank to pursue its primary objective comes into the picture when it is seen as one potential solution to the inflationary bias.[2] This suggests that the central bank is forced to bear some cost of any deviation from its announced policy objectives. However, studies have argued that a lack of central bank credibility has been a significant source of inflation persistence (Blejer and Liviatan 1987; Dornbusch 1991; Sargent 1983; Van Wijnbergen 1988; Vegh 1992; Agenor and Montiel 1999). The repeated failure of stabilization programmes in developing countries has been attributed to private agents' lack of confidence in the ability of governments to persevere in reform efforts and to maintain a consistent set of policies over time.

Cukierman (1992) argued that a key feature of the literature on mechanisms aimed at establishing or enhancing policy credibility and reputation of policymakers is the stress that private agents interact strategically with policymakers and determine their behaviour based on their expectations about the likely course of current and future policies. Or credibility problems can even be self-fulfilling, that is, policy reversals occur because of the belief that a policy will be aborted (Rodrik 1991).

Credibility problems could emanate from internal inconsistency, time-inconsistency, asymmetric information, policy uncertainty and stochastic shocks, as well as from political uncertainty. First, a credibility problem may stem from inconsistency between government's stabilization programme and reforms and other policies being pursued simultaneously. Moreover, inconsistencies in the overall formulation of an economic programme or an inappropriate sequencing of policy measures may hurt the credibility of the stabilization effort, even if the components of the programme are internally consistent.

Second, lack of credibility may result from a time-inconsistency dilemma faced by policymakers, that is, their ex post strategy may differ from their ex ante strategy. An example is that once a nominal wage is set by the private sector, authorities may be tempted to disinflate less than they had promised, in order to generate output gains (Barro and Gordon 1983). This is because policymakers are concerned about both inflation and unemployment. But such an announcement is argued to be non-credible in the end.

Another example of a time-inconsistency problem is one that may emerge in a small open economy opting for a fixed exchange rate arrange-

ment (Agenor and Montiel 1999). By fixing the exchange rate (and therefore the domestic price of tradeable goods), the policymaker's objective is to dampen any inflationary expectations that may ensue in the nontradeable sector of the economy. However, price and wage setters understand the policymaker's incentive to deviate from the fixed exchange rate announcement and to devalue the currency in order to depreciate the real exchange rate and stimulate output; they therefore will not fully believe the initial announcement.[3] The time-inconsistency dilemma implies that rational agents could discount announcements of future policy actions or assurances regarding the continuation of present policies if authorities have an ex post incentive to renege on their promises. This could affect inflation performance, as it will be difficult to reduce over time.

A third source of credibility problems is incomplete or asymmetric information about the authorities themselves. Barro (1986) argued that rational agents would have difficulty in assessing how serious the incumbents really are about fighting inflation. Without a reputation of being "serious" or "tough" authorities may find it difficult to dampen any inflationary pressures that may ensue.

A fourth source has to do with the uncertainty surrounding the policy environment and the predictability of policy measures. In particular, even if the authorities do not intend to depart ex post from preannounced policy measures, exogenous shocks could undermine authorities' stabilization efforts (Dornbusch 1991; Orphanides 1992). This would lead to a lack of policy predictability and could cast doubt on the sustainability of the reform process. This might eventually affect the credibility of an otherwise consistent and viable programme.

Finally, a credibility problem may stem from public perceptions that policymakers will be unable to implement their programmes or reforms because their political base would crumble, as may occur when the government is built on a coalition of parties with different ideological orientations or when the government's legitimacy is in doubt. Although private agents may believe in the government's economic objectives and policy intentions, they will also evaluate the political feasibility of potentially painful macroeconomic reforms. The less cohesive political forces are, or the greater the strength of vested interests, the more severe will be the credibility problem.

Establishing a reputation for responsible policymaking is particularly important in countries where failed stabilization attempts have created a deeply rooted skepticism and lack of confidence in the willingness or capacity of policymakers to reduce inflation. To counter the problem of

self-fulfilled policy outcomes, some economists have proposed slow but steady approaches to stabilization measures in order to build credibility while others suggest bold reforms that send clear signals as to the government's intentions (Rodrik 1991).

However, in reality, it has proven difficult to provide evidence, even retroactively, regarding the particular type of credibility problem authorities face. Empirical studies have embraced the premise that a credible stabilization programme would translate into a change in the process driving a key variable such as prices, money demand, nominal wages and interest rates, for instance, while a programme that lacks credibility would often have no discernible effect.[4] Although some improvements have been made in gauging the practical importance of the alternative sources of credibility problems, devising appropriate policy responses or undertaking corrective measures has become more difficult. Most empirical studies point to how the economic setting has complicated responses to credibility problems.

In particular, when credibility is undermined by the time-inconsistency problem, it is difficult to implement the proposed solution of assigning policymaking to an independent authority without the motives and strategic advantages of government in its interactions with the public. Independent central banks are seen as relatively apolitical institutions, which put a different emphasis on the alternative policy objectives than the government. It is argued that if monetary policy is conducted by an independent central bank, a lower time-consistent rate of inflation will ensue.

Although Blinder (1998) suggests that independent central banks are rewarded with more favourable short-run trade-offs, the majority of empirical findings on the credibility-enhancing effects of central bank independence do not support the hypothesis that independent central banks are able to achieve better inflation performance at little or no cost in terms of lost employment and output due to the improved credibility of their policies (Fisher 1994; Posen 1995; Fuhrer 1997). In fact, some empirical findings reveal that central bank independence is unrelated to economic growth (Eijffinger and De Haan 1996; Barro 1995; Grimes 1991).

Failed stabilization attempts suggest that the credibility problem each new monetary framework must confront become more severe over time. The shift to IT makes the credibility issue even more crucial in the formation of private agents' long-run expectations. This is difficult to capture in a unifying analytical framework to guide monetary authorities. At the heart of this issue is Lucas' (1976) critique, which argues that estimated functional forms obtained for macroeconometric models in the Keynesian

tradition (such as dynamic IS-LM models) are not deep because these models do not correctly take into account the dependence of private agent behaviour on perceived or anticipated government policy rules for generating current and future values of government policy variables.

While such models may be useful for forecasting future states of the economy conditional on a given policy rule, they are flawed for the purpose of analysing the effects on the economy of changes in government policy rules. Specifically, they may seriously mislead policymakers as regards the effectiveness and desirability of their policy rule choices.

Broadly, these findings suggest that the role of expectations in monetary policy has become more significant in a globalized financial market. This necessitates an understanding of how monetary policy affects the aggregate economy.

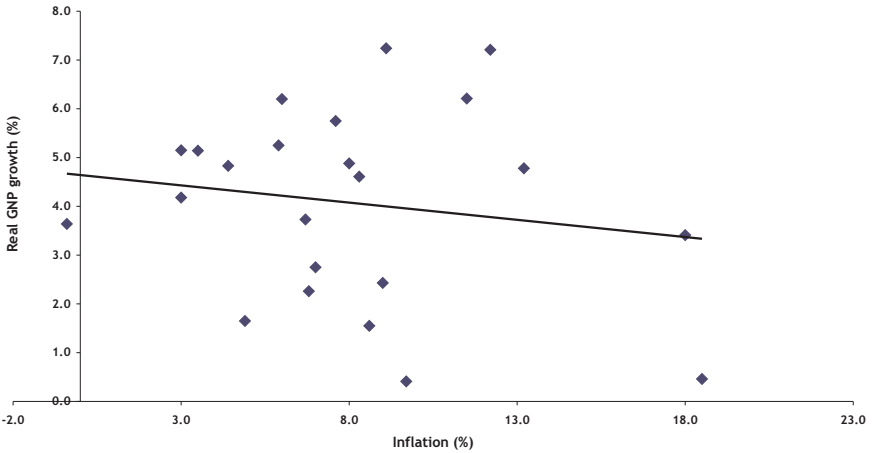
3.4 The costs of inflation

Indeed, the relative weight given to price stability through the years takes us back to the costs of inflation, defined as the overall reduction in real incomes. Experience shows that higher inflation is often associated with more variable inflation. Since planning decisions are, however, typically based not on rates of price increase but rather on absolute price levels, volatile inflation leads to cumulatively larger errors in forecasting future prices. This ultimately compounds the difficulty of planning future expenditures and discourages commitment of resources to long-term projects.

High inflation might create incentives to engage in non-productive ac tivities. As such, it may induce greater allocations to services industries that cater to the handling of transactions and thus overinvestment in the financial sector.

Inflation might further have distributional effects on those segments of the population whose incomes are fixed in nominal terms. This might lead to a reduction in even the nominal incomes of salaried workers, especially if the tax system is indexed on inflation.

Figure 3.1 shows the negative long-term relationship between inflation and real GNP growth for the Philippines from 1981 to 2005. The debt crisis years, 1984 and 1985, were removed from the full sample. A simple regression between inflation and real GNP growth implies that from 1981 to 2005 a one percentage point increase in inflation leads to a 0.1% reduction in real GNP growth. This is in line with the econometric evidence pre-



Source of basic data: BSP (2006), selected Philippine economic indicators.

Figure 3.1
Annual and economic growth in the Philippines, 1981-2005

sented by Mishkin and Posen (1997) that every one per cent rise in inflation can cost an economy 0.1 to 0.5 percentage points in rate of growth.[5]

Yap (1996) and Lim (1996) analyse the direct costs of inflation by estimating its impact on output components. Using the Philippine Institute for Development Studies (PIDS) annual macroeconometric model, Yap (1996) shows that a rise in sectoral prices and the general price level results in a decline in demand for the relevant sectoral output. In addition, the study finds that inflation as a proxy indicator has a negative impact on real fixed investment.

Lim (1996) also found, among others, that an increase in the inflation rate reduces output growth and eventually leads to an increase in the unemployment rate. Yap (1996) investigated further the relationship between output and inflation and claimed that only unanticipated inflation or monetary growth has a positive effect on the growth rate. Any increase in the expected inflation rate due to supply-related developments leads to a decline in the output growth rate.

3.5 Monetary policy, employment and output

Section 3.4 emphasized the importance of expectations and the channels of monetary policy transmission. This arises from the fact that real prices (as opposed to nominal prices) are the factors that enter into households'

decisions on how much labour to supply to the market and how much income to save as well as firms' decisions on how much labour to hire and how much to invest. In other words, it forms part of virtually all economic decisions.

If prices were perfectly flexible and responded instantly to market developments, then monetary policy actions would be immediately mapped into price levels, while changes in these actions would have no impact whatsoever on output. However, institutional arrangements are such that market price adjustments take place at different speeds. In general, there are delays and lags at every stage of policy transmission that could be prevalent during the period of recognition of any disturbance in the decision mechanism and, further, implementation, as well as in the timing of the effects of the policy action on the economy which are spread over time.

However, before such adjustments are realized, unexpected real sector disturbances may ensue and the impact of such disturbances cumulate before the next round of adjustments. This implies that such disturbances could impact badly on the efficiency of resource allocation. In such a scenario, the importance of monetary policy as a stabilizing factor (to a large extent in addressing disturbances) becomes clear. In the short term, the impact of monetary policy changes would be felt partially through an increase in output. However, over the long term the price level fully adjusts to the monetary policy action, so that output is unaffected.

This then creates a direct relationship between output and inflation in the short run, and therefore an inverse short-term relationship between unemployment and inflation. It is instructive to point out that in the literature higher output (lower unemployment) is associated with higher prices. In the long run, this relationship is absent. These features are reflected in the Phillips curve.

Conventional macroeconomic theory claims that the inflation-unemployment trade-off is central to understanding not only the effects of monetary policy but also other policies and events that influence aggregate demand for goods and services. In classical theory, money is neutral. It has been argued that it is only the numeraire in which prices are quoted. Changes in its quantity should affect the overall price level, but not relative prices, production and employment. However, in the empirical setting, this classical theory of monetary neutrality continues to fail; and money thus remains crucial.[6]

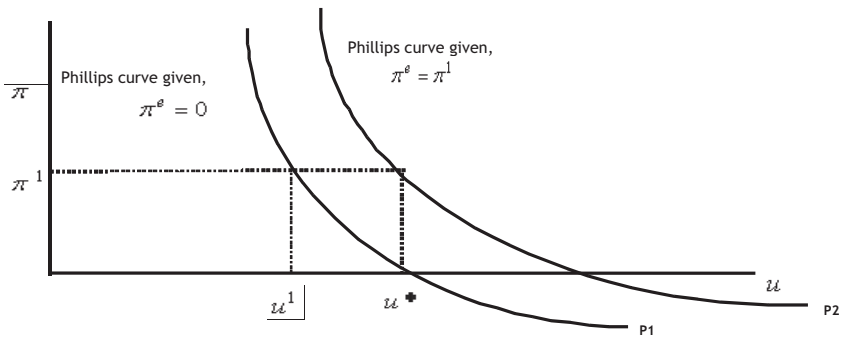
This analysis has been challenged by Friedman and Phelps and elaborated by Lucas as it ignores the impact of a central bank's attempt to exploit

the trade-off on the public's expectations in the conduct of monetary policy and consequently on the rate of inflation. Section 3.7 terms this the "expectations-augmented" Phillips curve. From this debate, several major lessons emerge from the policy experience and the accompanying theoretical debate.

First, the Phillips curve changes as people's expectations of inflationary outcomes change. Second, people's inflationary expectations change with changes in the economic environment, including the stance of monetary policy. Third, monetary policy actions bring about instability in the Phillips curve. This greatly complicates the conduct of policy, since failure to consider how the curve shifts in response to a policy change leads to an erroneous assessment of the impact of policy. Fourth, over time, the curve shifts in such a way that the output response becomes reflected in the price level alone.

The changing Phillips curve is presented in Figure 3.2. When the economy is in a steady state, that is, the unemployment rate is at the natural rate or the rate u^* that exists when inflation expectations are realized, the inflation rate and agents' inflation expectations π^e are both equal to zero. This is represented in curve *P1*.

Assuming the central bank is successful in driving the unemployment rate below the natural rate, say to u^1, at a cost of higher inflation at π^1, this higher inflation rate becomes incompatible with the original inflation expectations. Some adjustment in expectations must then be made to the inflation rate actually realized. This then feeds into agents' planning and



Source: Walsh (2002a).

Figure 3.2
Phillips curve and changes in expectations

pricing decisions, so that the natural unemployment rate would no longer be associated with zero inflation but rather with a positive inflation rate. Figure 3.2 shows that in such a scenario the Phillips curve shifts to the right, that is, to curve *P2*, and that continued attempts by the central bank to bring unemployment below the natural rate would result in higher and accelerating inflation. In the long run, such policies are bound to fail. Hence, central banks should focus on containing inflationary pressures, not on lowering unemployment.

The changing Phillips curve also assumes that expectations are rational and that the natural rate will converge to the actual unemployment rate over the long run. In a similar manner, the average expected inflation should match the average inflation actually realized in the long run. In other words, in the long run, u cannot deviate from u^*. However, in principle u^* can exhibit significant variation. The more recent literature on these inflation-unemployment dynamics adds another parameter to take into account supply shocks. While u^* is affected by changes in the labour market and institutions, supply shocks in the inflation process could include an oil price shock or large movements in the exchange rate.

Further, at any point in time, the economy faces a trade-off and changes over time. Expected inflation is a factor that is argued to explain the shift in the trade-off. Assuming all other things to be constant, an increase in expected inflation leads to an equal increase in actual inflation.

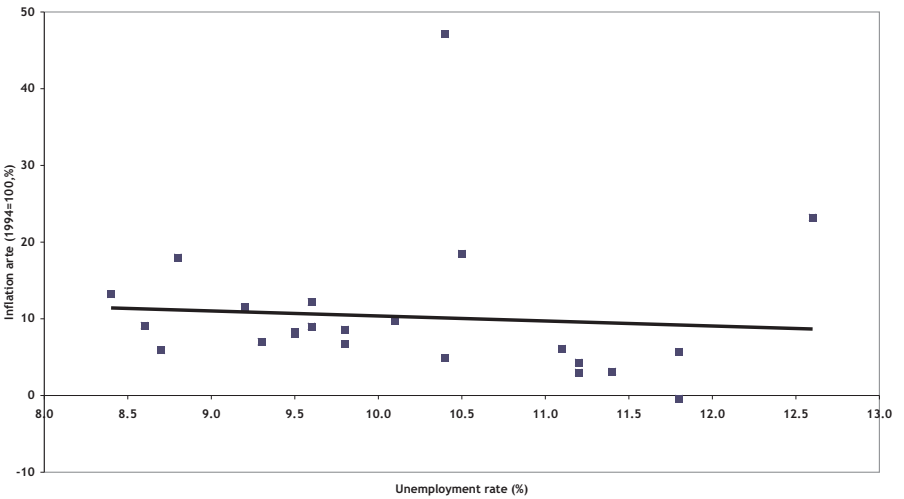
Moving forward, one of the reasons why the natural rate of unemployment could change over time is due to a phenomenon with which the labour market exhibits a form of "hysteresis" (Blanchard and Summers 1986). This phenomenon (originally derived from physics) is comparable to the failure of an object to return to its original value after being changed by an external force, even if that force is removed. In economics, this has come to mean that the impact of an exogenous shock persists in the system in some way, even after the shock ceases (Rosser 2003). Using the labour market, a similar phenomenon would arise if the natural rate u^* depends on previous unemployment u. If there is a change in aggregate demand, unemployment u will initially be affected by deviating from u^*. Consequently, a persistent effect on unemployment will be observed as u^* changed. The validity of this phenomenon is still subject to debate. But regardless of how this question is resolved, the phenomenon appears to validate the natural unemployment rate, suggesting that at any point in time, there will be an unemployment rate consistent with stable inflation.

When empirical evidence is taken into account, recent behaviour of both unemployment and inflation does not convincingly demonstrate a trade-off, particularly in the industrialized economies (Blanchard and Katz 1997). For instance, the decline in the unemployment rate to nearly four per cent in recent years in the United States has not been accompanied by an acceleration in inflation. On the other hand, the rise in the unemployment rate in Europe in the 1990s was not matched by a deceleration in inflation rates.

Recently, more thorough studies have challenged the validity of the natural unemployment rate, both in theory and in practice. Criticisms were raised regarding measurement difficulties, as well as operational ambiguities. The difficulty of measuring the natural rate is attributed to the fact that it varies over time, independently of monetary policy, and operates asymmetrically, hence, understanding of its inherent dynamics remains limited (Staiger et al. 1997; Blanchard and Katz 1997). Moreover, Galbraith (1997) and Palley (1998) argued that while inflation might be affected by unemployment, it is also affected by both endogenous and exogenous variables. This suggests that using the the equilibrium level of unemployment for policy decisions could be inadequate.

There are, however, studies that try to validate the natural rate. Among these is that prepared by Rowthorn (1999), who argued that using plausible assumptions on the structure of the economy, lower real interest rates can increase the rate of capital accumulation and lower the rate of unemployment in the long run. Ball (1997) provided some crucial empirical evidence strengthening the view that tight monetary policy can have significant negative and long-term impacts on unemployment. Using cross-country comparison, he argued that countries with larger decreases in inflation and longer disinflationary periods had larger increases in the rate of unemployment.

Indeed, the empirical results so far are mixed. These suggest that it would be difficult for central banks to shrug off any proposed trade-off between inflation and real variables, such as unemployment, investment and economic growth in the long run. However, it should be noted that the link between inflation and unemployment (and therefore output) is part of the monetary policy transmission mechanism. That is, monetary policy reduces, through various channels, aggregate demand and the output gap, and this in turn reduces inflationary pressures. In this case, the Philips curve not only reflects central banks trying to rev up output but also their trying to cut inflation.



Source of basic data: BSP (2006), selected Philippine economic indicators.

Figure 3.3
Annual inflation and unemployment rates, 1981-2004

However, it is also apparent from empirical findings that attempts to utilize this trade-off over the long run have produced only high inflation, with no lasting gains for the real sector in terms of productivity, employment or growth. This could support a rather large-scale conversion in economic thinking as to what central banks can and cannot do over the long run and how the monetary policy regime should be designed.

The formal debate on whether the Phillips curve is indeed downward sloping or flat in the case of the Philippines is rather scant. In fact, the very few studies show mixed results.[7] Figure 3.3 plots the annual CPI-inflation rate against the unemployment rate for the Philippines for the period 1981 to 2004. A regression line, a line which best fits the relationship between the two variables, is also shown.

The almost-flat line broadly indicates a very loose relationship between inflation and unemployment rate, as the regression explains only 10% of the variation in inflation for the period. However, when the high inflation years of 1984 and 1985 are added, the negative relationship between inflation and unemployment becomes a bit clearer but the relationship continues to be loose. The regression explains only 24% of the variation in inflation for the period.

These findings indicate that factors other than labour market pressures account for the major portion of price development. They also suggest that

the apparent inflation-unemployment trade-off is of limited use as a guide for setting monetary policy in the Philippines.

There are a few possible explanations for the rather flat relationship between inflation and the unemployment rate in the Philippines. Recent international literature points to globalization as a major contributory factor.[8] Lower trade barriers, deregulation, increased innovation and the greater competition brought about by the forces of globalization are suggested as having contributed to cross-border trade, even exceeding the impact of output. Production of tradable goods has expanded significantly and domestic economies are increasingly exposed to the challenges of international competition and comparative advantage. In such a situation, the monetary authorities' focus has shifted to macroeconomic stability and lower inflation.

This is where the credibility of a central bank may be relevant. If consumers believe that the central bank will keep inflation low, then it is expected that they would not react to temporary shocks (such as oil prices) by demanding higher wages. However, this would mean that the central bank and the public have the same thinking or rules. Otherwise, the situation would be much more challenging to the central bank.

3.6 Nominal anchors of monetary policy

Given the discussion in section 3.5, the issue of appropriate nominal anchors arises. These nominal anchors arguably solve the problem of time-inconsistency and credibility. A number of nominal anchors for monetary strategy can serve as targets.

A target growth path for a monetary aggregate such as the monetary base may be fixed. Since monetary aggregates are known quickly and are relatively easy for the public to understand, transparency is a main advantage of a monetary anchor. Unfortunately, velocity fluctuations have been so large in many countries that have liberalized their financial system that the relationship between monetary aggregates and goal variables have weakened and finally broken down.

An exchange rate may be fixed relative to the currency of a low-inflation economy, most frequently the United States. However, events such as the Asian financial crisis in 1997 have brought into question the feasibility of such fixed exchange rate systems. Large inflows and outflows of capital render the maintenance of fixed exchange rates costly for the domestic economy.

An interest rate target such as the Federal Funds Rate of the United States aims to maintain continuity in short-term interest rates; this is also known as "interest rate smoothing". However, interest rate smoothing can imply increased persistence of inflation. In addition, policies that maintain an expected constancy in interest rates tend to induce non-trend stationarity in the inflation rate (Goodfriend 1991).

An inflation target or price level target allows monetary policy to be directed to the considerations of the domestic economy. In contrast to monetary targeting, inflation targeting avoids problems posed by velocity shocks.

3.7 The model of inflation targeting: How is IT set up theoretically?

As stressed in Chapter 1, IT has grown rapidly in importance as a monetary framework. From the prerequisites discussed, IT could be defined as including four requirements for monetary management. First is institutional commitment to price stability as the primary goal of monetary policy. This commitment ensures the credibility of the ultimate objective of monetary policy and gives the central bank the independence to pursue it. The second requirement is a mechanism through which the central bank can be held accountable for attaining this ultimate objective. The third requirement is that this mechanism be effectively set up and determined, suggesting an encompassing (or eclectic) approach in establishing the policy instruments. The final requirement is operationalization of the mechanism, in the form of public announcements of targets for inflation and a policy for communicating to the public and to markets the rationale for decisions taken by the central bank. These four basic elements imply that IT is all about the central bank's objective and its reaction function.

In the long run, the IT model specifies the neutrality of money supply, with inflation determined by monetary policy and equilibrium values of real variables being independent of the money supply. In addition, the role of money supply is limited (or absent) in the model.

The crux in the theoretical foundation of IT is the expectations-augmented Phillips curve equation (this is also the *PC* curve in Figure 3.4 in the next section):

$$\pi_t = \alpha\pi^e + \delta y^g + \rho\pi_{t-1} + e_t. \tag{3.1}$$

Equation (3.1) assumes that the current realized inflation π_t depends on the expected inflation rate π^e, the output gap y^g, measured as the gap between output and the natural rate of output at full employment (or potential output) and an inflation shock e which captures any other factors affecting inflation. This specification assumes that the central bank controls the inflation rate through its policy instruments. Equation (3.1) indicates some price rigidity seen in π_{t-1} (Hall and Taylor 1997; Dornbusch, Fischer and Startz, 1998; Blanchard 1999; Mankiw 2000) but full price flexibility in the long run. This means that economic agents react to new information but they cannot fully adjust to it immediately. The presence of "stickiness" implies that shifts in aggregate demand, including those induced by monetary policy, can affect output and employment in the short run.

Recent research (such as Clarida, Gali and Gertler 2000) has introduced New Keynesian assumptions that characterize the expectations-augmented Phillips curve, but the most important difference is that the expected inflation rate is forward-looking. This means that when firms set prices that remain fixed for several periods into the future, they are concerned with the future path of inflation.[9]

Assuming a closed economy, conventional macroeconomic models combine a *PC* curve with an aggregate demand equation, as follows:

$$y_t^g = \rho y_{t-1}^g + \varpi e y_t^g - \vartheta i_t^r + \varepsilon. \tag{3.2}$$

Equation (3.2) provides a reduced form representation of the demand side of the model. This relates the demand equation with the current output gap y_t^g determined by the past y_{t-1}^g and expected future output gap ey^g, the real rate of interest and a demand shock ε. Equation (3.2) resembles the traditional *IS*, but expenditure decisions are seen to be based on intertemporal optimization of a utility function. There are both lagged adjustment and forward-looking elements.

There are two approaches so far for specifying the role of monetary policy. One approach uses a rule for setting a short-term interest rate (or the central bank's policy rate) in response to changes in inflation and output, often referred to as the Taylor rule (Taylor 1993). According to this rule, the central bank should raise interest rates when inflation and output rise above target levels, with the inflation response relatively higher than the output response. Conversely, when inflation or output falls below its target, the central bank should cut interest rates.

Another approach is to start with the central bank's objectives, typically assumed to be stabilization of inflation and the output gap. The central bank sets its policy instrument with more flexibility to achieve these objectives. Walsh (2002) argued that one advantage of this approach is that it serves to highlight how changes over time in the objectives of monetary policy will result in different policy behaviour.

This approach is represented in equation (3.3), in what Svensson (2003) described as a 'prescribed guide for monetary-policy conduct'.

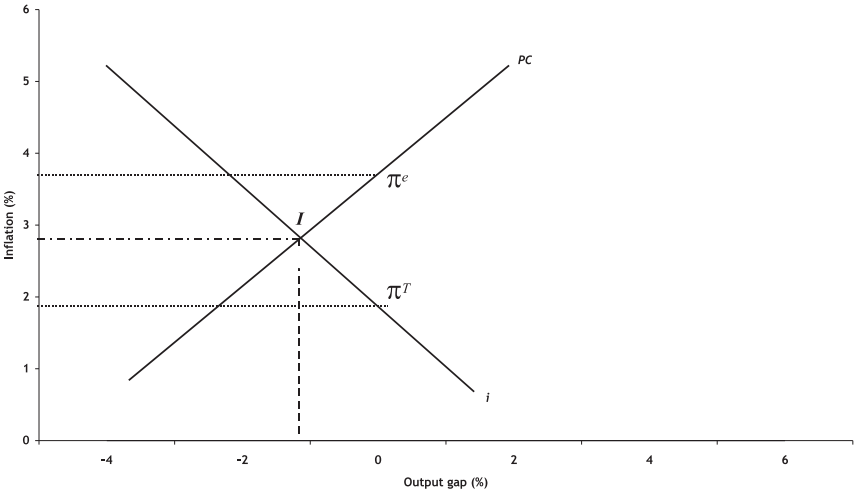
$$i_t^n = (1-\upsilon)[i^* + \pi^e] + \kappa y^g + \sigma(\pi - \pi^T) + \upsilon i_{t-1}^n. \tag{3.3}$$

This is argued to replace the old *LM* curve. In this equation, the nominal interest rate i_t^n is based on the "equilibrium" real rate of interest i*; that is, the rate of interest consistent with the zero output gap implied in equation (3.2), expected inflation or a constant rate of inflation, the output gap and the deviation of realized inflation from the target π^T (or "inflation gap"). Some models use the inflation forecast (a two-year ahead forecast) instead of realized inflation. The lagged nominal interest rate represents interest rate "smoothing" undertaken by monetary authorities (see, for example, Rotemberg and Woodford 1997).

Equation (3.3) connotes that monetary policy becomes part of the systematic adjustment to changes in inflation and output. Recall that the nominal rate of interest is the sum of the real interest rate and expected inflation. As such, it incorporates a symmetric approach to IT. Inflation above the target dictates higher interest rates to contain inflation, whereas inflation below the target requires lower interest rates to stimulate the economy and accommodate inflation. In addition, equation (3.3) contains no stochastic shock, implying that monetary policy operates without random shocks.

The term π^e in equations (3.1) and (3.3) reflects central bank credibility (Arestis and Sawyer 2003). If a central bank can credibly signal its intention to achieve and maintain low inflation, then expectations of inflation will be lowered, and this term indicates that it may possible to reduce current inflation at a significantly lower cost in terms of output than otherwise could be achieved.

Figure 3.4 shows the short-run equilibrium between the *PC* and *i* curves at point *I*. *PC* refers to the expectations-augmented Phillips curve (from equation 3.1) while *i* (from equation 3.3) is a description of monetary policy



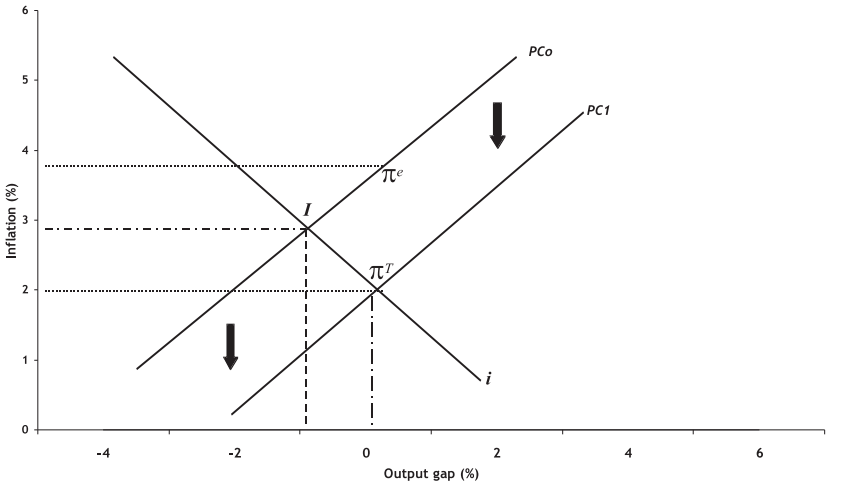
Source: Walsh (2002a).

Figure 3.4
Short-run equilibrium: Inflation, output gap and monetary policy in inflation targeting

or the central bank's reaction in trading off fluctuations in output and inflation.

Note that at the short-run equilibrium, the output gap is negative (which indicates a recession), that is, below the natural rate. This is the result of the central bank's choice to be in recession following a higher inflation rate than the target. Moreover, point *I* is consistent with *PC* – at the output gap consistent with *I* – at which firms are setting prices such that the inflation rate is at the rate given by *I* (in this case 3%). It is also indicates the behaviour of the central bank to balance the marginal benefit of pushing output closer to the natural rate (that is, closer to 0) and the marginal cost of the additional inflation that would result from the expansion n output. At the equilibrium rate, the realized inflation rate is above the central bank's target (π^T) along curve , but is below the level expected by households (π^e) and firms along *PC*.

Over the long run, expected inflation will fall as people recognize that the actual inflation is less than they had expected. This reduction in expected inflation leads to a downward shift from PC_0 to *PC1* (Figure 3.5). This in turn lowers the actual inflation rate for each value of the output gap. A lower inflation rate reduces the marginal cost of inflation and allows the central bank to expand its policy stance. The short-run equilibrium moves



Source: Walch (2002a).

Figure 3.5
Long run equilibrium: Inflation, output gap and monetary policy in inflation targeting

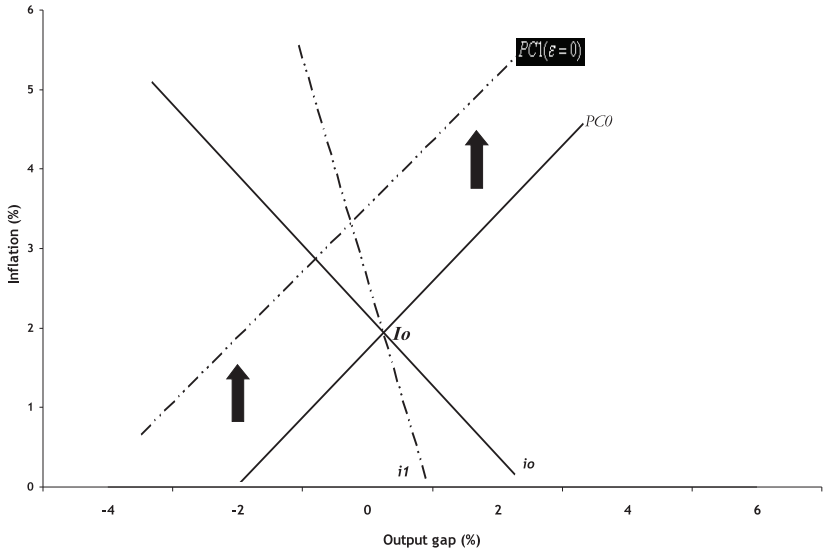
towards lower inflation and a higher level of output until the gap closes to 0. This is seen in the intersection point of curve *i* and *PC1*.

Meanwhile, the *PC* curves will eventually shift downwards until the inflation rate is equal to the central bank's target (in this case 2%). This is the economy's long-run equilibrium. In such a scenario, the adjustment of inflation expectations plays a crucial role in moving the economy from a point such as *I* or the point at which inflation is above the target and the economy is in a recession to long-run equilibrium.

3.7.1 Temporary shocks and the role of policy preferences

The intercept of PC_0 in Figure 3.5 is $\pi^e + \varepsilon$, in which ε indicates an inflation shock. Suppose a negative inflation shock occurs. This lowers inflation at each value of the expected inflation and an output gap is temporarily created. A negative ε then shifts the PC_0 curve down to *PC1*. Note that a negative inflation shock does not impact *i*, hence, it remains unchanged.

Figure 3.6 implies that an upward shift to *PC1* increases inflation in the short run. In such a situation, a new short-run equilibrium that has a negative output gap can ensue. Eventually, if *e* returns to 0, *PC1* returns to its original position at PCo, the inflation returns to its targeted value and the output gap returns to 0. In this scenario, the contraction in the real econ-



Source: Walsh (2002a).

Figure 3.6
The role of policy preferences

omy and the rise in inflation in response to the inflation shock are temporary.

Curve *i* is crucial. In practice, however, the slope of *i* affects the relative volatility as the economy experiences inflation shocks (Walsh 2002a). Figure 3.6 below shows two alternative *i* curves having different slopes. If the economy is characterized by a steep policy curve such as *i*1, a positive inflation shock leads to a large rise in inflation and a relatively small reduction in the output gap. The *i* curve becomes steep when the central bank places a higher value on output gains, relative to the cost of inflation. In the face of an inflation shock, such a central bank acts to limit fluctuations in output, letting inflation fluctuate more instead.

Walsh (2002b) often refers to the dependence of inflation and output gap volatility on the slope of curve *i* as the new policy trade-off (Walsh 2002). Figure 3.6 shows that as the relative weight placed on output increases, *i* becomes steeper. As a result, the variance of the output gap narrows while the variance of inflation widens. A central bank that assigns a greater weight to output stability accommodates more inflation variability and less output variability than a central bank putting a greater weight on its inflation objective. This indicates that a central bank's attempt to achieve

greater inflation stability comes at the cost of increased variability in real output. However, placing emphasis on maintaining stable output at around the natural rate leads to greater fluctuations in the inflation rate around its target rate.

This new policy trade-off is equally important in the macroeconomics of IT, as monetary policy is taken as the main instrument of that policy. The view is that it is a flexible instrument for achieving medium-term stabilization objectives, that is, it can be adjusted quickly in response to macroeconomic developments. Indeed, monetary policy is the most direct determinant of inflation, so much so that in the long run the inflation rate is the only macroeconomic variable that monetary policy can affect.

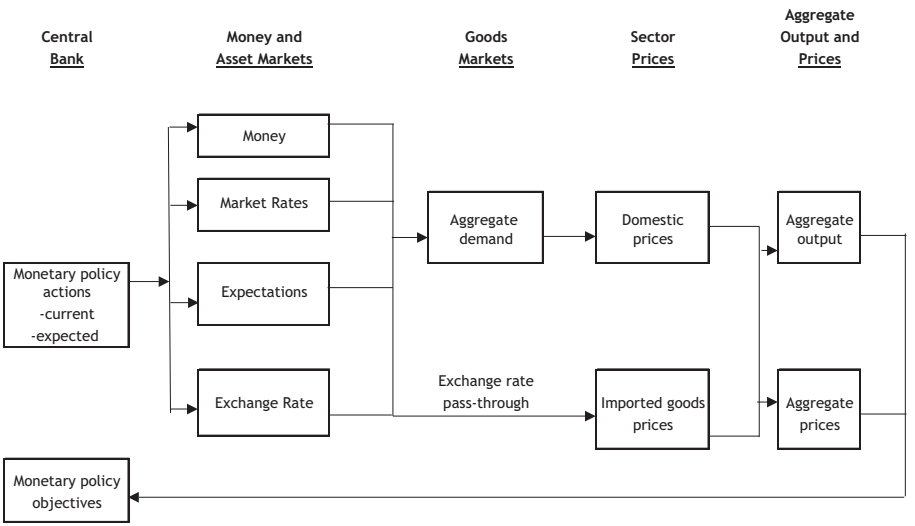
The objectives of the IT framework are achieved through the principle of "constrained discretion" (Bernanke and Mishkin 1997). With this, monetary policy is constrained in achieving clear long-term and sustainable goals, but discretion is allowed to respond sensibly to unanticipated shocks. In this way, IT serves as a nominal anchor for monetary policy, thereby pinning down precisely what the commitment to price stability means. Monetary policy thus imposes discipline on the monetary authorities and the government within a flexible policy framework.

However, from policymakers' perspectives, it could be argued that the instability implied so far of the *PC* and *i* curves, especially in their position in the central bank's objective function, or uncertainties about the appropriate objectives of monetary policy, play a crucial role in the sustainability of IT as a monetary policy framework. These issues are crucial and should be foremost in the minds of developing economies' policymakers when deciding on the suitability of different monetary regimes.

3.8 The transmission mechanism of policy

In section 3.7, the central bank's reaction function or *i* (Figures 3.4 to 3.6) summarized the relationship between the output gap and inflation as consistent with the optimum behaviour by the central bank in balancing the marginal costs and benefits of policy actions. Lying behind the *i*, however, is the monetary policy transmission mechanism.

Monetary policy works largely through its influence on aggregate demand, with little effect on the trend path of supply capacity. The transmission mechanism works through various channels, affecting different variables and different markets over the short and medium run. This is important because these impacts determine the most effective set of policy



Source of basic framework: Loayza and Schmidt-Hebbel (2002).

Figure 3.7
Policy instruments and transmission mechanisms

instruments, the timing of policy changes, the speed and the main restrictions that central banks face in making their decisions. This section follows the current mainstream view on the monetary macroeconomics of a small open developing economy according to which the money stock plays only a minor role in describing monetary policy effects (Romer 2000).

Figure 3.7 provides a schematic diagram of the monetary policy transmission mechanism patterned after Loayza and Schmidt-Hebbel (2002). This serves as a guide to identify the major assumptions of the most traditional transmission mechanisms and their implications for the evolution of monetary policy effectiveness.

A central bank derives its power to determine a specific interest in wholesale money markets from the fact that it is the monopoly supplier of "high-powered" money, also known as base money. In essence, the central bank chooses the price (the official rate) at which it will lend base money to private-sector banks through the open market. Moreover, the quantitative effect of a change in the official rate on the other interest rates, and on financial markets in general, depends on the extent to which the policy change was anticipated and how the change affects expectations of future policy. In this exposition, it is assumed for illustration purposes that changes in the official rate are not expected to be reversed quickly and that no further future changes are anticipated as a result of the change.

A change in the official rate is immediately transmitted to money market rates and to the other short-term rates, including interbank rates. These rates may not always move by the exact amount of the official exchange rate. Banks soon adjust their lending rates (or base rates), usually by the exact amount of the policy change. In order to preserve the margin between deposit and loan rates; rates offered to savers also change.

Though a change in the official rate unambiguously moves other short-term rates in the same direction, the impact on longer term interest rates can go either way. This is because long-term interest rates are influenced by an average of current and expected future short-term rates, so the outcome depends upon the direction and extent of the impact of the official rate change on expectations of the future path of interest rates. A rise in the official rate, could, for example, generate an expectation of lower future interest rates, in which case, long-term rates might fall in response to an official rate rise. The actual effect on long-term rates of an official rate change will partly depend on the impact of policy change on inflation expectations.

The consequences of changes in real interest rates are largely conventional. Movements in real interest rates affect the wealth of households through either financial or physical asset prices, in turn affecting consumption. For instance, lower real interest rates increase wealth, leading to lower savings out of current income and increased consumption spending. [10]

Lower real interest rates also reduce the cost of capital for investment by firms and households, and lower the opportunity cost of holding stock. The combined effect is to encourage final domestic demand. To meet that demand, firms will have to pay more for factors of production.

The extent of the response in terms of spending depends partly on how long the changed level of interest rates is expected to persist. In particular, the cost-of-capital route works as follows: an expansionary monetary policy leads to a fall in real interest rates which lowers the cost of capital, causing a rise in investment spending (including housing) or purchases of durable goods, therefore leading to an increase in aggregate demand and a rise in output.

In this channel, the rise in the interest rate leads to a reduction in the present value of durable goods and thus decreased demand. Conversely, a lowered interest rate leads to increased present value of goods and thus increased demand. Implicit in this route is the mechanism whereby spending is sensitive to interest rate changes and affected by changes in the marginal cost of borrowing.

It should be pointed out that it is real rather than nominal rates which are important, and therefore inflation expectations[11] matter; and it is real long-term rates, not so much short-term rates, which have a major effect on spending. Because it is real rates that matter, monetary policy can affect real activity even with low or zero nominal rates.

In particular, the relationship between nominal and real interest rates is explained by theories based on price and wage rigidities, the link between short- and long-term interest rates follows from the expectations hypothesis of the term structure of interest rates, and the relationship between aggregate demand, on the one hand; and output and prices, on the other, is explained by combining the Phillips curve with temporary nominal price rigidities. The interest rate channel lies at the core of the new Keynesian perspective (Clarida, Gali and Gertler 2000).

Taylor (1995) surveyed recent research on interest rate channels. He claimed that there is strong empirical evidence for a substantial effect of interest rates on consumer and investment spending, suggesting that the interest rate transmission channel is a strong one. However, it could also be argued that the impact of shifts in the real interest rate on consumption and investment spending could in turn depend on their sensitivity to changes in the price of intertemporal substitution. The elasticity of aggregate demand to the interest rate will determine how, when and to what extent monetary policy will affect the economy. In addition, it should be emphasized that the increase in the interest rate might not only have substitution effects that discourage investment and consumption spending, but also create wealth effects depending on the borrowing or lending position of private agents.

Another channel relevant in an open economy is the exchange rate channel. Taylor (1993) argued that the exchange rate becomes effective through the UIP. The UIP provides an instantaneous and efficient market-based link between the current nominal interest rate and the current nominal exchange rate. If the central bank lowers nominal interest rates, the nominal exchange rate immediately depreciates, and with it, the real exchange rate. The transmission of the change in the real exchange rate is further divided into direct and indirect channels. The direct channel explains inflation fluctuations via the passing through of exchange rate fluctuations to import prices, and hence to inflation. Indirectly, the real exchange rate affects the relative prices of domestic and foreign goods, which in turn impacts both domestic and foreign demand for domestic goods and hence contributes to the aggregate demand channel for the transmission of monetary policy.

The precise impact on the exchange rate though is seen to be uncertain, as it depends on expectations about domestic and foreign interest rates and inflation, which may themselves be affected by a policy change. There is an important forward-looking dimension to this. Asset returns will move to reflect the shift in real interest rates. Clearly, the intertemporal substitution effect relies on forward-looking consumers. But firms are also forward-looking, so current prices are affected by current and future costs.

Another monetary policy channel is based on private-sector expectations about the future stance of monetary policy and, more generally, about all future-related variables. According to this expectations channel, all variables that have intertemporal implications, and are therefore determined in a forward-looking way, are affected by agents' beliefs about future shocks to the economy and how the central bank will react to them.

The specific mechanisms for the expectations channel are intertwined versions of the static interest rate, the asset price, the exchange rate and monetary mechanisms. For instance, when the central bank announces future policy, even without it being supported by a corresponding change in current policy, such a strategy is argued to exert real effects by modifying market expectations. This in turn triggers current changes in money and asset markets and leads ultimately to changes in output and inflation. An announcement of future policies may, however, have the desired effects only if the monetary authorities are perceived as committed to their policies. In this scenario, the credibility of monetary policy becomes increasingly relevant.

There is a direct role for nominal interest rates via other domestic asset prices and the credit and bank-lending channels. Although the mechanisms needed to embed these is argued to be less significant to a small open economy like the Philippines, it is nonetheless instructive to expound on them at this point.

Changes in the interest rate also affect the level of other domestic asset prices. When monetary policy lowers the return on holding money by lowering interest rates, demand for other assets increases. These other assets include bonds issued by firms to finance their investment projects and equities. As demand for bonds increases (raising their price and lowering the return), firms realize that more of their investment projects have positive net present value, and they issue more bonds in order to finance them. This causes investment and output to increase. The price of bonds is inversely related to long-term interest rates, so a rise in long-term interest rates lowers bond prices, and the reverse is true for a fall in long-term interest rates.

Moreover, in the case of equity and real estate, a rise in real interest rates increases the cost of capital and reduces the demand for real assets. This lowers production and sales of these assets and at the same time lowers their value. This in turn causes a fall in investment and output.

Other things being equal, especially inflation expectations, higher interest rates also lower prices of other securities, such as equities. Tobin's q theory claims that an expansionary monetary policy leads to higher equity prices, which make investment more attractive, thus raising aggregate demand.[12] Higher equity prices also increase wealth, which raises consumption and thus raises aggregate demand. The link between the increased money supply and higher equity prices can be argued from either a monetarist or a Keynesian perspective. In the former, an increase in money raises consumer wealth and asset prices, and hence, spending on household and enterprise assets, whereas in the latter, the increase in money lowers interest rates and makes equity markets more attractive.

Mishkin (1996) discussed another channel that provides a link between financial conditions and the spending decisions of households and firms but emphasizes asymmetric information in financial markets. In this situation, aggregate demand could be influenced more by the quantity rather than the price of credit (Bernanke and Gertler 1995).[13] This channel is categorised as operating through bank lending and through effects on firm and household balance sheets.

The bank lending channel starts with the notion that banks help to resolve the asymmetric information problem in credit markets. Certain borrowers do not have access to the credit markets unless they borrow from banks. If there is no perfect substitutability of bank retail deposits with other sources of funds, the bank lending channel is quite straightforward. Expansionary monetary policy increases bank reserves and bank deposits, which increases the quantity of bank loans available. Moreover, borrowers dependent on bank loans to finance activities will increase investment and consumption, hence, spending rises. It should be noted that this type of mechanism will have greater effect on small firms, which are typically more dependent on bank lending for funds than large firms which raise funds more easily through the stock market. This channel is argued to be empirically less powerful as there has been a worldwide decline in the level of bank lending as banks diversify into other activities.

The balance sheet channel helps explain some of the previous more traditional channels which relate to the asymmetric information in financial markets. This channel indicates that the lower the net worth of a company

the more severe adverse selection[14] and the moral hazard problem[15] in lending to these firms. Lower net worth means that lenders have less collateral for loans and so potential losses from adverse selection is higher. A decline in net worth, which raises the adverse selection problem, leads to decreased lending to firms to finance investment spending. Lower net worth increases the moral hazard problem because it means that owners have a lower equity stake in their firms, giving them more incentive to engage in risky investment projects. Taking on riskier projects makes it more likely that lenders will not be repaid, in turn leading to reduced lending investment spending.

Monetary policy might cause equity prices to move up which raises the net worth of firms and leads to higher investment spending by firms and a decrease in adverse selection and the moral hazard problem. An expansionary monetary policy, which lowers nominal interest rates, also causes an improvement in firms' balance sheets, because it raises cash flow. The rise in cash flow causes balance sheet improvement because it increases the liquidity of a firm (or household) and makes it easier for lenders to ascertain whether the firm (or household) will be able to pay its bills. Adverse selection and moral hazard therefore become less severe, hence, leading to an increase in lending and economic activity.

The credit channel could also be affected by rationing. This phenomenon occurs when firms willing to pay high interest rates are denied loans because this willingness is seen as an indication that they represent a high risk. Therefore, higher interest rates increase adverse selection, whilst lower rates reduce it. After all, at lower rates the less risky loans form a higher proportion of the total and therefore lenders are more willing to lend and investment increases.

It is useful to point out that money supply in this discussion has limited role as an anchor of monetary policy. Chapter 2 argued that the relationship between money supply and output in the Philippines appears to be insufficiently stable (partly owing to financial innovation) for the money supply to provide a robust indicator of future inflation developments. As such, money supply may not yield a precise way to provide a quantitative guide for monetary policy in the short to medium term. For this reason, money supply's role is limited as an indicator of monetary policy stance.

Woodford (2000) argued that there need not be a stable relation between the overnight interest rate and the size of the monetary base in order for the central bank to effectively control overnight interest rates. This suggests that it is possible to wipe out the impact of policy actions on money supply. Woodford (2000) further argued that it is indeed possible to characterize

monetary policy actions in terms of the policy rate of interest, except to the extent that real monetary balances matter in the economy. But this does not mean that the presence of real monetary balances does not qualitatively matter in determining the impact of monetary policy decisions on the real rate of interest. In fact, many central banks (Bank of Chile, Bank of Brazil and Bank of England to name a few) have minimized the role of money supply in their analyses of the monetary policy transmission mechanism.

On the other hand, it is sensible to closely monitor development of the money supply and credit, as shocks to spending can have their origin in the banking system through the lending channel. This suggests that there may be effects running from the banking sector to spending behaviour which may not be caused by changes in interest rates. An example is a fall in bank lending caused by losses in capital due to bad loans or a strict regulatory environment, which could lead to a credit crunch. Without awareness of developments in monetary aggregates, this would bring the central bank into difficulty.

Recent empirical studies show that channels of monetary policy transmission remain uncertain not only in the industrialized countries but even more so in developing and emerging markets. In particular, these studies show that these channels are unexplored in developing countries, as data limitations continue. There are numerous changes in regime and macroeconomic volatility that make these channels less clear and ambiguous. In fact, in an interdependent system, where everything causes everything else, it is difficult to identify causal linkages. Moreover, identifying monetary transmission channels may be particularly difficult because theories are basically developed for industrial countries.

3.9 IT and inflation expectations in the Philippines

Section 3.8 set out the important role of inflation expectations in IT. The inflation target itself (which represents long-run inflation expectations) and the forecasts (for two years) of the central banks strongly steer perceptions regarding inflation expectations (Arestis and Sawyer 2003). Consequently, inflation forecasting is a key element of IT for many of the countries adopting IT to the extent that it is used as the intermediate target of monetary policy (Svensson 1997).

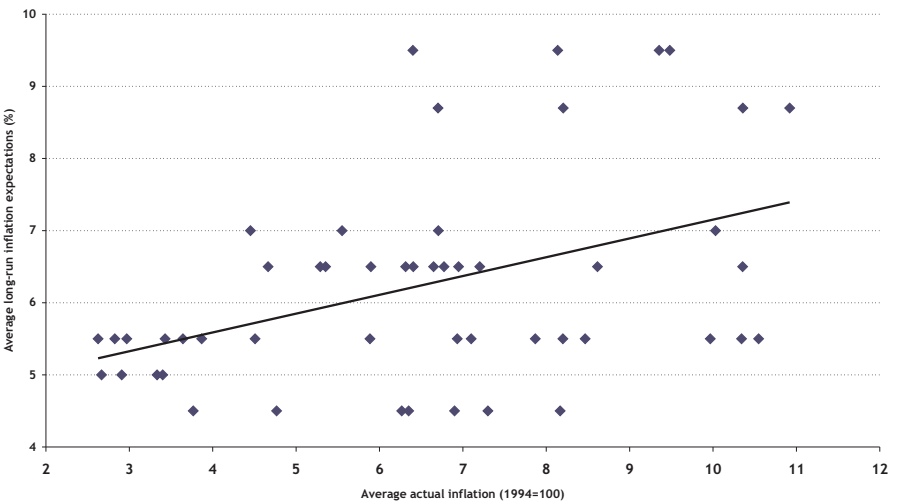
Levin et al. (2004) drew on the macroeconomic effects of IT in industrialized countries. At the same time the literature emphasizes concerns regarding measurements of inflation expectations. This is due to the large

margin of error in forecasting inflation, which may lead to damage to the reputation and credibility of central banks as implied in section 3.3. The relationship between long-run inflation expectations and realized (actual) inflation is therefore viewed here as providing a sense of the macroeconomic effects of IT in the Philippines (Figure 3.8).

As a first step, the volatility of inflation expectations is computed. Long-run inflation expectations is proxied by inflation targets announced by the government and consistent with medium- and long-term development programme objectives. In some studies, inflation expectations is proxied by inflation forecasts made by private institutions. However, these are available starting only in 2004.

Using the coefficient of variation,[16] the quarterly volatility of inflation expectations is computed before (1994 to fourth quarter 2001) and after (first quarter 2002 to fourth quarter 2005) the official adoption of IT. Results suggest that the coefficient of variation of long-run inflation expectations is less volatile after the BSP officially adopted IT (0.11 compared to 0.20 from 1994 to 2001).

It is argued that given the relatively less volatile inflation expectations, the next step is to determine whether expectations became more anchored with the adoption of IT. Levin et al. (2004) demonstrated that IT has a sub-



Source of basic data: BSP (2006), selected Philippine economic indicators..

Figure 3.8
Quarterly actual inflation and long-run inflation expectations, 1994-2006

stantial impact in anchoring long-run inflation expectations and in reducing intrinsic persistence of inflation in industrialized countries. In the case of the Philippines, the analysis focuses on whether expectations are sensitive to realized inflation. An almost flat line would broadly indicate a loose relationship between realized inflation and inflation expectations. This would mean that a country has been successful in delinking expectations from macroeconomic fluctuations.

Figure 3.8 suggests that long-run inflation expectations explain about 19.8% of the variation in actual inflation for the period 1994 to 2006. This reduces the value of using the apparent inflation and expectations as a sole guide for setting monetary policy. It can be interpreted as a sign that the disinfation process from high levels of inflation has come close to an end, forcing the Philippines to re-think the long term (in this case the medium term) and develop a more operational concept of price stability. In fact, if the relationship between long-run inflation expectations and actual inflation from 2002 to 2006 is analysed, the coefficient of determination (or R^2) is only 10.8%.

To complete the analysis, inflation volatility (using the coefficient of variation) is also determined after IT was officially adopted in 2002. When the coefficient of variation from 2002 to 2006 is compared to that from 1994 to 2001 (pre-IT) average quarterly inflation turns out to be more volatile after the BSP officially adopted IT (0.36 compared to 0.30 from 1994 to 2001). Note that actual inflation from the first quarter of 1997 to the first quarter of 1999 was omitted due to the currency crisis in 1997. As implied in Chapter 2, inflationary pressure increased significantly after 2002 following shocks to the peso-dollar exchange rate and increases in oil prices.

3.10 Concluding thoughts

This chapter has established that the macroeconomic foundation of IT, such as the basic time-inconsistency model of monetary policy and the resulting credibility issues faced by monetary authorities, is empirically unfounded and limited. The theory of rational expectations argues basically that there is an inherent time-inconsistency in monetary policy, resulting in an inflation bias. Some institutional arrangements, such as central bank independence, and policy rules, such as inflation targeting, are deemed necessary to achieve a lower and more desirable inflation rate. Moreover, the argument that there is no long-run trade-off between inflation and unemployment implies that monetary authorities can achieve a desirable low

inflation rate without negatively impacting unemployment, investment and economic growth. This chapter raised doubts as to whether IT can remove these problems along with the inflationary bias.

The way IT is theoretically set up reveals instability in the expectations-augmented Phillips curve and interest rate curves (especially in their position in the central bank's objective function), uncertainties about the linkages between the policy instrument and aggregate demand, and uncertainties regarding the appropriate objectives of monetary policy as all playing a crucial role in IT's sustainability as a monetary policy framework. In fact, while the volatility of inflation expectations has been modest since the adoption of IT, the sensitivity of realized inflation to expected inflation is quite moderate indicating that IT has yet to significantly delink expectations from macroeconomic fluctuations. These issues are crucial and should be foremost in the minds of developing economies' policymakers when deciding on the suitability of different monetary regimes.

The principle behind IT's objectives constrains the use of monetary policy to achieve long-term and sustainable goals, but discretion is allowed to respond sensibly to unanticipated shocks. In this way, IT serves as a nominal anchor for monetary policy. However, a great challenge to the framework is the rather uncertain behaviour of the exchange rate and the strong reactions of central banks to exchange rate shifts. In the short run, the complexity and intricacy of the exchange rate behaviour has made monetary management more difficult. Leading advocates of IT for emerging market countries advise against benign neglect of the exchange rate but have not provided specific guidance on what this should mean.

The tentative conclusion can be formed that IT's role to dampen the time-inconsistency and credibility difficulties is complex and limited. In this regard, discussions devoted to uncovering the relationship between the exchange rate, inflation and the level of economic activity and their implications for aggregate demand and supply would clarify the reasons behind this limitation and provide an adequate framework for credible and sustainable commitments in monetary policy as emphasized in IT. This is crucial in the next chapter, which discusses the role of the exchange rate in an IT framework.

Notes

1. In the literature, this is synonymous with the theory of the natural rate of unemployment or the so called non-accelerating inflation rate of unemployment (NAIRU).

2. Following Kydland and Prescott (1977) and Barro and Gordon (1983), a large literature emerged which examines alternative solutions to the inflationary bias under discretion. Walsh (2003) classified these solutions into three groups, all of which have been the subject of extensive study. The first group of solutions has to do with reputation. These solutions force the central bank to bear some cost the moment it deviates from the target or from the announced policy. The second solution group focuses on central bank independence, which provides it more room for preferences other than those of the elected government. The third group imposes limitations on the central bank's flexibility by adopting some form of targeting rules which require achievement of an inflation target.

3. The authorities' incentive to inflate may also arise from their desire to reduce the real value of the nominal public debt or because of seignorage considerations.

4. This was challenged by Calvo and Vegh (1993) and Vegh (1992) as they argued that in an exchange rate based stabilization programme, the lack of credibility may translate into large real effects, rather than a sharp reduction in inflation.

5. See also Chapter 2.

6. Ball and Mankiw (2002) enumerated some answers to short-run nonneutrality such as imperfections of information, long-term labour contracts, costs of price adjustments and departures from full rationality.

7. Dakila (2003) showed that the shifting Phillips curve is validated by Philippine data using simple regression analysis. Meanwhile, Dumlao (2005) estimated the effect of capacity utilization in determining the aggregate supply curve of the Philippines. Insight from the estimation leads to a modified Phillips curve that turned out to be consistent with Philippine data. Importantly, the estimation showed that the Philippine Phillips curve is downward sloping and the aggregate supply curve is upward sloping. The policy implication is that policy driven shifts of the aggregate demand curve have real effects on a country's output, employment and inflation.

8. See Rogoff et al. (2003), Rogoff (2003) and the IMF *World Economic Outlook* (2005).

9. The other difference is that models are typically derived from the explicit optimizing problem. Hence, it is implied that the coefficient on expected future inflation term should equal one.

10. As will be emphasized in Chapter 5, the role of interest rates is generally disputed in literature.

11. The propagation of policy actions throughout the whole structure of the interest rate also depends on the structure of financial markets. For instance, in an underdeveloped financial market, the monetary policy authorities' control on the interest rate of other instruments could be large. But because this is not explicitly taken into this basic model, its role in the transmission mechanism is not discussed.

12. Tobin's q is defined as the market value of a firm divided by the replacement cost of capital. If q is high, the market value is also high relative to the replacement cost; therefore investment is cheap. In this situation, companies issue stock and get a relatively high price for it compared to the cost of capital. Therefore, investment will rise because firms can buy a lot of new investment goods with only a small issue of stock.

13. Much work has recently been done on the credit channel. Li (2000) used a general equilibrium model to show that monetary expansion can generate a liquidity effect that increases credit to households and increases aggregate activity. Repullo and Suarez (2000) developed a model of heterogenous firms and banks in which the latter engage in monitoring to alleviate the moral hazard problem. These authors basically show that monetary expansion increases the bank-lending channel and aggregate investment, narrows spreads between rates charged to borrowers and the risk-free rate, and causes a shift in the extension of credit toward more risky firms.

14. Adverse selection occurs before financial transactions take place, as potential bad credit risks are the ones who most actively seek out loans. For example, those who want to take big risks are likely to be the most eager to take out a loan, even at a high rate of interest, because they are less concerned with repaying the loan. Thus, the lender must be concerned that parties who are most likely to produce an undesirable or adverse outcome are most likely to be selected as borrowers (Mishkin 1996).

15. Moral hazard occurs after transactions take place. It occurs because a borrower has incentives to invest in projects with high risk in which the borrower would do well if project succeeds, but the lender bears most of the loss if the project fails (Mishkin 1996).

16. The coefficient of variation (CV) is a relative measure defined as the ratio of standard deviation to the mean (Mukherjee et al., p. 81).

4 The Exchange Rate and Inflation Targeting

4.1 Introduction

The behaviour of the Philippine peso has become more volatile in recent years. Viewed over the long term, the peso has depreciated steeply and rapidly against the US dollar. In these circumstances it is unsurprising that the exchange rate has been the focus of much attention in open macroeconomic issues.

During the late 1990s, several countries, including the Philippines, adopted some form of IT. Most of these countries are small open economies, which means that exchange rate changes have both direct and indirect effects on prices. Monetary policy, in turn, has an important influence on the exchange rate, although it is only one of many influences. Thus, the relationships between the exchange rate, inflation and monetary policy are multifaceted.

An open economy, moreover, brings uncertainties regarding movements of exchange rates. The main view taken in this chapter is that exchange rates, when under a flexible exchange rate regime, apart from being a transmission mechanism, can also change as a result of exogenous shocks thereby introducing disturbances to the economy. This view, which runs contrary to the functioning of an efficient foreign exchange market, implies some indeterminacy in the transmission mechanism to aggregate demand (and to some extent aggregate supply) and finally to the rate of inflation.

Indeed this uncertainty of monetary policy is crucial, especially when a forward-looking IT framework is expected to focus on the indirect effects of exchange rates on inflation. When operating with a 15 to 21 month ahead inflation forecast, it is the indirect impact of the exchange rate which is most important. However, the monetary authorities are better equipped

to respond to the short-term direct effect of exchange rate changes on the price level when there are real or external economy shocks.

Section 4.2 begins with a brief discussion of alternative exchange rate regimes. Section 4.3 reviews how monetary policy influences the exchange rate and how monetary policy is transmitted via the exchange rate. Section 4.4 considers the role of exchange rates in a flexible regime using three major open economy macro models. Section 4.5 argues further that behaviour of the exchange rate via purchasing power parity (PPP) and UIP conditions, can also change due to exogenous shocks. Section 4.6 points out that there is more to the role of the exchange rate and monetary policy than these models indicate. This leads up to section 4.7's discussion of sources of deviation from arbitrage conditions. Early experiences with IT on exchange rate management are discussed in section 4.8. Section 4.9 concludes the chapter.

4.2 Exchange rate regimes

In theory, the official spectrum of exchange rate regimes in recent years ranges from fixed to managed, and finally, the floating exchange rate. Under a fixed regime the future path of the exchange rate is fixed. The central bank thus effectively imports the monetary policy of the country to whose currency it has fixed its own currency. Indeed, where the exchange rate is irrevocably fixed, the central bank effectively no longer has its own monetary policy. Interest rates will be similar for both currencies: otherwise, there would be opportunities to borrow in the lower interest rate currency and invest in the higher rate currency and make riskless profits. In a competitive open market, such a situation would be quickly traded away.

At the other end of the spectrum is a free float. In this case, the central bank, rather than fixing a rate at which it will buy and sell domestic currency for foreign exchange, leaves it entirely to market participants to determine the price at which they trade the currency. In this situation, the central bank does not buy or sell its own currency for foreign exchange in order to influence the exchange rate. Rather, the price of the domestic currency (or the exchange rate) is determined entirely in the market. In addition, allowing the exchange rate to float implies that central bank reserves (or base money) is insulated from the foreign exchange market, enabling monetary policy to be focused on a domestically determined objective.

However, operating an independent, that is, domestically determined monetary policy under a floating exchange rate regime does not mean that

monetary policy is disconnected from the exchange rate. On the contrary, monetary policy targeted at an inflation objective is, in important respects, transmitted through the exchange rate. In short, while floating the exchange rate gives the monetary policy independence, it does not convert an open economy into a closed economy.

At the middle of these two corner regimes is the managed float (or the intermediate regime). This is evident among central banks which have moved to a freely floating exchange rate regime but rarely allow the floats to be free. Strong empirical support for this view is found in Calvo and Reinhart (2002) and Levy-Yeyati and Sturzenegger (2002).

In this regime, central banks intervene, if only to reduce short-run fluctuations of the exchange rate, rather than leaving it to the market. Intervention is done in two ways: small fluctuations in the exchange rate are smoothed by the central bank's buying the country's currency when its price would otherwise fall and by it selling its currency when the price would otherwise rise. In such a situation, intervention is not sterilized, and this has a direct impact on the level of monetary base. Meanwhile, empirical evidence on the impact on the exchange rate remains contentious.

The central bank can also opt to simultaneously (or with a short lag) intervene in the foreign exchange market and sterilize the effects on the monetary base of a change in the official foreign asset holdings. The impact on the monetary base when there is sterilization is seen in the rise in net foreign assets of the central bank that is matched by the sale or purchases of its own holdings of domestic securities through open market operations. In such a situation issuance of domestic securities by the central bank will have no significant impact on the monetary base, as it offsets an increase in net foreign assets emanating from changes in reserve holdings.

Effects on the exchange rate are expected when intervention is sterilized. Sarno and Taylor (2002) argued that this is possible through the portfolio balance channel and the expectations (or signalling) channel. Assuming there is imperfect substitutability, altering the supplies of domestic and foreign securities will perhaps cause little or no movement in interest rates, since the monetary base is held constant. In such a situation, the exchange rate (in the spot market) must shift in order to affect the domestic value of foreign securities and the expected return from holding them. For instance, to increase the supply of Philippine peso-denominated assets in the hands of the public relative to the dollar-denominated foreign assets requires a decline in the relative price of peso-denominated securities.

In response to sterilized intervention, agents may revise their expectations of the future exchange rate, altering the expected rate of depreciation and hence the return to foreign bond holdings. This indicates that the risk is shifted from the short position to the long-run position.

Officially, the Philippine peso has been freely floating since July 1997, and since then the BSP has operated a monetary policy aimed at achieving low and stable inflation**.** The floating exchange rate regime was adopted because the central bank considered the occasional, large fluctuations that are typical of a fixed exchange rate system to be more costly, destabilizing and disruptive to the economy than the more frequent but gradual changes that may occur in a free float.

However, while officially supporting a freely floating exchange rate system, the country in fact follows a managed floating system. BSP actions allow it some scope to dampen sharp fluctuations in the exchange rate. For such cases, the BSP does enter the money market (through the interest rate) and the foreign exchange market (through purchases and sales of foreign exchange) to maintain order and stability in the value of the peso.

4.3 The role of exchange rates and monetary policy in an open macroeconomy

The role of the exchange rate in a flexible regime is captured by the three major open economy macro models discussed in most macroeconomics textbooks and literature, namely, the Mundell-Fleming model, the New Classical/Monetarist model and the New/Neo-Keynesian model: Hall and Taylor (1997); Dornbusch et al. (1998); Sarno and Taylor (2002); and Wollmershauser (2003). This section refers to discussions of Hall and Taylor (1997).

These models, which are based on the efficient functioning of markets, are presented in this section along with their basic structure, followed by a discussion of how exchange rates are determined, and how monetary policy affects exchange rates.

4.3.1 The Mundell-Fleming model

The Mundell-Fleming model is basically a reduced three-equation macro model which includes the equilibrium in goods market or *IS* curve (equation 4.1), the money market or *LM* curve (equation 4.2) and the balance of payments (equation 4.3).

$$y_t = \beta_0 - \beta_i i_t + \beta_e e_t^n + \varepsilon, \tag{4.1}$$

$$m_t - p_t = \alpha_y y_t - \alpha_i i_t + \varepsilon, \tag{4.2}$$

$$i_t = i_t^f. \tag{4.3}$$

where y_t is the logarithm of output, i_t is the nominal interest rate on domestic bonds, e_t^n is the logarithm of the nominal exchange rate, m_t is the log of money supply, p_t is the log of the price index, which is assumed to be fixed. The error terms ε (in equation 4.1 and 4.2) are assumed to be white noise at time *t*.

Real output in equation (4.1) is negatively related to the nominal interest rate and positively related to the nominal exchange rate. Real demand for money in equation (4.2) is positively related to output and negatively related to the nominal interest rate. Equation (4.3) assumes that under perfect capital mobility, arbitrage ensures that bond yields are continually equalized so that the domestic interest rate must equal the foreign interest rate i_t^f. Implied here is that exchange rate expectations are static, that is, the average expectation is that the exchange rate will not change.

This model defines the exchange rate as the relative prices that lead to an equilibrium in the balance of payments. In the literature, this is called the "balance-of-payments approach" or the "flow approach". The approach starts with the demand and supply of foreign exchange in the exchange market, which eventually brings demand and supply into equality and restores the balance of payments. The basic idea is that flows resulting from changes in any of the positions of the balance of payments (traditionally exports and imports of goods and capital movements) create additional demand for and supply of foreign exchange.

However, the literature claims this approach to be limited, as it neglects the asset market view. The asset market view holds foreign exchange to be an asset traded in competitive markets, and these assets are said to be dependent on expectations of fundamental changes. Part of this view is the increasing role of information and pricing models, which affect policy under a flexible exchange rate regime. A contradiction in this model, however, is the assumption of static exchange rate expectations. Recall that the exchange rate is free to float; yet in the model foreign exchange market participants regard each day's exchange rate as effectively fixed and have no anticipation of any future change. This suggests that the foreign exchange market fails to anticipate monetary policy action or its subsequent effects.

Under market determined exchange rates, the instrument of monetary policy is the money supply. Monetary policy impacts on the level of the exchange rate by the extent to which the central bank creates imbalances in the capital account. An expansionary monetary policy, say through purchase by the central bank of bonds, leads to excess liquidity in the system. With domestic interest rates effectively fixed at the world level and constant prices, the only way money market equilibrium can be restored is through an increase in income. The excess liquidity in the system leads to a decline in interest rates. This in turn guides capital flows to leave the economy while the exchange rate depreciates. But the rising price of foreign exchange results in an improved trade balance. This leads to an expansionary effect on income as demand is switched from foreign goods to domestic goods.

However, under a fixed exchange rate, monetary policy is totally subordinated to the exchange rate target. For instance, if there is negative demand and the exchange rate has to be kept unchanged then the depreciation resulting from the shock must be matched by restrictive monetary policy. In such a situation, real output declines even further and the goal of output stability is sacrificed in favour of exchange rate stability.

4.3.2 The New Classical/Monetarist open economy model

Real output in the New Classical/Monetarist open economy model is determined by an aggregate supply function where price and wage adjustments are quick to clear the competitive markets. The exchange rate is assumed to be an asset price which clears the market for relative money supply. A role of rational expectations, implicit in the behaviour of firms, is also assumed.

The structure of the model includes a demand side of the economy described by an equilibrium in the domestic money market similar to the Mundell-Fleming model:

$$m_t - p_t = \alpha_y y_t - \alpha_i i_t + \varepsilon. \tag{4.4}$$

Following the rational expectations assumption, the supply side is based on the Lucas supply function in which the output gap y_t, defined as the deviation of real output from its full employment level, depends on the unanticipated component of the logarithm of the current domestic price p_t:

$$y_t = v_p(p_t - E_{t-1}p_t) + \varepsilon. \tag{4.5}$$

In equations (4.4) and (4.5), the error terms ε are assumed to be white-noise at time *t*.

The nominal exchange rate is determined by a standard monetary model in which the spot rate adjusts to clear the money market. In this approach, the exchange rate can be expressed as the relative price of two monies,

$$e_t^n = m_t - m_t^f - \varpi_1(y_t - y_t^f) + -\varpi_2(i_t - i_t^f) + \varepsilon, \tag{4.6}$$

where the superscript *f* denotes foreign variables and ε is the error term. Equation (4.6) assumes that m_t^f behaves as in equation (4.4), and PPP, defined as

$$e_t^n = p_t - p_t^f \tag{4.7}$$

continuously holds.

The basic tenet of PPP is that the nominal exchange rate between a pair of currencies will be altered to reflect movement in price levels between two countries. The underlying assumption is that the arbitrage will ultimately force exchange rate movements so that comparable goods will cost the same in a number of countries. If the most restrictive form of PPP, which is the law of one price (LOP) or the so-called "no arbitrage" argument",[1] holds, then international arbitrage causes the price of every good across the countries to be equalized when expressed in terms of a common currency.

In addition, if UIP is assumed to perfectly hold, defined as

$$i_t = i_t^f + E_t e_{t+1}^n - e_t^n, \tag{4.8}$$

then equation (4.6) can be expressed as

$$e_t^n = m_t - m_t^f - \varpi_1(y_t - y_t^f) + \varpi_2(E_t e_{t+1}^n - e_t^n) + \varepsilon. \tag{4.9}$$

Note that e_t^n can be solved by forward iteration. Following Mussa (1990), the basic asset-pricing model of the exchange rate is described as

$$e_t^n = \frac{1}{1+\varpi_2} \sum_{j=0}^{\infty} \left(\frac{\varpi_2}{1+\varpi_2}\right)^j E_t k_{t+j}, \tag{4.10}$$

where the economic fundamentals of the exchange rate are summarized in $k_t = m_t - m_t^f - \varpi_1(y_t - y_t^f) + \varepsilon$. Equation (4.10) indicates that the nominal exchange rate is determined by the present discounted sum of current and expected future economic fundamentals affecting the foreign exchange rate market.

Equation (4.10) suggests how the foreign exchange market operates. As mentioned earlier on, this model assumes rational expectations, indicating that economic agents form subjective expectations according to the mathematically predicted value, conditional on a set of publicly available information. Effectively, this states that on average, mathematical prediction and subjective expectations on one hand and realized value on the other hand should match. A market in which all agents behave according to the rational expectations paradigm and in which the asset price in question always correctly reflects all available information is defined as a speculative efficient asset market. The speculative aspect enters the monetary model of exchange rate determination through the uncovered interest arbitrage shown in equation (4.8).

Meanwhile, monetary policy is typically implemented in the form of a fixed money supply rule. This means that the central bank keeps money supply constant whatever happens. As such, the public can fully anticipate monetary policy.

4.3.3 The New/Neo-Keynesian open economy model

There are three major structures of the New Keynesian open economy model: the purely forward-looking; the hybrid, that is with forward-looking and backward-looking elements; and the purely backward-looking.

A purely backward-looking specification is appealing in that it resembles the empirical macroeconometric models used by many central banks (Ball 1999). This is confirmed by BIS (1995) and Rudebusch and Svensson (1999), who also used a purely backward-looking model. Such a specification is appropriate for an IT strategy that has only just been introduced, implying that the public is still learning about the new monetary policy regime.[2] In fact, the macro model estimated for the Philippines uses this specification, as data shows a high degree of persistence in both inflation and output (Estrella and Fuhrer 2002).

In contrast to the New Classical paradigm, the New Keynesian approach reintroduces important nominal rigidities. In particular, sticky prices and wages are assumed on the supply side so that output is demand determined

in the short run, and the nominal exchange rate is allowed to transitorily deviate from PPP so that movements in the real exchange rate occur. In addition, nominal short-term interest rates play the leading role as the instrument of monetary policy, with the role of money limited.

The structure of the model is based on two major equations. The demand side of the Ball (1999) model is given by the following open economy *IS* equation:

$$y_t = \alpha y_{t-1} - \delta r_{t-1} + \beta q_{t-1} + \varepsilon. \tag{4.11}$$

Equation (4.11) shows that real output depends positively on its own lag, negatively on lags of the real interest rate *r* and positively on the real exchange rate *q* and a demand shock ε. In this equation, household decisions are seen as being based on the household's past consumption pattern. In particular, consumers are assumed to maximize their lifetime expected utility, leading to behaviour that is often referred to as consumption smoothing. In the resulting *IS* equation, consumption, hence, real output, adjusts (with a lag) to information regarding income prospects, typically seen in the previous changes in real interest rates.

Meanwhile, the real exchange rate appears in this equation to the extent that it determines the relative cost of foreign and domestic goods which feed into the consumption bundle of domestic households. There is additionally a world demand for domestic goods.

As mentioned earlier on, sticky prices is an important requirement for short-run demand management to work. Hence, the supply side is given by the following Phillips curve equation:

$$\pi_t = \pi_{t-1} + \gamma y_{t-1} + \beta(q_{t-1} - q_{t-2}) + \varepsilon. \tag{4.12}$$

Equation (4.12) resembles equation (3.1) in Chapter 3 except that the exchange rate is included and that past behaviour of inflation, output and exchange rate are assumed. Following the inclusion of the exchange rate, the inflation rate π_t is defined as a weighted average of domestic π_t^d and imported inflation π_t^m:

$$\pi_t = (1-\beta)\pi_t^d + \beta\pi_t^m. \tag{4.13}$$

The domestic inflation process is governed by a backward-looking accelerationist closed economy Phillips curve in which the current rate of

domestic inflation is positively related to the lagged value of the output gap and to the lagged value of overall inflation:

$$\pi_t^d = \pi_{t-1} + \gamma y_{t-1} + \varepsilon. \tag{4.14}$$

Recall that the theorem of acceleration argues that the natural rate of unemployment (and hence the output gap) is consistent with any rate of inflation. There is no stable relationship between unemployment and inflation, but only between unemployment and changes in the inflation rate.

Meanwhile, the exchange rate impacts domestic inflation indirectly through wage-setting. A more direct exchange rate effect though is captured by imported inflation:

$$\pi_t^m = \pi_{t-1}^f + (e_{t-1}^n - e_{t-2}^n) = \pi_{t-1} + (q_{t-1} - q_{t-2}), \tag{4.15}$$

where π_t^f is the domestic price of foreign inflation. In this equation, Ball (1999) assumed a one-period lag for the impact of exchange rate changes on import prices. Meanwhile, the right side of equation (4.15) can be obtained by replacing the nominal exchange rate change with the assumed real exchange rate equation:

$$q_t - q_{t-1} = e_t^n - e_{t-1}^n + \pi_t^f - \pi_t. \tag{4.16}$$

Note that equation (4.16) assumes that movements in the real exchange rate are due to deviations from PPP.

The UIP underpins determination of the nominal exchange rate. Compared with equation (4.8) earlier on, equation (4.17) now explicitly includes deviations from the UIP, u_t.

$$i_t = i_t^f + E_t e_{t+1}^n - e_t^n + u_t. \tag{4.17}$$

These deviations are typically referred to as the foreign exchange risk premium that incorporates any exogenous residual disturbances to the nominal exchange rate, including changes in portfolio preferences, credibility effects, etc. (Svensson 2000).

Since the risk premium implies risk aversion on the part of investors making portfolio decisions, it is important to note that this assumption does not fundamentally alter the model. This is because the demand for and the supply of stocks of assets which become directly affected by the non-substitutability of domestic and foreign assets figure only in the back-

ground of the model as residual variables. This is argued to be in sharp contrast to the monetary models of the New Classical approach.

Solving equation (4.17) by forward iteration, the nominal exchange rate is obtained as follows:

$$e_t^n = E_t \sum_{j=0}^{\infty} (i_{t+j}^f - i_{t+j} + u_{t+j}). \tag{4.18}$$

Equation (4.18) shows that the nominal exchange rate e_t^n is an asset price that is forward-looking and expectations-determined. In particular, it shows that the current and expected future interest rate differentials, as well as the current and expected future risk premium, determine the nominal exchange rate. On the whole, this is the core relationship of an efficient speculative foreign exchange market in which the exchange rate fully reflects information available to market participants and in which every new piece of information is immediately mapped into prices.

The monetary policy instrument in New Keynesian models is the short-term nominal interest rate. It is implemented either as a simple policy rule where the interest rate responds to a small subset of the central bank's information, or as an optimal policy rule which is derived from a dynamic programming procedure and according to which a central bank responds to all information available.

As stressed in Chapter 3, this characteristic of the interest rate constitutes an integral part of an IT strategy and resembles equation (3.3) in Chapter 3. The short-term nominal interest rate affects the nominal exchange rate through equations (4.18) and (4.16) and sticky prices affect the real exchange rate. As mentioned earlier on, the model assumes that capital mobility is imperfect and hence the adjustment runs through the commodity market. This adjustment highlights the importance of the real exchange rate more than the previous two models.

4.4 The exchange rate and uncertainty

An open macroeconomy is susceptible to shocks. In general, shocks to the exchange rate could be pure exchange rate shocks or (purely exogenous) shocks emanating from market perceptions at the equilibrium level of the exchange rate and other shocks that may impact on the exchange rate such as oil prices and supply shocks.

Wout (2003) argues that shocks stemming from the international financial markets as the most unpredictable and therefore difficult, especially for small developing economies. Central in this regard is when the market suddenly expects a change in the equilibrium level of the exchange rate. How the monetary authorities respond to this uncertainty is crucial. Monetary authorities may disregard uncertainty, they may be cautious, or they may be aggressive or experiment with policy intervention. Under that last, relying on monetary policy rules and paying attention to risks that have a low probability of causing a crisis have become popular with the adoption of IT.

Any uncertainty then that affects the equilibrium level of the exchange rate raises concern about how to restore the exchange rate back to its equilibrium level. The link between the exchange rate and prices is uncertain. This section takes a closer look at the two important arbitrage conditions, the PPP and UIP, built into open economy models. These two conditions continue to be reflected in many empirical open macroeconomic models. Although neither of these enjoy much empirical support, this section discusses the uncertainty in these two conditions and the implications for monetary policy. Particular attention is given to UIP and how its deviations lead to uncertainty for the central bank.

4.4.1 The PPP disconnect

In any test of PPP, the objective is to ascertain whether the nominal exchange rate changes to ensure that comparable goods in each country cost the same in real terms. Deviations from PPP are then measured by taking the real exchange rate (the nominal exchange rate deflated by the ratio of foreign to domestic price levels). If this equals one, PPP holds.

However, when it is less than one, the nominal exchange rate is overvalued, hence, domestic currency would need to depreciate for goods in each country to cost the same in real terms. On the other hand, when the real exchange rate is greater than one, the nominal exchange rate is undervalued and the domestic currency must appreciate in order for goods in each country to cost the same in real terms. Any deviation from PPP suggests frictions within the market. These frictions could be transport costs or imperfect competition. They may also be a sign of a large non-traded sector within a country or of exchange rate intervention that prevents the rate from fluctuating with changes in the price level (Haskel and Wolf 2000). Deviations from PPP constitute the first step in understanding what drives the exchange rate in an economy and at times is an indicator of currency crisis.

Empirical findings show that PPP holds only in the very long run. In addition, the general result is that in floating exchange rate regimes, the real exchange rate and the nominal exchange rate are closely correlated. The early literature fails to reject the hypothesis that the real exchange rate follows a random walk. There are studies in which deviations of the nominal exchange rate from PPP are found to be larger in developing than in developed countries (Tang and Butiong 1994; Allsopp and Zurbruegg 2003). The deviations could be attributed to differences in government intervention and trade restrictions, suggesting that the analysis of PPP can help to measure the degree of economic development in different markets.

Explanations for deviations from PPP are typically varied. A common thread is that put forward by Goldberg and Knetter (1997). They argued that deviations from PPP are highly correlated with nominal exchange rate movements, especially in the short run. At the heart of explanations are border effects or friction in international arbitrage due to transportation costs and trade barriers (Engel and Rogers 1996) and price rigidities under variable nominal exchange rates (Krugman 1987), both of which lead to sticky import prices which only gradually adjust to the level implied by PPP. These deviations suggest that the puzzle between inflation and exchange rate has a partial pass-through in the short run which becomes complete only over the long run.[3] But what remains a riddle in these findings is the slowness of adjustment speeds, indicating a great degree of persistence.

This partial pass-through becomes important in the New Keynesian open economy model discussed earlier on. Equation (3.3) in Chapter 3 implies that the central bank has the objective of stabilizing the output gap and inflation around its targets. Meanwhile, equation (4.17) implies that the central bank considers another important channel, that is, the exchange rate. The view is that with the UIP assumption, interest rate changes directly affect the exchange rate. Recall that a rise in the interest rate leads to the simultaneous appreciation of the domestic currency, which impacts both on aggregate demand by altering the relative costs of foreign and domestic goods and on inflation by passing through exchange rate changes to import prices and thus to inflation as implied in equation (4.13). The exchange rate then has direct and indirect effects.

The low pass-through signifies that the direct effect is relatively small, hence, could be seen as less effective as a transmission variable. However, due to price stickiness, changes in the nominal exchange rate affect the real exchange rate, which implies that the indirect effects could be stronger. In this situation, more of the adjustment from shocks needs to be endured by

the domestic interest rate channel which primarily affects domestic demand (Smets and Wouters 2002). These direct and indirect effects could then have crucial policy implications, as the implied degree of inflation depends on the extent of exchange rate pass-through, especially in the presence of monetary transmission lags.

4.4.2 The interest parity puzzle

The limitations of PPP led to the asset market view of the exchange rate theories. This view holds foreign exchange to be assets traded in competitive markets and these assets are fundamentally dependent on the expectation of fundamental changes. It also incorporates the increasing role of information and pricing models to explore the limitations of PPP and, hence, to provide insight into their effects on policy under a flexible exchange rate regime.

When an asset market is taken into account, an interest parity condition follows the essence of international manifestations of the LOP. Without any form of constraint,[4] the dollar return on security investments or the dollar cost of borrowing, will be equal in different countries where there is perfect capital mobility and perfect capital substitutability.

The covered interest rate parity (CIRP) theory stresses that a country has no incentive or advantage of borrowing or lending from or to the domestic asset market. Rather, it is more favourable to transact in another country's asset market. If there is any advantage at all, then interest arbitrageurs will move the market towards CIRP. This theory implies that the CIRP condition is completely hedged, as it includes the use of a forward rate.

Empirical findings show some deviations in CIRP that could be due to transaction costs, political risk (such as capital controls and changes in regime policy), potential tax advantages and liquidity preferences.

The CIRP is clearly evident in a pricing model for forward rates. The higher the uncertainty on the political front, the more costly is the capital inflow in terms of country risk reflected in money and forward markets. In addition, when the central bank has to intervene to stabilize its own currency, it must consider the link between the foreign exchange market, the money market and the forward market as described in CIRP theory. Central bank intervention in the spot foreign exchange market alone may be limited and therefore ineffective. This is argued to increase interest rates, including forward rates, thus increasing the cost of capital.

Moving to the other extreme, in the international finance literature, the UIP condition represents a behavioural relationship among speculators on

international financial markets. It is not an exchange rate model per se, but it constitutes the fundamental law governing the functioning of an efficient speculative asset market. Due to this characteristic, UIP is a central relation in virtually all asset market models of the exchange rate as well as in all open economy macro models.

The basic UIP theory indicates that if international capital markets are free from capital controls and international investors are risk neutral, on average, the exchange rate will evolve in line with interest rate differentials. However, there is a likelihood of random variation around this path. Indeed, this will occur if investment in the domestic currency is expected to do neither better nor worse than investment in any foreign currency.

Empirical studies validating the UIP condition have been unsatisfactory and limited. Though different techniques have been used to test UIP, results have been mixed and unconvincing. One significant result from these studies is the presence of forward risk premiums with mixed signs, casting doubt on whether these mixed signs could be classified as exchange rate risk at all. These findings are normally contained in the so-called "forward premium/discount puzzle/bias" or briefly the "UIP puzzle" in Bilson (1981), Fama (1984), Cumby and Obstfeld (1984) and, more recently, in Mark and Wu (1998), Meredith and Chinn (1998) and Roll and Yan (2000). The dilemma is particularly crucial as it confirms the complexity of the actual behaviour of exchange rates. In policy terms, this implies uncertainty in the central bank's actions over time.

Both the PPP and UIP have repercussions for the New Classical and the New Keynesian open economy model. Unlike the New Classical model in which PPP is assumed to continuously hold, the New Keynesian model explicitly takes into account deviations from PPP by allowing for movements in the real exchange rate.

In the literature, uncertainty regarding UIP could emanate from three sources. The first and perhaps most prominent is a time-varying risk premium that drives a wedge between the forward rate and the future spot rate. Assuming rational expectations, risk-averse international investors demand a higher rate of return on investments they expect to be more risky.

A second source of uncertainty regards questions on the efficiency of the foreign exchange market, hence, models cast doubt on the notion that the expectation of the exchange rate at time $(t+1)$ formed in time t is an unbiased predictor of the realized exchange rate in time $(t+1)$. Recall that in an efficient speculative market prices should fully reflect information

available to market participants and it should be impossible for a trader to earn excess returns to speculation (Sarno and Taylor 2002).

A third source of uncertainty relates to policy behaviour. Central banks that use the short-term interest rate as their operating target are assumed to set interest rates according to a rule in which the exchange rate figures as an important variable, despite the fact that there is more to the UIP condition.

Regardless of these uncertainties, the assumption of the UIP condition is still widespread among economists, that is, the UIP remains a core relation determining the exchange rate.

4.5 But there is more to the UIP condition

In the presence of uncertainty about the source of exchange rate changes, a prudent central bank will attempt to identify a consistent policy response that achieves the inflation target and also results in a stable a path for the real economy if possible. The consistent policy response will depend on the typical pattern of shocks to which the economy is exposed, and the economy's inherent reactions to those shocks.[5]

Thus, in an economy where exchange rate developments reflect inflation shocks more than real shocks, and/or where inflation expectations are not well anchored, it would be prudent for policy to offset the first-round direct effects on tradeable prices of an exchange rate. This means that the prudent monetary policy response would be to lean against the exchange rate change, at least until there are grounds for more confidence that it was the fundamentals that had changed.

On the other hand, in an economy where exchange rate movements typically reflect fundamental factors, and/or where inflation expectations are better anchored, movements in tradeable prices relative to domestic economy prices caused by exchange rate changes should typically be accommodated. Under this scenario, if monetary policy leans against exchange rate changes until strong evidence emerges of a real shock, then more of the real adjustment has to come through domestic prices moving in the opposite (offsetting) direction (like deflation of domestic prices in the case of a negative shock like the Asian currency crisis). The alternative, of allowing the exchange rate and thus the tradeables components of prices to adjust, means that there will be less offset and more movement in the overall level of prices in the economy.

4.6 The uncertain UIP in Philippine context

Chapter 2 claimed that of all the factors affecting inflation and growth in the Philippines, the exchange rate is doubtless one of the most important. Since adoption of the floating exchange rate in 1997, the peso has been weak (in fact it has been the weakest currency in the East Asian region) and highly volatile. Given a thin and segmented foreign exchange market, the peso-dollar rate has tended to be sensitive to news and market perception.

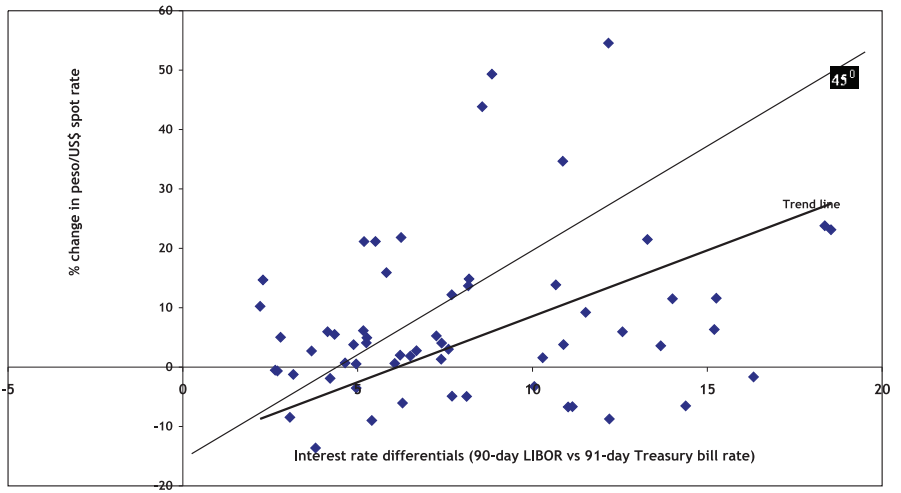
Officially, the BSP maintains a freely floating peso, with the currency's value determined, to a great extent, by supply and demand factors. The BSP, however, intervenes in the open market as well as in the foreign exchange market when there are speculative fluctuations of the peso against the dollar. As implied in Chapters 2 and 3, monetary policy in practice falls in a middle ground, between reacting to exchange rate changes as if they were always inflationary (or deflationary), and assuming that exchange rate movements reflect changed fundamentals.

This BSP strategy stems from the difficulty of predicting the behaviour of the peso-dollar rate. Even the UIP condition has some limitations. Recall that the UIP theory claims that exchange rate changes are predictably related to interest rate differentials. As seen in a vast literature, this section argues that in the Philippines, exchange rate changes are in fact not completely predicted by interest rate differentials.

This claim is broadly illustrated in Figure 4.1, which shows a scatter plot of interest rate differentials (horizontal axis) with the subsequent quarterly percentage changes in nominal exchange rate (vertical axis) for the peso. The sample period is from the first quarter of 1988 to the fourth quarter of 2005. The interest rate differential is expressed as a quarterly rate. Were UIP to hold, the dots would be scattered around a forty-five degree line. The trend line is not located at the forty-five degree position, although it is relatively close. The dispersal around the two lines is wide, indicating a lot of noise in the relationship between interest rate differentials and exchange rate changes during the period.

4.7 Alternative cases to the UIP puzzle

Section 4.5 mentioned the lack of empirical evidence for the UIP theory. This suggests a failure of the efficient market hypothesis. However, recent empirical literature has argued that there are some cases that tentatively explain the failure of the UIP condition, beyond the risk premium. These cases, typically represented by non-rationality of international investors, are



Source of basic data: BSP (2006), selected Philippine economic indicators.

Figure 4.1
Nominal peso-dollar rate and interest rate differentials

said to better describe exchange rate behaviour under uncertainty. In an uncertain situation, a central bank could shift to these cases for guidance on monetary actions. The crucial issue is then the effects of these tentative approaches on the true behaviour of the exchange rate under a market determined regime and on the performance of monetary policy.

However, these cases represent the process of expectations formation, not the exchange rate equation as a whole. Thus, the exchange rate model given by these specifications should not be understood as a better exchange rate model than the UIP, but as tentative approach to introduce an element of uncertainty. Tentative here means that these cases do not yet provide a satisfactory and full-fledged model of exchange rate determination. From the perspective of macroeconomic modelling, they can be viewed as proposals for better describing the behaviour of international investors but which have not yet produced a reliable relationship between the exchange rate on the one hand and the interest rate or other macroeconomic variables on the other hand.

Nevertheless, these approaches will be used in the quantitative analysis in Chapter 6, but will be treated as alternative exchange rate models to the UIP which have unknown reliability. This section, largely patterned after Wollmershauser (2003), explores and analyses empirical studies on ex-

change rate uncertainty. For simplicity, the discussion omits the dynamics of exchange rate uncertainty.

Case 1 in Table 4.1 is based on the Ball (1999) model for open economies, where a static relationship is assumed between the real exchange rate (e^r)and the real interest rate (defined as the difference between the nominal interest rate and the inflation rate). This is argued to be an alternative to the UIP specification. In implicit terms, this model rejects the hypothesis of an exchange rate as an asset price, as rational expectations do not form part of the determinants of the current exchange rate. In essence, the model suggests that a rise in the interest rate makes domestic assets more attractive, leading to an appreciation of the domestic currency. This specification is mainly based on reduced-form exchange rate equations and the error term is assumed to be white noise.

Case 2 is patterned after the empirical approach of Ryan and Thompson (2000) where the current real exchange rate is determined by its own lagged realization and the lagged real interest rate differential. In this specification, the error term is assumed to be white noise. Following the omission of rational expectations in the determinants of the current exchange rate, this case rejects the hypothesis that the exchange rate is an asset price. The idea is that higher domestic interest rates lead to appreciation of the currency, however, with a one-period lag.

Cases 3 and 4 attempt to introduce mixed expectations or to simultaneously capture the features of data-based models on the one hand and rational expectations in an efficient market on the other hand.

Table 4.1
Sources of exchange rate uncertainty

Cases	Sources	Specifications
1	Static relationship: Real interest rate and real exchange rate	$e_t^r = -\alpha^{i^n}(i_t^n - \pi_t) + \varepsilon_t^{e^r}$
2	Lagged interest rate differential	$\Delta e_t^r = -\alpha_t^{i^{rd}}(i_{t-1}^{rd} - i_{t-1}^{rf}) - \alpha_{t-1}^{e^r} + \varepsilon_t^{\Delta e^r}$
3	Mixed expectations: Static and backward-looking	$e_t^n = \upsilon E_t e_{t+1}^n + (1-\upsilon)e_{t-1}^n - i_t + i_t^f + \varepsilon e_t^n$
4	Mixed expectations: Adaptive and backward-looking	$e_t^n = \upsilon E_t e_{t+1}^n + (1-\upsilon)Xe_{t-1}^n - i_t + i_t^f + \varepsilon e_t^n$
5	Random behavior	$e_t^r = -\alpha^{er} e_{t-1}^r + \varepsilon_t^{er}$

Source of basic data: Wollmershauser (2003).

Case 3 is patterned after Dennis (2000), which adopts a simple forecast of the nominal exchange rate in $t+1$ by its realization in $t-1$. The error terms as well as the foreign interest rate follow the autoregressive process. In this case, the parameter υ defines the degree of forward-looking and rational behaviour while $\varepsilon e_t''$ is a white noise disturbance. If υ approaches unity, expectations are predominantly forward-looking; if it approaches zero, expectations are predominantly static and backward-looking. It should be noted as well that uncertainty in the exchange rate occurs with respect to the degree of backward-looking behaviour, $1-\upsilon$, in the foreign exchange market.

Case 4 assumes another version of mixed expectations suggested by Leitemo and Söderström (2001). Instead of static expectations for the backward-looking part of the expectations, they assumed agents form expectations adaptively. The parameter υ again defines the degree of forward-looking behaviour in the international financial markets while X serves as the adaptive expectations operator. If expectations are purely adaptive ($\upsilon = 0$), agents update their exchange rate expectations gradually in the direction of the observed exchange rate. Note that uncertainty occurs with respect to the degree of rationality and the rate at which agents with adaptive expectations revise their expectations about the future exchange rate.

Case 5 assumes that the real exchange rate follows a random walk. Meese and Rogoff (1983) argued that a whole range of fundamentals-based nominal exchange rate models (flexible-price monetary models with and without current account effects and a sticky-price monetary model) were unable to outperform a simple random-walk model in an out-of-sample forecasting exercise. That is, when changes in the real exchange rate are regressed on real interest rate differentials to forecast the real exchange rates, forecasts from a random-walk model have lower root-mean-square error.

Indeed, results of random-walk model were rejected by recent studies using long-span datasets in favour of autoregressive process with a high degree of persistence. Using Kilian and Taylor (2003) and Wollmershauser's (2003) specification, the real exchange rate only depends on its own lagged value and white noise å as seen in Table 4.1. In addition, no other macroeconomic variables, such as the domestic interest rate, influence the exchange rate.

In determining the best specification for the peso-dollar exchange rate, all cases of exchange rate uncertainty discussed in Table 4.1 were estimated and tested. Table 4.2 shows that Cases 2, 3 and 4 failed the diagnostic tests.

Table 4.2
Sources of exchange rate uncertainty and estimated equations

Case	Sources	Estimated equations
1	Static relationship: Real interest rate and real exchange rate	$e_t^r = -\alpha^{i^n}(i_t^n - \pi_t) + \varepsilon_t^{e^r}$ log(*PFXR*) = 4.14 – 0.58 * (*TBR*91 – *FINFL*) + [*AR*(2) = 1.16, *AR*(4) = –20] *(5.99) (-1.89) (8.17) (-1.86)* Adj. R2=0.93, Jarque-Bera=0.09(0.96); White=0.30(0.74); Breusch-Godfrey=0.48(0.62); RESET=0.54(0.59)
2	Lagged interest rate differential	$\Delta e_t^r = -\alpha_t^{i^{rd}}(i_{t-1}^{rd} - i_{t-1}^{rf}) - \alpha_{t-1}^{e^r} + \varepsilon_t^{\Delta e^r}$ Dropped in the exercise as regression coeffcients are insignificant and diagnostic tests are weak.
3	Mixed expectations: Static and backward-looking	$e_t^n = \upsilon E_t e_{t+1}^n + (1-\upsilon)e_{t-1}^n - i_t + i_t^f + \varepsilon e_t^n$ Dropped in the exercise as regression coeffcients are insignificant and diagnostic tests are weak.
4	Mixed expectations: Adaptive and backward-looking	$e_t^n = \upsilon E_t e_{t+1}^n + (1-\upsilon)Xe_{t-1}^n - i_t + i_t^f + \varepsilon e_t^n$ Dropped in the exercise as regression coeffcients are insignificant and diagnostic tests are weak.
5	Random behavior	$e_t^r = -\alpha^{er} e_{t-1}^r + \varepsilon_t^{er}$ log(*PFXR*) = 0.11 + 0.98 * log(*PFXR*(–1)) + [*AR*(1) = 0.40] *(1.84) (27.43) (2.94)* Adj. R2=0.98, Jarque-Bera=0.16(0.78); White=1.22(0.30); Breusch-Godfrey=1.05(0.36); RESET=0.21(0.81)

Source of basic data: Wollmershauser (2003); own computation.

These were subsequently dropped from the exercise. Hence, only Case 1 and Case 5 are used in the exercise.

The adjusted R^2 values for all equations are greater than 90% and values in all equations suggest that there is no penalty for the number of explanatory variables used. Attempts were made to correct for varying degrees of serial correlation in the structural equations. With a lag order of up two and at 5% to 10% level of significance, Breusch-Godfrey's test results show that not all equations exhibit serial correlation. White's results suggest homoscedasticity of residuals. Finally, results from regression specification error test (RESET) up to two lags reveal that there are no specification errors in equations.

4.8 Early experiences with IT: Towards indirect effects on prices?

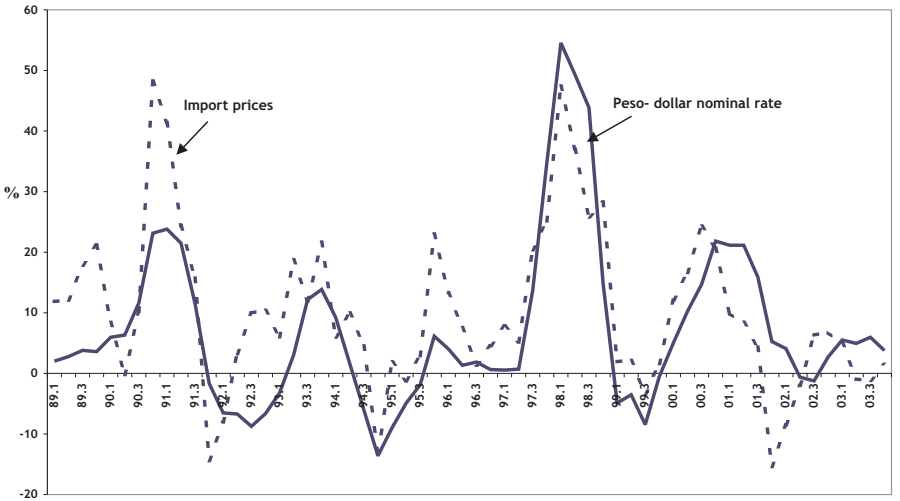
This section reviews how the BSP has approached the exchange rate when forming monetary policy since the adoption of IT. As experience has been gained with the IT regime, the BSP now targets inflation 15 to 21 months ahead.[6]

In the early period of IT, the exchange rate was seen as a key variable in the formulation of monetary policy because of its rapid and direct influence on future prices. There was less confidence about the longer lagged indirect effects of interest rates and the exchange rate on inflation. Essentially for credibility reasons, the BSP was keen that inflation remain within its target band. The direct pass-through from exchange rate movements to the CPI was a means by which to achieve this with a reasonable probability of success.

Formal quarterly reassessments of inflation prospects were established based on an estimate of the extent of the pass-through within 24 months from changes in the exchange rate to consumer prices. The assessments were not enforced by any exchange rate peg, but rather by the BSP's standing ready to adjust monetary policy, that is, interest rates, if required. It served as a mechanism to limit the extent to which the exchange rate could move between comprehensive quarterly reassessments of inflation prospects. In effect, these assessments reflected a cautious stance by the BSP with respect to exchange rate movements, and stemmed primarily from concern about the direct effect of exchange rate movements on prices.

But as low inflation has been sustained, and the transmission mechanisms are now better identified, the BSP is showing some early signs of relying less on the direct and more on the indirect channels of the exchange rate (and interest rates). In various episodes (especially in 2002) the BSP decided to reduce both RRP and RP rates to help revive demand from the real economy. In this respect, the inflation target horizon has become more forward-looking.

This chapter argues that this apparent change of emphasis to accommodate more indirect effects is appealing for a number of reasons. First, recent evidence (from the past two years or so) suggests that the direct effect of exchange rate changes on tradeables prices in the Philippines has become more muted than in previous years (Figure 4.2). Import prices in peso terms have, since the latter part of 2002, tracked movements in the exchange rate less closely than in earlier years, albeit with lags. Thus, for the present at



Source of basic data: 2006 PIDS database, selected Philippine economic indicators.

Figure 4.2
Import price index and nominal peso-dollar rate
(average quarterly percentage change)

least, there is probably less cause for concern about the potential for a direct effect on the CPI of exchange-rate-induced shifts in relative prices. The reasons why the pass-through has become more muted are unclear though.

Furthermore, the economy evolved below its potential after the currency crisis, as noted in Chapter 2. When the peso floated, the output gap was undoubtedly negative, which provided a major force for countering pass-through pressures.

Beyond Goldfajn and Werlang (2000), another possibility is that traders have adapted to the large swings that have occurred in the value of the peso (and other currencies) by looking through the exchange rate cycle. There is also the possibility that, as trade has become more globalized, firms may have become more willing to operate on the basis of "swings and roundabouts" across different markets (Orr et al. 1998). In this sense, the phenomenon may be specific to the most recent business cycle, and not indicative of a permanent change.

An additional aspect is when an exchange rate adjustment that stems from a change in the fundamentals is considered. There will be a direct effect on tradeables prices, with this effect generally thought to be reasonably fully reflected in these prices within a year or so of the exchange rate adjust-

ment occurring. If policy is to offset this effect on the price level, the main instrument would be higher interest rates. But the effect of interest rates on aggregate demand, and thus on inflation, is slower. Hence, unless monetary policy is adjusted aggressively, not much can be done to prevent the direct effect of the exchange rate change on prices. As pointed out in empirical studies on monetary policy, aggressive policy reactions are generally not preferred because, given the lags, they may generate unwarranted volatility in output, as well as in prices, in the medium term.

A second reason why emphasis on more indirect channels is appealing is that there have indeed been incidences of trade-offs in inflation and output variability. A growing body of research suggests that central banks face a short term trade-off between variability in inflation and variability in output. This is not the same as saying that there exists a sustainable, or even an exploitable, trade-off between inflation and output growth; rather, that there is a trade-off between the degree of variability in one vis-à-vis the other.

This trade-off has always been recognized in the Philippine IT framework. The framework allows flexibility for the BSP to deal with unforeseen developments or shocks to prices, at least to the extent that generalized inflation (or deflation) has not resulted. These caveats include movements in prices of agricultural products, natural calamities, movements in international oil prices and changes in administrative measures. Recognizing that these circumstances limit the effectiveness of the BSP's measures, these are argued to be consistent with international best practice in monetary policy among central banks.

In fact, the inflation target range for the Philippines in 2005 was raised from 4-5% to 5-6%. The target for 2006 however remains at 4-5% and those for succeeding years over the medium term at 3-4%. This implies that there is now more scope to accommodate the direct effect of any supply-side movements on tradeables prices before breaching the band.

But this set of caveats does not consider spikes in exchange movements. Thus, any unforeseen developments in the exchange market would necessitate a direct and immediate response from the BSP. In contrast with other practices of the central bank, the view could be held that if policy were to attempt to offset the effect of such relative price shocks on the general, that is, the average, level of prices, there would be an unwarranted impact on real economic activity. Recent research tends to confirm that policies directed at achieving very strict price stability in the short run, in a world where the economy is being buffeted by external and real shocks, can result

in unnecessary medium-term volatility in both output and inflation. In other words, by adopting a medium-term horizon for the inflation target, and hence being concerned primarily with the indirect exchange rate impact, monetary policy can achieve the desired medium-term inflation results with less output variability.

The explanation for such a circumstance is quite obvious. If the exchange rate depreciates because of, say, an adverse external shock, and monetary policy attempts to prevent any impact on the overall level of prices, including from the direct effect of the exchange rate, then monetary policy would have to be aggressively tightened. This would prevent the exchange rate from falling as much, and force some of the adjustment required to improve external competitiveness to come through lower domestic costs and prices. Such a policy route would involve a greater short-term loss of output or, in other words, more variability in output, than if the exchange rate were allowed to carry more of the adjustment.

It might also end up causing more instability in the price level. This could well be the case if the downward pressure on domestic costs and prices occurred with a longer lag than the direct effect of the exchange rate on tradeables prices. Thus, a short policy horizon focused on offsetting the effect on tradeables prices might result in more instability in the overall price level.

By contrast, if the BSP focused only on the indirect impact of the exchange rate on prices, then the policy response would be less active, but with more stable long-term inflation outcomes. It follows that an inflation target can be achieved in many different ways, and that monetary policy choices may have different implications for the variability of output, monetary conditions and inflation. Much of the BSP's current research is being directed at establishing a framework for monetary policy that results in the most "efficient" outcomes. This means that research is focused on what policy response and target horizon minimizes the overall volatility in output and policy instruments, while maintaining price stability.

4.9 Concluding thoughts

For a small open economy like the Philippines, the exchange rate plays a central role in relation to monetary policy. It has an important influence on the overall level of prices, and is also influenced by monetary policy. When operating with a 15 to 21 month ahead inflation target, the indirect impact of the exchange rate is most important. However, the short-term direct ef-

fect on the price level of exchange rate changes that stem solely from real or external economy shocks are still the best policy option by the BSP.

A key point is that the implications of a move in the exchange rate for inflation depend critically on why the movement has occurred. And exchange rates can move for a range of reasons. Apart from being a mechanism that allows a domestic economy to adjust to shocks and disturbances, the exchange rate could also be a source of shocks to the economy, for instance, if its movements are mainly driven by "irrational" movements in financial markets rather than by economic fundamentals.

Using the major assumptions of the arbitrage conditions, PPP and UIP, this chapter has emphasized sources of exchange rate uncertainties in an open macroeconomy. Uncertainty of exchange rate behaviour in this chapter is grounded on two observations. First, there is poor empirical evidence of the validity of an unbiased UIP condition. Second, there exist some approaches to tentatively explain the origin of the failure of unbiased UIP. Due to uncertainty in exchange rate behaviour, the exchange rate is treated not only as an endogenous variable but also as an source of shocks, which on one hand is likely to provoke a more activist stabilisation policy and on the other hand implies an uncertain transmission of interest rate impulses via the exchange rate channel.

Philippine monetary policy in practice falls on a middle ground, between reacting to exchange rate changes as if they were always inflationary (or deflationary) and assuming that exchange rate movements reflect changed fundamentals. In the early period of IT, the exchange rate was seen as a key variable in the formulation of monetary policy because of its rapid and direct influence on future prices. Essentially for credibility reasons, the BSP was keen to ensure that inflation remained within its target band. However, there seem now to be early signs of a shift of emphasis to accommodate more indirect effects. But it remains to be seen whether this shift will be sustained.

Historically inflation in the Philippines has tended to be consistently higher and more volatile than in other Southeast Asian countries due to fluctuations in the peso-dollar exchange rate which feed directly into domestic prices. The magnitude and frequency of shocks have heightened since 2001. This has clearly posed difficulties for the BSP, as similar events may demand different responses because the overall economic conditions must be taken into account. The Philippines adopted IT at a time when inflationary pressures were benign. However, serious tests came into play starting in 2003 when, apart from international oil price shocks, volatility in

the foreign exchange market became more pronounced, due to a weakening of investor confidence and a declining interest rate differential. Clearly, the BSP's instruments were insufficient to dampen inflationary risks, as these were limited to an interest rate response with some form of foreign exchange controls and administrative measures.

A worthwhile finding of the chapter is the need to broaden the scope to include other alternative views on exchange rate uncertainty and that how monetary policy works in the Philippines is important and worthy of more in-depth reflection.

Notes

1. The literature also calls this the "inflation theory of the exchange rate".
2. Also cited in Wollmershauser (2003).
3. See Campa and Goldberg (2002) for an estimation among Organisation for Economic Co-operation and Development (OECD) countries.
4. Constraints in capital markets include restrictions on the movement of capital, transaction costs, taxes and risks.
5. Svensson (1997) discussed the implications of uncertainty for IT.
6. Based on the BSP's estimate as of October 2005.

5 Model Specification and Estimation Results

5.1 Introduction

Chapters 2 and 4 implied that the historically high and variable inflation in the Philippines has often been linked to shocks in the real and monetary sectors. In fact, the magnitude and frequency of shocks, especially in the foreign exchange market, have heightened since the monetary authorities adopted IT in 2001. This is crucial since the exchange rate occupies a pivotal role in anchoring inflation expectations.

The BSP's policy reaction has been to reset the policy interest rate, with some form of foreign exchange controls and administrative measures to dampen inflationary pressure. However, the past two years showed that these measures were of limited utility in dampening inflationary risks, and real output growth continued to be unimpressive.

The main policy implications of these findings are twofold. First, given the importance of the exchange rate for the Philippines, there is a need to better understand the dynamics of the exchange rate, its impact on the economy and the effectiveness of policy instruments. Second, since a certain degree of flexibility is called for in policy response, clear and consistent intention is vital to the conduct and credibility of IT.

This chapter presents a framework for analysing the Philippine monetary policy transmission mechanism. The core theory describes the main building blocks of the model, highlighting the interaction between markets and the key assumptions. These are summarized in section 5.2. Section 5.3 traces the monetary policy transmission mechanism in detail, along with its underlying assumptions. What makes our model different from the available macro model for the Philippines and that of Brazil or Chile is discussed in section 5.4. This is followed by the simulation properties of the open macro model in section 5.5 and the overall modelling estimation

strategy, diagnostic tests and solution in section 5.6. Monetary policy transmission in the Philippines is discussed in section 5.7, while the analytical points of the results are discussed in section 5.8. The caveats of the model are laid out in section 5.9. Section 5.10 tests the simulation performance of the macro model. The implied dynamics and order of magnitude from impulse response scenarios and evaluation are discussed in section 5.11, while lessons for monetary policy are set out in the concluding remarks in section 5.12.

5.2 The theoretical underpinnings of the macro model

To a broad extent, the structural, dynamic, quarterly, macroeconometric model presented here is New Keynesian a la Ball (1999). As discussed in Chapter 4 (Section 4.3.3) the Ball (1999) model assumes that inflation and output are backward-looking. It thus deliberately abstains from any optimizing foundation. In addition, a purely backward-looking specification is appealing in that it resembles the empirical macroeconometric models used by many central banks (Ball 1999; BIS 1995; Rudebusch and Svensson 1999). Such a specification is appropriate for an IT strategy that has only just been introduced, implying that the public is still learning about the new monetary policy regime. Central to this model are important nominal rigidities in describing the macroeconomy, typical of the New Keynesian approach. In addition, there are lag effects in the transmission mechanism.

The agents in this macro model include (i) households, (ii) domestic firms, (iii) government, (iv) the rest of the world (which provides capital, goods and services demanded by the domestic economy and a market for domestic production) and (v) the central bank. In this model, the central bank has the task to anchor the nominal side of the economy. The central bank adopts an IT framework and is a flexible inflation targeter, and it sets a short-term interest rate to achieve an inflation target, consequently providing nominal stability. There are lags and delays between a change in interest rate and inflation. Given these lags and price and wage rigidities, the use of a simple interest rate rule is required to anchor inflation in the long run, leaving the role of the money supply limited (Romer 2000). As stressed in Chapters 3 and 4, this characteristic of the interest rate constitutes an integral part of an IT strategy.

Moreover, this model describes an economy in which there is excess supply, hence, aggregate output is demand-determined in the short to medium run.[1] How agents react in various markets is crucial. This model

characterizes markets with the following features: (i) Goods markets are monopolistically competitive (Blanchard and Kiyotaki 1987),[2] leading to profits for firms to charge non-competitive sticky prices (Calvo 1983), and which clear all of domestic production to satisfy demand (net of imports) for consumption, investment, government spending and exports. (ii) Labour equilibrium is not perfectly competitive as households and firms negotiate a non-competitive real wage and engage in sticky nominal contracts (Calvo 1983); when setting prices, firms' mark-up is responsive to demand and monetary conditions. (iii) Asset markets (domestic and foreign) are imperfect.

Asset markets, largely dominated by the banking sector, are fragile to sharp swings in investor confidence. This is reflected in significant volatility of the exchange rate. In fact, the nominal exchange rates in our macro model reflects not only the UIP condition, but also deviations from the UIP. In Chapter 4, Svensson (2000) refers to these deviations as foreign exchange risk premium. This foreign exchange premium typically incorporates any exogenous residual disturbances to the nominal exchange rate, including changes in portfolio preferences, credibility effects, etc (Svensson 2000). This foreign exchange risk premium is oftentimes a source of higher volatility in the behaviour of the exchange rate. In our model, the nominal exchange rate is allowed to transitorily deviate from PPP so that movements in the real exchange rate occur.

The theoretical underpinnings of our macroeconometric model stem from a need to reflect the current realities of the Philippine economy. Gochoco-Bautista (2000) and Yap (1996) argued that the economic structure of the Philippines has changed very little over the past two decades. The economy is a dualistic type in which a small proportion of the labour force is employed in a capital-intensive and highly protected manufacturing sector, while the larger share of the population is employed in low productivity agriculture and informal urban services.

In general, the New Keynesian features are consistent with the actual economic structures of the Philippines. The country's economic structure reflects institutional constraints in the industrial sector wherein the goods markets are monopolistically competitive and imported intermediate inputs are extremely important in industrial production (Bautista et al. 2004; Balisacan and Hill 2003; Cororaton and Reyes 1997; Constantino et al. 1990). These features of the production sector impede the operation of the market-clearing process.

There has been a continuous struggle to maintain macroeconomic stability with growth being alternately limited by a foreign exchange constraint, a savings constraint and a fiscal constraint (Vos and Yap 1996). The financial market is underdeveloped and financial disintermediation is evident. Chronic budget deficits and other macroeconomic imbalances are addressed with fiscal and monetary policies.

Under such imbalances, the BSP is tasked to steer the nominal side of the economy. Stone (2003) implied that the BSP has adopted an "IT lite" framework. Under this framework, inflation targets are oftentimes breached, though the inflation target is maintained as the foremost policy objective. The role of the BSP is to focus on bringing inflation into the single digits and maintain financial stability.

5.3 The monetary transmission mechanism

This section establishes more detailed theories regarding transmission mechanisms from changes in the central bank's policy rate to changes in inflation, wages, employment and real output. As we go along, the subscript *t* denotes current time period.

For open developing economies like the Philippines, the choice of the most effective variables in monetary policy transmission is clearly a matter of judgment. The discussions in Chapters 2 and 3 leave us with four variables of monetary policy relevant to the Philippine: the interest rate, the exchange rate, money supply and inflation expectations.

The transmission mechanism starts when domestic interest rate policy is left to the BSP. The RRP is prescribed as the nominal policy interest rate and follows a behavioural specification as in Clarida, Gali and Gertler (2000).

The RRP adjusts to inflationary pressure measured by the difference between the inflation forecast and the inflation target announced by the government, the output gap and exchange rate pressure (or the difference between the expected peso-dollar rate and the realized peso-dollar rate). This is specified as follows:

$$r_t^p = \alpha + \beta(\pi_t^f - \pi_t^*) + \rho(q_t - q_t^*) + \gamma(E_t e_{t+1}^n - e_t^n) + \varepsilon_t, \tag{5.1}$$

where r_t^p is the RRP, α connotes the neutral monetary policy stance,[3] π_t^f is the inflation forecast, π_t^* is the medium-term inflation target announced by the government, q_t is real output, q_t^* is the potential real output, $E_t e_{t+1}^n$ is

the expected nominal peso-dollar rate at time t, e_t^n is the realized nominal peso-dollar rate and the error term is ε_t.

The parameter β in equation (5.1) is expected to be less than 1. The parameter β is an indicator of whether the BSP as an inflation targeter is strict (when the parameter β is 1) or flexible (or when the parameter β is less than 1). A strict inflation targeter implies that the BSP's sole objective is price stability.

Note that parameters β and γ are adjustable weights, given policy preferences. For instance, if the BSP prefers an aggressive stance to contain excessive pressure on the exchange rate, γ would have to be adjusted upwards, while inflation would be adjusted downwards.

The RRP is transmitted to the benchmark interest rate r through the natural arbitrage condition. In this model, the benchmark interest rate is the 91-day treasury bill rate. As seen in equation (5.2), r_t is also affected by other variables, such as the RRP r_t^p, the inflation rate π_t, the foreign interest rate r_t^f, the real money supply m_t and an error term ε_t.

$$r_t = \alpha + \beta r_t^p + \rho\pi_t + \gamma r_t^r - \vartheta m + \varepsilon_t. \tag{5.2}$$

Equation (5.2) states that the 91-day treasury bill rate is higher, the higher the RRP, the higher the inflation rate, the higher the foreign interest rate and the lower the level of money supply. In this equation, there is a direct channel from the BSP's policy rate to the benchmark interest rate.

Changes in the 91-day treasury bill rate are then carried over to the changes in the other market interest rates, such as savings and lending rates, through the natural arbitrage condition.

It is instructive to mention at this point that short-run domestic inflation is relatively sticky, indicating that inflation expectations for the short term are similarly sticky. This further implies that by controlling the nominal RRP the BSP can also affect the short-run real RRP rate or the difference between the short RRP rate and short-term inflation expectations. Through market expectations of future real rates, longer real rates (that is, longer than overnight rates) are also affected. Thus, the lowering of the RRP is expected to lower short and longer real interest rates, and consequently affect economic activity.

Money supply is estimated as an indicator of the quantity of money that the economy requires, without the BSP setting any target for it. The impact of changes in the RRP and market interest rates affects deposit liabilities

and the currency in circulation in the monetary system. These two indicators generate the money supply.

Changes in the RRP affect the nominal peso-dollar exchange rate and the expected nominal exchange rate. Our macroeconometric model embeds the UIP cum risk premium assumption in the nominal exchange rate determination. Indeed, the UIP relies on arbitrage arguments which are expected to be true even though arbitrage is often subject to limits (Shleifer and Summers 1990; Shleifer and Vishny 1997; Wollmershauser 2003). Regardless, arbitrage is one of the basic building blocks of economic decision making. The UIP is defined as

$$E_t e^n_{t+1} - e^n_t = r^f_t - r^d_t + u^e_t, \tag{5.3}$$

where the difference between the foreign interest rate r^f_t and the domestic interest rate r^d_t is the interest rate differential; and u^e_t is the risk premium (Svensson 2000, Leitemo and Soderstrom 2004, West 2003; Wollmershauser 2006).

In equation (5.3), the risk premium is assumed to follow the stationary process,

$$u^e_{t+1} = \rho_e u^e_t + \varepsilon^e_{t+1}, \tag{5.4}$$

where $0 \leq \rho_e < 1$. In this equation, ρ_e could capture the persistent movements in the risk premium and ε^e would capture exchange rate shocks. In the simulations of the model it is assumed that the risk premium is constant in this equation. This implies that when the effects of say, alternative interest rate policies, are assessed our model would assume that the time series for u^e_t is invariant to such policies. That is, *ceteris paribus*, movements in r^d_t lead one-to-one to movements in expected nominal exchange, where one of the *cetera* held fixed is u^e_t. This may not be a good assumption, but it arguably is as good as any. A good assumption about how u^e_t would change as monetary policy changes requires a good model for the shock u^e_t. This would be one area of improvement in our macro model. Nevertheless, equation (5.3) then feeds into the BSP reaction function in equation (5.1).

Expectations about the exchange rate typically require more detailed data on the foreign exchange market. However, in the absence of microstructure data on this market and of concrete information about the expected exchange rate in the next period, the intuitive argument could be

that agents form expectations starting with knowledge about the current exchange rate and about the model behind the exchange rate. This implies that the only information that agents have are the exchange rate in the current period and an estimate of the exchange rate equation (like equation 5.3) above. On the basis of this information and with the knowledge of domestic and foreign interest rates, the expectation for the exchange rate is formed. Actual future exchange rates may differ from this expectation due to exchange rate shocks (see equations 5.3 and 5.4).

To determine the link between the real exchange rate and the nominal exchange rate, equation (5.5) below explicitly takes into account that changes in deviations from purchasing power parity occur in the short run. This is seen as follows:

$$e_t^r - e_{t-1}^r = e_t^n - e_{t-1}^n + p_t^f - p_t^c, \tag{5.5}$$

where e_t^r is the real exchange rate, p_t^f is the foreign price and p_t^c is the domestic price.

Changes in interest and exchange rates lead to changes in the real sector.

Real consumption (C) in equation (5.6) follows the permanent income and life-cycle hypothesis. In the long run, it is assumed to depend on real disposable income d_t and real wealth m_t.[4] The presence of d_t implies that a proportion of households are "liquidity constrained" in the short run. The remaining households' consumption, however, is determined by both their wealth positions. In the literature, real wealth includes real financial and non-financial aspects (including the market value of domestic equity):

$$C_t = \alpha + \beta d_t + \lambda m_t - (r_t^d - \pi_t^e) + \varepsilon_t. \tag{5.6}$$

Meanwhile, the inclusion of the long-term real interest rate $r_t^d - \pi_t^e$ in equation (5.6) captures the direct substitution effect between consumption and savings.[5] [6]

In addition, the presence of ε accounts for the time lag before consumption responds to changes in the real interest rate (Pauly 2000).

The desired investment spending by domestic firms (I_t) in equation (5.7) uses the accelerator principle linking the desired fixed capital with output q_t, real interest $r_t^d - \pi_t^e$ and the exchange rate e_t^r (Montiel 2003):

$$I_t = \alpha + \beta q_t - (r_t^d - \pi_t^e) - \vartheta e_t^r + \varepsilon_t. \tag{5.7}$$

In this model, technology is fixed. Moreover, firms hold inventories which represent insurance against demand surprises. However, this is taken as exogenous in the model, implying that firms make their decisions regarding capital, labour and prices first, and then make decisions about the desired level of inventories.

The choice of investment demand model stems from the ease of identifying the policy instruments (in our macro model interest rate and exchange rate) available to monetary authorities to influence the aggregate supply resulting from investment behaviour.[7] However, in the empirical estimation, an attempt is made to produce a complete and detailed estimation of investment in terms of capital stock and employment. This is essential in determining the link between investment and production capacity and consequently the output gap. Recall that the output gap is one of the main variables affecting inflation in the medium term. However, the attempt to generate a complete specification of investment failed to pass the diagnostic tests. Better specification of the supply side is an area for further improvement in our macro model.

Meanwhile, changes in exchange rate affect the price competitiveness of the economy, thereby affecting net exports. However, the degree and direction of the exchange rate channel ultimately depend on factors such as the elasticity of demand for exports and imports, the openness of the economy and the exchange rate pass-through. Net exports represent net spending by foreigners on domestic goods. It is derived as the difference between merchandise exports and imports of goods and services.

Real exports and imports of goods and services is the sum of merchandise exports and imports of goods and non-factor services, converted into Philippine pesos. Non-factor services in this model are exogenous. Exports and imports of goods are estimated separately.

Merchandise exports of goods (X_t) in equation (5.8) is positively related to foreign market income (q_t^f) and the real exchange rate (e_t^r).

$$X_t = \alpha + \beta e_t^r + \vartheta q_t^f + \varepsilon_t. \tag{5.8}$$

Merchandise imports of goods (M_t) in equation (5.9) is positively related to domestic income or output (q_t) and negatively related to the real exchange rate (e_t^r).

$$M_t = \alpha - \beta e_t^r + \vartheta q_t + \varepsilon_t. \tag{5.9}$$

Explicit in the IT requirements is that fiscal dominance should be non-existent. Otherwise, the effectiveness of monetary policy is reduced. Chapter 2 stressed that the public sector deficit has been a major handicap for the Philippine economy. To ignore this aspect in the model is then tantamount to ignoring a major concern of the BSP.

However, Republic Act No. 7653 (or the new Central Bank Act) provides safeguards against fiscal dominance in the form of prescribed limits on the extent of financial assistance that can be provided to the national government. This indicates that any deficit financing from the central bank would be discouraged.

Our model assumes the Ministry of Finance's approach in determining the government budget position. In this model, the government deficit target is set and revenues are estimated, with the residual being the expenditures.

Tax revenues are divided into direct and indirect taxes. Government expenditures are divided into government investment and government consumption. In practice, changes in revenues and expenditures affect the government's budget position and consequently financing.

Indeed, the monetary authorities recognize three modes of financing, namely, foreign borrowing,[8] domestic borrowing[9] and changes in financial cash balances within the BSP.[10] In the absence of a detailed BSP balance sheet, this model does not distinguish between these modes of financing. Again this is a potential area for improvement.

In the empirical estimation in section 5.5, equations (5.7) to (5.10) are disaggregated further. Substituting these equations in the national income accounting identity, $q=C + I + G + X–M$, yields the *IS* equation.

Real output by sectors is estimated through sectoral demand functions. Intermediate goods producers are assumed to maximize profits. As indicated earlier on, the goods market is monopolistically competitive and each producer sells a single, slightly differentiated good in different domestic and foreign markets. Because firms have some market power, they make a profit from each unit of output.

The output of final goods, which includes domestic production plus imports, is produced using inputs of intermediate goods. Firms produce value-added but have excess capacity, and they transform intermediate goods produced in the economy into final output.

A price is set as a mark-up over marginal cost. Mark-up pricing decisions indicate that firms respond to demand shocks with large changes in prices

and small changes in production. In the empirical estimation, the mark-up price is represented by the producer price index.

As discussed in Chapter 3 potential output and the resulting gap as a measure of future inflationary pressure has regained importance under the IT framework. Over the long run, real output grows as a result of supply-side factors in the economy, like technology, capital accumulation and the size and quality of the labour force. Some government policies may be able to influence these factors, but as argued in most literature, monetary policy cannot do so directly, at least not to raise the growth trend in the economy. There is always some level of output at which firms in the economy would be working at their normal capacity output, without any pressure to change output or product prices faster than the expected rate of inflation. This is called the potential level of GDP.

The difference between actual GDP and potential GDP is known as the output gap. When there is a positive output gap (or in the extreme case a boom in the economy), a high level of aggregate demand has taken actual output above its sustainable level, and firms are working above their normal capacity levels. According to the literature, excess demand may partly be reflected in the balance of payments, but it is also likely to increase domestic inflationary pressures. On other hand, when there is a negative output gap, the reverse is generally true. This means that during recessions, when the level of output is below its potential, a slowdown in inflationary pressure usually follows.

In mainstream growth theory, potential output is usually measured from the supply side (or the production side), that is, from the long-run equilibrium values of the capital and labour inputs and their corresponding productivity levels. There are non-mainstream theories which include demand factors in the estimation, like the impact of investment on capital accumulation and productivity.

In practice, however, potential output cannot be measured with much precision. Use of the Hodrick-Prescott filter has become widespread. This is based on the assumption that a time series, say for GDP, is decomposed into a trend component (permanent component) and a cyclical component (temporary component). This methodology actually minimizes the quadratic difference between actual and trend output under the assumption that potential output does not vary excessively.

Nevertheless, for a given output gap level, inflation is also independently affected by production costs, such as wage costs and costs of imported intermediate inputs such as oil and raw materials. This is the production-cost

channel to domestic inflation. A fall in the exchange rate increases the cost of imported intermediate inputs as well as imported final goods, and the reduced purchasing power of wages may trigger increased wage demands.

In equation (5.10), the behaviour of nominal wages (w_t), defined as the average compensation of industry and services sector workers combined, reflects the Phillips curve through changes in the unemployment rate (u_t), while CPI inflation (π_t) reflects indexation. For simplicity, note that average compensation in the agriculture sector is fixed in the short and medium run:

$$w_t = \alpha + \beta u_t + \rho \pi_t + \varepsilon_t. \tag{5.10}$$

The behaviour of wages is fundamental in establishing the unemployment rate in the economy. In this model, sectoral demand for employment in industry and the services sector is estimated. Wages, along with the labour force participation rate, determine the supply of labour. The difference between labour supply and labour utilization generates the unemployment rate. This then influences wages.

As indicated earlier on, changes in the real interest rate generate deposit liabilities in the monetary system. In this model, inflation can still be affected by money supply (Friedman 1956). This model takes up Taylor's (1993) argument that while the interest rate remains the preferred instrument of monetary policy, the empirical evidence that inflation persistence is related to an equally persistent growth of money supply appears to be valid in the Philippines. This indicates that money demand could be an indicator of monetary stance.

To complete domestic price formation, a link must be established between product prices and final demand prices (p_t^c). In this model, product prices are represented by the wholesale price as expressed in the index (p_t^w) in equation (5.11) below:

$$p_t^w = \alpha + \delta p_t^m + \lambda w_t + \mu(q_t - q_t^*) + \kappa m_t + \varepsilon_t, \tag{5.11}$$

where p_t^w depends on the (peso) import price (p_t^m), wages (w_t), the output gap ($q_t - q_t^*$) and financial wealth as represented by real money supply (m_t). Note that p_t^w is affected by the output gap. This indicates that the role of the output gap in equation (5.11) is to reflect that producer prices do not only respond to changes in production costs, but that supply and demand

factors also play a role. This could be interpreted as price formation being part of a flexible mark-up mechanism.

Changes in wholesale prices drive prices of the industry and services sectors, and ultimately final demand prices. Final demand prices are dependent on the relative weights of industry and services prices and are contained in the implicit GDP deflator (p_t^c). This then is the basis of headline inflation (π_t).

As noted previously, the change in the implicit GDP price index, or headline inflation, reflects changes in import costs, wages, the output gap and real money supply.

Unlike the standard monetary policy transmission mechanism presented in Chapter 3, the claim that price and wage settings are strongly affected by expectations of future inflation is not included in the empirical model. This is the expectations channel to domestic inflation. In this model, it is intuitive that any increased inflation expectations that may be generated by the lowering of the BSP policy rate and the resulting increase in activity will then independently add to the effect on domestic inflation.

Because of the forward-looking nature of IT, the role of inflation ex pectations becomes crucial in this transmission mechanism. Indicators of inflation expectations include the two-year inflation forecast and long-run inflation expectations.

The inflation forecast π_t^f is a intrinsic element of IT. In the IT framework the inflation forecast is based on expectations formed in the market. However, according to Bernanke and Woodford (1997) there are important limitations to identifying market-based inflation expectations. In particular, they consider inflation expectations to be backward-looking and reflect adaptive behaviour by the public. In addition, where a central bank conducts IT based on market-based inflation expectations and where there is a gradual learning about the anti-inflation process stance of the central bank, it is very difficult to determine the properties of such expectations.

Keeping these difficulties in mind, the BSP uses the inflation forecast that is based on the expected inflation rate drawn from its inflation model. The expected inflation rate starts with estimating inflation and then incorporating this as the forward-looking inflation rate by moving variables one quarter ahead. This inflation forecast is compared with the inflation target and fed into equation (5.1):[11]

$$\pi_t^f = \pi_{t+1}. \tag{5.12}$$

Using limited information, the long-run inflation expectation (π^{e}_{t}) is assumed rather than determined. A hybrid structure (containing both forward-looking and backward-looking expectations) is assumed. The structure includes a rational component of inflation, indicated by the medium-term (three- to five-year) inflation target announced by the government (π^{*}_{t}) and contemporaneous and inertial components indicated by the current and past inflation rate. The rational component is based on Demertzis and Viegi's (2005) work on inflation targets as focal points for long-run inflation expectations. The idea is that in the absence of concrete information on inflation expectations, the only information that agents have is the quantitative inflation target announced by the government. Meanwhile, the contemporaneous and inertial components assume that agents develop expectations based on current and past actual inflation rates.

$$\pi^{e}_{t} = \alpha + \beta\pi^{*}_{t} + \rho\pi_{t} + \nu\pi_{t-1} \tag{5.13}$$

In the empirical estimation, our macro model uses a more detailed approximation of GDP. This provides the impact of RRP, the 91-day treasury bill rate, the lending rate, the peso-dollar rate and money supply into the different components of expenditure and sectoral output separately, allowing more accurate identification of monetary policy transmission variables. Inflation expectations (*XINFL*) provide the bridge between the relatively short-term RRP and the rather long-term rates, such as the 91-day treasury bill rate, savings rates and lending rates.

Hence, the analytical structure discussed so far captures the changes in monetary policy channel to inflation and is seen in the aggregate demand, production-cost and the money supply variables. Changes in short and longer real interest rates lead to changes in consumption and investment and thereby affect aggregate demand and output in the economy (Mishkin 1996).

For instance, the fall in real interest rates will stimulate consumption and investment, and thereby increase aggregate demand and output in the economy. Changes in the real exchange rate lead to changes in trade activity in the economy and, hence, affect aggregate demand and output. For instance, real depreciation of the exchange rate makes domestically produced goods less expensive compared to foreign goods. This increases demand for exports, thereby leading to increased aggregate demand. This affects the output gap, given the potential output.

Inflation is also independently affected by production costs such as wage costs and the cost of imported intermediate inputs, such as oil and raw materials. This is the production-cost channel to domestic inflation. A fall in the exchange rate increases the cost of imported intermediate inputs as well as imported final goods, and the reduced purchasing power of wages may trigger increased wage demands. Meanwhile, in this model, inflation can still be affected by the money supply.

5.4 What makes our macro model different?

Chapters 1 and 4 stressed that the New Keynesian open economy models made a significant contribution from the theoretical front in addressing uncertainties in the determination of the exchange rate and the impact of exchange rate changes on the monetary policy transmission mechanism. Works by Leitemo and Soderstrom (2004) and Wollmershauser (2006) both delve specifically into this issue, but their analyses are limited to calibrated and reduced-form open economy macroeconometric models.

Our current study intends to capture the impact of exchange rate uncertainty on IT in a more comprehensive and detailed manner. This task requires economy-wide models for projections and policy simulations.

Given the theoretical and analytical discussions in sections 5.2 and 5.3, our macro model is different from available Philippine macro models in three respects:

(i) It explicitly estimates the BSP policy interest rate, including its reaction to inflationary, aggregate demand pressure and exchange rate pressures. Such a specification characterizes the BSP as a flexible inflation targeter.

(ii) The model contains a UIP cum risk premium exchange rate equation. This specification connotes that the behaviour of the nominal peso-dollar rate could frequently be subject to undue volatility and uncertainty.

(iii) Its long-run inflation expectations follow a hybrid structure that contains both forward-looking and backward-looking expectations. The structure includes a rational component of inflation, represented by the medium-term (three- to five-year) inflation target announced by the government, as well as contemporaneous and inertial components represented by the current and past inflation rate, respectively.

Meanwhile, to the extent that the policy interest rate reacts to deviations from inflation target, output gap and exchange rate expectations, our model provides a more complete representation of monetary policymaking under IT, compared with that of the Central Bank of Brazil or the Central Bank of Chile. The Central Bank of Brazil and Central Bank of Chile have built models similar to ours. Brazil's model is quarterly. However, the interest rate policy is estimated without the exchange rate. Meanwhile, the Central Bank of Chile's quarterly model assumes that the central bank can assert a rather predictable impact via changes in its policy rate on the exchange rate, without explicitly including exchange rate movements in its policy rate.

5.5 Simulation properties of the macro model

The focus of our model is to ascertain the impact of uncertainty in the determination of the exchange rate on the credibility of the BSP. Our model focuses on the variability of the goal variables, hence the BSP policy loss function. The analysis is based on the isolated performance of the policy loss function. It has two levels. The first level examines the performance of the BSP policy loss function, with and without the exchange rate gap. This is interesting in relation to the question of whether exchange rate uncertainty undermines the BSP's credibility in general. The second level relates to the performance of the baseline policy loss function with alternative exchange rate uncertainty specifications. These alternative specifications were introduced in Chapter 4. The results of this exercise are expected to provide an answer to the question of whether the conduct of monetary policy is affected by uncertainty about the true behaviour of the exchange rate. Or to be more precise, whether the baseline BSP policy loss function yields reasonably good outcomes over the different exchange rate uncertainty specifications.

If the answer turns out to be positive, then the potentially high degree of exchange rate uncertainty would not be a cause for concern for the BSP. The commitment to such a so-called robust monetary policy would insulate the economy from the negative consequences of both exchange rate shocks and uncertain transmission of interest rate impulses via the exchange rate channel.

If, however, the performance of the policy rules depends largely on the concrete exchange rate specification (which is subject to uncertainty), the role of the market-determined exchange rate in monetary policy has to be assessed.

For these purposes, the model has been designed to allow for variations in the exchange rate specification in a number of dimensions:

(i) The degree of indirect exchange rate pass-through to consumer prices (through the wholesale price index) is seen in parameter in equation (5.11). The degree of indirect pass-through to investment, exports and imports are given in parameters and in equations (5.7), (5.8) and (5.9).

(ii) The extent of shocks to nominal exchange rate is given in the parameter in equation (5.3).

(iii) The impact of these dimensions on the central bank's policy interest rate, RRP, is given in parameter in equation (5.1). To capture the impact of a more aggressive stance on exchange rate pressure on the real economy, different weights for this parameter are used. This implies lesser weight on inflation and output gaps.

(iv) The scope for an alternative adjustment to RRP (in (iii) above) is analysed. The exchange rate gap is then dropped to assess its impact on the real economy. This is the basis of the first level of the isolated performance of the baseline policy loss function in equation (5.1).

(v) Part of the dimension in (iv) is a test of whether it would make any difference if the inflation target were dropped from equation (5.1) and replaced by the realized inflation.

(vi) The scope for alternative explanations for exchange rate behaviour is analysed. The UIP specification in equation (5.3) is replaced by the exchange rate cases based on empirical studies summarized by Wollmershauser (2003) and discussed in Chapter 4 (Table 4.1). This is the basis of the second level of the isolated performance of the baseline policy loss function in equation (5.1).

(vi) Finally, given the policy interest rate model in equation (5.1), the BSP's policy loss function is estimated.

5.6 Modelling estimation strategy, diagnostic tests and solution

5.6.1 Modelling estimation strategy

The Philippine quarterly macroeconometric model consists of 65 equations, with 27 simultaneous equations estimated using two-stage least squares and ordinary least squares. There are 32 recursive equations largely estimated using ordinary least squares, and the remaining 6 are identities.

The 27 simultaneous equations are estimated using single-equation methods: 15 are estimated using two-stage least squares[12] and the remaining 12 equations are estimated using ordinary least squares. The choice of instruments for the two-stage least squares is assumed to be all the lagged endogenous variables and all current and lagged exogenous variables in the whole system. These equations are largely overidentified, while the rest are identified. It is argued that there is nothing wrong with overidentified equations since the statistical fit is never perfect anyway (Greene 2003).

A system of equations can be estimated using a number of multivariate techniques that take into account the interdependencies among the equations in the system. There are various methods for estimating the parameters of the system. One approach is to estimate separately each equation in the system. A second approach is to estimate simultaneously the complete set of parameters of the equations in the system. This approach allows constraints to be placed on coefficients across equations and employment of techniques that account for correlation among the residuals across equations.

While there are important advantages to using a system to estimate the parameters, it does not come without cost. Most importantly, if one misspecifies one of the equations in the system and estimates the parameters using single-equation methods, only the misspecified equation will be poorly estimated. If system estimation techniques are employed, the poor estimates for the misspecified equation may "contaminate" estimates for other equations.

Two other issues are worth discussing at this point. The first is that raised by Arestis (2003) of the limitations and weaknesses of empirical evidence on the monetary policy transmission mechanism based on econometric modelling and single-equation techniques. An example in this regard is the simultaneity seen as central banks relax policy in the wake of weaknesses in the economy and tighten policy when there are strengths in the economy. In essence, this has proven sensible and useful, especially to industrialized economies. Indeed, such aspects imply that the link between monetary policy and the real economy changes over time. With these changes, it is then difficult to identify and isolate the effects of different monetary policy transmission channels. Nevertheless, simultaneity is addressed by estimating equations using two-stage least squares.

The second issue is the use of econometric theory-based explanations of equilibrium through cointegration techniques. In the initial stage of esti-

mation, the cointegration technique was used. However, the diagnostic tests as well as forecasting performance were weak.

This model is similar to those used in recent studies in that it draws on modern macroeconomic theory as the main guide for model estimation. In particular, the model adopts McCallum's (1993) argument that unit roots in macroeconomic time series are not crucial provided that serial correlation corrections are applied to the residuals of the relationships being studied. There are cases in which studies that encountered the same problem argued that unit root tests have low power anyway (Clarida, Gali and Gertler 2000).

Moreover, the line adopted in building this macroeconometric model takes up the challenge presented in Valadkhani (2004) calling for the application of recent developments in macroeconomic theory in the modelling process.[13] The literature points out two disadvantages of relying on cointegration analysis in specifying a structural macroeconomic model. First, it limits the ability to adopt desirable specifications. For instance, a regression of the real exchange rate level on the real interest rate differential, while having a rigorous theoretical foundation, is not permitted because the latter is arguably known to be $I(0)$ while the former is often found to be integrated in the order of (1). Second, the unit root test is known to have weak power over the alternative of linear mean reversion. It is therefore difficult to assert that no relationship exists simply because no evidence of cointegration was found.

5.6.2 Basic diagnostic tests

Appendix C provides the more detailed results of both the basic and higher order diagnostic tests. Each of the 27 simultaneous equations is assessed for whether explanatory variables conform to theoretical predictions, their statistical significance (in a range of 5% to 10% level of significance) as well as the overall explanatory power of the equation. This means that the signs and magnitudes of individual coefficients in each equation, such as t statistics, the adjusted R^2, Durbin Watson and F statistics are all examined. In general, all of the behavioural equations pass these tests.

In particular, the adjusted R^2 values for all equations are greater than 60% and values in all equations suggest there is no penalty for the number of explanatory variables used. All calculated F values are higher than the critical values, at the 5% to 10% level of significance, thereby indicating a significant degree of reliability of coefficients of determination.

Since this macro model is designed as a forecasting tool, attempts are made to correct for varying degrees of serial correlation in the structural

equations. Only two regressions (currency in circulation and domestic interest payments) are performed with autoregressive terms (*AR*). *AR* uses the lagged value of the residual in the forecasting equation for the unconditional residual. The *AR* is a first-order term and is rigidly examined. The roots of the *AR* term are less than one, suggesting that the autoregressive process is not explosive.

Exact collinearity is similarly checked. Highly collinear regressors lead to spurious estimates. There are a few cases though where exact collinearity is encountered especially when dummy variables are used, however, a re-specification of some of these equations are done.

5.6.3 Higher order diagnostic tests

Results of higher order test statistics of residuals are similarly examined. Higher order diagnostic tests start with the Jarque-Bera test. This test is designed to ascertain whether the series is normally distributed. Results show that all of the series are normally distributed.

With a lag order of up two and at a 5% to 10% level of significance, Breusch-Godfrey results show that not all equations exhibit serial correlation. There are equations which initially exhibit serial correlation but for which additional lags are incorporated to make the residuals stationary.

White's heteroskedasticity test in the residuals is also used. White's test is a test of the null hypothesis of no heteroskedasticity. There are equations where evidence of heteroskedasticity is initially found. For these, standard error and covariance are corrected to make them robust and homoskedastic.

Using the 5% to 10% level of significance and in general up to two fitted items, RESET results reveal that there are no specification errors in equations. Initially there were equations which failed this test. For these, the number of fitted items is increased until the equation exhibits the correct specification.

5.6.4 Model solution

Solving a system simultaneously is indeed difficult. Both deterministic and static simulations are performed using the Fair-Taylor method.[14] This is an iterative algorithm, where each equation in the model is solved for the value of its associated endogenous variable, treating all other endogenous variables as fixed. Meanwhile, terminal conditions are assumed to hold in a specified time period. Put simply, this means that the values contained in

the actual series after the end of the forecast sample are used as fixed terminal values. Forward solution is similarly used for equations that contain future (forward) values of the endogenous variables.

5.7 The Philippine monetary transmission

Figure 5.1 provides a schematic and simplified overview of Philippine monetary transmission. The 65 equations are grouped into seven major blocks: monetary sector (bottom left), public sector (bottom right), prices (middle left), expenditures including balance of payments (middle right), production (upper right) and employment (upper left).

The estimated macro model captures the transmission of changes in monetary policy to inflation through the aggregate demand (output gap), production cost and money supply variables.

There are various types of two-way linkages between the monetary sector and the other components of the economy. The feedback linkages between the monetary sector and the price sector are essential to the complete model. In the equation for the implicit GDP price index (*PGDP*),

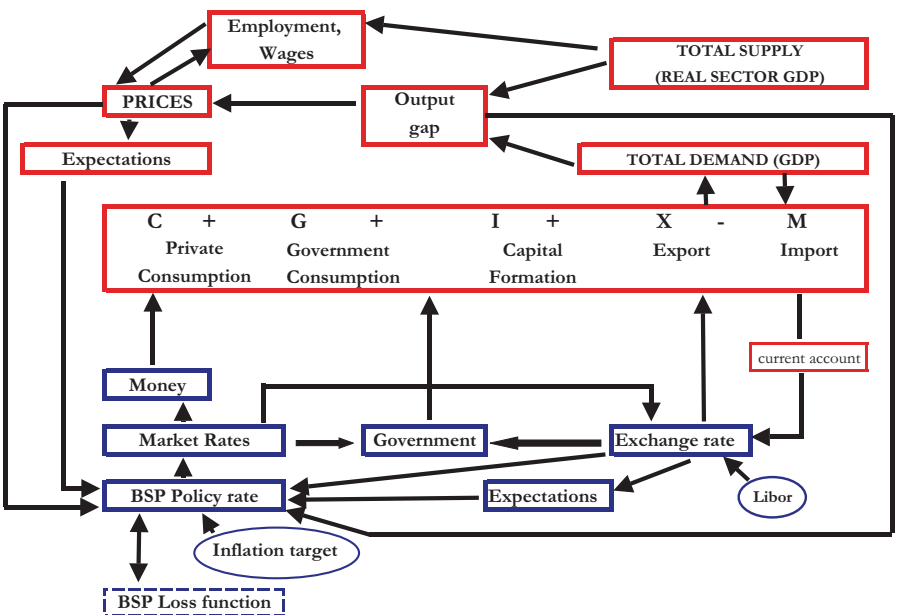


Figure 5.1
Philippine monetary policy transmission mechanism

monetary policy impacts indirectly through the money supply (*MS*) and through the import costs (*PMGDS*) in the wholesale price index (*WPI94*). The 91-day treasury bill rate (*TBR91*) and the lending rate (*LR*) directly affect consumption (*PCE*) and investment (*DUREQ*) expenditures. Meanwhile, the savings deposit rate (*SDR*) affects the money supply (*MS*). The money supply (*MS*) similarly affects consumption (*PCE*) spending and the output gap (*POTGAP1*). In the other direction, the output gap (*POTGAP1*) and inflation forecast (*FINF*) directly affect the BSP overnight reverse repurchase policy rate (*RRP*). Merchandise exports (*XMFG, XNMFG*) and imports (*FUEL, NONOIL*) affect the trade balance accounts, while the peso-dollar exchange rate affects exports and imports of merchandise as well as durable equipment (*DUREQ*).

The analyses in this section use short-run, and in some instances long-run multipliers.[15] Appendix A provides the data details while Appendix C provides the complete estimation and results of diagnostic tests of the 27 estimated equations. This section uses Appendix C as reference.

Equation (C.1) states the BSP's reaction function since 1994, which is consistent with IT requirements. It shows that nominal RRP reacts to inflationary pressure as seen in the difference between the inflation forecast and the inflation target, the output gap, the difference between actual GDP and potential GDP, the exchange rate gap or the difference between the expected nominal peso-dollar exchange rate and the actual nominal peso-dollar rate.[16]

Equation (C.1) implies that the BSP raises the *RRP* rate by 0.39 percentage point whenever the difference between the inflation forecast and target is expected to rise by one percentage point. The coefficient of the output gap implies that the BSP increases *RRP* by 0.35 percentage point when it is positive or excess aggregate demand is anticipated.

The more appealing finding of this specification is that regarding the exchange rate gap. It signifies that the BSP has restricted shocks to the nominal peso-dollar rate to contain a possible expansionary impact on inflation. Assuming all other things unchanged, the BSP's mechanism to stabilize the exchange rate is to increase *RRP* by 0.29 percentage point when the exchange rate gap is expected to increase by one percentage point.

The long-run impact, though, appears to be moderate. The BSP has to raise *RRP* by 1.36 percentage points when the inflationary gap increases by one percentage point; by 1.23 percentage points when there is excess aggregate demand; and by 1.01 percentage points when there is exchange rate pressure.[17]

Meanwhile, the lagged *RRP* rate turns out to be of greatest importance in terms of the magnitude of coefficient. This is not unusual, as most quarterly macro models exhibit this behaviour. This estimation follows the conventional wisdom that this gradual adjustment reflects policy inertia (or the action of not adjusting once for all to changing conditions) or interest rate smoothing behaviour by the BSP.[18]

There is a direct channel from the level of *RRP* to *TBR91* in equation (C.2) to long-run inflation expectations (*XINFL*) and to 90-day Libor (*LIBOR90)*.[19] The idea is that increases in *TBR91* are warranted when *RRP, XINFL, LIBOR90* rise by one percentage point. For instance, *TBR91* increases by 0.82 percentage point when *LIBOR90* increases by one percentage point. However, in the long run, the impact of a one percentage point rise in *LIBOR90* translates into a 1.41 percentage point increase in *TBR91*.

Note that the transmission to longer term rates is seen in market expectations. This is because the Philippine financial market is argued to be underdeveloped compared with other East-Asian countries. This means that the market could interpret current policy decisions as a signal of future monetary policy decisions, making longer term rates react consistently. For instance, a decline in RRP can be construed as a factor that will raise future inflation. Since a contractionary monetary policy is expected to offset such an increase in inflation, longer term treasury bill rates may end up increasing as an indication of the expected rise in the future policy rate.

Changes in *TBR91* translate into the other market interest rates, such as the savings deposit rate *SDR* (equation C.3) and the average lending rate *LR* (equation C.4). These rates are a particularly significant feedback mechanism to the real sector.

In these two equations, lagged *SDR* and lagged *LR* were of greatest importance in terms of the magnitude of coefficient. This is not unusual, as most quarterly macro models exhibit this behaviour. This gradual adjustment could reflect banks' refraining from a once-for-all adjustment to changing conditions.

The *TBR91* then feeds into the nominal peso-dollar exchange rate (*FXR*) in equation (C.5) through the interest rate differential (*LIBOR90-TBR91*). This, along with the risk premium, drives the behaviour of *FXR*. The magnitude of the risk premium is seen in the coefficient of lagged *FXR*.[20] Thus, a positive interest rate differential, that is, when the 90-day Libor is higher than the 91-day T-bill rate, and an increasing (positive) risk premium signify a depreciating *FXR* in the future. In equation

(C.5), a one percentage point increase in the interest differential leads to an 0.11% depreciation of the peso-dollar rate.

Meanwhile, an indication of the peso's competitiveness in international trade in equation (C.5) shows that a positive current account balance (or current account surplus) relative to GDP (*CA/(GDP/FXR)*) leads to appreciation of *FXR*.[21] In particular, equation (C.5) indicates that an increase in the current account balance relative to GDP leads to an appreciation of the nominal peso-dollar rate.

The expected nominal peso-dollar rate (*EXPFXR*) is equally crucial to the BSP's reaction function. As mentioned earlier on, a widening gap between the *EXPFXR* and *FXR* leads to tightening by the BSP through an increase in RRP. In this model, the estimation of *EXPFXR* leads into a rational expectations assumption following the absence of microstructure data on the foreign exchange rate market. Hence, the *FXR* is the basis for the expected peso-dollar rate (*EXPFXR*). The difference between *EXPFXR* and *FXR* then feeds into the RRP in equation (C.1).

In this model, the real peso-dollar rate (*PFXR*) is the ratio of the price level in the United States (the US being the Philippines' major trading partner) and the Philippine consumer price level, measured by the nominal peso-dollar rate.

The *TBR91* and savings deposit rates feed into the real money supply (*MS*). Two accounts from the liabilities side are estimated. Equation (C.6) relates real deposit balances (*DEPLIAB/PGDP)* to real output (*GDP*) lagged by four quarters, to *FXR* and to the real savings deposit rate (*SDR-XINFL)*. Real deposit balances include demand, savings, time and deposit substitutes held by the public. In this equation, real deposit balances appear to respond sluggishly to real GDP by four quarters. These lag effects are however not unusual. In general, there are certainly delays and lags at every stage of policy transmission that could be prevalent during the period of recognition of any disturbance to the decision mechanism and further to implementation as well as in the timing of the effects of the policy action on the economy (the timing is spread).

Equation (C.7) relates the level of real currency in circulation (*CC/PGDP*) to real output (*GDP*) and the real 91-day T-bill rate (*TBR91-XINFL*). *DUMMILBUG* is the dummy variable for the BSP's adjustment for the millennium bug (the Y2K phenomenon) in 2000.

There is a significant break in data prior to 1994. The break is explained by the impact of financial innovations which affected the composition of

the money supply. Hence, estimation of deposit liabilities starts in the first quarter of 1994 and extends until the fourth quarter of 2003.

The sum of the level of real deposits and real currency in circulation yields the total level of the real money supply.

5.7.1 From interest rates, exchange rate and money supply to aggregate spending

The effects of monetary policy are transmitted to aggregate demand through the functioning of money markets. In contrast to the more recent assumption of IT models that the output behaviour of firms is forward-looking, the dynamics of Philippine data show that it is backward-looking (Estrella and Fuhrer 2002).

Backed by sustained inflows of remittances from Filipino workers abroad, real private consumption (*PCE*) has been the main driver of economic growth in the Philippines. Equation (C.8) shows that monetary policy feeds into *PCE* through the real 91-day treasury bill rate *(TBR91-XINFL)* and real money supply *(MS/PGDP)*. In addition, *PCE* relates positively to disposable income (*DISY*),[22] its behaviour one quarter ago and seasonal factors (second to fourth quarters).

The presence of *DISY* implies that households make consumption choices based on their disposable income. This is consistent with BSP (2004).[23] Equation (C.8) implies that a one percent increase in *DISY* leads to a 0.38% increase in *PCE*. The remaining household consumption, however, is determined by the level of financial wealth, indicated by the real money supply. The equation shows that a higher level of financial wealth leads to a higher *PCE*. Note that the value of Philippine stock was used to represent wealth but was subsequently dropped as it proved insignificant based on *t statistics*.

Meanwhile, the real treasury bill rate captures the direct substitution effect between consumption and savings. An interpretation of equation (C.8) implies that an increase in the real T-bill rate leads to a decline in *PCE*.

The above finding provides additional information for the long-standing debate on how lower interest rates might lower savings out of current income and increase spending. The general conclusion in the literature though is indeterminate. [24] This model does not delve into this issue in detail however. It is treated as an area warranting further study.

Lagged *PCE* accounts for a household's behaviour to protect itself against income fluctuations.[25]

Gross domestic capital formation (total investments) consists of fixed capital and inventory changes. While inventory changes are exogenous, fixed capital is further divided into private and government construction and durable equipment. The Philippines has one of the lowest investment ratios in the East Asia region, and the lowest capital stock per worker among emerging economies in the region (ADB 2004b). In fact, over the long run, both national savings and domestic investment rates have been falling. The persistent inflows of remittances have helped to boost consumption, but the relatively slow rate of new investment raises questions as to the overall sustainability of investments. Nevertheless, the estimated components show that monetary policy significantly impacts on total investments through the real lending rate and the nominal peso-dollar exchange rate.

Equation (C.9) shows that investments in private construction (*CONS*) are determined by the real lending rate (lagged by one quarter) and real output (*GDP*). The relevance of real output in the behaviour of private construction connotes that real output growth must be sustained to maintain private investment. The lagged dependent variable captures the adjustment costs in investment decisions of individuals, potentially due to expectations. Investments in government construction are exogenous and are taken in this model as a policy variable.

Meanwhile, real spending on durable equipment (*DUREQ*) in equation (C.10) is largely influenced by real output (*GDP*) and movements in the nominal peso-dollar exchange rate (*FXR*). The significant indirect effects of the exchange rate reveal that a depreciation of *FXR* is expected to dampen demand for imported equipment.

Another component of the economy's spending pattern is exports of goods and services. Monetary policy affects exports of goods through the real peso-dollar rate (*PFXR*). In defining exports and, later on, imports of goods, domestic and foreign goods are assumed to be imperfect substitutes. Both are estimated in real terms to capture the correct signs. Services on trade, on the other hand, is exogenous in this model.

Exports of goods are disaggregated into manufactured (*XMFG*) and non-manufactured export (*XNMFG*) groups. These two groups comprise total exports of goods. In 2006, the top-five manufactured export goods were semi-conductors and electronic microcircuits, garments, finished electrical machinery, other manufactured products and ignition wiring sets. These goods made up 33% of total merchandise exports as of 2006.[26] Meanwhile, the major non-manufactured exports include crude coconut

oil, shrimp and prawns, and bananas and plantains. These occupied less than 10% of total merchandise exports as of 2005.

Equation (C.11) captures the effects of the real peso-dollar exchange rate (*PFXR*) on real spending for manufactured goods (*XMFG/USDEF)*. It implies that a one per cent depreciation of *PFXR* leads to a 0.25% increase in the volume of manufactured goods. There is a time lag of one quarter before the impact of the depreciation of the real peso-dollar rate takes effect. In reality, export orders are placed several months in advance. In the first few months after the currency depreciation, export volumes therefore may reflect buying decisions that were made on the basis of the old exchange rate.

Equation (C.11) also captures the dependence of Philippine manufactured goods on its leading trade partner's economy, that of the United States (*USGDP/USDEF)*. In addition, the quarterly volume production index of key manufacturing enterprises (*VOPI*), lagged by one quarter, affects *XMFG*. The *VOPI* is used as an indicator of the production trend in the manufacturing sector. The equation shows that a one per cent increase in *VOPI* leads to a 0.82% rise in the volume of manufactured exports.

In a similar manner, equation (C.12) shows that the volume of real exports of non-manufactured goods (*XNMFG/USDEF)* captures the impact of the real peso-dollar exchange rate (*PFXR*) and the US economy (*USGDP/USDEF)*. Meanwhile, the impact of a depreciating real peso-dollar rate on *XNMFG* reflects the time lag before any change in the real peso-dollar rate takes effect. In addition, its behaviour also depends on a dummy variable, *DUMASIAN* to take account of the Asian currency crisis.

Over the long run, spending on real imports of goods is a function of output and the relative price of these goods. The real dollar value of goods imports is estimated separately for fuel imports (including mineral, fuel and lubricants) and non-oil imports. These two groups comprise the bulk of total goods imports, which feeds into the trade balance and consequently into the current account.

Equation (C.13) shows that the nominal peso-dollar exchange rate (*FXR*), real output (*GDP*) and the price index of merchandise goods (*PMGDS$/PGDP*), lagged by two quarters, determine the behaviour of real fuel import goods (*MFUEL/PGDP)*.

Meanwhile, equation (C.14) shows that the behaviour of real non-oil imports (*NONOILM/PGDP*) is dependent on real output (*GDP*) lagged by one quarter, the nominal peso-dollar rate (*FXR*) and seasonal dummy variables.

The lagged non-oil imports reflects uncertainty and perhaps expectations of demand for non-oil imports.

It is implied so far that the impact of depreciation of the peso-dollar rate on exports and imports is expansionary, assuming all other factors affecting exports and imports remain constant. A depreciation would likely lead to a lower trade deficit or higher surplus and possibly higher reserve accumulation. This is turn would weaken the depreciation effect.

All the changes in spending behaviour discussed so far, when added up across the whole economy, generate changes in aggregate spending. Total domestic expenditure plus the balance of trade in goods and services reflects the aggregate demand in the economy and is equal to GDP.

5.7.2 From aggregate spending to sectoral demand and the output gap

The GDP demand side feeds into the GDP production side, which consists of two sectors: the primary sector (agriculture) and the advanced sector (industry and services). The output of the agriculture sector is exogenous in the model. This leaves industry and the services sector, which are assumed to have excess capacity. Hence, supply responds to the level of aggregate demand. Equations (C.17) and (C.18) show that over the long run, output of industry (*VIR*) and the services (*VSR*) sectors are determined by their own price relative to the CPI and to total domestic demand.

As implied earlier on, an attempt was made to estimate a more detailed potential output through a production function for industry and services, with capital stock and employment for industry and services determining output. This is essential for determining the output gap. Recall that the output gap is one of the main variables affecting medium-term inflationary pressures. However, the estimation equation was weak in terms of diagnostic tests.

This is not however unusual. Several key issues surround the role of the output gap in an IT framework. The most important is use of the appropriate technique to estimate the output gap. Yap (2003b) expounded on the several research strategies that have been employed for output gap estimation in the Philippines. A common weakness runs across these; that is, the estimates are largely dependent on the sample period. Changing the sample therefore creates large deviations in the estimates.

In terms of estimating potential output, some studies suggest that fitting a trend on output using Hodrick-Prescott (HP) filter yields more benefits in terms of explaining the potential output. However, other studies seem to

be weary of using HP filter. There are of course limitations on using HP filter as it depends on what adjustment factor has been used in smoothing the time series. There are rules that are widely used in practical work but these are rules of thumb and arbitrary.

This model used the HP filter procedure. In particular, potential output is derived by fitting a trend on gross value-added of the industry and services sectors using the HP filter. The output gap in this model is estimated based on Dakila (2001), in which it is expressed as the difference between the log of a one-quarter moving average of the supply side (industry and services) GDP (deseasonalized series) and potential output.[27]

The output gap (*POTGAPL1*) then feeds into the wholesale price index (*WPI94*). Equation (C.24) shows that *WPI94* is affected by the average prices of merchandise imports in pesos (*PMGDS*), the excess liquidity as represented by the real money supply relative to GDP (*MS/GDP*), average compensation (or wages) for the industry and services sectors *(QSE1P*) and *POTGAPL1*. This specification makes up the pricing decision based on a flexible mark-up.

The main link here between monetary policy and *WPI94* and consequently inflation is *POTGAPL1*. Hence, monetary policy impacts on expenditure. In addition, the *MS/GDP* strengthens the link to the price level and consequently between monetary policy and the production sector, and by transitivity the link between monetary policy and *GDP*.

WPI94 then enters into the sectoral prices for industry (*PVIR*) in equation (C.19) and, together with corporate tax (*TAXCORPRT*), into the services sector (*PVSR*) in equation (C.20). Meanwhile, the agriculture price equation is exogenous.

The average prices of imported merchandise goods (*PMGDS*) is dependent on the peso-dollar exchange rate and the average dollar prices of merchandise goods (*PMGDS$)*. As seen in equation (C.25), *PMGDS$* is determined by movements of oil prices (*OILPR*) and a dummy variable for the crisis in 1997. It is rather clear from this equation that the Philippine economy is dependent on fuel imports through the price of imported oil. Net petroleum imports accounted for 3.9% of the economy's GDP in 2003.[28]

The overall deflator (or GDP deflator) is determined by the relative weights of agriculture, industry and services sector prices to total output, which is indirectly affected by demand factors as well. This then enters the consumer price index (*CPI94*) in equation (C.26).

5.7.3 From sectoral output and prices to labour force and employment

Equation (C.22) shows that changes in the GDP deflator affect the labour force (*LF*) through real wages (*QSE1P*). A one per cent increase in the real wage is found to stimulate labour supply by 0.23%. In addition, the working age population (defined as 15 years and older) (*WORKAGE*) is estimated to have an impact on *LF*.

Sectoral demand employment (*ISEMP*) is estimated for the industry and services sectors combined. Employment growth has been strongest in the services sector. Employment in the services sector grew by almost 50% in the 1990s, well above growth in industry (30%) and in agriculture (8%). By the end of 2003 (October 2005 being the last labour force survey), employment in the services and industry sectors registered a combined share of 63% of total employment.

In equation (C.21), *ISEMP* is affected by industry and services real output (*VIS*). Meanwhile, the lagged dependent variable *ISEMP* captures uncertainty and expectations.

However, the implied employment-output elasticity is rather low at 0.18. This suggests that a one percent increase in *VIS* leads *ISEMP* to rise by 0.18%. Moreover, the implied long-run elasticity is relatively low at 0.37. This could reflect the relatively weak labour productivity performance in the Philippines (Felipe and Sipin 2004).[29] Labour productivity declined between 1980 and 1993. It has been increasing since 1993 though, but at a very slow pace (for 1993-2002 it grew at a rate of 1.20% per annum).

These figures corroborate the conclusions of Herrin and Pernia (2003), namely, that the stagnation of labour productivity in the Philippines is the result of a flat capital-labour ratio, indicating that firms have failed to invest in state-of-the-art technology and to implement best practice. Additionally, the Philippine labour force has been unable to maintain the level of human capital and the rapid expansion of employment in the low-productivity services sector.

The unemployment rate (*UR*) is then determined as the difference between the labour force (*LF*) and employment in agriculture (*AGRIEMP*) and *ISEMP*. *AGRIEMP* in this model is exogenous.

The unemployment rate (*UR*) influences the non-agricultural compensation index (*QSEIP*) through a Phillips curve relationship in equation (C.23). The consumer price index (*CPI94*) affects *QSE1P* due to indexation.

5.7.4 Consumer prices, inflation and inflation expectations

The consumer price index is normally constructed as a weighted average of consumer prices of food, clothing, energy products, etc. Each of these goods is an aggregation of imported goods and goods produced domestically using both domestic and imported inputs. A detailed breakdown of consumer prices in this manner is difficult to incorporate into a model of this size, as it requires a different dataset. This could be another area of improvement for the model, including the measure of core inflation.[30]

Equation (C.26) shows that consumer prices (*CPI94*) are dependent on a GDP deflator (*PGDP*) and lagged *CPI94* . The rate of inflation is described within this index using 1994 as the base year. This then feeds into the BSP's reaction function.

The lagged *CPI94* is an indication of price rigidity. As mentioned earlier on, this implies limits in the analysis of any optimizing foundations and the related forward-looking behaviour of inflation. From the point of view of the BSP, this suggests some difficulty for policy action since it reduces the efficiency of domestic interest rates in controlling inflation.

Due to limited information, the role of expectations in this model is assumed rather than determined. Several business tendency surveys are being conducted by the private sector in the Philippines which could indicate expectations. These include those being done by the Social Weather Station, Pulse Asia, Makati Business Club and Business World (in collaboration with New York-based Roper ASW Asia Pacific).

The BSP initiated the harmonized Business Expectations Survey (BES) in the second quarter of 2001. To complement the BES in judging the state of domestic demand in monetary policy, a consumer expectations survey was initiated in 2004. Results from these surveys validate key demand indicators, including demand for money and loan growth. However, these surveys all have limited scope. The BES has six quarterly observations for analysis (Cintura and Gador 2003), while the consumer expectations survey started only in December 2004.

Inflation also feeds into long-run inflation expectations (*XINFL*), as seen in equation (C.27). Different assumptions about the inflation expectation structure were tried and tested. Such estimations led to a hybrid structure that includes a rational component of inflation, proxied by the medium-term inflation target announced by the government (*INFTAR*), contemporaneous inflation (*INFL*) and *INFL* lagged by one quarter.

Equation (C.27) is based on Demertzis and Viegi's (2005) work on inflation targets as focal points for long-run inflation expectations. The idea is

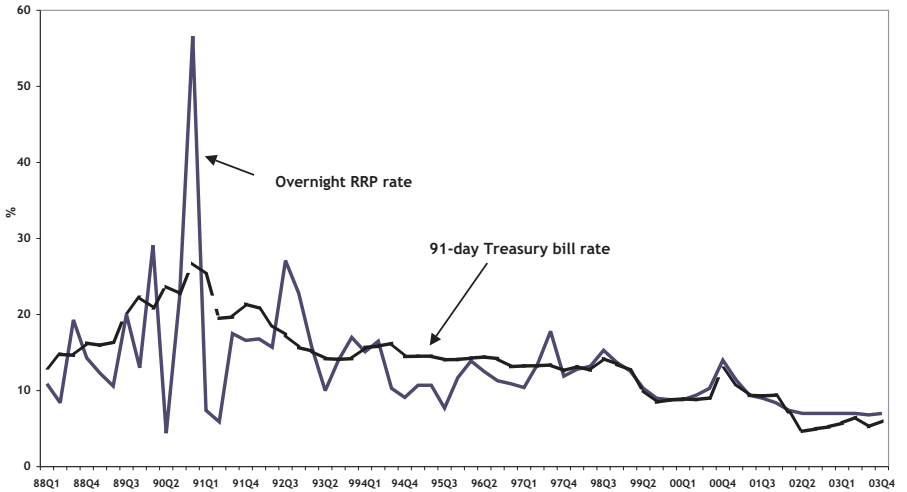
that in the absence of concrete information on inflation expectations, agents know only the quantitative inflation target announced by the government. In this situation, the agents assume that inflation is ultimately affected by both the central bank's objectives and the policies it pursues.

The relatively larger coefficients on current inflation and past inflation signify that the BSP's credibility is an important factor. Private agents assess the credibility of the BSP and form their expectation based on what they have learned at the end of the current period. In turn, the credibility of the BSP determines the effectiveness of IT. Agents are similarly interested in the declining medium-term path of inflation announced by the government.

5.8 Some analytical points

This section highlights some analytical points arising from the results in section 5.7. First, the relationship between the BSP policy RRP rate and the benchmark 91-day treasury bill rate is rather modest. Figure 5.2 below shows the rather close tracking performance of both *RRP* and *TBR91* in the model. The magnitude of the track is also rather modest when compared to macro models built by the central banks of Brazil and Chile. As indicated earlier on, these two macro models bear some resemblance to the estimated macro model of the Philippines. Equation (C.1) shows that a one percentage point rise in RRP leads to a 0.18 percentage point increase in *TBR91*. This magnitude is rather low compared with that of Brazil, at 0.5 percentage point (impact to 6-month central bank Seltic rate), and that of Chile, at 0.8 percentage point (central bank bond rate and policy rate). There is no model in the Philippines to which this magnitude could be compared.[31]

On balance, this moderate impact could be attributed to certain interventions (such as the variety of credit and mandatory allocation of funds), implying that the transmission of changes in benchmark rates to lending rates is weak. Although there was an agreement between the Bankers Association of the Philippines and the BSP to keep the lending spread at 2.5 percentage points, this spread remains high. Thus, the transmission mechanism channel from the benchmark interest rate to market-determined lending rates is much weaker than is desirable. In part, this could also explain the high volatility of interest rates observed since the peso was floated in 1997.



Source of basic data: BSP (2006), selected Philippine economic indicators.

Figure 5.2
RRP and 91-day treasury bill rate,
first quarter 1988 to fourth quarter 2003

A related point is that the monetary authorities (the BSP and government) believe that the financial system operates as a free market. In practice, however, interest rates are determined by the market only up to a certain point. The Bureau of Treasury auctions treasury bills (in tenors of 91, 182 and 364 days) twice a month, and rates are determined by the bids that the Treasury accepts. The Bureau of Treasury may reduce or increase its regular offering of T-bills to influence rates, either to save the government from paying high rates on its debt or to control liquidity. It may also reject all tenders in order to force participating financial institutions to return the following week with lower bids.

The policy implications are quite clear. The relatively moderate impact of the policy rate leaves the impression that a slight deviation from the expected path requires a significant change in the RRP to bring the economy back to the central path. Put simply, this is a strong indication that the elasticity of the interest rate to macroeconomic equilibrium is moderate and hence, demand policies are important. There is then a need to correct these distortions in the financial system and improve the efficiency of the transmission mechanism.

Another point is the presence of a risk premium in the determination of the nominal peso-dollar exchange rate. Table 5.1 shows that the degree of

Table 5.1
Persistence of UIP shocks (u^{en}) in empirical literature

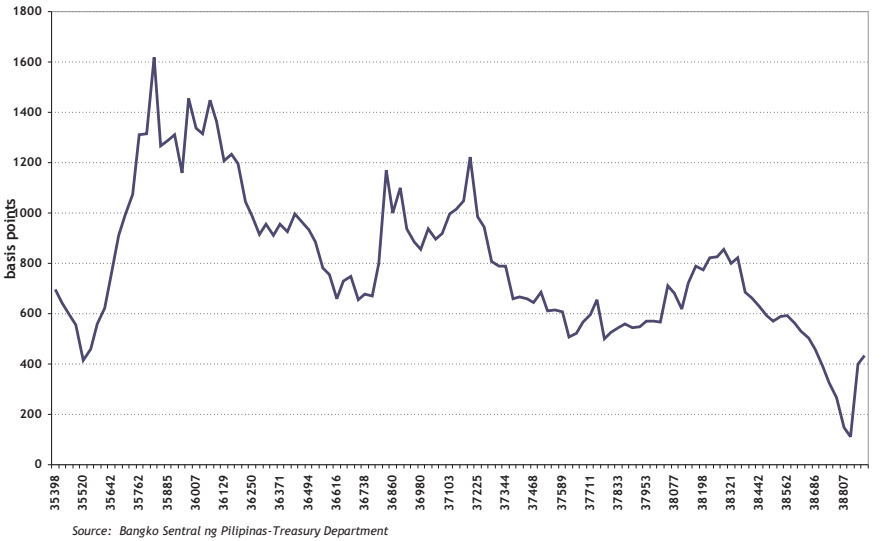
	Frequency	u^{en}	Annualized
Dennis (2000)	a	0	0
Adolfson (2002)	a	0.8	0.800
Batini and Nelson (2000)	q	0.753 (estimated for UK)	0.320
Batini et al. (2001)	q	0.261 (estimated for UK with survey data)	0.005
Taylor (1993)	q	0.5 (estimated equally for all countries)	0.063
Leitemo and Soderstrom (2001)	q	0.3 (calibrated at conventional values)	0.008
Svensson (2000)	q	0.8 (calibrated)	0.410
Philippines: Baseline model	q	0.741	0.301

Notes: Annualized u^{en} is computed as $u^{en(4quarters)}$
a=annual; q=quarterly
Source of data: Wollmershauser (2003), p. 120.

risk premium estimated for the Philippines is within the range of estimates in the empirical literature. Though it is difficult to compare the estimated risk premium for the Philippines with these studies, they nevertheless provide a tentative point of reference for analysis.

As discussed in Chapter 4, the risk premium is usually associated with macroeconomic fundamentals and a number of subjective factors that are not easily anticipated. One indicator is the country risk premium (or country credit rating) released by JP Morgan Bank to guide clients on future investments. This figure measures the degree of unease that exists in relation to 21 emerging economies, including the Philippines, Brazil, Mexico and Russia. It is a based on a basket of foreign debt titles negotiated at the major international financial market centres. The market interprets high country risk premiums as indicative of a significant likelihood that a country will not honour its commitments, such as foreign debt payments. Investors tend to shy away from countries with a high risk premium.

In the case of the Philippines, the yield spread of 10-year Philippine bonds provides an indication of the risk premium. Figure 5.3 shows that despite the rise in the yield spread of the 10-year Philippine bonds in January 1998 (after the currency crisis in July 1997), the overall trend after November 1996 was a downtrend, bringing the spread to 432 basis points by end June 2006. However, this spread is still far above the latest levels for



Source: Bangko Sentral ng Pilipinas-Treasury Department

Figure 5.3
Ten-year Philippine bond yield spread, November 1996-December 2006

other emerging economies[32] such as Brazil (301 points as of January 2006), Mexico (122 as of December 2005) and Russia (113 points as of December 2005).

In this situation, it is instructive to point out the implications of price stickiness. When prices are sticky, monetary policy tightening results in substantial real appreciation of the exchange rate. This is even more pronounced in the presence of a risk premium since the exchange rate may continue to appreciate before falling back to its long-run equilibrium. Real appreciation has two distinct effects. Its first and most immediate impact is to lower prices of imported goods. This accelerates the impact of monetary policy tightening on consumer prices by reducing the price of imported consumer goods and also reducing the price of imported intermediate goods thereby reducing the marginal cost of firms. Second, the loss of competitiveness following the real appreciation has substitution effects, as both domestic and foreign demand shift towards goods produced abroad. This leads to falls in net exports and in output, which puts further pressure on domestic prices.

Another point is the pass-through effect of the exchange rate on inflation. Exchange rate changes directly affect domestic inflation. This is because changes in the exchange rate affect the peso prices of imported goods, which is an important determinant of many firms' costs and of the

retail price of many goods and services. Appreciation of the peso lowers the peso price of imported goods; depreciation raises the peso price of imported goods. The effects, though, may take many months to work their way fully through the pricing chain.

Table 5.2 presents three recent studies based on Ho and McCauley (2003). These examined exchange rate pass-through effects (one year) across emerging countries that had adopted IT. The magnitudes are not expected to be comparable across studies. For comprehensiveness of estimates, the estimated Philippine baseline macroeconometric model is compared to that in the study by Choudri and Hokura (2001), with the rather obvious argument that the pass-through effects estimated in the Philippine model are higher than those for the industrialized countries and

Table 5.2
Exchange rate pass-through effects to prices

Country/Region	Hakura 1979-2000	et al 1990-1999	Goldberg 1980-2000
Duration	**One year**	**One year**	**One year**
Asia			
Indonesia	0.41	0.92	-
South Korea	0.10	0.59	-
Philippines	0.33	1.16	-
Thailand	0.12	0.19	-
Latin America			
Brazil	0.39	-	-
Chile	0.35	-	-
Mexico	0.27	0.93	-
Europe			
Czech Republic	0.16	1.17	0.61
Hungary	0.48	-	0.85
Poland	0.08	0.80	0.99
Middle East			
Israel	0.28	0.55	-
Africa			
South Africa	0.13	0.47	-
Memo items:			
Philippines: Estimated baseline model: 1988-2003	0.44		
Emerging Countries: Average	0.26	0.75	0.82
Industrialized countries */	0.12	0.19	0.67

*/ Includes Australia, Canada, New Zealand, Sweden, Switzerland and the United Kingdom.

Source of data: Ho and McCauley (2003), "Living with flexible exchange rates: issues and recent experience in inflation targeting emerging market economies," BIS Working Paper No. 130, February.

even than those of emerging countries in Latin America, Europe (except Hungary), the Middle East and Africa and Asia. Recall from equation (C.24) that a one per cent increase in the peso prices of merchandise goods (*PMGDS*) leads to a 0.11% rise in *WPI94*, bringing the total magnitude to 0.44% in a year.

As implied in Chapters 2 and 4, there are two distinct reasons why the pass-through effects to prices of the nominal peso-dollar rate is relatively high. One is the historically high inflation in the Philippines, which heightens the linkage between the exchange rate and domestic prices. Recall from Chapter 2 that the Philippine inflation rate from 1981 to 2005 was relatively high (compared with its Asian neighbours) and highly variable.

A related point is the history of crisis in the Philippines. The idea is that episodes of large depreciation could raise the salience of the local price of foreign exchange for domestic prices and wages, which could heighten the sensitivity of domestic inflation to the exchange rate. As noted in Chapters 2 and 4, the economy suffered from boom-bust cycles, especially after the authorities embraced various measures of liberalization and globalization of financial markets.

It is instructive at this point to highlight the indirect magnitude of pass-through of the peso-dollar rate to prices. Recall from Chapter 4 (section 4.8) that in the early period of IT, the BSP viewed the exchange rate as a key variable in the formulation of monetary policy because of its direct influence on future prices. Essentially for credibility reasons, the BSP's primary concern has been to ensure that actual inflation remains within its target band. However, as mentioned, the BSP has shown some early signs of relying less on the direct and more on the indirect channel of the exchange rate. In fact, in various episodes (especially in 2002) the BSP decided to reduce RRP rates to help revive demand from the real economy.

When the pass-through effects and interaction with the overall economy are considered, a one percent sustained depreciation of the nominal peso-dollar rate for two years is found to lead to some stimulative effects on net trade and aggregate demand. As a result prices (indicated by wholesale prices) rose by 4.42%, an increase from the baseline rate of 3.17 %.

Table 5.3 shows the results of an impact scenario simulated in the macro model from the first quarter of 1996 to the fourth quarter of 2003. Note that the impact of depreciation of the nominal peso-dollar exchange rate is an increase in the baseline and, hence, is expansionary.

Table 5.3 shows that a one per cent sustained depreciation of the peso-dollar rate from first quarter of 1994 to the fourth quarter of 1995.

Table 5.3
Philippines: Direct and indirect pass-through effects to prices and demand, based on simulated pass-through effects from baseline (1996-2003)

Indicators	Direct effects (In %)	Indirect effects (via aggregate demand) (In Billion Pesos)
Durable equipment	-	0.576
Interest payments		
Domestic	-	1.016
Net trade		
Manufactured export goods	-	15.215
Non-manufactured export goods	-	1.415
Fuel imports	-	-0.879
Non-oil imports	-	-0.698
Peso Prices of merchandise goods	1.098	-
Implied total effects	**1.098**	**16.645**

raises peso prices of essential imports and raises costs (direct effects) by 1.10%.This direct effect implies an increase in wholesale prices of 0.12 per cent (see equation C.24). This is only a small part of the total change in wholesale prices of 1.24 per cent. The rest of the increase in wholesale prices is due to the indirect effects. The indirect effects work mainly through durable equipment (a component of total investment), domestic interest payments and net trade.

The value of exports of both manufactured and non-manufactured goods increased by 16.63 billion pesos, dampening the decline in fuel and non-oil imports.

In addition, investment spending in durable equipment (equation C.10) shows that the impact of real GDP and other variables on investments in durable equipment is more significant than that of the peso-dollar rate depreciation. This dampens the negative impact of a depreciation of the nominal peso-dollar exchange rate in the simulation. Meanwhile, the impact on domestic interest payments is an increase of 1.02 billion pesos.

The implied indirect effects translate to an increase in (positive) output gap of P2.098 billion which, through equation (C.24) affects wholesale prices. This accounts for about 0.92 percentage points of the change in wholesale prices. It is clear that these indirect effects have a much bigger

impact than the direct effect through import prices. The remainder of the change in output prices are driven by the other variables in equation (C.24)

These results conform with the actual data. There are three episodes in which significant peso depreciation was measured, both in nominal and real terms: 1990-91, 1993 and 1997. All of these episodes are associated with domestic shocks (such as the earthquake and the eruption of Mount Pinatubo) or external shocks (the currency crisis). It is clear, however, that these periods were accompanied by improvement in the current account balance, the balance of payments position and real growth after a year. For instance, when the peso depreciated against the US dollar in 1997, the current account position recorded a surplus, while real growth remained positive (though low) at 0.1% in 1998.

5.9 Some caveats to the model

There are areas that warrant improvement in the model, both in the specification and in the estimation techniques. In addition, regular updates and simulations are required to maintain the model.

There are three issues to be clarified in the BSP's reaction function in equation (C.1). First, following Clarida, Gali and Gertler (2000), the equation may include a desired interest rate that is expected to prevail when inflation and output are at their targets. The absence of micro-founded behaviour equations does not allow this model to endogenously find a steady-state value for RRP. At the same time, the model is geared towards short-run policy analysis.

Second, it should again be stressed that changes in the exchange rate can also be achieved by interventions in the foreign exchange market. However, interventions are non-sterilized in this model simply because the BSP's primary objective is precisely to change the interest rate and, with this, the exchange rate.

The third issue pertains to the measure of inflation. Note that in both textbook and New Keynesian models, the measure of inflation that appears in the Phillips curve is domestic or core inflation, rather than overall (or headline) inflation. This model uses headline inflation instead of core inflation. The use of the CPI-based expected and target inflation rate is consistent with the BSP's IT framework.

The BSP uses the CPI-based (headline) inflation rate as its target for monetary policy because the CPI is the most commonly used inflation measure and is, therefore, widely known and easily understood by the public.

However, since some price movements are not within the control of monetary policy, the BSP would also take into account movements in the so-called "core inflation"[33] in determining its monetary policy stance. Thus, the core inflation rate would serve as an additional indicator of consumer price movements.

In fact, some studies argue that the strongest influences on the headline inflation rate are weather and policy regarding agricultural imports.[34] The implication is that if supply-side factors dominate inflationary movements in the Philippines, then a commitment to IT, by directing monetary policy to a process over which the central bank has weak control, would serve no purpose except to undermine credibility. However, core inflation figures are limited; that is, official figures from the National Statistics Office (NSO) and BSP run from 1995 to the present only. More importantly, central banks seem to be rethinking the use of the core inflation rate under the IT framework. IT pioneers like the Reserve Bank of New Zealand, the Bank of England and the Reserve Bank of Australia have moved back to headline CPI inflation as their operating target due to limitations of core inflation.

For the specification described here, the more important area to be improved is the estimation of potential output. A detailed breakdown of consumer prices, including a measure of core inflation, would be useful as well. This model concentrates on the GDP implicit price index while inflationary expectations are assumed. Further work remains to be done to more carefully model the CPI relationship and expectations. In addition, there is a need to look at a detailed estimation of money supply and financing of the national government deficit.

5.10 Simulation performance of the model

To gauge the simulation and forecasting performance of the model, the mean absolute percent error (*MAPE*) of selected endogenous variables is computed. As a general rule, the smaller the *MAPE* the better the fit of the model to the actual data. *MAPE* (which is unit free) is computed as follows:

$$MAPE = (1/n)\sum \left| \ (P - A)/A \ \right| * 100 ,$$

where A refers to the actual value, P is predicted or simulated by the model and n is the number of periods covered by the simulation.

Recall that the equations in this macro model include lagged dependent variables on the right-hand side. There are two ways to evaluate the lagged

value of the dependent variable: dynamic forecasting and static forecasting. Dynamic forecasting uses the previously forecast values of dependent *Y*, while static forecasting uses the one-step-ahead forecast of the dependent variable. Dynamic forecasting oftentimes requires availability of data for the exogenous variables for every observation in the forecast sample and observed values for any lagged dependent variables at the start of the forecast sample.

The model's forecasting performance over parts of the sample period and the simulated response to some exogenous changes in policy variables are assessed. The simulation period extends from the first quarter of 1994 to the fourth quarter of 2006. The simulation period includes the in-sample (historical) performance from the first quarter of 1994 to the fourth quarter of 2003, while the out-of-sample performance extends from the first quarter of 2004 to the fourth quarter of 2006.

The out-of-sample performance is based on an ex post forecast.[35] This means that the forecasts are generated beginning from the end of the estimation period (in this model the fourth quarter of 2003) and then extended to the present.

The forecasting process starts with the generation of the values for the exogenous variables. For variables with distinctive trends, it is sufficient to base the assumptions on historical trends or an extrapolation of the historical data into the future. However, most of forecasts of exogenous variables are generated based on the Medium-Term Philippine Development Plan, 2004-2010 (fiscal strength, financial sector and labour) and the Philippine 2004 Article IV Consultation and Post-Programme Monitoring Discussions with the IMF (financial sector and external sector).

Forecasts are derived from other reliable sources and international groups regarding expected values for world developments such as the GDP of the United States and Japan, world inflation and interest rates and world prices. The World Bank's *Global Economic Prospects 2005*, the Economist Intelligence Unit's (EIU) country forecast and the ADB's *Development Outlook 2005* are useful sources, and a consistency check was done. The BSP's inflation targets are based on the Medium-Term Philippine Development Plan, 1994-2000 (for the pre-IT period) and BSP inflation reports for the IT and forecast IT periods.

In our model, the major macroeconomic variables can be predicted within reasonable error margins (Table 5.4). In general, the mean absolute percent errors (MAPEs) of the static model are lower than those of the dynamic model. In fact, using static model, most of the real and financial

sectors have a MAPE below the benchmark of 10%, except for two variables; for the dynamic model this is four variables.

Using two-stage least squares and ordinary least squares, about 86% of the MAPEs fall below 10%. These include key variables in the real sector, like real personal consumption (*PCE*), the consumer price index (*CPI94*), the wholesale price index (*WPI94*), the price index for services gross value-added (*PVSR*), the labour force (*LF*) and long-run inflation expectations *(XINFL)*. For instance, *CPI94*, *WPI94* and *XINFL* have a MAPE of, respectively, 0.91%, 2.28% and 9.87%.

Meanwhile, individual income tax collection (*INDIV*) and dollar exports of manufactured goods (*XMFG*) have a MAPE of, respectively, 0.91% and 9.14%. In the monetary sector, the overnight reverse repurchase rate (*RRP*), the nominal peso-dollar exchange rate (*FXR*) and the 91-day treasury bill rate (*TBR91*) have a MAPE of 9.06%, 9.84% and 9.87%, respectively. Indeed, these are major monetary variables in the model. A MAPE rather close to the benchmark of 10% would mean that regular model updates are needed, as it would signify that the model is sensitive to changes, and hence, its fit to actual data could be weak.

Four variables have a MAPE between 10% and 11%, namely, exports of non-manufacturing merchandise goods (*XNMFG*), imports of fuel goods (*MFUEL*), currency in circulation (*CC*) and real investments in private construction (*CONS*). These results indicate that their fit to the actual data is relatively poor, hence, in-depth analyses are limited.

This is not unusual though. Following Reyes and Buenafe (2001), MAPEs of *XNMFG, MFUEL, CONS* and *CC* have similarly surpassed the 10% benchmark. Note that the rather significant changes in banking products and activities (financial deepening) has made the appropriate amount of *CC* extremely difficult to predict (Vital 2003).

In a similar vein, real sector variables, namely *XNMFG* and *MFUEL,* and *CONS,* imply that additional explanatory variables are needed for good fit. For instance, international trade taxes (tariff rates) could be included for both *XNMFG* and *MFUEL*. *CONS* could include the amount of credit to the private sector or the loans available to firms for private investment.

Fifteen policy experiments are generated to check the model's tracking ability. The results show adequate tracking ability. For each experiment, an exogenous/policy variable is changed to determine whether it has a recessionary or expansionary effect. The results for all experiments show that their effects on the price level and output conform to predictions from economic theory. This means that the model is able to capture the expected

Table 5.4
In-sample and out-of-sample performance of selected endogenous variables (1994-2006)

	Variables	Sector	MAPE	
			Dynamic	Static
1	PCE	Real	0.71	0.70
2	CPI94	Real	0.91	0.54
3	PVSR	Real	1.36	0.77
4	LF	Real	1.77	1.22
5	INDIV	Fiscal	2.15	2.22
6	ISEMP	Real	2.22	1.32
7	VSR	Real	2.25	0.53
8	WPI94	Real	2.28	1.35
9	PVIR	Real	3.05	1.35
10	VIR	Real	3.13	2.94
11	QSE1P	Real	4.58	4.41
12	DOMIP	Fiscal	5.39	4.16
13	NONOILM	Real	6.93	5.41
14	SDR	Monetary	7.68	6.61
15	DUREQ	Real	8.38	5.85
16	RRP	Monetary	9.06	8.26
17	XMFG	Real	9.14	8.18
18	PMGDS$	Real	9.45	4.85
19	DEPLIAB	Monetary	9.59	4.01
20	LR	Monetary	9.81	7.22
21	FXR	Monetary	9.84	3.51
22	XINFL	Real	9.87	9.10
23	TBR91	Monetary	9.88	8.87
24	XNMFG	Real	10.41	6.66
25	CC	Monetary	10.49	10.01
26	MFUEL	Real	10.75	9.35
27	CONS	Real	11.01	10.08

movements in key economic variables as a result of changes in selected external or policy variables. The magnitude of the changes in the endogenous variables also tapers off in the succeeding years after the shock is introduced.

While the estimated quarterly model has satisfactory tracking performance, it should be noted that it is sensitive to the values of the starting

period of the simulation. If in the simulation the model encounters large deviations from the actual values or if it encounters negative values for variables that are expressed in a logarithmic form, the model does not converge. The model, however, converges for all of the starting quarters from 1994 to 2003.

Reflecting on some exercises, increases in the minimum wage and crude oil prices have recessionary effects, that is, declining output and increasing inflation. Meanwhile, an increase in capital outlays, private construction, government consumption and reserve money are expansionary, as growth and inflation occur.

Meanwhile, an increase in the 90-day Libor is simulated to determine the impact on the 91-day T-bill rate, inflation and GDP growth. Starting in the fourth quarter of 2001, the 90-day Libor was raised by 25 basis points up until the first quarter of 2003 (a cumulative increase of 150 basis points). The initial impact of the rise in Libor is felt after two quarters and the full impact, an increase of 0.076 percentage point over the baseline scenario, is felt up to the fourth quarter of 2003. On balance, the 150 basis-point increase in the 90-day Libor leads to a rise in the 91-day T-bill rate. This consequently leads to a decline in GDP and inflation.

5.11 The impact of a change in monetary policy on GDP and inflation: Orders of magnitude

The simulation performance of the model discussed in the previous section is now complemented by an analysis of the implied dynamics and broad orders of magnitude involved when changes in monetary policy affect the 91-day T-bill rate, the peso-dollar exchange rate, GDP and the inflation rate. A key point to note in this section is that monetary policy changes affect market interest rates, the peso-dollar rate, real GDP and inflation with lags.

A recursive dynamic simulation of the model is utilized. In particular, simulations of an upward revision of the inflation target lasting for one year and temporary shocks in the augmented RRP are evaluated. Complementing these simulations are impulse responses. The simulations generally concur with theoretical expectations.

In addition, the evolution of the RRP after shocks is assessed. Even though the shocks are temporary, the trajectory of RRP after the shocks depends on the response of the BSP to the conditions of the economy. All responses are depicted in Figures 5.3a to 5.3c.

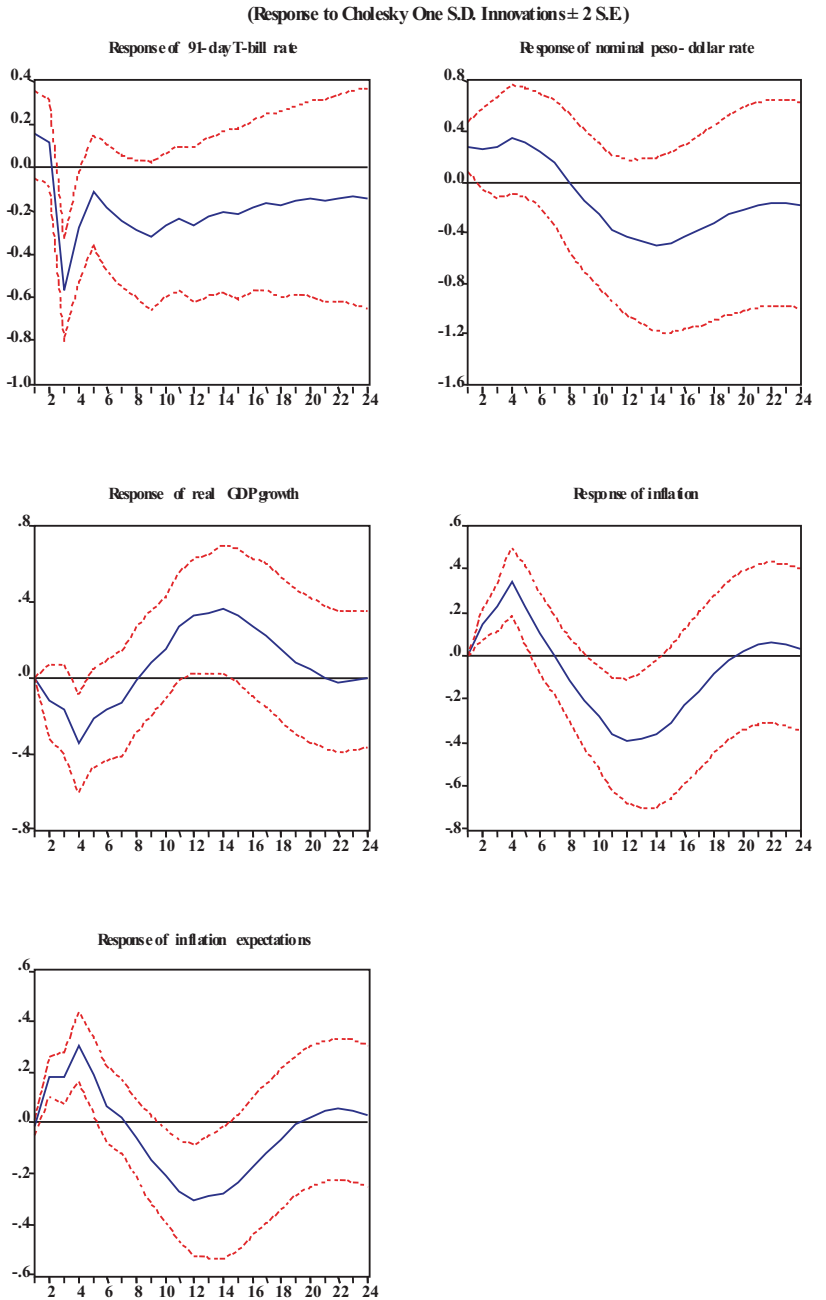


Figure 5.3a

Response to a sustained upward revision in inflation target

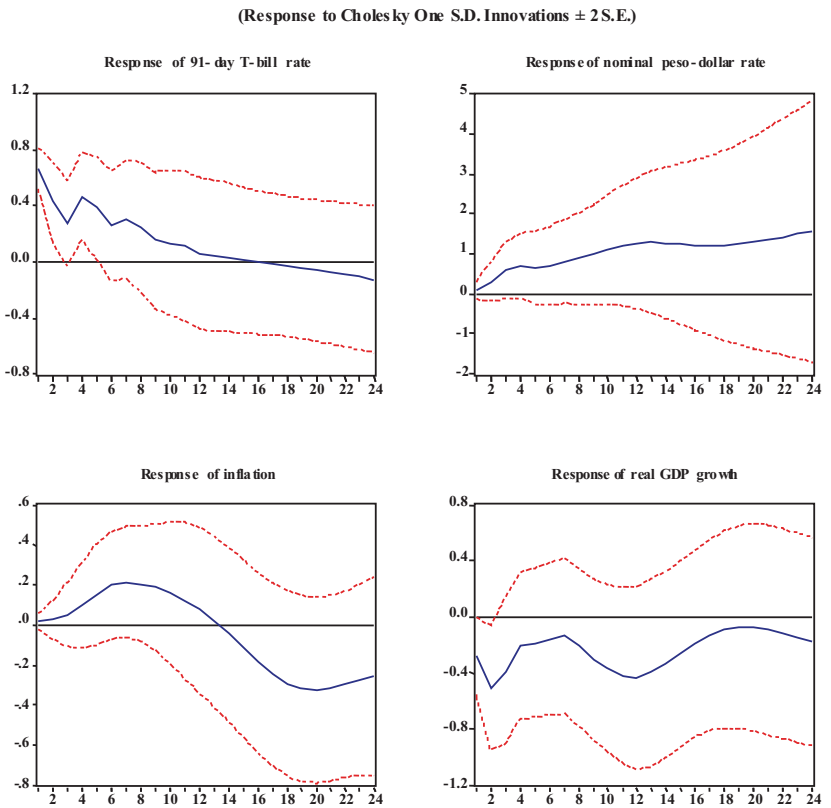


Figure 5.3b
Response to a sustained one percentage point rise in RRP

Figure 5.3a illustrates the response of 91-day T-bill rate, the nominal peso-dollar rate, real GDP growth, inflation and inflation expectations to a one percentage upward revision of the inflation target from the first to the fourth quarter of 1994. The original inflation target is then used thereafter. The inclusion of long-run inflation expectations is justified by the strength of the inflation target as a determinant. The RRP drops by less than 0.4 percentage point during the next two quarters and further by 0.8 percentage point in the next two quarters. The decline then stabilizes until it reaches its initial level after four quarters. The 91-day T-bill rate declines after two quarters, and diminishes further after two more quarters. This impact is expectedly short considering the marginal impact of the RRP on the longer term 91-day T-bill rate.

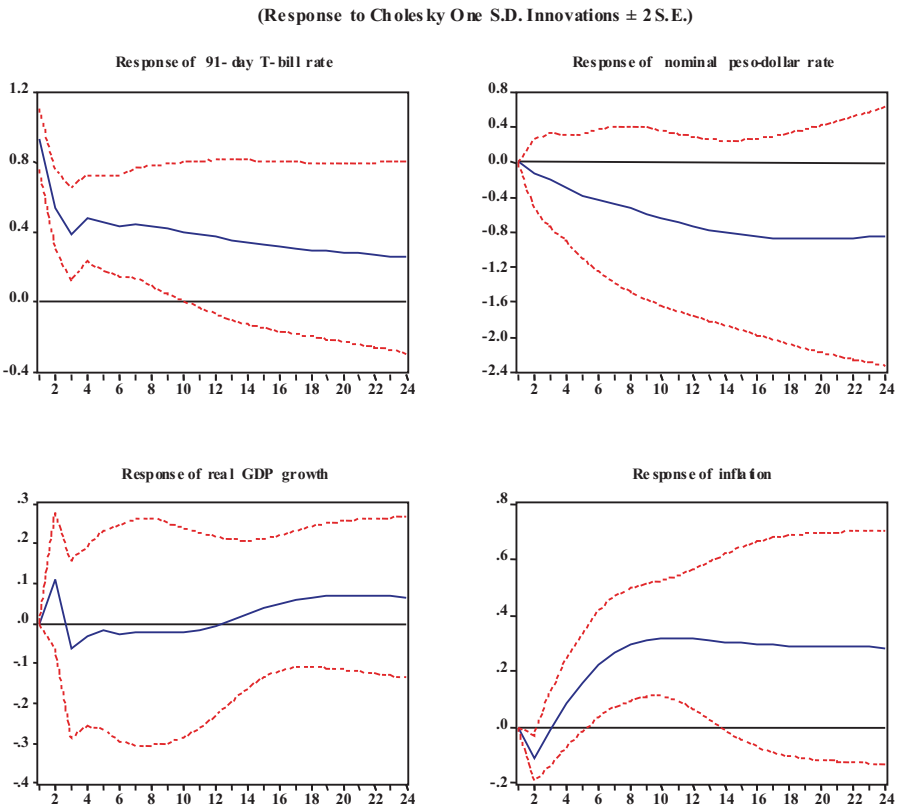


Figure 5.3c
Response to a one-off 100 basis point rise in RRP

Meanwhile, the nominal peso-dollar rate depreciated after two quarters, before reaching its peak in the succeeding two quarters. However, the impact is similarly short. The impact on real GDP growth is likewise short-lived and lasted for three quarters.

Figure 5.3b shows the response of the 91-day T-bill rate, the peso-dollar rate, real GDP and inflation to an unexpected one percentage point rise in RRP that lasts for one year. In this simulation, the shock emanated from the expected exchange rate, which led to a rise of one percentage point in augmented RRP sustained for four quarters. This increase translated into a significant increase in the 91-day T-bill rate after one quarter and then a diminishment onwards.

The course of inflation is little changed during the first year. But in the second year, inflation falls sharply, and the maximum effect is felt after

about six quarters, or 18 months. This finding is well within the BSP's estimate of the impact of changes in monetary policy on inflation between 15 and 21 months. The impact then starts to diminish, but it does not return to the base figure, even three years after the initial policy change. This causes a rise in the real rate of interest, which reduces investment by about 0.1% beginning in the first year after the policy shock.

In turn, real GDP starts to fall quite quickly and by a comparatively minimal amount after the initial policy change. The fall reaches a maximum from the baseline estimate of 0.2 percentage point after five quarters. From that quarter onwards, GDP returns smoothly to the base level.

Meanwhile, Figure 5.3c illustrates a one-off 100 basis point increase in RRP in one quarter. This is compared to Figure 5.3b's rather gradual increase in RRP spread over four quarters. The impact on the 91-day T-bill, inflation and the real interest rate is rather modest. In turn, real GDP growth declined only for about two quarters before rising. From the third quarter onwards, real GDP returns to its baseline level rather quickly.

5.12 Concluding thoughts: Lessons for monetary policy

This chapter described in greater detail the major links in the Philippine monetary policy transmission mechanism from the BSP's policy rate decisions to economic activity and inflation. In particular, this chapter traced how the policy rate affects important variables, such as inflation and economic growth, through three channels:

- the traditional channel of the interest rate, or the 91-day treasury bill rate, deposit and lending rates and their impact, albeit limited, on consumption, investment demand and money supply;
- the real exchange rate and its impact on international trade, durable investment, the price level and the expected exchange rate
- inflation expectations and their impact on consumption and investment.

However, two issues arise as monetary policy transmits its effects to the overall economy. First, the RRP and the 91-day treasury bill rate showed rather close tracking performance. However, the magnitude of the track is modest compared to figures for Brazil and Chile after which this model is patterned. The relatively moderate impact of the policy rate suggests that a slight deviation from the expected path requires a significant change in the RRP to bring the economy back to the central path. Put simply, this is a

strong indication that the elasticity of the interest rate to macroeconomic equilibrium is moderate. There is then a need to correct these distortions in the financial system and improve the efficiency of the monetary policy transmission mechanism.

Second, the peso-dollar exchange rate contains important information about the stance of monetary policy and is therefore an effective transmission mechanism. Both direct pass-through and indirect effects on inflation are high for two reasons. One is the historically high inflation, which heightens the linkage between the exchange rate and domestic prices. The Philippine inflation rate from 1981 to 2005 was high compared with its Asian neighbours and highly variable. A related point is the history of crisis in the Philippines. The idea is that episodes of large devaluation or depreciation could raise the salience of the local price of foreign exchange for domestic prices and wages, which could heighten the sensitivity of domestic inflation to the exchange rate. The Philippine economy has suffered from a boom-bust cycle, especially after the authorities embraced various measures of liberalization and globalization of financial markets.

This justifies the BSP's concern about excessive shocks to the peso-dollar rate. In such cases, the BSP intervenes, if only to reduce short-run fluctuations of the peso. However, such intervention may create uncertainty in the foreign exchange market sending negative signals to the exchange market which could eventually lead to exchange rate instability.

An interesting finding of this chapter is the significant degree of risk premium in the nominal peso-dollar exchange rate behaviour. This indicates that instead of the UIP, another exchange rate model better describes the peso-dollar rate at certain points in time. This leads to uncertainty in the conduct of monetary policy.

The uncertainties regarding changes in the nominal peso-dollar rate and constraints on the BSP's reaction function could lead to the tentative conclusion that the BSP's credibility might be susceptible to being undermined.

Notes

1. This is a typical Keynesian approach in describing an economy.

2. Also assumed for the Philippine quarterly macro model in Bautista et al. (2004).

3. In some studies, the constant represents the desired *RRP* that is expected to prevail when inflation and output are at their target growth.

4. In the empirical estimation,, real wealth is proxied by interest-earning deposit liabilities such as savings and time deposits.

5. In some models, the presence of short-term interest rates is meant to capture the effects of both the initial value of non-financial wealth and households' propensity to consume out of their disposable income

6. Early empirical works, however, suggest that growth of consumption is not very sensitive to changes in interest rate, implying a low intertemporal elasticity of substitution. See Campbell and Mankiw (1991).

7. This is in contrast to other models of investment behaviour, such as Q (or Tobin) models, which are argued to provide a theoretical and empirical foundation for optimization behaviour and to rationalize the importance of expectations in investment decisions (Blundell et al. 1992). However, empirical studies argue that the application of the Tobin Q model within the context of developing economics is limited by measurement problems (Allen 1997), in particular problems in measuring firm (Blundell et al. 1992).

8. Meanwhile, gross foreign borrowing depends on the requirements of the government less principal payments. This borrowing then feeds into the level of foreign debt.

9. Gross domestic borrowing feeds into the amount of treasury bills to be floated in the market. This then feeds into the level of domestic debt.

10. In practice, the change in the financial cash balance within the BSP is the residual. This accounts for the difference between the fiscal budget position and domestic and foreign borrowing, then feeding into the level of reserve money.

11. Technically speaking, this model could also include inflation expectations in the monetary policy rule only, as suggested by Huang et al. (2001).

12. See Appendix C for references. Major equations include *RRP, TBR91, DEPLIAB, PCE, CONS, DUREQ, WPI94, CPI94, XINFL*.

13. Also mentioned in Bautista et al. (2004).

14. In technical terms, this is called the Gauss-Seidel algorithm method.

15. The long-run multiplier is derived based on the following: in the model with lagged dependent variable, $y_t = c + ax_t + by_{t-1} + e_t$, the long run multiplier (m) of a change in x is $m = \frac{a}{(1-b)}$.

16. The regression starts from the first quarter of 1994 (instead of 1988) and extends until the fourth quarter of 2003 for a total of 40 observations. This is due to the fact that the official announcement of inflation targets (taken from the BSP and the Medium-Term Development Plan of the NEPA) started in 1994 only, while the official IT framework was announced only in January 2002. Some macro models have the same specification and the number of observations in this equation is empirically acceptable.

17. Note that long-run coefficients are computed by dividing the corresponding short-run coefficients with *POTGAP1, EXPFXR-FXR* and *FINFL-INFTAR* by one minus the coefficient of lagged *RRP*.

18. The literature on interest rate smoothing has laid out some general hypotheses: policymakers dislike frequently reversing the direction of interest rates; the nature of the decision-making process leads to conservatism; and smooth changes in the target provide greater control over long-term interest rates and thereby enable greater control over inflation and economic activity (Lowe and Ellis 1998).

19. In its original specification, real money supply (*MS*) as indicator of demand for private loans and the nominal peso-dollar exchange rate (*FXR*) was included but was dropped as it yielded an insignificant coefficient and incorrect sign.

20. Numerous studies refer to this as inertia. This is not unusual following the uncertainty and shocks affecting movement of the peso-dollar rate.

21. In its original form, inflationary pressure, specified as the difference between inflation forecasts and inflation and the inflation target as well as relative money stocks and GDP were tested, but the coefficient signs were incorrect. Following Garcia et al. (2002), a measure of interest spread is included, that is, *LIBOR90* and *RRP*, but was similarly insignificant.

22. Disposable income is computed as gross national product (*GNP*) less direct tax revenues from the Ministry of Finance.

23. From the demand side, an econometric study by the BSP (2004) revealed that in the case of the Philippines, income variables (disposable income, including agricultural income) are significant determinants of changes in consumption spending. This finding is consistent with evidence from the empirical literature on the "excess sensitivity" of consumption to income. It also suggests that Filipino consumers typically rely more on their own income than on borrowing to satisfy their consumption needs.

24. However, some empirical studies argue that it is becoming clear that interest rate changes do have wealth effects and that the indeterminacy of the final conclusion reflects the joint influence of substitution and wealth effects. But since most studies argued that interest rate changes do not affect real wealth, it must be concluded that the only channel through which interest rates affect consumption is the substitution effect.

25. In the original specification, the unemployment rate was included to capture households' perceptions of uncertainty and expectations. However, this was dropped as it proved insignificant based on the *t statistic*.

26. Figures for total exports of goods are based on the Philippine National Statistical Coordination Board's National Income Accounts in 2006.

27. Also cited in Angeles and Tan (2004).

28. This figure is lower than Thailand's 4.36% but higher than Korea's 3.78%, China's 1.49% and Indonesia's 0.23%. Indonesia became a net importer of oil in 2003, while China became a major net petroleum buyer in 2000.

29. Also cited in Brooks (2002).

30. In its annual macroeconometric model, the BSP provides a more detailed determination of prices in the economy. Headline and core CPI inflation are treated separately in the model. In the specification of core CPI inflation, food and energy prices are omitted.

31. The 2004 National Economic Development Authority (NEDA) Quarterly Macro Model (QMM) has some Keynesian elements while, the the real and monetary and external sectors of the model are linked through an open economy IS-LM aggregate demand framework. Using this model's estimate of *TBR91*., the impact though is much weaker, at only 0.05 percentage point when compared to our macro model.

32. For Brazil, the Brazilian foreign debt title known as the "C-Bond" is used.

33. In February 2004, the NSO began publishing, alongside the CPI headline inflation rate, an official rate of core inflation, defined as the rate of change of the headline CPI after excluding selected food and energy items (Guinigundo 2004).

34. See the reaction by Felipe Medalla on the paper by Donald Brash, *Fifty Years of Central Banking in the Philippines: Symposium on Inflation Targeting and the Asian Crisis* (Manila: BSP, 1999).

35. Two types of forecasts can be used. The first is the ex post forecast, for which forecasts are generated beginning from the end of the estimation period and then extended to the present, and the results are compared with the actual data available. This is often performed to test the forecasting accuracy of the model. The other type of forecast is the ex ante forecast. This begins with the simulation in the current year and then extends this farther into the future.

6 Uncovering the BSP Policy Objectives

6.1 Introduction

The open and dynamic macro model presented in Chapter 5 identified the economic variables of Philippine monetary policy transmission. All provide important information about the stance of Philippine monetary policy. However, results show that the elasticity of the policy interest rate to market interest is moderate. This suggests that a slight deviation from the expected path requires a significant change in the policy rate to bring the economy back to the central path.

In addition, the direct and indirect pass-through effects from exchange rate to inflation are both above average, suggesting that the exchange rate is an effective transmission mechanism. However, the influence of monetary policy on the exchange rate is limited, as the standard UIP condition is inadequately satisfied. Results show that the risk premium largely determines the behaviour of the nominal exchange rate, suggesting that its behaviour could become more volatile with globalized financial markets. This means that the link between the interest rate and the exchange rate is highly unpredictable, leading to uncertainty in the conduct of monetary policy (Wollmershauser 2003).

These findings have crucial implications for IT frameworks and pose a dilemma for central banks, especially where the exchange rate serves as a focal point for inflation expectations.

This chapter sheds light on the impact of exchange rate uncertainty on the credibility of the BSP. Two questions emerge in this respect. First, does IT result in greater volatility of the nominal exchange rate and of other macroeconomic indicators? Second, does exchange rate uncertainty weaken the BSP's credibility?

The chapter begins with section 6.2's presentation of the structure and basis of analysis. Section 6.3 answers the question of whether IT leads to greater volatility of the exchange rate and other macroeconomic variables. Section 6.4 analyses the isolated performance of the BSP's baseline objective function to determine whether exchange rate instability undermines the bank's credibility. Some policy implications are set out as concluding thoughts in section 6.5.

6.2 The structure of analysis

Our analysis includes three sub-periods: pre-IT (first quarter 1994 to fourth quarter 2000), the IT period (first quarter 2001 to first quarter 2003) and forecast IT period (second quarter 2003 to fourth quarter 2006). Meanwhile, the forecast IT period is based on the ex post forecast discussed in Chapter 5.

Annualized quarterly growth as well as volatility using the coefficient of variation (CV) are computed. Volatility is a measure of how wild or quiet an indicator is relative to its history. The CV is a comparative measure defined as the ratio of the standard deviation to the mean.

The impact of exchange rate uncertainty on BSP credibility is based on the estimated BSP objective function (or the welfare loss of a policy rule or the "policy loss function"). The idea is to map the impact of policy simulations and cases to the BSP's objective function over time, not to derive the optimizing policy loss function. A welfare or credibility loss (gain) to the BSP is measured by a higher (lower) value of the policy loss function. The impact on interest rates, the exchange rate, the money supply, components of GDP and finally inflation and inflation expectations are also assessed.

The objective function of the BSP is assumed to exhibit the standard quadratic form presented in Chapter 3, with some modifications:

$$L = \frac{1}{2}\left[\varpi(\pi_t^r - \pi_t^*)^2 + \rho(q_t - q_t^*)^2 + \gamma(E_t e_{t+1}^n - e_t^n)^2\right], \tag{6.1}$$

where π_t^f is the inflation forecast, π_t^* is quarterly inflation target announced by the government, q_t is actual quarterly real GDP growth, q_t^* is potential real GDP, E_t denotes expectations conditional upon the information set available at time t and e_t^n is the average quarterly nominal peso-dollar exchange rate. Meanwhile, ϖ, ρ and γ represent, respectively, the BSP's aversion to inflationary pressure, real GDP growth fluctuations around the

potential (the output gap) and nominal peso-dollar exchange rate fluctuations around the expected rate.

In the empirical estimation of RRP in Chapter 5 (equation C.1), inflationary pressure (ϖ in equation 6.1 above) carried a coefficient of 0.39, implying that the BSP is a flexible inflation targeter. Meanwhile, ρ and γ are estimated to be 0.35 and 0.29, as the BSP responds to shocks on the output gap and peso-dollar rate, respectively.

6.3 Does IT increase volatility of the exchange rate and other macroeconomic indicators?

Recall from Chapter 1 that responding to exchange rate movements is very different from targeting the exchange rate. While the latter makes the exchange rate an intermediate target, the former treats the exchange rate as one further piece of information to be weighed when setting interest rates. Expressed in this manner, the BSP is expected to be able to gain only by responding to all information that helps it to meet its final target and achieve economic outcomes.

The main view in this regard is that if the BSP strictly focuses on inflation (direct effects), it may have to accept rather large fluctuations in output (indirect effects) and exchange rate. It would thus gain credibility as an inflation-fighter, but at the expense of loss of output and, possibly, financial crisis. This is consistent with Taylor's (1979) view that a trade-off exists between inflation and output variability.

If, on the other hand, the BSP extends the scope of its monetary policy to include, for instance, exchange rate stability, it may create confusion among economic agents and undermine its credibility in the market (which would reduce the effectiveness of its policy signals), all the more so because it would have to cope with the fact that there is so much uncertainty surrounding the determinants of the exchange rate.[1]

Equation (C.1) (RRP) is the main focus on which alternative scenarios are built. Table 6.1a presents the baseline scenario plus three alternatives. Table 6.1b shows the deviations of the alternative scenarios from the baseline. There are two remaining alternative scenarios found in Table 6.2a and deviations of these alternative scenarios from the baseline in Table 6.2b.

Recall that the policy simulations in Chapter 5 captured the transmission mechanism quite well and generated reasonable outcomes. In this section, sensitivity analysis is performed to see the impact of exchange rate instability and uncertainty on target variables and policy loss function. To study the

impact of exchange rate instability, weights of the terms in the policy rule are adjusted. The adjustment in weights of the terms in policy rule and the corresponding analysis does not seek to capture the absolute sense of "tightness" or "looseness" in monetary policy and the real economic outcomes, rather the focus is on the impact of the adjustments on the volatility of target variables and policy loss function.

Recall that the uncertainty emanates from the international financial markets, not in the domestic economy. Hence, the output gap does not introduce any uncertainty in this exercise. The focus then is not on the output gap and inflation, but on inflation and the exchange rate.

In the base run of the model the weights in the policy rule are 0.35, 0.29 and 0.39 for the output, exchange rate and inflation gap respectively. Changing the weights given to inflation and exchange rate would mean that the policy interest rate is determined in another way. This enables us to assess whether a greater concern for, for instance, inflation would lead to different outcomes for the level and volatility of other policy concerns, such as output and the exchange rate.

For instance**,** Scenario 1 slightly increases the weight given by the BSP to the exchange rate gap, by 0.06 percentage point, with a corresponding decline in the weight of the inflationary gap from the baseline. Recall that the estimation period shows that on average the inflation target was hardly breached or the inflation forecast was lower than the target. In contrast, the expected nominal peso-dollar rate on average was higher than actual, suggesting shocks to exchange rate are generally significant over the estimation period. To the extent that this scenario captures preference of the BSP to lean towards exchange rate gap, the RRP is expected to rise from the baseline.

In Scenario 2, the weight of the inflationary gap increases by 0.21 percentage point, while the exchange rate gap drops by the same magnitude from the baseline. This scenario places greater weight on the inflationary gap. Hence, the RRP is expected to drop from the baseline.

Meanwhile, Scenario 3 increases the weight on the exchange rate gap by 0.21 percentage point, leaving the weight on the inflationary gap almost nil, at 0.07. The RRP is expected to increase significantly.

The decision to lean slightly towards exchange rate pressure in Scenario 1 led to a rise in the BSP's policy rate by almost 0.32 percentage point. This consequently raised other market interest rates, such as the 91-day T-bill rate, the average lending rate and the savings deposit rate, albeit marginally at less than 0.05 percentage point. The nominal peso-dollar rate and the ex-

pected peso-dollar rate appreciated, albeit moderately, from the baseline. Meanwhile, the growth of the real money supply dropped below the baseline by 0.2 percentage point. The relatively subdued growth was reflected in the combined impact of the higher savings deposit rate and the depreciating peso-dollar rate.

Components of domestic demand felt the impact of higher real interest rates. In particular, the impact of the higher interest rate was seen in the significant decline in growth of private investment (construction) as the real lending rate rose.

Another component to feel the effect of higher real interest rates was real personal consumption, the significant decline of which was attributed to the reduction in growth of the real money supply while the real 91-day T-bill rate rose. There was a modest increase in durable equipment, as the depreciation rate of the nominal peso-dollar exchange rate slowed.

Similarly, the average growth of total imports grew slightly by 0.09 percentage point, while total exports growth diminished by 0.03 percentage point from its baseline growth rate. In effect, the total external deficit continued to slide slightly from the baseline.

The volatility measure in Tables 6.1a and 6.1b indicates that the BSP's reaction leaning slightly towards exchange rate pressure generated, from the baseline, higher volatility of inflation, the two-year-ahead inflation forecast, long-run inflation expectations and the nominal peso-dollar exchange rate. The trade-off was evident, as real GDP growth and the output gap both showed higher volatility. Lower volatility compared to the baseline was seen in all of the interest rates.

With these results, the BSP's preference to slightly control the exchange rate gap through an increase in the RRP resulted in the improvement of its credibility, as the policy loss estimate dropped during the IT period and the forecast IT period.

The BSP's preference to rein on inflationary pressure in Scenario 2 has led to lower RRP from the baseline. A slight increase in real GDP growth and a narrowing of the (negative) output gap was also evident.

Components of domestic demand exhibited some expansion with lower real interest rates. In particular, the impact was seen in the increase in real personal consumption, the growth of which was attributed to expansion of the real money supply, while the real 91-day T-bill rate declined. Real private investment (construction) similarly increased as the real lending rate dropped. There was a modest decline in real government investment and

Table 6.1a
Philippines: Alternative scenarios to BSP objective function, 1994-2006

Economic indicators	1994-2003 (Main indicators)							
	Baseline		Scenario 1		Scenario 2		Scenario 3	
	Average	CV	Average	CV	Average	CV	Average	CV
GDP and components (year-on-year growth)								
Domestic Demand								
Personal consumption	3.67	0.27	3.65	0.27	3.92	0.38	3.47	0.26
Government consumption	2.70	1.06	2.70	1.05	2.72	1.06	2.69	1.05
Private construction	7.51	1.74	7.50	1.74	7.79	1.88	7.36	1.74
Government construction	10.51	1.75	10.53	1.75	10.47	1.78	10.57	1.74
Durable goods	3.06	1.90	3.10	1.89	2.94	2.01	3.23	1.87
External Demand								
Total exports								
Year-on-year growth	6.28	2.43	6.25	2.43	6.40	2.42	6.08	2.46
Total imports								
Year-on-year growth	7.59	1.59	7.68	1.57	7.31	1.7	8.00	1.52
Financial indicators (%)								
Money supply (year-on-year growth)	17.32	0.95	17.14	0.96	17.91	0.92	16.54	0.99
RRP	8.02	0.30	8.34	0.18	6.98	0.47	9.36	0.15
91-day treasury bill rate	12.33	0.15	12.38	0.09	12.16	0.21	12.55	0.14
Lending rate	14.28	0.09	14.32	0.07	14.17	0.15	14.42	0.08
Savings deposit rate	7.56	0.08	7.58	0.06	7.51	0.14	7.63	0.07
Nominal peso-dollar rate (year-on-year growth)	3.90	1.95	3.81	2.10	4.23	2.68	3.45	2.27
Expected peso-dollar rate (year-on-year growth)	3.82	1.99	3.71	2.05	4.19	2.78	3.30	2.36
Macroeconomic indicators (%)								
Real GDP growth	3.54	0.72	3.48	0.58	3.56	0.88	3.51	0.48
Output gap (in billion pesos)	-381.7	-10.5	-382.7	-10.78	-380.2	-10.34	-384.9	-10.88
CPI-Inflation	5.57	0.41	5.55	0.56	5.63	0.36	5.50	0.53
CPI-inflation forecast (two years)	5.41	0.40	5.39	0.49	5.48	0.34	5.33	0.49
CPI-Inflation expectations (long run)	6.08	0.33	6.07	0.46	6.13	0.28	6.02	0.44
BSP policy loss estimate (1994-2006)								
Pre IT period: 1994 Q1-2000 Q4	1.83	0.60	1.86	0.63	2.69	0.69	1.17	0.89
IT period: 2001 Q1-2003 Q1	1.63	1.05	1.48	1.07	2.05	1.23	0.58	0.90
Forecasted IT period: 2003 Q2 - Q4 2006	1.54	0.92	1.36	0.94	1.96	1.10	0.47	0.86

Scenarios:
Baseline: Weight given to inflationary gap (0.387) and exchange rate gap (0.287).
Scenario 1: Weight given to inflationary gap (0.324) and exchange rate gap (0.350)
Scenario 2: Weight given to inflationary gap (0.600) and exchange rate gap (0.074)
Scenario 3: Weight given to inflationary pressure (0.074) and exchange rate gap (0.600)

durable equipment as depreciation of the nominal peso-dollar rate inched up.

Following the higher depreciation of the nominal peso-dollar rate, the average growth of total imports declined by 0.3 percentage point, while total exports growth was higher by 0.1 percentage point over the baseline growth rates. Meanwhile, average inflation, the inflation forecast and long-run inflation expectations rose.

Results of Scenario 2 led to lower volatility of inflation, the inflation forecast and long-run inflation expectations from the baseline. However, real GDP growth and the output gap have exhibited higher volatility. With a more benign control on the exchange rate gap, the peso-dollar rate variability increased slightly from the baseline.

Table 6.1b
Philippines: Deviations of alternative scenarios from baseline, 1994-2006

Economic indicators	1994-2003 (Main indicators)					
	Scenario 1		Scenario 2		Scenario 3	
	Average	CV	Average	CV	Average	CV
GDP and components (year-on-year growth)						
Domestic Demand						
Personal consumption	-0.01	0.00	0.25	0.11	-0.20	-0.02
Private construction	-0.01	0.00	0.28	0.14	-0.15	0.00
Government construction	0.01	0.00	-0.04	0.03	0.05	-0.01
Durable goods	0.04	-0.01	-0.13	0.11	0.17	-0.03
External Demand						
Total exports						
Year-on-year growth	-0.03	0.00	0.12	-0.01	-0.20	0.03
Total imports						
Year-on-year growth	0.08	-0.02	-0.28	0.07	0.41	-0.07
Financial indicators (%)						
Money supply (year-on-year growth)	-0.18	0.01	0.59	-0.03	-0.78	0.04
RRP	0.32	-0.12	-1.04	0.17	1.34	-0.16
91-day treasury bill rate	0.05	-0.06	-0.17	0.06	0.22	-0.02
Lending rate	0.03	-0.02	-0.11	0.06	0.14	-0.01
Savings deposit rate	0.02	-0.02	-0.06	0.06	0.07	-0.01
Peso-dollar rate (year-on-year growth)	-0.10	0.15	0.33	0.73	-0.45	0.32
Expected peso-dollar rate (year-on-year growth)	-0.11	0.06	0.36	0.79	-0.52	0.37
Macroeconomic indicators (%)						
Real GDP growth	-0.06	-0.14	0.02	0.16	-0.03	-0.24
Output gap (in billion pesos)	-0.92	-0.24	1.59	0.20	-3.16	-0.34
Inflation	-0.02	0.15	0.06	-0.05	-0.07	0.12
CPI-inflation forecast (two years)	-0.02	0.09	0.07	-0.06	-0.09	0.09
Inflation expectations (long run)	-0.01	0.13	0.05	-0.05	-0.06	0.11
BSP objective function (1994-2006)						
Pre IT period: 1994 Q1-2000 Q4	0.04	0.03	0.87	0.09	-0.66	0.28
IT period: 2001 Q1-2003 Q1	-0.15	0.01	0.41	0.17	-1.05	-0.15
Forecasted IT period: 2003 Q2 - Q4 2006	-0.18	0.01	0.41	0.17	-1.07	-0.06

Scenarios:
Baseline: Weight given to inflationary gap (0.387) and exchange rate gap (0.287).
Scenario 1: Weight given to inflationary gap (0.324) and exchange rate gap (0.350)
Scenario 2: Weight given to inflationary gap (0.600) and exchange rate gap (0.074)
Scenario 3: Weight given to inflationary pressure (0.074) and exchange rate gap (0.600)

Meanwhile, the BSP's policy loss estimate showed an increase from baseline, signifying credibility loss. This indicates there is no guarantee that credibility gains would be achieved if the BSP concentrated only on inflationary pressure.

Scenario 3 focuses more on the exchange rate gap, placing less weight on inflationary pressure. This resulted in a significant decline in inflation, the inflation forecast and inflation expectations. Real GDP growth diminished slightly while the output gap widened, albeit marginally.

In particular, the RRP rose by 1.3 percentage points over the baseline. In turn, market interest rates inched up from the baseline level. The 91-day treasury bill rate rose by 0.22 percentage point. The increase in RRP siphoned off liquidity from the system and contained its growth by 0.8

percentage point from the baseline. Meanwhile, the increase in the 91-day treasury bill rate led to the appreciation of the realized and expected nominal peso-dollar rate by an average of 0.5 percentage point over the baseline.

The impact of higher interest rates was felt in components of spending patterns. Following the contraction of the real money supply and the increase in the real 91-day T-bill rate, growth of personal consumption declined by 0.2 percentage point. Private investment dropped by 0.15 percentage point from the baseline level following the rise in the real lending rate. This contraction more than offset the rise in growth of durable goods as depreciation of the peso-dollar rate slowed from the baseline level. Indeed, a policy shift leading to high real interest rates implied an extremely restrictive impulse to the domestic sector of the economy.

The impact on external demand is a net decline from the baseline scenario. While the appreciation of the peso-dollar rate led to growth of total imports, total exports declined. This implies that a strict focus on exchange rate pressure limits the competitiveness of exports.

It could also be seen that a significant rise in interest rates leads to a widening of the output gap, implying that resources have become unemployed and actual output falls below potential output. The rise in interest rates has led to a decline of inflation and the inflation forecast.

However, the BSP's preference to strictly focus on the exchange rate gap generated more volatility of inflation, the inflation forecast and inflation expectations. Meanwhile, volatility of real GDP growth and the output gap declined from the baseline level. With a more benign control on inflationary pressure, the variability of the peso-dollar rate increased from the baseline and in fact was the highest here of all the scenarios.

This scenario, however, showed a decrease in the policy loss estimate from the baseline from 2001 to 2003 that was relatively significant amongst the three scenarios. This indicates that it could potentially be feasible for the BSP to achieve credibility gains if the exchange rate pressure is managed.

Three messages can be derived from these three scenarios. First, the trend of inflation and output performance across all scenarios can be established. In accordance with the literature, inflation, the inflation forecast and long-run inflation expectations have declined when the exchange rate pressure stabilised. However, real GDP growth has also declined and the output gap has widened. This is seen in Scenarios 1 and 3. The opposite is true in Scenario 2; when BSP allows RRP to drop, inflation rate starts to pick up. In contrast, real GDP growth rose while the output gap narrowed. The real-

ized and expected nominal peso-dollar rate continued to depreciate in Scenario 2, but not enough to improve the external trade balance.

Second, and perhaps the most interesting result of these exercises, the magnitude of effects was largely marginal compared to those reported by other countries. In a survey conducted by Fuentes et al. (2003),[2] the maximum decline in annual inflation from a 100-basis-point increase in policy rate range from 0.04 to 1.00 percentage point. Table 6b shows a rise in RRP in Scenarios 1 and 3 ranging from 0.32 to 1.34 percentage points. However, the corresponding decline in average inflation rate from the baseline ranges only from 0.02 to 0.07 percentage point. The implication is that the BSP needs to raise its policy rate significantly in order to make an impact. This could be attributed to the continuing underdevelopment of the Philippine financial market.

Third, the results of volatility measures are consistent with Taylor's proposition that there is a negative relation between inflation and output variability. For instance, when the BSP strictly focuses on inflation, higher volatility in real GDP growth was noted (Scenario 2). In addition, volatility of the nominal peso-dollar rate and of interest rates was relatively higher than the baseline.

At this point, it could be established that the BSP's attempts to raise its policy rate to achieve low inflation during the IT period resulted in larger volatility of other variables, especially the peso-dollar exchange rate. In particular, a policy shift leading to high interest rates could lead to a restrictive impulse to the real sector. This leads to greater volatility of inflation, the inflation forecast and long-run inflation expectations.

However, significant credibility gains (across scenarios) to the BSP are achieved, compared to the baseline scenario, when the BSP responds solely to exchange rate pressure. This finding runs contrary to quantitative work by Ball (1999), Svensson (2000), Batini et al. (2001) and Leitemo and Soderstrom (2001), all of whom found small credibility gains when the central bank's objective function includes the exchange rate. However, more data and longer time series for the IT period of our model are needed to make this a strong argument.

Given the finding that the effects of a shift in the BSP's objective function are largely marginal, perhaps a provisional conclusion is that IT and exchange rate management would lead to the same result. Note that this is because the alternative scenarios are built with weights given to inflationary and exchange rate pressures. Meanwhile, the more volatile nature of most macroeconomic indicators, especially the nominal peso-dollar rate, con-

notes that the IT process is ineffective for achieving greater macroeconomic stability.

Given these findings, two scenarios are assessed further. Scenario 4 looks at the situation in which the BSP puts zero weight on both inflation and exchange rate pressure. This leaves equation (C.1) with the output and the lagged RRP variables. This scenario leads to a higher RRP, as coefficients of both output gap and lagged RRP rise.

Meanwhile, Scenario 5 looks at a situation in which the inflation target is dropped to assess whether IT matters. In this scenario, the inflation target in equation (C.1) is replaced by realized inflation. The idea is that the BSP must raise the RRP whenever the inflation forecast generated is rising compared to the realized inflation. Hence, RRP is expected to rise in this scenario.

Tables 6.2a and 6.2b present the results. Both scenarios lead to higher RRP and market interest rates compared to the baseline. Inflation, the inflation forecast and long-run inflation expectations are lower than the baseline. With lower inflation indicators, the BSP gains credibility as an inflation fighter. However, in both scenarios, real GDP growth is lower than the baseline and even the three previous scenarios. With regard to volatility, both scenarios generate more volatile behaviour compared with the baseline.

Results of Scenario 4 show that putting zero weight on inflation and exchange rate pressure would not lead to credibility gains. The computed BSP policy loss function (IT period) increased from the baseline figure of 1.63 to 1.77. While inflation, the inflation forecast and inflation expectations decreased, the cost in terms of lower output growth was evident. In fact, average real GDP growth is the lowest here compared to the baseline across the four scenarios. In addition, this scenario generated more volatility, especially in the real sector components.

Scenario 5 shows that excessive focus on keeping actual inflation down and stable and thereby higher interest rate would indeed result in restrictive impulses to the real sector, and it would lower GDP growth from the baseline. Results also show that this strategy would not increase BSP credibility. The computed BSP policy loss function rose from the baseline figure of 1.63 to 1.99. This suggests that a focus on inflation target could be a credible monetary policy framework for the Philippines.

Table 6.2a
Philippines: Alternative scenarios for the BSP's objective function, 1994-2006

Economic indicators	1994-2003 (Main indicators)					
	Baseline		Scenario 4		Scenario 5	
	Average	CV	Average	CV	Average	CV
GDP and components (year-on-year growth)						
Domestic Demand						
Personal consumption	3.67	0.27	3.19	0.28	3.32	0.31
Private construction	7.51	1.74	7.12	1.64	7.25	1.64
Government construction	10.51	1.75	9.81	1.59	9.81	1.59
Durable goods	3.06	1.90	2.95	2.36	3.13	2.08
Total GDCF as % of GDP	20.80	0.09	20.74	0.11	20.86	0.10
External Demand						
Total exports						
Year-on-year growth	6.28	2.43	4.86	3.00	5.35	2.85
Total imports						
Year-on-year growth	7.59	1.59	8.14	1.79	7.88	1.70
Financial indicators (%)						
Money supply (year-on-year growth)	17.32	0.95	17.10	0.46	16.52	0.95
Overnight RRP	8.02	0.30	8.80	0.13	9.78	0.24
91-day treasury bill rate	12.33	0.15	12.54	0.14	12.78	0.23
Lending rate	14.28	0.09	14.40	0.08	14.58	0.13
Savings deposit rate	7.56	0.08	7.61	0.07	7.86	0.09
Nominal peso-dollar rate (year-on-year growth)	3.90	1.95	3.65	2.70	3.23	1.95
Expected peso-dollar rate (year-on-year growth)	3.82	1.99	3.52	2.81	3.12	0.16
Macroeconomic indicators (%)						
Real GDP growth	3.54	0.72	3.00	0.78	3.02	0.85
Output gap (in billion pesos)	-381.7	-10.5	-391.72	-13.09	-399.00	-10.54
CPI-Inflation	5.57	0.41	5.45	0.39	5.12	0.37
CPI-inflation forecast (two years)	5.41	0.40	5.38	0.39	4.85	0.37
CPI-Inflation expectations (long run)	6.08	0.33	4.72	0.33	4.19	0.32
BSP policy loss estimate (1994-2006)						
Pre IT period: 1994 Q1-2000 Q4	1.83	0.60	1.87	0.61	2.12	0.46
IT period: 2001 Q1-2003 Q1	1.63	1.05	1.77	1.31	1.99	0.22
Forecasted IT period: 2003 Q2 - Q4 2006	1.54	0.92	1.73	1.27	1.95	0.18

Scenarios:
Baseline: Weight given to inflationary gap (0.387) and exchange rate gap (0.287).
Scenario 4: Weight given to inflationary pressure (0.000) and exchange rate gap (0.000)
Scenario 5: Inflation target was replaced by realized inflation

6.4 Does exchange rate instability undermine credibility?

This exercise extends the issue of whether exchange rate uncertainty weakens BSP credibility. The idea is to compare the performance of a baseline BSP reaction function (in which the exchange rate represents the UIP-cum-risk premium specification) with two cases of exchange rate specification estimated as alternative cases to UIP (Tables 6.3a and 6.3b). Hence, equation (C.5) (the nominal peso-dollar equation) of the macro model is replaced by Cases 1 and 5.

Table 6.2b
Philippines: Deviations of alternative scenarios from baseline, 1994-2006

Economic indicators	1994-2003 (Main indicators)			
	Scenario 4		Scenario 5	
	Average	CV	Average	CV
GDP and components (year-on-year growth)				
Domestic Demand				
Personal consumption	-0.48	0.00	-0.34	0.03
Private construction	-0.38	-0.11	-0.26	-0.10
Government construction	-0.71	-0.15	-0.71	-0.15
Durable goods	-0.11	0.46	0.07	0.18
External Demand				
Total exports				
Year-on-year growth	-1.43	0.57	-0.93	0.42
Total imports	0.00	0.00	0.00	0.00
Year-on-year growth	0.55	0.20	0.28	0.10
Financial indicators (%)				
Money supply (year-on-year growth)	-0.22	-0.50	-0.80	0.00
RRP	0.78	-0.18	1.76	-0.07
91-day treasury bill rate	0.21	-0.01	0.45	0.08
Lending rate	0.11	-0.01	0.30	0.04
Savings deposit rate	0.05	-0.01	0.30	0.01
Peso-dollar rate (year-on-year growth)	-0.25	0.75	-0.67	0.00
Expected peso-dollar rate (year-on-year growth)	-0.30	0.82	-0.70	-1.83
Macroeconomic indicators (%)				
Real GDP growth	-0.54	0.06	-0.52	0.13
Output gap (in billion pesos)	-9.98	-2.55	-17.26	0.00
CPI-Inflation	-0.12	-0.02	-0.45	-0.04
CPI-inflation forecast (two years)	-0.03	-0.01	-0.56	-0.03
CPI-inflation expectations (long run)	-1.36	0.00	-1.89	-0.01
BSP policy loss estimate (1994-2006)				
Pre IT period: 1994 Q1-2000 Q4	0.04	0.01	0.29	-0.14
IT period: 2001 Q1-2003 Q1	0.14	0.25	0.36	-0.83
Forecasted IT period: 2003 Q2 - Q4 2006	0.19	0.34	0.41	-0.74

Scenarios:
Baseline: Weight given to inflationary gap (0.387) and exchange rate gap (0.287).
Scenario 4: Weight given to inflationary pressure (0.000) and exchange rate gap (0.000)
Scenario 5: Inflation target was replaced by realized inflation

The cases of exchange rate uncertainty in Table 4.2 (Chapter 4) were estimated and tested.[3] Only Cases 1 and 5 passed the diagnostic tests and converged with the model. Case 1 is based on Ball's (1999) model for open economies, where a static relationship is assumed between the real exchange rate and the real interest rate. This model implicitly rejects the hypothesis of an exchange rate as an asset price, since rational expectations do not form part of the determinants of the current exchange rate. In es-

sence, the model suggests that a rise in the interest rate makes domestic assets more attractive, leading to appreciation of the domestic currency.

Meanwhile, Case 5 assumes that the real exchange rate follows a random walk. Meese and Rogoff (1983) argued that a whole range of fundamentals-based nominal exchange rate models (flexible-price monetary models with and without current account effects, and a sticky-price monetary model) were unable to outperform a simple random walk in an out-of-sample forecasting exercise. That is, when changes in the real exchange rate are regressed on real interest rate differentials to forecast real exchange rates, forecasts from a random walk model have lower root-mean-square error.

Case 5 in this exercise adopts the specification of Kilian and Taylor (2003) and Wollmershauser (2003) in which the real exchange rate depends only on its own lagged value and a white noise disturbance error term. In addition, no other macroeconomic variables, such as the domestic interest rate, influence the exchange rate. Hence, in this case, the exchange rate is no longer a transmission mechanism, it is only a source of shock. In the estimation, the exchange rate is excluded from the RRP equation.

The BSP's objective function is used as the basis. A positive answer, measured by a lower value, connotes that the high degree of exchange rate uncertainty would not be a cause for concern for the central bank. The commitment to such an objective function is expected to insulate the economy from the negative consequences of both exchange rate shocks and uncertain transmission of interest rate impulses through the exchange rate channel. Meanwhile, a negative answer, measured by a higher value of the policy loss function, connotes a substantial risk of an increase in volatility of interest rates in the event of the alternative cases.

The isolated performance has two levels. The first level compares the BSP baseline objective function that includes the exchange rate gap with the case without the exchange rate gap. This is essential to determine whether the open policy reaction (that is, with the exchange rate) matters. The idea is to shed light on the long-run argument of Ball (1999) that it is more helpful to target a long-run inflation rate that excludes exchange rate effects. Though inflation volatility may increase in the short run, output variability will be greatly reduced onwards. This is referred to as Case 0 in Tables 6.3a and 6.3b.

Results show that when the exchange rate gap is excluded from the equation, the RRP increases as the coefficient of the lagged RRP increases along with that of the output gap and inflationary pressure. Case 0 leads to a rise in the BSP's policy rate by almost 0.12 percentage point over the baseline.

This consequently raised, albeit marginally, other market interest rates, such as the 91-day T-bill rate, the average lending rate and the savings deposit rate. The nominal peso-dollar rate and the expected peso-dollar rate both appreciated slightly from the baseline. Meanwhile, growth of the real money supply dropped by 0.2 percentage point from the baseline. This relatively subdued growth reflects the combined impact of a higher savings deposit rate and an appreciating peso-dollar rate.

Components of domestic demand felt the impact of higher interest rates. In particular, the impact was seen in the significant decline in growth in private investment (construction) as the real lending rate rose. Another is real personal consumption, the significant decline of which was attributed to the reduction in growth of the real money supply, while the real 91-day T-bill rate rose. There was modest increase in investments in durable equipment as the nominal peso-dollar rate appreciated over the baseline level.

Similarly, the average growth of total imports increased slightly, by 0.14 percentage point, while total export growth diminished by 0.11 percentage point from the baseline growth rates.

The impact on the output gap was minimal. In a similar manner, downward movements were noted in the GDP deflator, the wholesale price index and the price index of dollar imports of merchandise goods with the rise in real interest rates. In turn, inflation, the inflation forecast and long-run inflation expectations dropped.

The baseline policy loss function is estimated at 1.63, which increases to 1.78 when the alternative reaction function is used. Thus, in a flexible exchange rate regime, the open economy reaction rule is superior to one that reacts only to inflation and output gap.

The second level deals with the issue of whether it would make a difference if another exchange rate case were adopted when market expectations become uncertain. However, the inclusion of the exchange rate implies that a rather credible framework for the Philippines contains the exchange rate; but the reaction need not be too frequent or too significant (or too restrictive) so as to generate undue volatility in the market.

From 1994 to 2003, results in Tables 6.3a and 6.3b show that both cases are restrictive. RRP rose by 0.32 percentage point in Case 1 and nearly four percentage points in Case 5. The rise in RRP led to higher market interest rates. The increase in the real savings deposit rate from the baseline siphoned off liquidity from the system and contained its growth by 0.3 percentage point in Case 1 and 1.3 percentage points in Case 5.

Table 6.3a
Philippines: Alternative scenarios for the BSP's objective function, 1994-2006

Economic indicators	1994-2003 (Main indicators)							
	Baseline		Case 0		Case 1		Case 5	
	Levels	CV	Levels	CV	Levels	CV	Levels	CV
GDP and components (year-on-year growth)								
Domestic Demand								
Personal consumption	3.67	0.27	3.65	0.27	-	-	-	-
Private construction	7.51	1.74	7.48	1.04	7.50	4.70	2.62	-5.99
Government construction	10.51	1.75	10.54	1.75	10.53	0.10	4.06	1.89
Durable goods	3.06	1.90	3.11	1.88	3.10	-3.14	10.26	0.10
External Demand								
Total exports								
Year-on-year growth	6.28	2.43	6.17	2.47	6.25	2.10	2.69	1.04
Total imports								
Year-on-year growth	7.59	1.59	7.73	1.57	7.68	1.08	17.81	0.24
Financial indicators (%)								
Money supply (year-on-year growth)	17.32	0.95	17.56	0.97	17.01	5.99	16.04	6.16
RRP	8.02	0.30	8.14	0.31	8.34	2.12	13.24	2.78
91-day treasury bill rate	12.33	0.15	12.34	0.15	12.38	0.29	17.20	0.31
Lending rate	14.28	0.09	14.28	0.09	14.32	0.20	17.15	0.21
Savings deposit rate	7.56	0.08	7.56	0.08	7.58	0.19	9.08	0.20
Nominal peso-dollar rate (year-on-year growth)	3.90	1.95	3.72	2.03	3.61	-7.70	-2.98	-3.24
Expected nominal peso-dollar rate (year-on-year growth)	3.82	1.99	3.60	2.09	3.41	-6.37	-3.12	-3.00
Macroeconomic indicators (%)								
Real GDP growth	3.54	0.72	3.52	0.72	2.54	1.78	1.65	1.69
Output gap (in billion pesos)	-382	-10.5	-383	-10.4	-425	-3.07	-614	-2.99
CPI-inflation	5.57	0.41	5.54	0.41	5.55	0.58	3.54	0.60
CPI-inflation forecast (two years)	5.41	0.40	5.38	0.40	5.39	0.56	3.26	0.62
CPI-inflation expectations (long run)	6.08	0.33	6.06	0.33	6.07	0.50	2.35	0.53
BSP objective function (1994-2006)								
Pre IT period: 1994 Q1-2000 Q4	1.83	0.60	2.09	0.70	5.53	0.97	8.43	0.98
IT period: 2001 Q1-2003 Q1	1.63	1.05	1.68	1.16	5.10	0.84	8.44	0.96
Forecasted IT period: 2003 Q2 - Q4 2006	1.54	0.92	1.59	1.05	5.01	0.73	8.35	0.85

Baseline: Exchange rate follows the UIP-cum-risk premium specification.
Case 0: When exchange rate gap deleted from baseline.
Case 1: When real exchange rate behaviour follows the static relationship between real exchange rate and real interest rate.
Case 5: When is real exchange rate behaviour follows a random walk.

Meanwhile, the increase in the 91-day treasury bill rate led to a slight appreciation of the nominal peso-dollar rate and the expected nominal peso-dollar rate by 0.3 percentage point and 0.4 percentage point, respectively, from the baseline rate. In Case 5, the nominal and expected peso-dollar rate appreciated rather significantly over the baseline. In turn, inflation, the inflation forecast and inflation expectations dropped. This, however, led to a decline in real GDP growth and the output gap in Case 5.

Across the cases, it was evident that the policy by which the central bank reacts to exchange rate specifications other than the UIP fared little better in stabilising inflation, inflation expectations and real output from 1994 to 2003. A closer look at Tables 6.3a and 6.3b shows volatility of RRP (except in Case 1) and of the nominal and expected peso-dollar rate well above the volatility of inflation and real output. Particular attention is due for Case 5

Table 6.3b
Philippines: Deviations of alternative scenarios from baseline, 1994-2006

Economic indicators	1994-2003 (Main indicators)					
	Case 0		Case 1		Case 5	
	Levels	CV	Levels	CV	Levels	CV
GDP and components (year-on-year growth)						
Domestic Demand						
Personal consumption	-0.02	0.00	-	-	-	-
Private construction	-0.03	-0.70	-0.01	3.65	-4.89	-10.69
Government construction	0.02	0.00	0.01	-1.65	-6.45	1.79
Durable goods	0.04	-0.02	0.04	-5.02	7.20	3.24
Total GDCF as % of GDP	-0.02	1.72	0.03	-0.02	-12.36	3.52
External Demand						
Total exports						
Year-on-year growth	-0.11	0.04	-0.03	-0.37	-3.60	-1.06
Total imports						
Year-on-year growth	0.14	-0.02	0.08	-0.49	10.22	-0.85
Financial indicators (%)						
Money supply (year-on-year growth)	0.24	0.02	-0.31	5.02	-1.28	0.17
RRP	0.12	0.00	0.32	1.81	5.22	0.66
91-day Treasury bill rate	0.01	0.00	0.05	0.14	4.87	0.02
Lending rate	0.00	0.00	0.03	0.11	2.87	0.02
Savings deposit rate	-0.01	0.00	0.02	0.11	1.51	0.01
Peso-dollar rate (year-on-year growth)	-0.19	0.08	-0.29	-9.72	-6.88	4.46
Expected peso-dollar rate (year-on-year growth)	-0.22	0.10	-0.41	-8.46	-6.95	3.37
Macroeconomic indicators (%)						
Real GDP growth	-0.02	0.00	-1.00	1.05	-1.89	-0.08
Output gap (in billion pesos)	-1.12	0.15	-43.11	7.31	-232.26	0.09
Inflation	-0.03	0.00	-0.02	0.17	-2.03	0.01
Inflation forecast (two years)	-0.04	0.00	-0.02	0.16	-2.15	0.06
Inflation expectations (long run)	-0.02	0.00	-0.01	0.17	-3.73	0.03
BSP objective function (1994-2006)						
Pre IT period: 1994 Q1-2000 Q4	0.26	0.10	3.70	0.27	6.60	0.01
IT period: 2001 Q1-2003 Q1	0.05	0.11	3.46	-0.32	6.81	0.12
Forecasted IT period: 2003 Q2 - Q4 2006	0.05	0.13	3.47	-0.32	6.81	0.12

Baseline: Exchange rate follows the UIP-cum-risk premium specification.
Case 0: When exchange rate gap deleted from baseline.
Case 1: When real exchange rate behaviour follows the static relationship between real exchange rate and real interest rate.
Case 5: When is real exchange rate behaviour follows a random walk.

in which the behaviour of the nominal and expected peso-dollar rate led to a significant appreciation.

In turn, estimates of the policy loss function for the two cases are higher than that in the baseline. This suggests a substantial risk that volatility of RRP and market interest rates increases in the alternative cases.

The policy implications are clear. When another exchange rate case is used, the RRP becomes more volatile and the exchange rate appreciates strongly, leading to lower but more volatile inflation and inflation expectations. Under these conditions, it would be more difficult to build credibility.

At this point, it should be emphasized that the literature on this type of exercise continues to be limited. Broadly, these results are comparable with those of Wollmershauser (2003), whose findings indicated that the objec-

tive function estimated for industrialized countries largely depends on the concrete exchange rate specification (which is subject to uncertainty). This then suggests that the role of market-determined exchange rates for monetary policy has to be assessed from a different angle. In the Philippines, some results of this exercise point to a study by Bautista and Gochoco-Bautista (2005) which argued that in the Philippines, contractionary monetary policy does reduce exchange market pressure, which could potentially reduce inflationary pressure. However, the magnitude of such impact was not analysed.

6.5 Concluding thoughts

A critical finding of these simulations is the limitations of relying on the BSP's policy rate as the sole instrument of monetary policy, even in the presence of discretion and flexibility. This is because the magnitude of its effects were generally marginal, even for extreme policy measures. Of particular interest is the relatively moderate impact of policy actions on the whole spectrum of interest rates and therefore on the real economy.

This critical finding led to two counterfactual simulations in which the BSP's objective function was limited to the output gap only and where the inflation target was dropped. Results from the simulations reveal that both scenarios would fail to lead to credibility gains for the BSP. The implication is that it is still beneficial for the BSP to adopt IT and that exchange rate pressure should form part of its objective function to maintain a credible monetary policy framework.

Another significant finding is that the open economy objective is superior to one that reacts only to inflation and the output gap.

However, the impact on monetary policy becomes significant the moment the BSP loses control over uncertainty in the exchange rate. In this situation, the RRP increases significantly when the BSP adopts another case of exchange rate specification and falls back on an indirectly managed float.

It was also evident that the policy that reacts to exchange rate specification other than the UIP do not work much better in stabilizing inflation and real output. In fact, in all scenarios and cases, volatility of the policy interest rate and the peso-dollar rate were much higher than volatility of inflation and real GDP. This indicates that in these uncertain cases, IT is crucially inadequate to achieve the long-run objective of sustainable growth. It would be beneficial for the BSP then not to react when there is uncertainty regarding the exchange rate.

The role of the BSP thus becomes crucial. This chapter implies that some discretion and flexibility as well as transparency are inevitable. Any policy inconsistency should be immediately addressed. For instance, the Department of Finance, particularly the Bureau of Treasury, should adjust interest rates to reflect market conditions. This requires closer coordination between the Department of Finance and the BSP to attain a good gauge of inflationary expectations in order to calibrate its interest rate policy accordingly.

It is equally crucial to further scrutinize the extent and depth of Philippine foreign exchange and financial markets. It is sensible to have regular dialogue between the BSP and the Bankers Association of the Philippines to maintain transparency between these institutions, especially regarding risk concerning exchange rate uncertainty. In particular, the BSP should have a better handle on various instruments and products that banks create or offer on the financial market. These strategies could arguably help avoid any over-reaction from the BSP when uncertainty in the exchange rate market sets in.

From the foregoing considerations, a tentative conclusion can be formed that IT, after all, has as yet had little significant impact on monetary policy strategies. It may not be a panacea for crisis. Nonetheless, IT can provide a basis on which the BSP can build a record of low inflation conducive to sustained growth credentials over the longer term.

Notes

1. Mishkin and Sevastano (2001) argued that reacting to exchange rate movements 'too heavily and frequently' raises the risk of the exchange rate becoming the *de facto* anchor of monetary policy.

2. The survey included Australia, Canada, Colombia, Czech Republic, Iceland, Mexico, New Zealand, Norway, Poland, South Africa, Sweden and the United Kingdom.

3. There are, however, some adjustments in these two cases compared with baseline scenario. Following difficulty in convergence, both real personal consumption and domestic interest payments were exogenized. Nevertheless, individual diagnostic tests for both cases showed that the adjusted values for RRP, the real exchange rate and the nominal exchange rate are greater than 80% and values in these equations suggest there is no penalty for the number of explanatory variables used.

7 Concluding Thoughts: What Does It Take to Make IT Effective?

7.1 The central research questions: An *aide memoire*

The main premise of this research is that the central bank, even under an IT regime, cares about more than inflation alone, that exchange rates in emerging markets tend to be volatile and that the effects of that volatility can be serious and destabilizing.

In particular, the determination of exchange rate faces uncertainty, though central banks may have exchange rate targets. Given the long lags in monetary policy, this introduces a fundamental uncertainty, as one of the main monetary policy transmission mechanisms is poorly understood.

Along these lines, this study basically argues that instability in the behaviour of the exchange rate undermines the credibility of the central bank, and the monetary policy regime. Developing economies may believe that by adopting IT, they make themselves less vulnerable to speculative attacks and shocks to the exchange rate. However, the IT process could require volatile and distortionary adjustments which have negative and disruptive effects on growth and employment.

This research argues further that the credibility of IT hinges on a mechanism to contain exchange rate instability.

The Philippines adopted IT in 2002 with the aim of achieving its primary objective of price stability conducive to sustainable economic growth. However, the economic growth picture has been less impressive here than elsewhere in Southeast Asia. The empirical analysis maintains that Philippine economic growth has been characterized by episodes of boom and bust, stagnant labour and capital formation and macroeconomic instability following relatively high inflation and unstable exchange rates.

These latter features of the growth picture connote that monetary policy in the Philippines has been difficult and ineffective at times. It has also

undermined economic growth at various points. Historically, Philippine inflation has been high and variable relative to its Southeast Asian neighbours due to a convolution of shocks and disturbances in various areas of the economy, notably the external sector (which relates to the balance of payments), the real sector (which relates to output or production) and the monetary sector.

In addition, the effectiveness of monetary policy has been hampered by a history of fiscal dominance in some periods, by a small and weak banking system and by a loss of control of monetary variables with globalization.

Also, through the decades Philippine monetary policy in practice has not seemed to move away from attempts to control two objectives – inflation and exchange rate – with one instrument. In particular, the BSP's reaction to exchange rate changes remains unclear in that it falls on a middle ground between reacting to exchange rate changes as if they were always inflationary (or deflationary) and assuming that exchange rate movements reflect changed fundamentals. This approach clearly sets real and financial limits on private investment in particular and on long-term economic growth in general.

This research essentially cast doubt on whether IT can overcome these weaknesses.

A summary of results of our research will be presented in this chapter. Our three research questions in Chapter 1 will guide this chapter: (i) Are interest rates, the exchange rate and inflation expectations significant indicators of monetary transmission? (ii) Does the IT process increase the uncertainty of the exchange rate and other macroeconomic variables? (iii) Does exchange rate uncertainty undermine credibility?

7.2 What does the Philippine monetary policy transmission mechanism reveal?

Our Philippine macro model reflects the structure of the economy. It presents in detail the major links in the Philippine monetary policy transmission mechanism from the BSP's policy rate decisions to economic activity and inflation. The BSP policy rate has significantly affected inflation and economic growth through three variables: (i) the 91-day treasury bill rate, deposit and lending rates and their impact on consumption, investment spending, the peso-dollar exchange rate and money supply; (ii) exchange rates and their impact on international trade, durable investment, the wholesale price level, domestic interest payments and the expected ex-

change rate; and (iii) inflation expectations and their impact on consumption and investment.

However, two salient observations can be made on the monetary policy transmission mechanism. First, though the RRP and the 91-day treasury bill rate showed rather close tracking performance, the relationship was modest compared to other macro models, such as those of Brazil and Chile. This indicates that the elasticity of the interest rate to macroeconomic equilibrium is moderate. There is then a need to improve the efficiency of the transmission mechanism.

Second, the nominal peso-dollar exchange rate contains important in formation about the stance of monetary policy and is therefore an effective transmission mechanism. Both direct pass-through and indirect effects of the exchange rate on inflation are above average in the Philippines compared to some other emerging economies. Our analysis points to two reasons why the effects are relatively high. First, the country's historically high inflation heightens the link between the exchange rate and domestic prices. Another reason is the history of crises in the Philippines. The idea here is that episodes of high depreciation could raise the salience of the local price of foreign exchange for domestic prices and wages, which could heighten the sensitivity of domestic inflation to the exchange rate.

These two reasons justify the BSP's concern about excessive shocks to the peso-dollar exchange rate. The BSP intervenes, if only to reduce short-run fluctuations of the peso. However, such intervention may create uncertainty in the foreign exchange market, sending negative signals to agents in the exchange market that could eventually lead to exchange rate instability.

A rather interesting finding is the significant degree of risk premium in the nominal peso-dollar exchange rate behaviour. An increase in risk premium is oftentimes the cause of higher volatility in the behaviour of the exchange rate. In such situations, monetary policy transmission becomes uncertain.

Given the rather modest impact of the BSP's policy rate on market interest rates and the significance of the risk premium for changes in the nominal peso-dollar behaviour, a closer look at the effectiveness of IT is warranted in terms of bringing credibility gains to the BSP.

7.3 Inflation targeting and volatility of the exchange rate and other macroeconomic variables

To assess the impact of the IT process on volatility of the nominal peso-dollar rate and other macroeconomic indicators, our research used the BSP objective function as its basis. Simulation results point to three messages. First, in accordance with the literature, inflation, the inflation forecast and long-run inflation expectations have declined when exchange rate pressure has stabilized. The opposite is true when the monetary policy stance has become accommodative, since inflation rate started to pick up. In contrast, real GDP growth rose.

Second, perhaps the most interesting result of these simulations is that the magnitude of the effects was largely marginal. This was expected, as the BSP's RRP is determined by its past behaviour and its impact on the 91-day treasury bill rate is moderate. This implies that the BSP needs to raise its policy rate substantially in order to make an impact.

Third, results of volatility measures, as indicated by the coefficient of variation, are consistent with Taylor's view that inflation and output vari ability are negatively related. For instance, when the BSP strictly focuses on inflation, larger volatility in real GDP growth was noted. However, volatility of the nominal peso-dollar rate was relatively benign while that of interest rates was rather large. When the BSP focuses strictly on the exchange rate, volatility measures were larger for inflation, the inflation forecast, inflation expectations and the realized and expected nominal peso-dollar rate.

With these results in hand, it could be established that the BSP's attempts to raise its policy rate to achieve low inflation during the IT period resulted in greater volatility of other variables, especially the peso-dollar rate. This implies that a policy shift leading to very high interest rates would send extremely restrictive impulses to the real sector of the economy. This would exert higher volatility on inflation, the inflation forecast and long-run inflation expectations.

7.4 Exchange rate uncertainty and BSP credibility

Given the crucial role of the exchange rate, some cases were used to shed light on whether exchange rate uncertainty undermines the BSP's credibility. Results conveyed interesting insights. First, the open economy objective function, that is, with the nominal exchange rate, turned out to be superior to one that reacts only to inflation and output gap pressures. This suggests that some amount of discretion and flexibility could help. In addition, it

confirms the BSP's keenness for a more active stance in which the exchange rate is included. Hence, this could potentially be considered a rationale for the observed fear of floating practices in the Philippines.

Second, following a very restrictive stance, the BSP would experience a loss of credibility if it considered another exchange rate specification, particularly in the case where the real exchange rate reacts to contemporaneous movements in the real interest rate and a random behaviour of the real exchange rate without any determinant other than its own lagged value.

Third, evident across these cases is that a policy that reacts to a exchange rate specification other than the UIP cum risk premium does not work much better in stabilizing inflation and real output. This implies a substantial risk that volatility of market interest rates and exchange rate would increase in the event of this case being used. The risk is reflected in all cases in which volatility measures of market interest rates and the peso-dollar rate were significantly higher than inflation, the inflation forecast and real GDP growth. This is even more so in the case in which a random walk was assumed to have determined the nominal peso-dollar rate behaviour. In that case, the policy loss function to the BSP was significantly higher than the baseline level, indicating that a reaction without a fundamental reason would bring only credibility loss to the BSP.

Given the results of simulations and scenarios, it is rather clear that while gains in credibility are generally indicative of a more cautious monetary strategy, these are seen as transitory and do not necessarily mean that long-run monetary objectives will be achieved. This indicates that the effectiveness of IT is undermined when the exchange rate becomes uncertain.

7.5 Policy lessons for developing economies

In the theoretical literature, the trade-off between price stability and stability in the real economy starts when the central bank wants to minimise a loss function that includes variations in output and variation in inflation. The central bank must then choose a path ahead for the interest rate that minimizes the expected discounted "losses" in all future periods. In practice, no inflation targeting central bank makes direct use of a loss function of this type. They use some amount of judgment in setting the policy rate. They try to set the interest rate so as to provide a "reasonable balance" between the objective of stabilizing inflation around the target and the objective of stable development of the real economy.

The exchange rate should thus be seen as an important part of the transmission mechanism, rather than as the final goal. Due to exchange rate uncertainty the exchange rate is not only treated as an endogenous variable, but also as an important source of shocks, which on one hand are likely to provoke a more activist stabilisation policy and on the other hand implies an uncertain transmission of interest rate impulses through the exchange rate channel of monetary policy.

In short, central banks must demonstrate their willingness to commit to the single objective of promoting a low inflation environment conducive to sustainable growth. There is a general consensus that the monetary policy environment entails risks that could affect interest rates and exchange rates. It would be difficult for policymakers to know exactly what causes these shocks. But without coming to some type of assessment about what the underlying forces at work are, policymakers could not decide what, if any, policy response is appropriate to changes in these indicators.

An important lesson from this research is that adverse consequences may result if central banks do not take into account that economic agents are forward-looking when they make decisions about consumption and investment, wages and prices. Agents take into account not only today's economic policy, but also their expectations concerning future economic policy. It is thus important for central banks to refrain from sowing doubt about their objectives. They must act predictably and within a long-term framework. Consistency is required, between the stated objectives of economic policy and that which is actually done to achieve these objectives.

At some points, an objective loss function that includes the exchange rate may matter. But this holds an important message for developing economies.

As implied in Chapter 1, there is an array of literature that criticises current thinking about the choice of exchange rate regimes for being dominated by the paradigm of the impossible trinity. Perhaps the solution to the impossible trinity is not a halfway house between half-stability and half-independence. Instead, an integrated approach would be required where an adequate interest rate path and adequate exchange rate path are determined simultaneously.

It should be clear, however, that managing unnecessary movements of the exchange rate is not a panacea. The most serious flaw of this strategy is the asymmetric control of the exchange rate: a central bank's ability to avoid unwanted depreciation is limited by its stock of exchange reserves (and the availability of balance-of-payments credits). Thus, a central bank could al-

ways be confronted with a major crisis of confidence which forces it to accept a depreciation that by far exceeds its exchange rate target path.

If a country loses control of the exchange rate, it must rely on implementation of its monetary policy, in particular, on the setting of the nominal interest rate, and thus falls back on "dirty floating". Maintaining a given degree of monetary restriction would then require a very strong increase in the interest rate. This is obviously critical. While the exchange rate mainly affects the international sector of the economy (exporters and import substitution), the interest rate affects the whole economy. A policy shift leading to a strong real depreciation and a very high real interest rate implies an extremely restrictive impulse to the real sector – the services and the construction sectors, and the government which is often heavily indebted (in a foreign currency as well) – and the banking system because of its maturity transformation.

Thus, under such a strategy countries remain vulnerable to crises of confidence which can be generated simply by contagion effects.

An interesting area for future work in this respect is analysis of the level of the instruments that is adequate to take into account the simultaneous use of the interest rate and the exchange rate as operating target. One strand in the empirical literature focuses on the interest rate as the operating target of monetary policy and examines the impact of interest rate shocks on macroeconomic variables (like output, inflation and the exchange rate) or tries to learn to which variables monetary authorities react.

7.6 What could make IT effective?

It is clear from the previous sections that liberalization of economies and globalization of financial markets are here to stay. Given the usefulness of this model of the monetary policy transmission mechanism, its possible adoption would require a number of changes in monetary policy decision processes, not only for the Philippines, but for all countries adopting a similar scheme.

IT perhaps places greater demands on our understanding of the way the economy functions than earlier monetary policy regimes. Macroeconomic models are useful tools that can combine empirical and theoretical insights. However, like any other macroeconometric model, some caveats to the Philippine macro model are worthy of mention.

Obviously, macroeconometric models cannot provide definitive answers to all of the questions that monetary authorities, as decision-makers,

face on a daily basis. Nor can they reduce the uncertainty surrounding economic developments. It is perhaps necessary to analyse the economy from different angles. Monetary authorities must be pragmatic and exercise discretion in this sense.

From the BSP's viewpoint, it should send a clear signal that fiscal imbalances must be taken care of, structural reforms must be continued and financial sector reforms must be pushed ahead aggressively. While the BSP might now be perceived as successful in its IT, without these elements, and with the return of global inflation, the BSP may find that its apparent successes were a mirage.

The issue of fiscal performance and the BSP's impact on macroeconomic management over the medium term pose a special challenge. Apart from their implications for the conduct of monetary policy, current concerns about fiscal sustainability underscore the notion that credible commitment to price stability necessarily implies an equivalent pledge to fiscal discipline. This suggests that the BSP has an important role to play in ensuring fiscal viability over the medium term, and this role requires a further strengthening of its coordination efforts with fiscal authorities.

Moving forward, it will be crucial to scrutinize further the extent and depth of Philippine foreign exchange and financial markets. In particular, the BSP should gain a better handle on the various instruments and products that banks create or offer on the financial market. Examples are swap deposit transactions, which prior to the currency crisis were popular among the large commercial banks. A probe into the workings of the market for these transactions may bare underlying trends and peculiarities that could be used in monetary policy strategies to help determine how robust or thin this market is and to what extent it will impact on the economy.

It would also be meaningful to look in greater detail at the source of foreign exchange in the Philippines. Remittances provided by Filipinos living abroad have become the largest source of foreign exchange for the Philippines, larger than direct investment and other private capital flows. Such a strategy would involve an analysis of how remittances could actually influence exchange rate volatility.

Towards this end, further modification of financial indicators and vigilance in their monitoring is proposed in a number of areas. First, careful monitoring is warranted of the statement of conditions upheld by the deposit money banks, the so-called "DMBs" (commercial banks and rural banks accepting demand deposits). The Monetary Survey is a consolidation of the accounts of the monetary authorities and DMBs that shows the fi-

nancial relationship between the monetary institutions subsector – whose liabilities include the economy's money supply – and other sectors of the economy.

The asset side is composed of domestic and foreign components. The liabilities side is constituted of total liquidity or the sum of M3 and deposit substitutes and other liabilities (marginal deposits, bills payable). Regarding domestic assets, the BSP should carefully monitor the quality of loans extended by the monetary system to the private sector, not only to tradeable sectors but even more so to non-tradeable sectors, such as financial services and real estate, to determine whether the economy is overheating. Another schedule on the domestic asset side that needs regular scrutiny is the DMBs' investment account, to determine the quality of bank investments.

On the foreign asset side, the BSP should vigilantly monitor the schedule of banks' net foreign assets to include not only the levels but also the nature and maturities of foreign borrowing of commercial banks. Prior to currency crisis, this account has historically shown significant growth, indicating overborrowing on the international market.

A concern in this regard is currency mismatches that may ensue. Currency mismatches are supposed to be addressed in the derivatives market. This is the principal reason why such a market was introduced in the Philippines some years ago. As implied in this study, the derivatives market in the Philippines is still at an early stage of development. The lack of a mature derivatives exchange market in the country remains a major concern. Instruments in the derivatives market include options, swaps and exotics. As of December 1999, nine foreign international banks and three local banks had been licensed by the BSP to go into derivative trading under the new set of rules. However, careful monitoring of this market could mean much for the regulation of the financial system.

Finally, regular and more transparent dialogue between the BSP and the Bankers Association of the Philippines is sensible. At times banks run in conflict with the BSP, particularly when the exchange rate is under pressure, specifically on matters concerning benchmark overbought and oversold positions. It would therefore be productive to have a regular dialogue to thresh out bank and BSP concerns.

It was implied that in general banks are ultimately concerned about the volatility of the peso vis-à-vis the US dollar and the associated risks (or expectations). To a limited extent, they are concerned about inflation expectations. All stressed the role of expectations in underlying all of the channels through which monetary policy impacts on the economy. The

Philippines' experience with cycles of boom and bust as well as perennial crisis have all affected the country's quest for balanced and sustainable economic growth. In addition, banks stress that the competitiveness of the Philippine currency with other regional currencies affects their investment decisions. On balance, the private sector's expectations, once formed, materially define the BSP's ability to use its bag of monetary tools to meet its objectives.

From the foregoing discussion, it is apparent that the IT framework, after all, has yet to make a significant contribution to monetary policy strategies. It may not be a panacea to crisis. It is worthwhile to stress that the adoption of IT does not itself guarantee immediate improvement in credibility of the BSP. Rather, IT can provide a benchmark against which the BSP can build a record of low inflation maintenance conducive to sustained growth credentials over a period of time.

This brings us back to the entire empire of monetary policy and its management as an effective strategy for overall development. Certainly, more is involved than just reversing whatever negative impacts might have emerged through untimely and unfounded monetary strategy. Better domestic policies lie at the heart of monetary policy. This implies vigilance in continuously seeking alternative ways to explain the changing monetary policy process while making prudent regulations work better. These lessons seem to have been learned by Philippine monetary authorities and other East Asian economies since the currency crisis of mid-1997. Yet putting these lessons in practice requires enormous discipline, commitment and political will.

Monetary authorities will continue to struggle and respond flexibly but cautiously to uncertainties, but the strong commitment and support of private institutions (banks and non-banks) to monetary policy strategy are essential if monetary authorities are to find more definitive, workable and lasting solutions to the threats of globalized financial markets. Obviously, the world is both more complex and more interesting than this. Moreover, it is worthwhile to remember that within the broader field of monetary policy strategy, the flow of traffic is not one way.

A Appendix: Data Details

Our macro model comprises endogenous and exogenous variables. The endogenous variables are those determined within the model. These are found in behavioural equations and identities. Identities provide the empirical link between two or more endogenous variables without explicitly explaining the nature of the linkage. Exogenous variables are those strictly determined outside of the model.

Macroeconomic data, such as GNP and its components, as well as the corresponding price indices (including whole and consumer price indices) are obtained from the National Income Accounts of the National Statistical Coordination Board. Labour force and employment data are culled from the Quarterly Labour Force Surveys of the National Statistical Office.

All data pertaining to monetary, external and balance of payments sectors are obtained from the BSP. Fiscal indicators are gathered from the Bureau of Treasury for the revenue and expenditure data on a cash basis and the Department of Budget and Management for the expenditure data on an obligation basis. The quarterly National Cash Operations and domestic debt figures are acquired from the Ministry of Finance. Data on foreign indicators are collected from International Financial Statistics and the Bureau of Economic Analysis.

	VARIABLE NAME	DESCRIPTION	UNIT
List of Endogenous Variables			
1	BOPX	Overall balance of payments	US$ million
2	BOTX	Balance of trade in goods (=EXPOX-IMPOX)	US$ million
3	CA	Current account balance, BOP data	US$ million
4	CC	Currency in circulation, end-period	P million

5	CONS	Private construction (real)	P million
6	CONSPUB	Government construction (real)	P million
7	CPI94	Consumer price index, 1994 base year	Index
8	DEPLIAB	Deposit liabilities of the monetary system	P million
9	DISY	Disposable income ((GNP-(DTAXESDOF/(PGNP/100)))	P million
10	DOMIP	Total interest payments on domestic borrowing by national government	P million
11	DUREQ	Durable equipment (real)	P million
12	EXPFXR	Expected nominal peso to US$ rate	P/US$
13	EXPOX	Total merchandise exports, in US$ (real)	US$ million
14	EXPN	Total disbursements of the national government corresponding to payments of interest, salaries and other budgetary transactions	P million
15	FCF	Fixed capital formation (real)	P million
16	FINFL	Two-year ahead inflation forecast (one quarter ahead)	%
17	FXR	Peso to US$ exchange rate, average	P/US$
18	GDCF	Gross domestic capital formation (real)	P million
19	GDP	Gross domestic product (real)	P million
20	GDPD	Gross domestic product, demand-side (real)	P million
21	GDPS	Gross domestic product, supply-side (real)	P million
22	GDPSMA1_sa	Gross domestic product, supply-side (real), seasonally adjusted one-quarter moving average	P million
23	GDPSMA1_saHP	Gross domestic product, supply-side (real), seasonally adjusted one-quarter moving average, filtered using Hodrick_Prescott	P million
24	GNP	Gross national product (real)	P million
25	IMPOX	Total merchandise imports, in US$	US$ million
26	INDIV	Individual income tax collection. This tax is imposed upon the income of every individual citizen both residing within and outside the country, including overseas contract workers. Under Philippine law, the same income tax rates apply for individual aliens having resident status	P million
27	INFL	Inflation rate (1994=100)	%
28	IP	Total interest payments covering both foreign and domestic payments	P million

29	ISEMP	Total industry and services employment	Thousand
30	LF	Total labour force	Thousand
31	LR	Lending rate of commercial banks (average)	% per annum
32	MFUEL	Imports of mineral, fuel, lubricants (from NSO)	US$ million
33	MGDS$	Merchandise imports, special transactions (STM) excluded, in US$	US$ million
34	MGDSCB	Merchandise imports (=mgds$+cif)*fxr/pmgds*100)	US$ million
35	MS	Money supply (M3) (from Monetary Survey)	P million
36	NINCPROF	Taxes on net income and profits, which comprise the bulk of total tax collection	P million
37	NONOILM	Non-oil imports (total imports less imports of mineral, fuel, lubricants	US$ million
38	PCE	Personal consumption expenditure (real)	P million
39	PGDP	Price index for GDP	Index
40	PGNP	Price index for GNP	Index
41	PFXR	Real peso to US$ exchange rate, average	P/US$
42	PMGDS	Peso price index for imports of merchandise goods	Index
43	PMGDS$	Dollar price index for imports of merchandise goods	Index
44	POTGAPL1	Output gap, measured as the difference between the log of a one-quarter moving average of quarterly GDP (seasonally adjusted) and a trend GDP series	P million
45	PVIR	Price index for industry gross value added	Index
46	PVIS	Price index for industry and services gross value added	Index
47	PVSR	Price index for services gross value added	Index
48	QSE1P	Compensation for non-agriculture workers (re-based to 1985)	Index
49	REVN	Total revenue collection of the national government consisting of tax and non-tax collections	P million
50	RRP	Overnight reverse repurchase rate by the BSP	% per annum
51	SDR	Average savings deposit rate of commercial banks	% per annum

52	TAXREVN	Total tax revenues include collections from BIR, BOC and other offices	P million
53	TBR91	91-day treasury bill rate	% per annum
54	TOTM	Total imports (real)	P million
55	TOTX	Total exports (real)	P million
56	UR	Unemployment rate	%
57	VIR	Industry gross value added	P million
58	VIS	Industry and services gross value added	P million
59	VSR	Services gross value added	P million
60	WPI94	Wholesale price index (re-based to 1994)	Index
61	XGDSCB	Exports of goods (BSP)	US$ million
62	XGDS$	Merchandise exports, special transactions (STX) excluded, in US$	US$ million
63	XINFL	Expected CPI inflation (1994=100)	%
64	XMFG	Exports of manufactured goods	US$ million
65	XNMFG	Exports of non-manufactured goods	US$ million

List of Exogenous Variables (and Dummies)

1	AGRIEMP	Total agriculture employment	Thousand
2	CAINCOME	Net income in current account and current transfers, BOP data	US$ million
3	CHSTK	Changes in stock	P million
4	CORP	Corporate income tax collections	P million
5	CPIUS	CPI of United States, re-based to 1994	Index
6	DEFG	Budget deficit of the national government resulting from the difference between expenditures and revenue collections	P million
7	DOMDEBT	Outstanding domestic debt	P million
8	DUM98_UP	Dummy for 1996 Q1 -1998 Q4	
9	DUMASIAN	Dummy for the Asian crisis	
10	DUMCRISIS	General dummy for all the crises in the Philippines	
11	DUMMILBUG	Dummy for the fourth quarter 1999 millennium bug	
12	EXCISEDOF	Excise tax collections	P million
13	FDI	Net foreign direct investment (BOP concept)	US$ million
14	IDTAXESDOF	Indirect tax revenues	P million
15	IMPDUTY	Import duties/collections from Bureau of Customs	US$ million
16	INDIVTXRT	Individual income tax rate	%

17	INFTAR	CPI inflation target by the BSP (1994=100)	%
18	KFA	Capital and financial account (BOP concept)	US$ million
19	LIBOR90	London Interbank Offered Rate - 90 days	%
20	M$ADJ	Adjustments to imports of goods and services	P million
21	MINW	Daily non-agriculture minimum legal wage rate in Metro Manila	Pesos
22	MSVNIA	Imports of services (real)	P million
23	NFIAR	Net factor income from abroad (real, NSCB)	P million
24	NONIPEXP	Non-interest expense (IP) expenditures	P million
25	NONTAX	Total non-tax revenues	P million
26	OEXPN	Other disbursement accounts; derived as the sum of net lending to corporations and disbursements for land acquisition and credit under CARP	P million
27	OILPR	World crude oil price, Dubai	US$/bbl
28	ONINCPROF	Other non-interest expense expenditure, including tax collections from bank deposits, treasury bills and commercial paper and capital gains	P million
29	ORCHBR	Orchard and breeding stock investment (real)	P million
30	OTHERBOP	Other BOP items (monetization of gold, revaluation adjustments and net unclassified items)	US$ million
31	OTHDTAXES	Other taxes, include stock, travel, motor vehicles fees, immigration, etc.	P million
32	PNFIA	Price index for net factor income from abroad converted into real peso dollar rate	Index
33	PNFIA$	Price index for net factor income from abroad	Index
34	PVAR	Price index for agriculture gross value added	Index
35	PXGDS	Implicit price index for exports of merchandise goods	Index
36	PXM	Implicit price index of top-five exports (NSCB)	Index
37	PXNM	Implicit price index for non-manufactured exports (NSCB)	Index
38	S1	Seasonal dummy for Q1	
39	S2	Seasonal dummy for Q2	

40	S3	Seasonal dummy for Q3	
41	S4	Seasonal dummy for Q4	
42	SALESTAX	Collection of sales taxes. Sales taxes are imposed on any person who, in the course of trade or business, sells, barters or exchanges goods, renders services, or engages in similar transactions, as well as those who import goods	P million
43	SERV	Net services, BOP	US$ million
44	TAXCORPRT	Exponent of the given log of corporate tax rate	
45	USDEF	US GDP deflator, 2000=100, www.bea.gov	Index
46	USGDP	US nominal GDP in billion, www.bea.gov	US$ billion
47	VAR	Agriculture gross value added	P million
48	VOPI	Volume of production index of key manufacturing enterprises	Index
49	WORKAGE	Working age population	Thousand
50	X$ADJ	Adjustments in exports	US$ million
51	XSVNIA	Exports of services (real), including monetization of gold	P million

B Appendix: Model Equations, Specifications

The final specification of the equations in the model depended on the availability of reliable quarterly data over a period of 16 years (1988 to 2003) to allow the conduct of time series and regression analysis. The econometric model comprises equations. These equations are arranged in blocks or major sectors of the Philippine economy, namely, the monetary and external sectors, the fiscal sector and the real sector. There are 65 equations in the model, 27 of which are simultaneous equations while the remaining 38 are recursive. Of the 27 simultaneous equations, 15 are estimated by two-stage least squares and the remaining by OLS. Meanwhile, the recursive equations are largely identities. There are recursive equations which are estimated by OLS.

Nevertheless, the model is transformed with log-linear functional forms, lagged dependent variables and specific lag structures. Dummy variables are also specified in some equations. Attempts to correct for varying degrees of serial correlation are made. There are only two equations with autoregressive disturbances. Each autoregressive term (AR) corresponds to the use of a lagged value of the residual in the forecasting equation for the unconditional residual. Meanwhile, the *Cs* and the corresponding numbers correspond to the coefficients of regressions in the model.

A. Monetary and external sectors

This model postulates that nominal rigidities result in a short-run output inflation trade-off that the central bank addresses by stabilizing both inflation and output.

** Money market rate **

The BSP is assumed to be a flexible inflation targeter and smoothing of the interest rate is assumed based on a small set of indicators. A simple policy guideline for its operating target of overnight reverse repurchase rate (*RRP*) is prescribed which adjusts to the output gap, expected exchange rate gap (the difference between the expected exchange rate and realized exchange rate) and inflationary pressure measured by the difference between the inflation forecast and inflation target.

$$RRP = C(1) + C(2)*POTGAPL1(-3)*100 + C(3)*(EXPFXR-FXR) + C(4)*(FINFL-INFTAR) + C(5)*RRP(-2) + C(6)*DUMASIAN \quad \text{(B.1)}$$

***Market interest rates ***

The RRP is transmitted to market interest rates through the natural arbitrage condition. The 91-day T-bill rate (*TBR91*) is considered the benchmark rate for all the market rates, particularly the savings (*SDR*) and lending (*LR*) rates.

$$TBR91 = C(1) + C(2)*RRP + C(3)*XINFL + C(4)*LIBOR90 + C(5)*TBR91(-1) \quad \text{(B.2)}$$

$$SDR = C(1) + C(2)*TBR91(-1) + C(3)*SDR(-2) \quad \text{(B.3)}$$

$$LR = C(1) + C(2)*TBR91(-1) + C(3)*LR(-2) \quad \text{(B.4)}$$

** Balance of payments **

To a large extent, the external sector captures the flow of goods and services, capital and transfers in and out of the Philippines. There are however some regulations on capital movements. Full repatriation of capital is permitted for all investments properly registered with the BSP or with a bank while full and immediate remittance is possible for all profits and dividends (including royalties and fees) earned in a foreign currency from Philippine investments. However, the BSP regulates foreign-currency loans to ensure control of interest and principal payments with due regard to the country's debt-servicing capacity.

$$EXPOX = XGDS\$ + X\$ADJ \quad \text{(B.5)}$$

$$IMPOX = MGDS\$ + M\$ADJ \quad \text{(B.6)}$$

$$BOTX = EXPOX - IMPOX \quad \text{(B.7)}$$

$$CA = BOTX + SERV + CAINCOME \quad \text{(B.8)}$$

The capital and financial account, as well as other components of the balance of payments are exogenous. Nevertheless, the capital and financial account (*KFA*) are disaggregated to reflect foreign direct investment, portfolio investment and other capital flows.

$$BOPX = CA + KFA + OTHERBOP \quad \text{(B.9)}$$

** Foreign exchange rate **

The estimation follows the convention in which an increase in the nominal peso-dollar rate (*FXR*) and the real peso-dollar rate (*PFXR*) corresponds to a depreciation rather an appreciation of the peso. The BSP maintains a freely floating peso, whose value is determined, to a great extent, by supply and demand factors. The general dummy *DUMCRISIS* takes into account the impact of all crises in the Philippines from 1988 to 2003.

$$LOG(FXR) = C(1) + C(2)*CA(-1)/(GDP(-1)/FXR(-1)) + C(3)*LOG(LIBOR90(-1)-TBR91(-1)) + C(4)*LOG(FXR(-1)) + C(5)*DUMCRISIS \quad \text{(B.10)}$$

The real exchange rate is the ratio of foreign to domestic prices, measured in the same currency. It measures a country's competitiveness in international trade. In this model, the real peso-dollar rate (*PFXR*) is the ratio of the price level of the United States (which is the Philippines' major trading partner) and the Philippine consumer price level, measured as the nominal peso-dollar rate.

$$PFXR = FXR *(CPIUS/CPI94) \quad \text{(B.11)}$$

** Expected foreign exchange rate**

Expectations on nominal peso-dollar rate (*EXPFXR*) typically require more detailed data on the foreign exchange market. In the absence of microstructure data on the foreign exchange rate market, this model assumes that the best single predictor of the exchange rate in the next period is the exchange rate in this period (West 2003). This assumption takes up findings from a vast literature studying exchange rate prediction. This indicates that modelling *EXPFXR* starts with estimating the nominal peso-dollar rate ((B.10) above) and then incorporating this as forward-looking exchange rate by moving variables one quarter ahead.

$$EXPFXR = FXR_{t-1} \quad \text{(B.12)}$$

** Money supply process **

The money supply process follows the estimation of deposit liabilities of the monetary system, such as demand, savings and time deposits as well as deposit substitutes, and currency in circulation.

* Deposit liabilities *

LOG(DEPLIAB/(PGDP/100)) =
*C(1) + C(2)*LOG(GDP(-4)) + C(3)*(SDR/100-XINFL/100) + C(4)*LOG(DEPLIAB(-2))* (B.13)

* Currency in circulation *

*LOG(CC/(PGDP/100)) = C(1) + C(2)*LOG(GDP(-3)) + C(3)*(TBR91(-1)-XINFL(-1)) +*
*C(4)*LOG(CC(-1)) + C(5)*DUMMILBUG+ [AR(2)=C(6)]* (B.14)

** Money supply (total liquidity) **

Given the real deposit liabilities and real currency in circulation, total domestic liquidity is determined through the identity

MS = DEPLIAB + CC (B.15)

B. Fiscal sector

The Philippine fiscal surplus (primary concept) is defined as total taxes revenue minus government expenditures. Tax revenues are divided into direct and indirect taxes. Government expenditures are divided into government investment and government consumption.

This model assumes the Ministry of Finance's approach in determining the government budget position. In this model, the government deficit target is set, revenues are estimated and then the expenditures are taken as the residual.

In practice, changes in revenues and expenditures affect the government budget position and consequently financing. Indeed, the monetary authorities recognize three modes of financing, namely, foreign borrowing,[1] domestic borrowing[2] and the change in financial cash balances with the BSP.[3] In the absence of more a detailed BSP balance sheet, this model does not distinguish these modes of financing. This could be an area for improvement.

On the revenue side, direct taxes on individual income (*INDIV*) is modelled separately. These tax revenues are added to other tax revenues (which are exogenous in this model) such as corporate tax, excise tax, sales tax, tax collected by the Bureau of Customs and other taxes.

** Revenues **

*LOG(INDIV) = C(1) + C(2)*LOG((PVIS/100)*VIS) + C(3)*LOG(INDIVTXRT) + C(4)*LOG(CPI94) + C(5)*LOG(FXR) + C(6)*S4* (B.16)

NINCPROF = INDIV + CORP + ONINCPROF (B.17)

TAXREVN = NINCPROF+OTAXREVN (B.18)

REVN = TAXREVN + NONTAX (B.19)

** Expenditures **

Apart from expenditure on personal services and maintenance, interest payments comprise the bulk of government expenditure. In addition, interest payments are arguably more prone to exchange rate changes. Domestic interest payments (*DOMIP*) are modelled explicitly. Meanwhile, foreign interest payments (*FORIP*) are exogenous in the model due to limited information on the more detailed balance of payments schedule.

*LOG(DOMIP) = C(1) + C(2)*LOG(TBR91*DOMDEBT) + C(3)*LOG(FXR) +C(4)*LOG(DOMIP(-1))+[AR(1)=C(5)]* (B.20)

IP = DOMIP + FORIP (B.21)

EXPN= IP + OEXPN (B.22)

Given the estimated revenues (*REVN*), expenditures on interest payments (*EXPN*) and government deficit (*DEFG*), government investment (*CONSPUB*) is derived as a residual.

CONSPUB = REVN-IP-DEFG (B.23)

C. Real sector block equations

In the real sector, the demand (expenditures) side and supply (production) side interact to determine aggregate output and the aggregate price level. An important assumption of aggregate output is that it is backward-looking while aggregate prices are sticky.

C.1 Demand side GDP

The interaction within the aggregate output is largely demand-determined. Different expenditure components, namely consumption and investment by both private sector and the government as well as merchandise exports (manufacturing and non-manufacturing) and imports (fuel and non-fuel

imports) are estimated separately. These are then summed to come up with aggregate demand.

** Personal consumption (PCE)**

DISY = GNP - (NINCPROF/ (PGNP / 100)) (B.24)

*LOG(PCE) = C(1) + C(2)*LOG(DISY) + C(3)*(TBR91(-1)/100-XINFL(-1)/100) + C(4)*LOG(MS/(PGDP/100)) + C(5)*S2 + C(6)*S3 + C(7)*S4 + C(8)*LOG(PCE(-2))* (B.25)

It is instructive to note that government consumption is exogenous in the model.

** Total investment (GDCF)**

Total investment (*GDCF)* comprises formation of fixed capital (*FCF*) and inventory changes (*CHSTK*). Investment in construction (*FCF*) are broken down into private (*CONS*) and public (*CONSPUB*) and machinery and durable equipment (*DUREQ*) and are modelled separately. An exogenous component refers to breeding stocks from livestock and poultry output (*ORCHBR*).

*** Private construction (CONS)***

*LOG(CONS) = C(1) + C(2)*LOG(@MOVAV(GDP,2)) + C(3)*(LR(-1)/100)-(XINFL(-1)/100) + C(4)*LOG(CONS(-2)) + C(5)*DUM98_UP* (B.26)

*** Durable equipment (DUREQ)***

*LOG(DUREQ) = C(1) + C(2)*LOG(GDP(-1)) + C(3)*LOG(FXR(-1)) + C(4)*LOG(DUREQ(-2))* (B.27)

** Fixed capital formation (FCF)**

FCF = CONS + CONSPUB + DUREQ + ORCHBR (B.28)

Gross domestic capital formation (GDCF)

GDCF = FCF + CHSTK (B.29)

** Merchandise exports **

Manufactured (*XMFG*) and non-manufactured (*XNMFG*) export groups comprise total Philippine merchandise exports.

*** Manufacturing exports ***

*LOG(XMFG/(USDEF/100)) = C(1) + C(2)*LOG(PFXR(-1)) +*
*C(3)*LOG(USGDP/(USDEF/100)) + C(4)*DLOG(VOPI(-2))*
*C(5)*DUMCRISIS* (B.30)

***Non-manufacturing exports ***

*LOG(XNMFG/(USDEF/100)) = C(1) + C(2)*LOG(PFXR(-1)) +*
*C(3)*LOG(USGDP/(USDEF/100)) + C(4)*LOG(XNMFG(-2)/(USDEF(-2)/100)) +*
*C(5)*DUMCRISIS* (B.31)

XGDS$ = XMFG + XNMFG (B.32)

*XGDSCB = XGDS$ * FXR / PXGDS * 100* (B.33)

The real exports of goods are then converted into pesos and fed into exports of goods and services. The peso real exports of goods, along with exports of services and monetization of gold, comprise the total exports of goods and services (*TOTX*).

TOTX = XGDSCB + XSVNLA (B.34)

** Imports **

Fuel (*MFUEL*) and non-oil imports (*NONOILM*) comprise Philippine total merchandise imports.

*** Fuel imports (MFUEL)***

*LOG(MFUEL/PGDP/100) = C(1) + C(2)*LOG(FXR(-1)) + C(3)*LOG(PMGDS$(-2)/PGDP(-2))*
*+ C(4)*DLOG(@MOVAV(GDP,4)) + C(5)*LOG(MFUEL(-1)/PGDP(-)/100)* (B.35)

*** Non-fuel imports (*NONOILM*)***

*LOG((NONOILM)/(PGDP/100)) = C(1) + C(2)*LOG(FXR) + C(3)*LOG(GDP(-1)) + C(4)*S2 +*
*C(5)*S3 +*
*C(6)*LOG(NONOILM(-2))* (B.36)

MGDS$ = MFUEL + NONOILM (B.37)

The real merchandise imports are then converted into pesos and fed into exports of goods and services.

*MGDSCB = MGDS$ * (FXR / PMGDS) * 100* (B.38)

The peso real merchandise imports, along with imports of services comprise total imports (*TOTM*).

TOTM = MGDSCB + MSVNLA (B.39)

** AGGREGATE DEMAND IDENTITY (GDPD)**

GDPD = PCE + CG + GDCF + TOTX - TOTM (B.40)

C.2 Supply side GDP

The production side is divided into the agriculture, industry and services sectors. Agricultural supply (*VAR*) and prices (*PVAR*) are exogenous in the model. On the other hand, the industry and services sectors are assumed to have excess capacity. Hence, supply responds to the level of aggregate demand. Prices, on the other hand are based on mark-up over producers' cost, which in this model is represented by the wholesale price index (*WPI94*).

** Sectoral quantities **

*** Industry***

*LOG(VIR) = C(1) + C(2)*LOG(@MOVAV(PCE+CG+GDCF+TOTX,1)) + C(3)*LOG(PVIR(-1)/PGDP(-1)) + C(4)*LOG(VIR(-3))* (B.41)

*** Services***

*LOG(VSR) = C(1) + C(2)*LOG(@MOVAV(GDP,3)) + C(3)*LOG(PVSR(-2)/PGDP(-2)) + C(4)*LOG(VSR(-1)) + C(5)*DUMCRISIS]* (B.42)

** Non-agricultural output identity (VIS) ***

VIS = VIR + VSR (B.43)

*** SUPPLY SIDE OF GDP***

GDPS = VAR + VIS (B.44)

** Sectoral prices **

*** Industry***

*LOG(PVIR) = C(1) + C(2)*LOG(@MOVAV(VIR,3)) + C(3)*LOG(WPI94) + C(4)*LOG(PVIR(-1))* (B.45)

*** Services***

*LOG(PVSR) = C(1) + C(2)*LOG(VSR) + C(3)*LOG(WPI94) + C(4)*LOG(@MOVAV(TAXCORPRT(-1) + C(5)*LOG(PVSR(-1))* (B.46)

*** Non-agricultural prices***

*PVIS = ((VIR / VIS) * PVIR) + ((VSR / VIS) * PVSR)* (B.47)

C.3 Potential output and output gap

Potential output or trend GDP (*GDPSMA_saHP*) is derived by fitting a trend on gross value-added of the industry and services sectors using the Hodrick-Prescott (HP) filter.

LOG(GDPSMA_saHP) = LOG(GDPSMA_sa) HP (B.48)

LOG(GDPSMA1_sa) = LOG(@MOVAV,VIS) (B.49)

Output gap (*POTGAPL1*) is measured as the difference between the log of one-quarter moving average of quarterly GDP (seasonally adjusted) and a trend GDP series.

POTGAPL1= LOG(GDPSMA1_sa) - LOG(GDPSMA_saHP) (B.50)

The system of equations simultaneously solves for total production (aggregate supply) and expenditures (aggregate demand), hence, the overall equilibrium.

GDP = GDPD = GDPS (B.51)

GDP, when net factor income from abroad is added, constitutes the gross national product (*GNP*).

GNP = GDP + NFIAR (B.52)

C.5 Employment, labour and wages

GDP feeds into sectoral demand for employment, which in turn interacts with the labour force to determine the rate of unemployment. Labour force (*LF*) is estimated simply as a function of the working age population (ages 15 years and older), the non-agricultural compensation index (*QSE1P*) and a degree of inertia.

Sectoral demand employment (*ISEMP*) is estimated for the industry and services sectors combined. The unemployment rate (*UR*) is then determined as the difference of labour force and employment in agriculture (*AGRIEMP*) and *ISEMP*. *AGRIEMP* in this equation is exogenous.

The unemployment rate then influences wages, proxied by *QSEIP* through a Phillips curve relationship. Consumer price index (*CPI94*) affects *QSE1P* due to indexation.

$$LOG(ISEMP) = C(1) + C(2)*LOG(VIS(-1)) + C(3)*LOG(ISEMP(-2)) \quad \text{(B.53)}$$

$$LOG(LF) = C(1) + C(2)*LOG(WORKAGE) + C(3)*LOG(QSE1P(-1)/PGDP(-1)) + C(4)*LOG(LF(-2)) \quad \text{(B.54)}$$

$$LOG(QSE1P) = C(1) + C(2)*LOG(UR(-1)) + C(3)*LOG(CPI94(-1)) \quad \text{(B.55)}$$

$$UR = ((LF - AGRIEMP - ISEMP) / LF) * 100 \quad \text{(B.56)}$$

C.6 Price variables and deflators

The wholesale price index (*WPI94*), a proxy for producer's price, and dollar price index of merchandise imports (*PMGDS$*) are modelled separately. The industry and services sectors are dependent on *WPI94* while *PMGDS$* is largely determined by movements of oil prices.

$$LOG(WPI94) = C(1) + C(2)*LOG(PMGDS) + C(3)*LOG(QSE1P) + C(4)*POTGAPL1(-4) + C(5)*(MS*S4)/(GDP) + C(6)*LOG(WPI94(-1)) + C(7)*DUMCRISIS \quad \text{(B.57)}$$

$$LOG(PMGDS$) = C(1) + C(2)*LOG(OILPR) + C(3)*LOG(PMGDS$(-2)) + C(4)*DUM98\_UP + C(5)*LOG(OILPR)*DUM98\_UP \quad \text{(B.58)}$$

$$PMGDS = PMGDS$ * PFXR \quad \text{(B.59)}$$

The overall deflator (or GDP deflator) is determined by relative weights of agriculture, industry and the services sector prices to total output. This then enters the CPI.

$$PGDP = ((VAR/ GDP) * PVAR) + ((VIS /GDP) * PVIS) \quad \text{(B.60)}$$

The GNP deflator is determined by relative weights of GDP to GNP and net factor income from abroad.

$$PGNP = ((GDP / GNP) * PGDP) + ((NFIAR / GNP) * PNFIA) \quad \text{(B.61)}$$

C.8 CPI and inflation expectations

The consumer price index (*CPI94*) is based on the overall output price deflator (*PGDP*) and its lagged behaviour. The rate of inflation is derived from the consumer price index (*PGDP*).

$$LOG(CPI94) = C(1) + C(2)*LOG(PGDP) + C(3)*LOG(CPI94(-2)) \quad \text{(B.62)}$$

$$INFL = ((CPI94 / CPI94(-4)) - 1) * 100 \quad \text{(B.63)}$$

** Inflation forecast **

Inflation forecast (two years ahead) is assumed to depend on one-quarter ahead realized inflation.

$$FINFL = INFL_{t+1} \quad \text{(B.64)}$$

** Long-run inflation expectations (long run and model consistent) **

Meanwhile, long-run inflation expectations (*XINFL*) are assumed to follow a hybrid structure (containing both forward-looking and backward-looking expectations). The structure includes a rational component of inflation, indicated by the medium-term (three- to five-year) inflation target announced by government (*INFTAR*) and an inertial component indicated by the past inflation rate. The idea is that in the absence of concrete information on inflation expectations, the only information that agents have is the quantitative inflation target announced by the government (Demertzis and Viegi 2005). Meanwhile, the inertial component assumes that agents develop expectations based on past actual inflation rates.

$$XINFL = C(1) + C(2)*INFL + C(3)*INFTAR + C(4)*INFL(-1) \quad \text{(B.65)}$$

Notes

1. Meanwhile, gross foreign borrowing depends on requirements of the government less principal payments. This borrowing will then feed into the level of foreign debt.

2. Gross domestic borrowing feeds into the amount of treasury bills to be floated in the market. This then feeds into the level of domestic debt.

3. In practice, the change in financial cash balances with the BSP is the residual. This accounts for the difference between the fiscal budget position and domestic and foreign borrowing. It then feeds into the level of reserve money.

C Appendix: Model Equations, Estimation Results

The model contains 65 estimated equations, with 27 simultaneous equations and 38 recursive equations.

Basic diagnostic test results using a range of 5% to 10% level of significance are adopted and examined before a particular behavioural equation is chosen. Each of the 27 equations is assessed as to whether explanatory variables conform to theoretical predictions, their statistical significance, as well as the overall explanatory power of the equation. The basic diagnostic tests such as the adjusted R^2, the Durbin-Watson as well as calculated F- values are examined. Exact collinearity is similarly checked. There are few cases though where exact collinearity is encountered, especially when dummy variables are used. However, a re-speciation of some of these equations is done.

Results of higher order diagnostic tests (of residuals) are also examined. Higher order diagnostic tests start with the Jarque-Bera test. The Jarque-Bera is a test statistic for testing whether the series is normally distributed. The test statistic measures the difference of the skewness and kurtosis of the series with those from the normal distribution. Under the null hypothesis of a normal distribution, the Jarque-Bera statistic is distributed as x^2 with two degrees of freedom. The reported probability is the probability that a Jarque-Bera statistic exceeds (in absolute value) the observed value under the null hypothesis. This means that a small probability value leads to the rejection of the null hypothesis of a normal distribution.

White's heteroskedasticity test in the residuals is also used. White's test is a test of the null hypothesis of no heteroskedasticity. The test statistic is computed by an auxiliary regression, where the squared residuals are regressed on all possible (nonredundant) cross products of the regressors. The F-statistic is used as the test statistic from the regression. F-statistic is an omitted variable test for the joint significance of all cross products, excluding the constant. There are equations where evidence of

heteroskedasticity are found initially. In such a scenario, standard error and covariance are corrected to make them robust and homoskedastic.

Breusch-Godfrey is used to check for higher order serial correlation, and the Breusch-Godfrey Lagrange multiplier test is carried out for general, high-order, autoregressive-moving average (ARMA) errors. The null hypothesis of the test is that there is no serial correlation in the residuals up to the specified order. In this test, the F-statistic is used. There are equations which initially exhibit serial correlation but additional lags are incorporated to make the residuals stationary.

Finally, the regression specification error test (RESET) is used to check for specification errors in the equations. RESET is a general test for the specification errors emanating from (i) omitted variables or where the model does not include all relevant variables, (ii) incorrect functional form for some or all of the variables in and should be transformed to logs, powers, reciprocals or in some other way, and (iii) correlation between and, which may be caused, among other things, by measurement error in, simultaneity or the presence of lagged values and serially correlated disturbances. The null hypothesis then is that there is no specification error in regression equations. An F-statistic is used as benchmark. Initially there are equations which failed this test. In such cases, the number of fitted items was increased until the equation exhibited the correct specification.

The regression coefficients of behavioural equations are presented in this appendix with *t statistics* in parenthesis immediately below these coefficients in. For higher diagnostic tests, indications of whether they are significant at 5% and 10% level are presented.

A. Monetary and external sectors

** BSP policy rate **

Dependent variable: RRP
Method: Two-Stage Least Squares
Sample (adjusted): 1994Q1 2003Q3
Included observations: 39 after adjustments
Convergence achieved after 8 iterations
Instrument list: C (POTGAPL1(-3) *100) (EXPFXR-FXR) FINFL -INFTAR RRP(-2) DUMASIAN (POTGAPL1(-2) *100) (EXPFXR(-2)-FXR(-2)) FINFL(-2)-INFTAR(-2) RRP(-2) (POTGAPL1(-4) *100) (EXPFXR(-4)-FXR(-4)) FINFL(-4)-INFTAR(-4) RRP(-4)
Lagged dependent variable & regressors added to instrument list

*RRP = 1.851 + 0.349*POTGAPL1(-3)*100 + 0.287*(EXPFXR-FXR) +*
(1.825) (2.199) (2.086)
0.387(FINFL-INFTAR) + 0.716*RRP(-2) -*
(2.247) (9.951)
*1.435*DUMASIAN*
(-2.343) (C.1)

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.75	
DW	2.01	
Prob (F-statistic)	0.00	
Jarque-Bera	2.602 (*0.272*)	*/
White (with cross terms, *Obs* R^2)	24.799 (*0.167*)	*/
Breusch-Godfrey (2 lags, Obs R^2)	3.653 (*0.161*)	*/
Ramsey *RESET* (2 fitted items, F-stat)	0 .780 *(0.468)*	*/

*** Benchmark interest rate***

Dependent Variable: TBR91
Method: Two-Stage Least Squares
Sample (adjusted): 1988Q4 2003Q1
Included observations: 58 after adjustments
Convergence achieved after 16 iterations
Instrument list: C RRP XINFL LIBOR90 LOG(MS) RRP(-3) XINFL(-3) LIBOR90(-3) LOG(MS(-3))
Lagged dependent variable & regressors added to instrument list

*TBR91 = 4.577 + 0.177*RRP + 0.338*XINFL + 0.817*LIBOR90 +*
(2.524) (5.111) (3.210) (4.312)
0.422 TBR91(-1)*
(6.218) (C.2)

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.82	
DW	1.65	
Prob (F-statistics)	0.00	
Jarque-Bera	0.800 (*0.670)*	*/
White (with cross terms)		
	1.496 *(0.157)*	*/
Breusch-Godfrey (2 lags)		
	2.221 (*0.120*)	*/
Ramsey *RESET* (2 fitted items)		
	1.481 *(0.231)*	*/

** * Other market interest rates ***

Dependent Variable: SDR

Method: Least Squares

Sample (adjusted): 1988Q4 2003Q1

Included observations: 58 after adjustments

Convergence achieved after 9 iterations

White Heteroskedasticity-Consistent Standard Errors & Covariance

$$SDR = 0.446 + 0.105*TBR91(-1) + 0.660 * SDR(-2) \quad (C.3)$$
$$(0.880) \quad (3.302) \quad (4.153)$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.77	
DW	1.75	
Prob (F statistic)	0.00	
Jarque-Bera	5.748 (*0.064)*	**/
White (with cross terms, *F stat*)		
	0.655 *(0.659)*	*/
Breusch-Godfrey (2 lags)		
	1.057 (*0.355*)	*/
Ramsey *RESET* (2 fitted items)		
	0.403 *(0.671)*	*/

Dependent Variable: LR
Method: Least Squares
Sample (adjusted): 1988Q3 2003Q4
Included observations: 62 after adjustments
Convergence achieved after 8 iterations

$$LR = 2.006 + 0.348*TBR91(-1) + 0.551*LR(-2) \quad \textbf{(C.4)}$$
$$(1.654)\ (2.452)\qquad (2.099)$$

Diagnostic Tests	**Statistic (*p* value)**	**Level of significance */ 5% **/ 10%**
Adjusted	0.90	
DW	1.92	
Jarque-Bera	5.560 (*0.062)*	**/
White (with cross terms)		
	1.262 *(0.293)*	*/
Breusch-Godfrey (2 lags)		
	0.485 (*0.618*)	*/
Ramsey *RESET* Test (2 fitted items)		
	1.642 *(0.203)*	*/

** Foreign exchange rate **

Dependent Variable: LOG(FXR)
Method: Least Squares
Date: 07/06/06 Time: 04:41
Sample: 1994Q1 2003Q4
Included observations: 40
Convergence achieved after 10 iterations
White Heteroskedasticity-Consistent Standard Errors & Covariance

$$LOG(FXR) = 0.774 - 0.116*CA(-2)/(GDP(-2)/FXR(-2)) + \quad \textbf{(C.5)}$$
$$(2.902)\qquad (-2.348)$$
$$0.109*LOG(LIBOR90(-1)-TBR91(-1)) + 0.741*LOG(FXR(-1)) +$$
$$(5.286)\qquad\qquad\qquad\qquad (14.014)$$
$$0.071*DUMCRISIS$$
$$(3.216)$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.98	
DW	1.94	
Jarque-Bera	0.091 (*0.956*)	*/
White (with cross terms)		
	1.751 (*0.128*)	*/
Breusch-Godfrey		
	0.163 (*0.851*)	*/
Ramsey *RESET*		
	0.438 (*0.650*)	*/

** Money supply process **

* Deposit liabilities*

Dependent Variable: LOG(DEPLIAB/(PGDP/100))

Method: Two-Stage Least Squares

Sample (adjusted): 1994Q1 2003Q1

Included observations: 37 after adjustments

Convergence achieved after 13 iterations

White Heteroskedasticity-Consistent Standard Errors & Covariance

Instrument list: C LOG(GDP(-4)) SDR/100-XINFL/100 LOG(DEPLIAB(-1)) LOG(GDP(-5)) SDR(-5)/100 -XINFL(-5)/100 LOG(DEPLIAB(-5))

Lagged dependent variable & regressors added to instrument list

$$LOG(DEPLIAB/(PGDP/100)) = \underset{(2.791)}{3.124} + \underset{(4.306)}{0.304}*LOG(GDP(-4)) + \underset{(8.884)}{0.764}*(SDR/100-XINFL/100) + \underset{(4.513)}{0.456}*LOG(DEPLIAB(-2)) \quad \textbf{(C.6)}$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.98	
DW	1.89	
Prob (F statistic)	0.00	
Jarque-Bera	1.951 (*0.377*)	*/
White (with cross terms)		
	2.103 (*0.057*)	**/
Breusch-Godfrey (2 lags, *Obs* R^2)		
	1.254 (*0.534*)	*/
Ramsey *RESET* (2 fitted items)		
	3.698 (*0.064*)	**/

* Currency in circulation *

Dependent Variable: LOG(CC)
Method: Least Squares
Sample (adjusted): 1994Q1 2003Q2
Included observations: 38 after adjustments
Convergence achieved after 8 iterations
White Heteroskedasticity-Consistent Standard Errors & Covariance

$$LOG(CC) = -1.830 + 0.514*LOG(GDP(-3)) - 0.013*(TBR91(-1)-XINFL(-1)) + 0.624*LOG(CC(-1)) + 0.500*DUMMILBUG + [AR(2)=0.169] \quad \textbf{(C.7)}$$
$$(-0.832) \quad (2.271) \quad (-1.256) \quad (5.322) \quad (19.120) \quad (1.680)$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.83	
DW	2.05	
Jarque-Bera	2.114 *(0.342)*	*/
White (with cross terms)		
	0.410 *(0.930)*	*/
Breusch-Godfrey (1 lag)		
	1.983 (*0.169*)	*/
Ramsey RESET Test (2 fitted items)		
	2.319 *(0.116)*	*/

B. Real sector block equations

B.1 Demand side GDP

** Personal consumption (PCE) **

Dependent Variable: LOG(PCE)
Method: Two-Stage Least Squares
Sample (adjusted): 1988Q3 2003Q1
Included observations: 59 after adjustments
Convergence achieved after 7 iterations
Instrument list: C LOG(DISY) (TBR91(-1)/100-XINFL(-1)/100) LOG(MS /(PGDP/100)) S2 S3 S4 LOG(PCE(-1)) LOG(PCE(-2)) LOG(DISY(-1)) LOG(TBR91(-2)/100)-(XINFL(-2)/100) LOG(MS(-1)/(PGDP(-1)/100))
Lagged dependent variable & regressors added to instrument list

*LOG(PCE) = 0.269 + 0.383*LOG(DISY) - 0.054*(TBR91(-1)/100-*
(1.734) (2.545)
*XINFL(-1)/100) + 0.015*LOG(MS/(PGDP/100)) +*
(-2.565) (1.703)
*0.144*S2 + 0.082*S3 + 0.090*S4 + 0.719*LOG(PCE(-2))*
(-1.740) (23.628) (22.711) (2.554) **(C.8)**

Diagnostic Tests	**Statistic (*p* value)**	**Level of significance** */ 5% **/ 10%*
Adjusted	0.98	
DW	2.02	
Prob (*F-statistic*)	0.00	
Jarque-Bera	2.253 *(0.324)*	*/
White (with cross terms)		
	1.868 *(0.054)*	**/
Breusch-Godfrey (2 lags)		
	1.501 *(0.233)*	*/
Ramsey *RESET* Test (2 fitted items)		
	0.644 (*0.530)*	*/

** Investment **

*** Private construction (CONS)***

Dependent Variable: LOG(CONS)
Method: Two-Stage Least Squares
Sample (adjusted): 1989Q1 2003Q2
Included observations: 58 after adjustments
Convergence achieved after 14 iterations
Instrument list: C LOG(@MOVAV(GDP,2)) (LR(-1)/100)-(XINFL(-1)/100) LOG(CONS(-1)) DUM98_UP (LR(-2)/100)-(XINFL(-2)/100) LOG(CONS(-2)) (LR(-3)/100)-(XINFL(-3)/100) LOG(CONS(-3))
Lagged dependent variable & regressors added to instrument list

*LOG(CONS) = -2.864 + 0.478*LOG(@MOVAV(GDP,2)) –*
(-1.812) (2.438)
0.476(LR(-1)/100)-(XINFL(-1)/100) + 0.534*LOG(CONS(-2))*
(-2.281) (3.114)
*- 0.292*DUM98_UP*
(-3.214) **(C.9)**

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.72	
DW	2.04	
Prob (F statistic)	0.00	
Jarque-Bera	4.977 *(0.061)*	**/
White (with cross terms)	4.074 *(0.990)*	*/
Breusch-Godfrey (3 lags, *Obs* R^2)	5.012 (*0.171*)	*/
Ramsey RESET Test (2 fitted items)	1.548 *(0.223)*	*/

*** Durable equipment (DUREQ)***

Dependent Variable: LOG(DUREQ)
Method: Two-Stage Least Squares
oSample (adjusted): 1989Q2 2003Q4
Included observations: 59 after adjustments
Convergence achieved after 8 iterations
White Heteroskedasticity-Consistent Standard Errors & Covariance
Instrument list: C LOG(GDP(-1)) LOG(FXR(-1)) LOG(DUREQ(-1)) LOG(GDP(-2)) LOG(FXR(-2)) LOG(DUREQ(-2)) LOG(GDP(-4)) LOG(FXR(-4)) LOG(DUREQ(-4))
Lagged dependent variable & regressors added to instrument list

$$LOG(DUREQ) = -5.238 + 1.187*LOG(GDP(-1)) - 0.393*LOG(FXR(-)) + 0.198*LOG(DUREQ(-2))]$$
$$(-2.176) \quad (4.267) \quad (-3.772) \quad (1.680) \qquad \textbf{(C.10)}$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.78	
DW	2.03	
Prob (F-statistic)	0.00	
Jarque-Bera		
	1.843 *(0.398)*	*/
White (with cross terms)		
	1.830 *(0.086)*	**/
Breusch-Godfrey (2 lags, *Obs* R^2)		
	4.190 (*0.123*)	*/
Ramsey RESET (2 fitted items)		
	1.890 *(0.175)*	*/

** Merchandise exports**

Dependent Variable: LOG(XMFG/(USDEF/100))

Method: Least Squares

Sample: 1990Q1 2003Q4

Included observations: 56

Convergence achieved after 8 iterations

White Heteroskedasticity-Consistent Standard Errors & Covariance

$$LOG(XMFG/(USDEF/100)) = 3.615 + 0.251*LOG(PFXR(-1)) + 0.608*LOG(USGDP/(USDEF/100)) + 0.617*LOG(VOPI(-2) + 0.112*DUMCRISIS$$

(2.615) (-2.073) (1.965) (2.570) (2.269)

(C.11)

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.99	
DW	1.81	
Jarque-Bera	3.046 (*0.218*)	*/
White (with cross terms)		
	1.056*(0.412)*	*/
Breusch-Godfrey (2 lags)		
	0.829 (*0.443*)	*/
Ramsey RESET (3 fitted items)		
	2.079 *(0.116)*	*/

Dependent Variable: LOG(XNMFG/(USDEF/100))
Method: Least Squares
Sample (adjusted): 1988Q3 2003Q4
Included observations: 62 after adjustments
Convergence achieved after 6 iterations
White Heteroskedasticity-Consistent Standard Errors & Covariance

$$\begin{aligned}LOG(XNMFG/(USDEF/100)) &= 8.261 + 0.151*LOG(PFXR(-1)) + \\ &\quad (2.297) \quad (2.009) \\ 0.338*LOG(USGDP(-1)/(USDEF(-1)/100)) &+ 0.734*LOG(XNMFG(- \\ &\quad (2.144) \\ 2)/(USDEF(-2)/100)) &- 0.063*DUMCRISIS \\ &\quad (8.019) \quad (-2.806)\end{aligned} \tag{C.12}$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted *DW*	0.74 1.95	
Jarque-Bera	0.626 (*0.731)*	*/
White (with cross terms)	0.659 *(0.791)*	*/
Breusch-Godfrey (2 lags)	0.651 (*0.423*)	*/
Ramsey RESET (4 fitted items)	1.409 *(0.254)*	*/

** Merchandise imports **

$$\begin{aligned}LOG(MFUEL/PGDP/100) &= -8.867 - 0.621*LOG(FXR(-1)) - \\ &\quad (-2.231) \quad (-3.619) \\ 0.222*LOG(PMGDS\$(-2)/PGDP(-2)) &+ \\ &\quad (-1.923) \\ 0.714*DLOG(@MOVAV(GDP,4)) &+ \\ &\quad (2.382) \\ 0.474*LOG(MFUEL(-2)/PGDP(-2)/100) & \\ &\quad (5.903)\end{aligned} \tag{C.13}$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.66	
DW	1.77	
Jarque-Bera	3.217 (*0.200*)	*/
White(with cross terms)		
	0.490 *(0.926)*	*/
Breusch-Godfrey Test (2 lags)		
	1.235 (*0.300*)	*/
Ramsey RESET Test (2 fitted items)		
	1.243 *(0.298)*	*/

Dependent Variable: LOG((NONOILM)/(PGDP/100))

Method: Least Squares

Sample (adjusted): 1988Q2 2003Q4

Included observations: 63 after adjustments

$$LOG((NONOILM)/(PGDP/100)) = -3.089 - 0.785*LOG(FXR) + 0.552*LOG(GDP(-1)) + 0.083*S2 + 0.036*S3 + 0.512*LOG(NONOILM(-2))$$
$$(-1.187)\quad(-9.876)\quad(2.313)\quad(3.201)\quad(2.270)\quad(12.653)$$

(C.14)

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.90	
DW Test	1.71	
Jarque-Bera	2.074 *(0.354*)	*/
White (with cross terms)		
	0.810 (0.679)	*/
Breusch-Godfrey Test (2 lags)		
	0.633 (*0.535)*	*/
Ramsey RESET Test (2 fitted items)		
	0.007 (0.993)	*/

B.2 Fiscal sector block equations

** Revenues **

Dependent Variable: LOG(INDIV)

Method: Two-Stage Least Squares

Sample: 1988Q1 2003Q4

Included observations: 64

White Heteroskedasticity-Consistent Standard Errors & Covariance

Instrument list: C LOG((PVIS/100)*VIS) LOG(INDIVTXRT) LOG(CPI94) LOG(FXR) LOG(MS/PGDP) DUM98_UP S4

$$LOG(INDIV) = 1.191 + 0.873*LOG((PVIS/100)*VIS) + 0.974*LOG(INDIVTXRT) + 0.168*LOG(CPI94) - 0.067*LOG(FXR) + 0.026*S4 \quad \textbf{(C.15)}$$

$$\begin{matrix} & & (6.942) & (29.078) \\ & & (83.239) & (3.673) \\ & & (-4.585) & (10.564) \end{matrix}$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.99	
DW	2.05	
Prob (F statistic)	0.00	
Jarque Bera	1.066 (*0.587*)	*/
White (with cross terms, *Obs* R^2)	17.127 *(0.715)*	*/
Breusch-Godfrey (1 lag, *Obs* R^2)	0.181 (*0.671*)	*/
Ramsey *RESET (2 fitted items, F-stat)*	1.060 *(0.353)*	*/

** Expenditures **

Dependent Variable: LOG(DOMIP)

Method: Two-Stage Least Squares

Sample (adjusted): 1988Q3 2003Q1

Included observations: 59 after adjustments

Convergence achieved after 7 iterations

Instrument list: C LOG(TBR*DOMDEBT) LOG(FXR) LOG(DOMIP(-1)) LOG(TBR(-1)*DOMDEBT(-1)) LOG(FXR(-1)) LOG(DOMIP(-2))

Lagged dependent variable & regressors added to instrument list

$$LOG(DOMIP) = 1.485 + 0.042*LOG(TBR91*DOMDEBT) + \underset{(2.672)}{(1.960)}$$
$$0.392*LOG(FXR) + \underset{(6.314)}{0.640*LOG(DOMIP(-1))} + \underset{(-5.639)}{[AR(1)=-0.631]} \quad \underset{(3.503)}{} \qquad \textbf{(C.16)}$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.77	
DW	1.94	
Prob (F statistic)	0.00	
Jarque-Bera	0.550 *(0.760)*	*/
White (with cross terms, *Obs* R^2)	0.781 *(0.635)*	*/
Breusch-Godfrey (2 lags, Obs R^2)	1.406 (*0.495*)	*/
Ramsey *RESET (2 fitted items)*	0.864 *(0.427)*	*/

B.3 Supply side GDP

** Sectoral quantities **

*** Industry (VIR)***

Dependent Variable: LOG(VIR)
Method: Two-Stage Least Squares
Sample (adjusted): 1989Q2 2003Q4
Included observations: 59 after adjustments
Convergence achieved after 16 iterations
Instrument list: C LOG(PCE+CG+GDCF+TOTX) LOG(PVIR(-1) /PGDP(-1)) LOG(VIR(-1)) LOG(PCE+CG+GDCF+TOTX (-4)) LOG(PVIR(-4)/PGDP(-4)) LOG(VIR(-4)) LOG(PCE+CG+GDCF +TOTX (-2)) LOG(PVIR(-2)/PGDP(-2)) LOG(VIR(-2))
Lagged dependent variable & regressors added to instrument list

$$LOG(VIR) = 0.393 + \underset{(1.803)}{}$$
$$0.722*LOG(\underset{(9.972)}{@MOVAV(PCE+CG+GDCF+TOTX,1)}) -$$
$$0.432*LOG(PVIR(-1)/PGDP(-1)) + \underset{(-2.259)}{0.153*LOG(VIR(-3))} + \underset{(2.634)}{} \qquad \textbf{(C.17)}$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.98	
DW	1.77	
Prob (F-statistic)	0.00	
Jarque-Bera	3.395 (*0.183*)	*/
White (with cross terms, Obs R^2)	6.744 (*0.565)*	*/
Breusch-Godfrey (2 lags)	2.025 (*0.363)*	*/
Ramsey *RESET* Test (3 fitted items)	1.256 *(0.095)*	**/

*** Services (VSR)***

Dependent Variable: LOG(VSR)
Method: Two-Stage Least Squares
Sample (adjusted): 1989Q3 2003Q4
Included observations: 58 after adjustments
Convergence achieved after 311 iterations
Instrument list: C LOG(GDP) LOG(PVSR(-2)/PGDP(-2)) LOG(VSR(-1)) LOG(GDP(-4)) LOG(PVSR(-4)/PGDP(-4)) LOG(VSR(-4))
Lagged dependent variable & regressors added to instrument list

$$LOG(VSR) = \underset{(2.004)}{110.990} + \underset{(2.766)}{0.312}*LOG(@MOVAV(GDP,3)) - \underset{(-2.091)}{0.082}*LOG(PVSR(-2)/PGDP(-2)) + \underset{(5.164)}{0.586}*LOG(VSR(-1)) - \underset{(-2.257)}{0.004}*DUMCRISIS + \underset{(66.139)}{[AR(4)=0.989]} \quad \textbf{(C.18)}$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.99	
DW	1.65	
Prob (F-statistic)	0.00	
Jarque-Bera	1.785 (*0.410*)	*/
White(with cross terms)	12.840 *(0.304)*	*/
Breusch-Godfrey (2 lags, Obs R^2)	4.588 (*0.101*)	*/
Ramsey *RESET* (1 fitted item)	2.581 *(0.086)*	**/

** Sectoral prices **

Dependent Variable: LOG(PVIR)
Method: Two-Stage Least Squares
Sample (adjusted): 1989Q3 2003Q4
Included observations: 58 after adjustments
Convergence achieved after 7 iterations
Instrument list: C LOG(VIR(-1)) LOG(WPI94) LOG(PVIR(-1))
LOG(VIR(-4)) LOG(WPI94(-4)) LOG(PVIR(-4))
Lagged dependent variable & regressors added to instrument list

$$LOG(PVIR) = \underset{(-2.650)}{-2.123} + \underset{(-2.826)}{0.247}*LOG(@MOVAV(VIR,3)) + \underset{(1.886)}{0.141}*LOG(WPI94) + \underset{(9.511)}{0.763}*LOG(PVIR(-1)) + \underset{(4.160)}{[AR(4)=0.589]} \quad \textbf{(C.19)}$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.99	
DW	1.69	
Prob (*F-statistic*)	0.00	
Jarque-Bera	3.990 *(0.136)*	*/
White (with cross terms, *Obs* R^2)	9.083 *(0.367)*	*/
Breusch-Godfrey (2 lags, *Obs* R^2)	4.384 (*0.112*)	*/
Ramsey RESET (3 fitted items)	1.482 *(0.237)*	*/

Dependent Variable: LOG(PVSR)
Method: Two-Stage Least Squares
Date: 11/22/05 Time: 18:42
Included observations: 60 after adjustments
Convergence achieved after 11 iterations
Instrument list: C LOG(VSR) LOG(WPI94) LOG(TAXCORPRT(-1))
LOG(PVSR(-1)) LOG(VSR(-2)) LOG(WPI94(-2))
LOG(TAXCORPRT(-2)) LOG(PVSR(-2))
Lagged dependent variable & regressors added to instrument list

$$LOG(PVSR) = \underset{(-3.788)}{-0.926} + \underset{(3.968)}{0.101}*LOG(VSR) + \underset{(3.147)}{0.226}*LOG(WPI94) + \underset{(5.377)}{0.025}*LOG(@MOVAV(TAXCORPRT(-1),2)) + \underset{(17.819)}{0.790}*LOG(PVSR(-1)) + \underset{(1.704)}{[AR(2)=0.205]} \quad \textbf{(C.20)}$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.99	
DW	2.01	
Prob (F-statistic)	0.00	
Jarque-Bera	1.837 (*0.399*)	*/
White (with cross terms)		
	0.759 *(0.740)*	*/
Breusch-Godfrey (3 lags, *Obs* R^2)		
	5.786 (*0.122*)	*/
Ramsey *RESET* (1 fitted item)		
	0.026 *(0.873)*	*/

B.4 Employment, labour and wages

Dependent Variable: LOG(ISEMP)

Method: Least quares

Sample (adjusted): 1989Q2 2003Q4

Included observations: 59 after adjustments

Convergence achieved after 22 iterations

White Heteroskedasticity-Consistent Standard Errors & Covariance

$$LOG(ISEMP) = -0.663 + 0.180*LOG(VIS(-1)) + 0.516*LOG(ISEMP(-2) \quad \textbf{(C.21)}$$
$$(2.519) \quad (2.758) \quad (2.968)$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.98	
DW	2.01	
Jarque-Bera	4.663 (*0.097*)	**/
White (with cross terms)		
	1.602 (*0.187*)	**/
Breusch-Godfrey (2 lags)		
	0.223 (*0.800*)	*/
Ramsey RESET Test (2 fitted items)		
	1.498 *(0.233)*	*/

Dependent Variable: LOG(LF)
Method: Least Squares
Sample (adjusted): 1989Q2 2003Q4
Included observations: 59 after djustments
Convergence achieved after 7 iterations

*LOG(LF) = -0.822 + 0.613*LOG(WORKAGE) + 0.234*LOG(QSE1P(-*
(-1.482) (2.756)
*1)/PGDP(-1)) + 0.164*LOG(LF(-2))*
(2.824) (2.817) **(C.22)**

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.98	
DW	1.90	
Jarque-Bera	2.617 (*0.270*)	*/
White(with cross terms)		
	2.253 (*0.054)*	**/
Breusch-Godfrey (2 lags)		
	0.955 (*0.391*)	*/
Ramsey RESET Test (2 fitted items)		
	1.319 *(0.276)*	*/

Dependent Variable: LOG(QSE1P)
Method: Least quares
Sample (adjusted): 1988Q3 2003Q4
Included observations: 62 after adjustments
Convergence achieved after 31 iterations

*LOG(QSE1P) = 1.762 - 0.104*LOG(UR(-1)) + 0.880*LOG(CPI94(-1)) +*
(11.282) (2.528) (29.120)
*0.328*LOG(QSE1P(-1)*
(2.442) **(C.23)**

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.97	
DW	1.82	
Jarque-Bera	3.769 (*0.152*)	*/
White (with cross terms)		
	1.643 (*0.164)*	*/
Breusch-Godfrey (1 lag)		
	1.659 (*0.203*)	*/
Ramsey RESET Test (3 fitted items)		
	1.812 *(0.110)*	*/

** Price variables**

Dependent Variable: LOG(WPI94)

Method: Least Squares

Sample (adjusted): 1989Q3 2003Q4

Included observations: 58 after adjustments

Convergence achieved after 11 iterations

*LOG(WPI94) = 0.353 + 0.110*LOG(PMGDS(-1)) +*
(3.033) (2.370)
*0.070*LOG(QSE1P)+ 0.448*POTGAPL1(-4)+*
(1.911) (2.033)
*0.067*LOG(MS/GDP) + 0.756*LOG(WPI94(-2))* *(3.049) (-1.877)*
-0.011 DUMCRISIS*
(1.933) **(C.24)**

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted *DW*	0.99 1.99	
Jarque-Bera	4.033 (*0.133*)	*/
White (with cross terms)	1.417 *(0.198)*	*/
Breusch-Godfrey (2 lags)	0.088 (*0.915*)	*/
Ramsey RESET (2 fitted items)	2.012 *(0.145)*	*/

Dependent Variable: LOG(PMGDS$)

Method: Least Squares

Sample (adjusted): 1988Q2 2003Q4

Included observations: 63 after adjustments

White Heteroskedasticity-Consistent Standard Errors & Covariance

*LOG(PMGDS$) = 0.193 + 0.154*LOG(OILPR) +*
(2.756) (3.142)
*0.870*LOG(PMGDS$(-1)) +*
(18.365)
*0.539*DUM98_UP - 0.185*LOG(OILPR)*DUM98_UP*
(2.408) (-2.518) **(C.25)**

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.87	
DW	2.01	
Jarque-Bera	3.656 (*0.161)*	*/
White (with cross terms)		
	1.572 *(0.141)*	*/
Breusch-Godfrey (2 lags)		
	1.227 (*0.301*)	*/
Ramsey RESET (2 fitted items)		
	2.077 *(0.135)*	*/

Consumer price index (CPI94)

Dependent Variable: LOG(CPI94)
Method: Two-Stage Least Squares
Sample (adjusted): 1989Q2 2003Q4
Included observations: 59 after adjustments
Convergence achieved after 15 iterations
White Heteroskedasticity-Consistent Standard Errors & Covariance
Instrument list: C LOG(PGDP) LOG(CPI94(-1)) LOG(PGDP(-1)) LOG(CPI94(-1)) LOG(PGDP(-4)) LOG(CPI94(-4)) LOG(PGDP(-4)) LOG(CPI94(-4))
Lagged dependent variable & regressors added to instrument list

$$LOG(CPI94) = \underset{(1.824)}{0.083} + \underset{(6.173)}{0.546}*LOG(PGDP) + \underset{(3.598)}{0.450}*LOG(CPI94(-2)) + \qquad \textbf{(C.26)}$$

Diagnostic Tests	Statistic (*p* value)	Level of significance */ 5% **/ 10%
Adjusted	0.98	
DW	1.97	
Prob (F statistic)	0.00	
Jarque-Bera		
	4.671 (*0.101*)	*/
White(with cross terms, *Obs* R^2)		
	1.117 (*0.016)*	**/
Breusch-Godfrey (2 lags, *Obs* R^2)		
	2.599 (*0.273*)	*/
Ramsey *RESET (2 fitted items)*		
	0.635 *(0.419)*	*/

Long-run inflation expectations

Dependent Variable: XINFL
Method: Two-Stage Least Squares
Sample (adjusted): 1994Q1 2003Q1
Included observations: 37 after adjustments
Convergence achieved after 12 iterations
White Heteroskedasticity-Consistent Standard Errors & Covariance
Instrument list: C INFL INFTAR INFL(-2) INFTAR(-2)
Lagged dependent variable & regressors added to instrument list

$$XINFL = -0.475 + 0.571*INFL + 0.139*INFTAR + 0.304*INFL(-1) \quad (C.27)$$
$$(1.824) \quad (4.155) \quad (2.122) \quad (2.111)$$

Diagnostic Tests	**Statistic (*p* value)**	**Level of significance** */ 5% **/ 10%**
Adjusted	0.86	
DW	1.95	
Prob (F-statistic)	0.00	
Jarque-Bera	0.198 *(0.906)*	*/
White (with cross terms, *Obs* R^2)		
	1.859 *(0.868)*	*/
Breusch-Godfrey (2 lags, *Obs* R^2)		
	0.748 (*0.688*)	*/
Ramsey *RESET* (2 *fitted items))*		
	1.439 *(0.253)*	*/

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