Forensic Finance

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Forensic Finance

Address delivered at the occasion of accepting the appointment of
Professor of Corporate Finance at the Erasmus School of Economics,
Erasmus University Rotterdam, on Friday September 19, 2014

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Samenvatting

De financiële wereld heeft reputatieschade opgelopen. Verscheidene voorbeelden van financieel wangedrag hebben ertoe geleid dat de integriteit van financiële markten in twijfel wordt getrokken. Ik betoog dat met de groeiende beschikbaarheid van financiële gegevens, academische onderzoekers een steentje kunnen bijdragen in het vinden van dubieuze financiële praktijken.

Ik geef voorbeelden van potentieel wangedrag rondom optieregelingen voor directeuren, en rondom de uitgifte van financiële instrumenten. Meer specifiek, het lijkt erop dat Amerikaanse bedrijven hebben gesjoemeld om hun directeuren meer te kunnen laten verdienen, en het ziet er naar uit dat handelen met voorkennis veelvuldig voorkomt rondom private plaatsingen van bijvoorbeeld aandelen. Een systematische analyse van de beschikbare data kan deze overtredingen opsporen. Forensisch financieel onderzoek heeft de potentie om verdacht gedrag te detecteren, en kan op die manier een belangrijke rol spelen in ons begrip en de integriteit van de financiële wereld.

Abstract

The financial world does not have the best reputation. One of the problems is the perceived lack of integrity of financial markets, which is fuelled by examples of financial misconduct. I argue that with financial data becoming more widely available and constantly improving, financial researchers could help in identifying suspicious behavior in financial markets.

I will provide examples of potentially fraudulent behavior surrounding executive compensation and security issuance. Allegedly, companies have backdated executives' stock options and as such have increased executives' effective compensation, and there might be widespread insider trading before the announcements of privately placed securities. Systematic analyses of the available data could detect these examples of misconduct. Overall, forensic finance has the potential to detect suspicious behavior and as such could play an important role in understanding and improving the integrity of the financial world.

Content

1. Introduction

Dear Rector Magnificus and Dean,
Dear colleagues, family, friends, and students,
Dear distinguished guests,

I find the world of finance fascinating. Part of this world is familiar to everybody. For example, putting money in a savings account is a financial decision, and this decision relates to the basic question of how to invest money. Similarly, taking out a mortgage to buy a house is part of the world of finance, and this decision relates to the question of how to get money to make investments. Raising money and investing money are very important topics in finance. Of course, these topics are not only important for individuals, but also for companies. Companies can invest in many projects, and they can obtain financing from a range of sources: they can use their own money, they can borrow from a bank, they can issue bonds, they can issue shares, they can issue more complex securities, or they can use a combination of sources.

Today I am accepting a chair in Corporate Finance. Researchers in corporate finance deal with the financial decisions made by business enterprises. Over my academic career, I have examined a range of financial decisions that are made by companies. These research topics include how firms raise money for their investments, and I have been particularly fascinated by a more complex security known as a convertible bond.

But let me start my inaugural address by highlighting two recent features of the world of finance:

1. The wide availability of data
2. The poor reputation of the financial world

2. Data and reputations

I have been able to do my research as the modern financial world is characterized by a wide availability of data. Many companies have to report their performance and how they are financed, and we can track many companies' share prices throughout the day. Moreover, the information that researchers have is getting better and better, with an increasing number of databases being available, and with an increasing level of detail. As such, researchers are almost drowning in data.

Still, we may be starving for wisdom. The world of finance does not currently have the best reputation. When asking people about the financial industry, or about Wall Street, the large majority of respondents turn out to have a negative impression. In fact, pick any recent survey on reputations, and chances are that the reputation of the financial industry is ranked the lowest of the major economic sectors, or if not, that only the tobacco industry scores lower. Social media will tell the same story. More specifically, a global survey of public opinion reports that 86% of comments shared on social media about banks are negative.[1]

So, in short, the financial world has a bad reputation. Most movies do not help either. Just think of the movie "Wall Street," or, more recently, "The Wolf of Wall Street." They paint a pretty alarming picture of the financial industry.

Do you remember the movie Wall Street? In that movie, actor Michael Douglas plays a fictional character, Gordon Gekko, who popularized the line: "Greed, for lack of a better word, is good," and who made large profits by trading based on private information. This kind of trading can be a type of securities fraud known as insider trading. Today, I'd like to tell you a bit more about insider trading. The movie provides a good example of what trading on inside information is about. In the movie, Gordon Gekko, a wealthy investor, learns from a character played by Charlie Sheen, a young stockbroker, that an airline company has been cleared of responsibility for a major incident before this information is made public by the aviation authorities. Charlie Sheen's character knows this because his father works for the airline company. Gordon Gekko thus realizes that the airline company's stock price will increase when the information is released, and starts buying the company's shares before the news release. As such, he can buy at a relatively low price, and will sell at a relatively high price when the positive news is incorporated into the stock price. This is how trading on private information could be profitable. In the movie, Charlie Sheen's character then continues to maximize insider information, going as far as dressing up as a cleaner to get into the offices of lawyers and businesses to collect information.

1 See, for example, http://www.forbes.com/sites/jonathansalembaskin/2013/07/22/you-wish-your-brands-reputation-was-as-bad-as-wall-streets/

The movie was released in 1987, but prosecutors are still highly worried about illegal insider trading. It is generally regarded as one of the most popular white-collar crimes these days. In fact, in 2013 the FBI showed a video of Michael Douglas making a statement about the importance of reducing insider trading: "Hello, I'm Michael Douglas. In the movie Wall Street I played Gordon Gekko, a greedy corporate executive who cheated to profit while innocent investors lost their savings. The movie was fiction, but the problem is real. Our economy is increasingly dependent on the success and the integrity of the financial markets. [...] To report insider trading, contact your local FBI office."[2]

My main statement today is that with data becoming increasingly available and constantly improving, financial researchers could help in identifying suspicious behavior in financial markets. I believe financial researchers could play a role in improving the integrity of financial markets. This is what Forensic Finance is about, a term introduced by Stephen Ross, and also used by Jay Ritter.[3] So basically, I'd like to talk about crime scene investigation today, from a financial researcher's perspective.

2 http://www.fbi.gov/newyork/press-releases/2012/fbi-announces-public-service-announcement-by-michael-douglas-on-securities-fraud-and-insider-trading

3 See Ross, S.A., 1999, "Forensic finance" (Risk Magazine) and Ritter, J.R., 2008, "Forensic finance" (Journal of Economic Perspectives 22, 127-147).

3. Forensic Finance

To be clear from the outset, I don't think financial researchers should use general data sources to accuse particular people of committing fraud. Instead, I think financial researchers are capable of showing regulators and prosecutors where to look. Using general data sources, researchers can discover in which areas and around which transactions there is a relatively high amount of suspicious behavior.

One reason why I think we as academics can add to crime scene investigation is that we are good at developing systematic approaches with which we can analyze large datasets. This may be more difficult for regulatory organizations, who often claim to be understaffed and underfunded. Academics are skilled at carrying out careful and structured analyses that control for a range of factors, and we are used to examining a variety of alternative explanations before drawing conclusions.

So today, I would simply like to give a few examples of how studying general data could help in identifying suspicious behavior. Perhaps surprisingly, I will start by describing an analysis of potential match fixing in sumo wrestling.

4. Sumo wrestling

Sumo wrestling has a tradition of more than a thousand years.[4] The long tradition is evidenced by the ritual elements in the sport, such as the use of salt purification, in which sumo wrestlers throw salt to get rid of evil on the ground and purify the ring before the match. In addition, most sumo wrestlers live in communal training stables, where many aspects of their daily lives follow strict tradition. In short, sumo wrestling seems to have a focus on honor and rituals.

Still, there have been rumors of match fixing. The question is: Are wrestlers purposely losing fights in this sport full of honor and rituals? This question led researchers Mark Duggan and Steven Levitt to analyze a large data sample of match outcomes. They noted an interesting incentive scheme in sumo wrestling. Within a tournament, there are 15 fights per wrestler. The ranking, which is the basis of salary, status and other benefits, is related to the number of wins. Interestingly, there is a non-linearity in the payoff structure. Typically, each additional victory is worth about three spots in the ranking. However, the eighth win leads to a ranking that is about 11 spots higher. So, the more a wrestler wins, the better this is for his ranking, but the eighth win is almost four times more important than any other win. Actually, a wrestler who has only seven wins or less at the end of the tournament falls in ranking, known as make-koshi, whereas a wrestler with eight wins or more rises in ranking, known as kachi-koshi. When a wrestler has seven wins at some point during the tournament, he is said to be "on the margin".

This payoff structure could provide incentives for collusion. Perhaps, a wrestler that already has more than seven wins, will let a wrestler who is on the margin beat him for some kind of payment. Researchers can look for these potentially suspicious patterns by analyzing data on many sumo wrestling matches. Indeed, Duggan and Levitt analyze over ten years of data with over 32 thousand fights, and they find that a wrestler who is on the margin is substantially more likely to win than a wrestler who is not on the margin.

This finding is interesting, but it doesn't automatically mean that matches were fixed. It could simply be that a wrestler who is on the margin is more motivated and will try harder to win than he would do in other matches. So how can we find evidence that would be suggestive of match fixing? In other words, are there predictions of a theory of match fixing that are not predicted by a motivational story?

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4 The description of sumo wrestling and the analysis of potential match fixing are based on Duggan, M., and Levitt, S.D., 2002, "Winning isn't everything: Corruption in sumo wrestling" (American Economic Review 92, 1594-1605). See also the book "Freakonomics" by S.D. Levitt and S.J. Dubner, first published in 2005 by William Morrow Ltd.

These predictions might exist. For example, wrestlers might find it easier to collude when they have met each other more often in the past. Indeed, Duggan and Levitt show that wrestlers on the margin are especially likely to win when they wrestle somebody they have met often before. But this is not all. Perhaps the most convincing evidence comes from examining the next time the two wrestlers meet. It turns out that the wrestler who is supposedly purposely losing the match against the wrestler who is on the margin, is much more likely than normal to win the next time the wrestlers meet. This pattern suggests some payment in kind. Also noteworthy is that these suspicious patterns disappear when there is attention on match fixing in the popular media.

As such, this evidence suggests fraud in sports. I know, you might not be too surprised, as you may have followed the news on for example performance enhancing drugs in cycling. But I think it is very interesting that researchers can do some type of crime scene investigation with general data, and without observing the bribes that might potentially be paid. Authorities could follow up on the discovery of suspicious patterns. Indeed, in 2011, it was announced that a police investigation had discovered cell phone text messages indicating that a number of sumo wrestling matches had been fixed. Eventually, several wrestlers admitted to match fixing for money.[5]

Now, let's move closer to some of my own research. Is there fraud in finance?

5 See, for example, http://www.huffingtonpost.com/2011/02/02/sumo-wrestling-scandal-match-fixing_n_817371.html

5. Stock option backdating

Considering the incentives, it would not be unlikely that there is fraud in financial markets. Think about it, the profits that can be made are huge. What about the risks? Well, the risks might currently not even be that high. Sure, some people get caught, but percentage-wise this number is probably small.

Perhaps the most famous example of forensic finance is stock option backdating.[6] Let me briefly explain what stock options are. Executives of companies typically receive stock options as part of their compensation package. The value of these options is linked to the company's share price. More specifically, the stock options increase in value when the company's share price increases, which should motivate managers to care more about their companies' stock price and to create shareholder value. The stock options are assigned to the executives by a company's compensation committee.

Assume that the stock price upon granting the options is 100, which typically means that the "exercise price" is also 100. It doesn't make any sense for the executives to exercise the options if the stock price declines below 100 or stays at 100. As a result, for these stock prices there is a payoff of zero. Importantly, executives do get more compensation when the stock price rises above the stock price that was observed at the issue date.

In 1997, David Yermack published an article in which he examined the timing of executive stock options.[7] More specifically, he was interested in stock prices around the date that options were awarded. Given that stock options are typically issued with the exercise price being equal to the stock price at the issue date, the stock price at the issue date and the price movements afterwards are very important for executive compensation.

Detailed data were available, and Yermack was able to find data on the past grant dates of options in the United States and on companies' share prices around these dates. His paper shows that, on average, stock prices increase immediately after options are awarded. The increase is on average about 2% in the next month or so. It seems that stock prices increase so fast that executives might not even have had the time to change the strategy of the company.

6 The option backdating case is also discussed in Ritter, J.R., 2008, "Forensic finance" (Journal of Economic Perspectives 22, 127-147).

7 See Yermack, D., 1997, "Good timing: CEO stock option awards and company news announcements" (Journal of Finance 52, 449-476).

So how can we explain this trend? Why is the stock price relatively low on the granting date, but significantly higher afterwards? Were the executives just lucky? Given that the pattern is an average over many executives, luck seems unlikely to be the answer.

One possibility is that investors value the firm higher due to the incentives provided by the stock options. That is, investors might now know that the executives care more about share prices. But it turns out that this explanation is unlikely, as investors at the time could only know about the option award dates after the proxy statements were filed, which happened much later.

Another explanation could be that managers wait with releasing good news after they have received their options, or that they ask the compensation committee to grant the options just before a positive announcement had been planned. In this way, they can immediately make their options worth more. This explanation appears unethical, but seemed a likely explanation of the findings.

Years later, Erik Lie examined the patterns again, based on a more recent sample. In 2005, he published an article that reports a pattern relatively similar to the one reported by Yermack in 1997.[8]

There are, however, also a few differences. One of these is that, on average, the stock price now fell before the award date. Another thing to note is that the pattern had intensified, as stock prices increased even more after the grant date in Lie's study than in Yermack's study.

Lie developed a story in which the award dates were chosen retrospectively. That is, in his story, executives or directors would observe the company's past stock prices, and would then select a date that corresponded to a particularly low stock price as the date at which the option was supposedly awarded. With such a strategy, the current stock price would already be above the stock price upon the selected granting date, and the options would already be quite valuable. This could correspond to having a current share price of 110, but setting the award date to a date when the stock price happened to be a 100. Hence, the CEOs would effectively get paid more, with the shareholders of the firm ending up paying for this increase. This practice seems illegal because the effective in-the-money issuance is not acknowledged and expensed.

8 See Lie, E., 2005, "On the timing of CEO stock option awards" (Management Science 51, 802-812).

The article, published in 2005, did not immediately receive large media attention or much attention from regulators. But then the Wall Street Journal started paying attention. Based on Lie's analysis, the Wall Street Journal began an investigation, and published its own findings in March 2006, with examples of suspicious patterns.[9]

It turned out that multiple companies were involved. Actually, the impact of the investigation was enormous. Over 250 companies announced internal investigations, many executives resigned, were convicted, or paid back money.[10] One executive even fled to Namibia. Years later, while still in exile in Namibia, he agreed to pay more than $50 million dollars to U.S. regulators.[11]

9 See http://online.wsj.com/article/SB114265125895502125.html and http://online.wsj.com/public/resources/documents/info-optionsscore06-full.html.

10 See also Ritter, J.R., 2008, "Forensic finance" (Journal of Economic Perspectives 22, 127-147).

11 http://www.theregister.co.uk/2010/11/24/comverse_deal/

6. Insider trading

The option award studies provide some insight into insiders taking advantage of their privileged positions. Let's now examine whether we can look more specifically at insider trading. As said before, insider trading is a type of securities fraud and indicates trading based on private information. This includes trading with private information on firms' new financing deals. As I mentioned at the beginning of my talk, an important part of finance deals with how firms obtain money for their investments. One popular way for firms to obtain financing is to conduct a private placement. In fact, in the United States, the private placement market has recently surpassed the traditional seasoned equity market in terms of both dollar volume and number of transactions. [12]

When conducting a private placement, a firm issues securities to a limited number of large investors, such as pension funds or hedge funds. Potentially, privately placing securities invites insider trading, which is due to a practice called wall-crossing.[13] In wall-crossings, when a firm is planning a private placement, it will typically gauge the interest of potential investors in a series of confidential conversations before the offering is publicly announced. In practice, this means that an investor receives a phone call asking whether he or she would potentially be interested in investing in an unnamed company in a particular industry. If the investor is potentially interested, he or she "crosses the wall" and receives detailed information, including the name of the company that is seeking financing. The investors can then decide whether to agree to invest or not. But regardless of this choice, after having crossed the wall, an investor is expressly prohibited from trading on the private information revealed during these conversations. The investor can only trade again after the financing intentions of the firm are made public. This legal restriction of the trading activity of wall-crossers is understandable given that the announcement of a private placement will often have a material price impact.

However, investors who have crossed the wall could consider an interesting strategy: short selling. When investors sell short, they anticipate a decrease in share prices. Around security offerings, this could be a profitable strategy, and this works as follows. Assume you are an investor and you receive private information that a company wants to privately place shares. The company will place these securities at a discount, which makes it likely that the company's

12 See, for example, Chen, H., Dai, N., and Schatzberg, J., 2010, "The choice of equity-selling mechanisms: PIPEs versus SEOs" (Journal of Corporate Finance 16, 104-119).

13 The description and analysis of wall-crossings draws heavily on my working paper "Hole in the wall: A study of short selling and private placements" with Henk Berkman and Michael McKenzie, which can be downloaded from papers.ssrn.com/abstract=2233757.

share price will fall when this information is released to the public. You receive this information on Monday, and you know that the information will become public on Wednesday. Even though you promised to keep the information in confidence, you might want to engage in short selling on Tuesday, so that you make a profit when share prices fall on Wednesday. Although this scenario is considered illegal, the profits might be sufficiently large for investors to take the risk of getting caught.

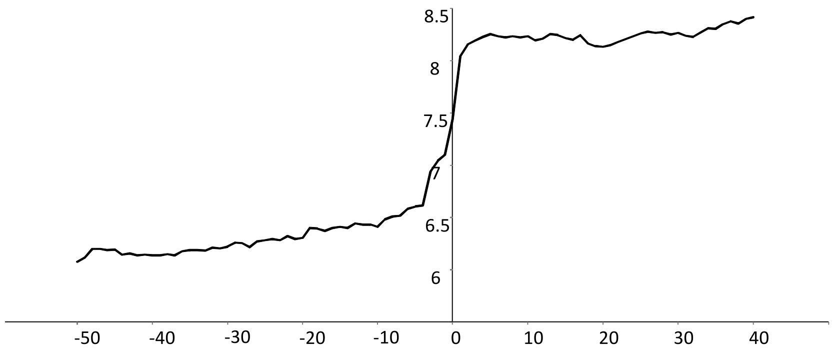
In fact, a few people have been accused of following the strategy I have just described. One of the first allegations in the United States regarding short selling around private placements was against a female hedge fund manager. Late September 2001, she received a phone call asking whether she was interested in a private equity issue by an electronic security company. She said yes and agreed on confidentiality, before the identity of the issuer was released. She agreed to buy about half a million shares. On October 8, she learned that the private placement was going through and that the offering price had been finalized at $12, even though the current share price was above $17. Hence, she could predict that when this news was publicly released, the share price would fall. So far, all her actions were legal. But then, on October 9th, before noon, she allegedly sold short more than a 100,000 shares. The offering was publicly announced by the company around noon. Upon the announcement, the price fell from about $17 to about $14. This $3 price drop meant that our investor, with a short position of about 100,000 shares, allegedly made about a $300,000 profit in a few hours.[14]

Unfortunately for her, the U.S. Securities and Exchange Commission prosecuted. The case was settled for over $1 million dollars.

The question is whether this was an isolated case, or whether this type of illegal behavior is more widespread. With Henk Berkman and Michael McKenzie, I have investigated patterns of trading behavior around private placements. We obtained a sample of private placements of common stock and convertible securities between January 2007 and August 2011 in the United States. The figure shows patterns in the size of short positions around convertible security offerings. The vertical axis reports short interest levels, and the horizontal axis reports trading days. Day zero represents the announcement date of the private placement. The wall-crossing of potential investors happened in the days before day zero. As mentioned, the line represents the size of short positions, and thus represents people's belief that share prices will fall.

14 See http://www.sec.gov/litigation/litreleases/lr19227.htm

Short Interest Around the Announcement of a Private Placement



We can see that people already start betting on price decreases before the information of a private placement is publicly released. We can especially observe an increase in short interest about four days before the public announcement. This seems suspicious, and it could be that investors illegally use the information that they receive during the wall-crossing procedure to trade on the stock before they are allowed to do so.[15]

Hence, we document significant pre-announcement increases in average short interest, which is evidence of information leakage. But we conduct more tests. We also find that abnormal pre-announcement increases in short interest are negatively related to the stock price reaction to the public announcement of the private placement. In other words, if there is more betting on negative news coming out, it turns out that it is indeed more likely that the private placement will negatively affect the stock price. This result suggests that some privately-informed investors take speculative positions prior to the announcement in order to profit from this information. And these profits can be substantial.

Furthermore, we find that short selling before the announcement is more pronounced when more buyers are involved in the private placement. Observing more buyers typically means that more people had inside information. The graphs below again show short positions around the announcements of privately placing convertible bonds, but we now distinguish between issues with a single buyer and issues with more than ten buyers.

15 Short selling after the announcement of convertible bonds is common. See, for example, Brown, S.J., Grundy, B.D., Lewis, C.M., and Verwijmeren, P., 2012, "Convertibles and hedge funds of distributors of equity exposure" (Review of Financial Studies 25, 3077-3112).

Short Interest Around the Announcement of a Private Placement

With one buyer, it is not very likely that insider trading occurs, as the chance of getting caught seems high, and the buyer often forms a strategic partnership with the issuer. Indeed, in the graph, there are no strong movements before the offering. After the offering, short positions decrease. The reason for this decrease could be that the chances the firm will default have decreased now that a single large investor has committed to being highly involved in the firm.

The graph looks very different with many buyers. Short interest increases from about 8% in the month before the announcement to about 10% just before the announcement. It seems that having a larger number of buyers increases the probability that at least some privately-informed investors are willing to risk possible prosecution by short selling before the public announcement. As such, this result also hints at people with private information using their information before the information is publicly released.

The results have regulatory implications and suggest that the limited resources of the regulators should be focused on examining placements with a large number of wall-crossers, and possibly those with strong announcement effects. Furthermore, the results suggest that regulators may wish to provide more extensive and timely disclosures of short interest. This would be of great interest to the parties directly involved in private placements, and would help market participants and enforcement authorities in filtering out suspicious private placements.

7. Conclusion

What we observe may be the tip of the iceberg. People can bet on changes in stock prices or in other securities in many ways. For example, instead of short selling, people can bet on decreases in stock prices by buying put options. Luckily, data on option trading have also improved in recent years. Further analysis would therefore involve examining other financial instruments, such as derivatives. Of course, there might always be things that remain hidden, even with the increasing quality of data.

Still, I believe research in forensic finance is important. It can highlight suspicious patterns, after which financial media or authorities might take over. As a conclusion, let me provide some additional reasons for why I think forensic finance is useful.

First, forensic finance improves our understanding of how people and markets operate. Studying suspicious behavior shows where proper regulation, monitoring, and personal and corporate integrity are and are not in place.[16] In some circumstances reputational effects might withhold people from committing fraud, while in other circumstances they might not. By studying where suspicious behavior is more widespread, we can get more insights into the dynamics of fraud, which could help in designing new systems. In the end, we might learn more from failures of systems than from successes.

Second, financial researchers can look at various markets and countries to look for solutions to particular problems. Researchers have the tools to systematically examine whether suspicious behavior is the exception, or whether it has spread among markets and countries. Markets without the suspicious patterns might provide ideas for solutions. Let me illustrate this by again focusing on wall-crossings. An increasing number of securities in the United States are placed over the weekend, or even overnight. For example, this means that an investor is called on Friday night after the stock market has closed, to ask whether he or she is interested in participating. The investor can decide on Saturday and the public announcement can then be on Sunday or Monday morning, before the opening of the stock market. These procedures would really make insider trading much more difficult.

16 For a similar argument, see Karpoff, J.M., 2013, “Reputation and the invisible hand: Financial misconduct research” (http://www.victoria.ac.nz/sacl/about/events/fmcgc2013/programme/jon-karpoff.pdf).

A third reason why forensic finance might be useful is that just by studying suspicious behavior, some of the problems might already disappear. Sunlight is often said to be the best disinfectant. If investors know that their actions are being watched, they might be more likely to refrain from any illegal behavior. Forensic finance thus has the ability to increase the integrity of financial markets.

Fourth, if forensic finance reduces the value of private information and leads to better regulations, it could lower the overall level of information asymmetry in the market. Consequently, if potential investors feel that they don’t have a great disadvantage compared to other stock market participants, they might be more likely to invest and the cost of capital for firms could reduce, which would ultimately lead to higher economic growth. In other words, in the long run, forensic finance could restore some of the trust in financial markets. And it is obvious that trust is essential in financial markets, as people part with their money in exchange for promises.

Fifth, forensic finance is linked to popular outrage in society. The general public seems to feel that privileged insiders have unfair advantages (just think of the Occupy Wall Street movement). So shouldn’t academics attempt to serve society? I think that forensic finance provides an opportunity to conduct research about issues that people in society care about, such as fairness.

My final reason why I like research on forensic finance is simple. In the end, who doesn’t like a good crime story?

8. Words of Thanks

I would like to thank a number of people who helped me reach this stage in my career. I'd also like to thank Erasmus University Rotterdam and Erasmus School of Economics for bestowing me with this honor. I'll do my utmost to live up to expectations.

As a young boy, I didn't dream of an academic career, but of becoming a firefighter, a fighter pilot, or a soccer player. As a student, I considered it likely that I would start working for a bank. It was Miguel Rosellon who, when supervising my master thesis, recognized my potential and recommended me for a PhD position, supervised by Abe de Jong and Marno Verbeek. It has changed my life dramatically, and I'm convinced it has changed for the better. I am very grateful for the opportunities presented to me to start an academic career.

I did my tenure track in Australia, where I joined the group of the inspiring Paul Kofman in Melbourne, and had an amazing time. In Australia I met Bruce Grundy, with whom I have written quite a few articles. Bruce is one of the kindest persons I know, and incredibly bright. I feel extremely honored that I can perform research with such a brilliant individual.

I've been very fortunate with my co-authors. There are too many to thank here individually, but they really make doing research so much more fun and rewarding.

After my time in Australia, I moved to the Vrije Universiteit in Amsterdam, but a few years later Willem Verschoor and Philip Hans Franses persuaded me to join Erasmus School of Economics. I am again very grateful for this opportunity, and for the trust presented in me, also by Bas Donkers. I would further like to thank my colleagues and students for providing such a friendly and positive working environment.

Uiteraard wil ik hier ook mijn vrienden, familie en schoonfamilie bedanken. Ik ben mijn ouders dankbaar voor hun onvoorwaardelijke liefde en steun. Ik ben ook oneindig trots op mijn jonge gezinnetje. Melissa is de liefde van mijn leven, en enkele maanden geleden is onze zoon Dylan geboren. Ik hoop nog heel lang van jullie te genieten.

Thank you.

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