Financial market supervision in the 21st century

P.J. Hagoort[1]

Erasmus University, Rotterdam, The Netherlands

November 2nd, 2017

Supervisor:
Dr. Ruben Cox

Second Assessor:
Dr. Jan Lemmen

Abstract

This study examines whether stronger trading rules improve market efficiency by ensuring that information is immediately reflected in stock prices. Furthermore, the implementation of MiFID is used as a natural experiment to assess the impact of exchange rule restrictions. The results reveal that trading rules pertaining to market manipulation, insider trading and the broker-agency conflict do not improve market efficiency. However, trading rules limiting the broker-agency in combination with proper governance does lead to a more effiicient market. Furthermore, fragementation and fiercer competition among European stock exchanges, as a result of MiFID, has not led to an increase in efficiency. Therefore, this study finds little justification of securities market regulation with respect to market efficiency.

[1] MSc Financial Economics (427421), ESE, Erasmus University, Burgemeester Oudlaan 50, 3062 PA Rotterdam

Table of contents

1. Introduction

Decades ago, the Efficient Market Hypothesis (EMH) was widely accepted by academic financial economists. In general, the EMH states that all information was immediately reflected in stock prices. Newly revealed news spreads very quickly and is incorporated in the prices of securities without delay. Hence, without acquiring additional risk, neither technical analysis nor fundamental analysis would provide investors with excess rates of return. The economist who is arguably most responsible for bringing the EMH under attention to the rest of the profession is Eugene Fama. He provided evidence, that, at least on a short-term basis, stock markets are weak-form efficient, meaning that stock prices follow a random walk (Malkiel & Fama, 1970).

By the start of the twenty-first century, the intellectual dominance of the efficient market hypothesis has become far less universal. Anomalies and financial crises shed new light on the EMH, casting doubt on the belief of efficient markets. One of the main challengers of the idea that financial markets are efficient is Robert Shiller. He showed that the stock market bounced up and down a lot more than it would be as predicted by the efficient markets model, which are based on economic fundamentals such as earnings and dividends. The discovered anomalies could be considered to be small departures from market efficiency, but if most of the volatility in the stock market is unexplained, it would call the basic underpinnings of the EMH into question. Shiller (1981) argues that the observed excess volatility implies that changes in prices occur for no fundamental reason at all, that they occur because of such things as "sunspots" or "animal spirits" or just mass psychology. In contrast, Fama argues that the discovered anomalies are indicators of unidentified risk factors, in the sense that small stocks tend to be riskier than large stocks, and that investors' tolerance for risk tends to vary over the economic cycle (Fama & French, 1993).

In his work on stock prices, Shiller recognized the importance of psychological factors which, in turn, laid grounds for the field of behavioural finance. In particular, he states that most investors do not have the capacity or inclination to make comparative investment decisions independently; investors are heavily influenced by others in making trading decisions. As a result, there is a group dynamic to the decision-making process, providing a setting in which rumours and fads can be disseminated rapidly contributing to the creation of bubbles (Shiller, 1981). Fama does admit that poorly informed investors could make decisions based on poor judgement, leading to somewhat irrational stock prices in times of economic booms and busts (Fama & French, 2008). However, the predictable patterns and stock price irregularities are unlikely to persist and periods of bubbles are an exception rather than the rule. Moreover, his belief in stock market efficiency persists. In 2013, both economists have been awarded with a Nobel Prize for their contributions in the research of market efficiency, that they share together with Hansen.

The literature leaves us with competing visions of the world of securities trading as to whether they are efficient or not. Nevertheless, stock exchanges around the world place great importance on market efficiency. They invest considerable manpower, technological effort and financial resources to

promote integrity and market efficiency. This while the impact of regulation and need for financial market regulation is still open for debate. Opposing views exist on whether financial market regulation is required and, if it is, whether it has the desired effect. In addition, differences in enforcement, penalties, interpretation and definition of trading rules exist across exchanges. Despite the diverging developments in the market efficiency literature and the progressive need for securities market regulation, a dearth of attention has been paid to the differences across exchanges with respect to exchange trading rules. It brings the question to light whether the differences in exchange trading rules matter for market efficiency.

This study tries to answer this question by examining the weak form market efficiency hypothesis. It examines whether stronger trading rules improve market efficiency by ensuring that information is immediately reflected in stock prices, resulting in independent price changes. Different trading rules indices are established to study the differences in regulation across the exchanges, with a focus on market manipulation, insider trading and the broker-agency conflict. The latter principal agent problem could arise from the failure of the broker to obtain the best price for a client, charging excessive fees, or investing in securities that do not match the risk-return profile of its client. All of which are detrimental to its clients' interests (Cumming, Johan, & Li, 2011). Furthermore, the implementation of MiFID is used as a natural experiment to assess the impact of exchange rule restrictions.

The results reveal that trading rules limiting the broker-agency conflict increase market efficiency. In particular, it is not the level of trading rules per se that is important to market efficiency but rather its combination with proper governance. Its impact is especially pronounced during the recent financial criss, a period characterized by high uncertainty. This suggest that the broker-agency conflict is critical in securities regulation. Therefore, in the future, securities regulation should focus on the conflict of interest between the broker and its client. The impact of restrictions on insider trading runs counter to the aim of trading rules (i.e. it decreases market efficiency). This result could imply that indeed insider trading leads to more informationally efficient stock prices. Or, in contrast, it could imply that insider trading rules are not properly enforced. Keeping an eye on every transaction might be too ambitious. Instead, the regulator focuses on the large transactions, which could lead to excessive profits, overlooking the relatively small trades. Furthermore, trading rules preventing manipulators to distort prices at the expense of other market participants have an ambiguous impact on market efficiency. This could be caused by its imprecise definition, which makes it difficult to formulate and quantify trading rules accordingly. As a result, no definite conclusions regarding both its impact on market efficiency and its importance in securities regulation can be drawn. It has to be concluded that the main objective of MiFID to increase market efficiency has not yet been reached. The additional requirements and strenghtened transparency rules did not lead to a more efficient market. The revision of MiFID (i.e. MiFID II) is likely to correct this by

strengthening and reforming current requirements to create more efficient, transparent and resilient capital markets.

This study is organized as follows. Section 2 summarizes previous research examining the need and impact of financial market regulation as well as the differences in regulation across exchanges. The hypotheses are formulated in Section 3, the data and methodology in Section 4 and 5, respectively. The results and concluding remarks follow in the last two sections; Section 6 and 7.

2. Literature review

2.1 Market efficiency

The essential role of the capital market is the allocation of ownership of an economy's capital stock. Generally, an ideal market provides accurate price signals that 'fully reflect' all available information at any point in time. In this market, firms and investors can make adequate production- and investment decisions to obtain the most efficient resource allocation. According to the Efficient Market Hypothesis (EMH), a market in which prices reflect accurate signals is called 'efficient' (Malkhiel & Fama, 1970).

Analysts classify market efficiency into three possible varieties: (1) the strong form, (2) the semi-strong form and (3) the weak form. The strong form hypothesis states that stock prices reflect all available information in a market. The semi-strong form argues that stock prices reflect all publicly released information. Finally, the weak form efficiency hypothesis states that only past information is incorporated in stock prices. The latter entails that if the flow of information is unimpeded and information is immediately reflected in stock prices, tomorrow's price change will reflect only tomorrow's news. In addition, tomorrow's price change will be independent of the price changes today, meaning that past movements in prices cannot be used to predict future movements. As a result, price changes represent random departures from previous prices and, therefore, stock prices follow a random walk (Malkiel, 2003).

The vast majority of studies examine the weak form efficient market hypothesis. Using serial correlations and runs tests, no large degree of dependence in stock prices is found in the short-run (Fama, 1965b). This result is in line with the view that the stock market has no memory. However, more recent work by Lo and MacKinlay (2002) reveals that short-run serial correlations are not zero, enabling them to reject the hypothesis of stock prices behaving as random walks. Also, and more generally, information efficiency implied by the EMH is examined. Fama, Fisher, Jensen and Roll (1969) state that the information implications regarding a stock split are fully reflected in the price of a share almost immediately after the announcement date, supporting the semi-strong form efficient market hypothesis. In contrast, Grossman and Stiglitz (1980) argue that it is impossible for a market to be perfectly informationally efficient. This is because information is costly, and investors who spent time obtaining and analyzing it would not be compensated if they were. Hence, a market

equilibrium model must leave some incentive for information gathering. Furthermore, the existence of trading costs is difficult to reconcile with the strong form efficient market hypothesis. In addition, Niederhoffer and Osborne (1966) find that specialists on security exchanges have monopolistic access to information and use this information to generate profits. Both conclusions result in the rejection of the strong form efficient market hypothesis.

It should be noted that the abovementioned studies examine market efficiency in the context of a pricing model, because market efficiency per se is not testable. Therefore, the possible misspecification of the model has to be accounted for. For example, the market might be efficient; however, the model might be miss-specified, leading to the wrong conclusion. This problem is known as the joint-hypothesis problem (Fama, 1991).

2.1.1 Anomalies

Subsequent studies on market efficiency have revealed predictable patterns in stock returns. Therefore, many financial economists have argued that stock returns are at least partially predictable. These predictable patterns, either time series or cross-sectional, are difficult to reconcile with the EMH and are denominated as anomalies accordingly.

The anomalies have enabled investors to earn excess rates of return. For example, investment strategies investing in small company stocks tend to outperform those who invest in large company stocks (Fama & French, 1993). In addition, several studies suggest that stocks with a low book-to market-ratio (‘value’ stocks) earn a relatively higher return than stocks with a high book-to-market-ratio or (‘growth’ stocks). Investors bid up the price of stocks they are satisfied with in terms of high quality, expansion and rising earnings. This, in turn, causes prices to rise faster than earnings, which is reflected in a high price-earnings ratio. Upward price trends are eventually subject to slow-down or reversal (Nicholson, 1960 and Banz, 1981). Furthermore, Jegadeesh and Titman (1993) demonstrate that recent top performing stocks (worst performing stocks) tend to keep increasing (decreasing), implying that one should buy past winners and sell past losers to outperform the market. This theory is known as the momentum effect, and builds on the argument that as investors tend to overreact to information, consequently so will stock prices.

The explanation of the profits resulting from investing in one of the abovementioned anomalies is still open to debate. Some have argued that the results provide strong evidence of market inefficiency, while others have argued that the returns from these strategies are a compensation for risk. Nevertheless, the number of documented anomalies is large and continues to grow.

2.1.2 Crises

Another argument that markets might not be efficient originates from recent market history. Critics argue that there are several instances where market prices could not have been set by rational investors. For example, the crash of 1987, where the stock market lost about one-third of its value

from early to mid-October with essentially no change in the general economic environment. This drop in prices is difficult to explain when at both points in time the market is assumed to be efficient.

Malkiel (2003) argues that there were changes in the economic environment that might have altered investors' view regarding the proper value of the stock market. He states that the decline in stock prices could be allocated in part to the increase in yields on long term Treasury bonds. Stock prices can be highly sensitive to interest rate changes and risk perceptions, which resulted in a decline in their value. In addition, a number of political events might have rationally increased the risk perception as well. In the US, for instance, Congress threatened to impose a 'merger tax' that would have made merger activity prohibitively expensive. Other examples of irrational pricing are the Internet Bubble of the Late 1990s and the spinoff of Palm Pilot from its parent 3Com Corporation.

All in all, some market participants are less than rational and investors will make decisions based on poor judgement. This leads to pricing irregularities and even predictable patterns in stock returns that can persist for short periods. As pointed out by Grossman and Stiglitz (1980) there must be an incentive for investors to uncover information, meaning that the market cannot be perfectly efficient. However, the predictable patterns and irregularities are unlikely to persist and periods of bubbles are an exception rather than the rule. Moreover, the belief in stock market efficiency persists and the discovery of patterns in stock market returns will not provide investors with a method to obtain extraordinary returns (Malkiel, 2003).

2.2 Regulation and efficiency

As mentioned, accurate price signals, reflecting all the available information, are essential to an efficient allocation of capital stock. In addition, it puts investment capital and other scarce resources to their most productive use (Stout, 1988). Therefore, improving market efficiency is an important goal of securities market regulation.

Several studies have investigated the impact of regulation on market efficiency. Opposing views exist on whether financial market regulation increases or decreases market efficiency. According to the perspective of 'law and economics', financial market regulation is unnecessary. As financial contracts take place between sophisticated issuers and sophisticated investors. These sophisticated investors are able to penalize firms that fail to disclose information or when they do not treat investors right. Therefore, the security issuers have an incentive to bind themselves through contracts with investors to limit expropriation. As long as these contracts are enforced, financial markets do not require regulation (Stigler, 1964). However, the securities market is not only comprised of sophisticated investors. It is precisely the goal of securities market regulation to protect the innocent (unsophisticated) investor. Nevertheless, Stigler (1964) argues that the Securities and Exchange Commission (S.E.C.) registration requirements had no important effect on the quality of new securities sold to the public, leaving his position on the importance of regulation unchanged.

On the contrary, legal rules and regulation to protect investors might also encourage the development of financial markets (Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998). Using a sample of 49 countries, they show that the legal environment matters for the size and extent of a country's capital markets. In particular, countries with limited investor protections, measured by both the character of legal rules and the quality of law enforcement, have smaller and narrower capital markets. This is supported by the research of Antoniou, Ergul and Holmes (1997). They have investigated market efficiency of the Istanbul Stock Exchange (ISE), an emerging market. The results indicate that changes in the regulatory structure have encouraged participation in the ISE, which improved the quality of information available to market participants. Both effects led the market to become more efficient.

2.3 Differences in regulation across exchanges

Differences in securities market regulation exist across exchanges. For example, the NASDAQ has detailed rules that explicitly prohibit specific manipulative practices and broker-agency conflicts. While other exchanges have broadly framed rules regarding what constitutes as market manipulation or broker-agency conflicts (Cumming, Johan, & Li, 2011). Considering this, this section is dedicated to the differences in various laws and their enforcement as part of securities market regulation.

2.3.1. Types of legal traditions

Laws protecting the investor vary across countries, in part because of their legal origin and traditions. Two broad legal traditions can be distinguished: (1) civil law and (2) common law. The former one is the oldest, most influential and most widely distributed around the world. In general, common law is more protective of investors than civil law. Legal scholars typically identify three common families of laws within the civil-law tradition: (1) the French Commercial Code, (2) the German Commercial Code and (3) the Scandinavian family. The law of England is the only law included in the common-law family. The resulting laws reflect both the influence of their families and the revisions specific to individual countries (Porta et al., 1998). The following briefly discusses the differences in security regulation across exchanges by focusing on three classes of trading rules: insider trading rules, the broker-agency conflict and market manipulation.

2.3.2 Insider trading rules

Two examples of insider trading are (1) client precedence and (2) front-running. In both cases, brokers use the information of a client's order. The brokers initiate a trade shortly ahead of the execution of a client's order, resulting in a worse price for their client. Front-running can also involve brokers who take the opposite position to their client's order without their knowledge. Immediately after the trade, the same broker crosses with the same client off-market at a profit. Other forms of insider trading concern market participants trading on material non-public information. Although

rules prohibiting insider trading are common around the world, specific regulations with respect to insider trading differ significantly across exchanges (Cumming et al., 2011).

Thompson (2013) investigates insider trading regulation and enforcement in fourteen countries and their exchanges throughout the world. He argues that the United States is the world leader in insider trading law. Some countries are strengthening their laws as well, some are not enforcing those in place and others are only beginning to establish insider trading laws. He finds that all countries agree on the broad definition of an 'insider' and 'insider trading'. Nonetheless, the countries include different additional provisions to the interpretation of an insider. All countries have a federal organization enforcing the law, with the sole exception of Canada, where regulatory duties are delegated to individual provinces. Furthermore, almost every country has specific fees and fines in place against insider trading; ranging from JPY3 million in Japan to an unlimited amount in the United Kingdom.

2.3.3 Broker-agency conflict

The broker is supposed to act on behalf of its client; however, by doing so it might operate in ways that are against its clients' interests. For example, the broker might fail to obtain the best price for its client. In addition, the broker could charge excessive fees or invest in securities that do not match the risk-return profile of its client. All of which are detrimental to its clients' interests (Cumming et al., 2011).

Important measures to tackle the broker-agency conflict are market surveillance and an efficient, legal environment, with high standards of transparency and integrity. Porta et al. (1998) find significant differences among countries in the quality of law enforcement as measured by the efficiency of the judiciary. They reveal that richer countries have a higher quality of enforcement than poorer countries. Specifically, Scandinavian and German legal origin countries receive the highest score, while French legal origin countries have the worst quality of law enforcement.

2.3.4 Market manipulation

Market manipulation is not explicitly defined in regulatory statutes. A common approach used to define manipulation is 'conduct intended to induce people to trade a security or force its price to an artificial level' (Fischel & Ross, 1991; Kyle & Viswanathan, 2008). Market manipulation has a direct effect on market efficiency by distorting prices and resource allocation. Despite its detrimental effects, only limited empirical research exists on its implications. This is because only a fraction of manipulation is detected and only a subset of detected manipulation is prosecuted (Comerton-Forde & Putniņš, 2011). Gerace, Chew, Whittaker & Mazzola (2014) argue that the effectiveness of the trading rules must be called into question if manipulation cannot be defined with precision. Nevertheless, the consensus view is that laws are required to effectively prosecute and deter market manipulation.

Bromberg, Gilligan & Ramsay (2016) compare sanctions imposed for trade-based market manipulation in Australia, Canada (Ontario), Hong Kong, Singapore and the United Kingdom (UK). The examined countries differ in their interpretation of market manipulation and imposed penalties. In the period 2006 through 2015, the number of defendants who received a sanction for market manipulation was highest in Hong Kong and lowest in Canada. In contrast, the relative enforcement intensity is highest in Singapore and lowest in the UK. Furthermore, the proportion of market manipulation defendants receiving sanctions was highest in Hong Kong (62%) and lowest in the UK (0%). Therefore, it can be concluded that even in jurisdictions with very similar legislation on market manipulation, different approaches are being used to enforce market manipulation laws.

2.4 Impact of regulatory differences

The previous section illustrates the differences in trading rules across exchanges. These differences might help to explain the diversity across exchanges.

2.4.1 Regulation as a source of international differences in stock markets

Cumming et al. (2011) examine whether differences in trading rules can help to explain the differences in liquidity among exchanges. They create new indices for trading rules pertaining to market manipulation, insider trading, and broker–agency conflict for 41 stock exchanges. The included stock exchanges extend to both developed and emerging markets from 2006 through 2008. To assess the impact of regulation on market liquidity, three different measures of liquidity are used: (1) a relative bid-ask spread, (2) velocity and (3) volatility.

Vaguely formulated trading rules could create inefficiencies as investors and traders are not clear as to which activities are acceptable and which ones are not. Therefore, detailed rules could generate greater investor confidence, reduce uncertainty and improve trading activity. On the other hand, investors could take advantage of loopholes within these detailed trading rules, which in turn reduces liquidity. Their results show that detailed trading rules are positively associated with velocity and negatively associated with volatility and bid-ask spreads. In addition, exchange trading activity is closely related to trading rules in regard to insider trading and market manipulation. However, it is not statistically significant related to rules pertaining to the broker-agency conflict. All in all, regulation in the form of trading rules facilitates trading velocity and reduces market volatility across exchanges (Cumming et al., 2011).

A subsequent study of Cumming and colleagues shows that stock exchange trading rules are also of central importance for the trading location of cross-listed stocks. The previously defined indices are reused to examine whether sovereign governance and exchange rules drive the trading location for non-US firms that cross-list in the US. The results reveal that stricter exchange trading rules increase trading on non-US exchanges for cross-listed stocks. However, the benefit of more rules diminishes as

trading and compliance become more costly and the non-US market loses its 'cheap compliance' competitive advantage (Cumming, Hou, & Wu, 2015).

Furthermore, the effectiveness of a country's legal institutions and trading rules is related to cross-country differences in the cost of equity capital (Hail & Leuz, 2006). A well-functioning legal system should protect investors and, therefore, improve firm's ability to raise external finance. The results indicate that firms in countries with more extensive disclosure requirements and stronger securities regulation display a lower cost of capital. A higher quality of the legal system is also associated with lower cost of equity capital. These results are especially significant in segmented, less integrated economies. This is consistent with the notion that integrated capital markets enable risk sharing (Hail & Leuz, 2006).

2.5 Markets in Financial Instruments Directive (MiFID)

Exchange trading rules are not amended very frequently; they are instituted over time. Most notably, the European exchanges experienced a significant change in securities regulation in November 2007, when the Directive on Markets in Financial Instruments (MiFID) became effective. The objective of MiFID is to increase both investor protection and competition in European financial markets by creating a single market for investment services and activities. Overall, it is designed to foster an integrated European financial market that is fair, competitive, transparent and efficient (European securities and markets authority, 2017).

2.5.1. Consequences of MiFID

Various studies have examined the impact of MiFID on European financial markets. One of the aims of MiFID is to increase transparency, which is investigated by Preece (2011). Under MiFID, multilateral trading facilities (MTFs) as well as regulated markets (RM) must publicly post current bid and offer prices to improve pre- and post-trading transparency. Even with these requirements in place, the quality, consistency, and reliability of reported data may differ. This means that transparency varies amongst different classes and sizes of orders. Preece (2011) shows that equity trading in Europe is roughly split in half between trades through transparent markets (RMs and MTFs) and trades executed in less transparent OTC capacity. No significant trend, either upward or downward, can be found post- MiFID for the transparent markets. Even though MiFID strengthened transparency rules, investors did not increase their trading towards the transparent markets. However, the implementation of MIFID has shifted trade to exchanges in the EU from exchanges in the USA, implying that it has at least partially succeeded in its aim of increasing trade in the EU (Cumming et al., 2015).

Furthermore, MiFID has fostered competition between stock exchanges and alternative trading systems, leading to a more fragmented market. The effect of larger fragmentation on market efficiency is ambiguous. For instance, Mendelson (1987) and Bennett and Wei (2006) show that

fragmentation can result in less liquid and less efficient markets. In contrast, Cumming et al., (2011) show that MiFID has had a positive impact on market liquidity. In addition, it is shown that the increased market fragmentation has led to an improvement in price efficiency (Riordan, Storkenmaier, & Wagener, 2010).

The Chartered Financial Analyst (CFA) Institute has a more moderate view by arguing that there is no evidence that the fragmentation of the market has weakened the price formation process. Using a survey, they find that the overall bid-ask spread has fallen after the introduction of MiFID. This trend is particularly pronounced in the UK, the most fragmented European market (Chartered Financial Analyst, 2009). However, the market fragmentation has made it harder for institutional investors to fulfil their post-trade reporting obligations. In addition, investors find it costly or prohibitive to access multiple sources of data. They do not have fair access to the appropriate data, making it difficult to paint an accurate and complete picture of market prices (Chartered Financial Analyst, 2009). This finding is in line with the research of Preece (2011) which revealed no significant trend of trading towards transparent markets.

2.5.2 Costs of MiFID

The implementation of MiFID is accompanied by an increase in compliance costs. Many financial firms had to alter computer systems and compliance procedures. These costs, however, do not need to be overwhelming; large investment banks frequently update such systems (Economist, 2006b). The Europe Economics Chancery House has tried to quantify the compliance costs of financial regulation by means of interviews. They have focused upon a few Directives which are important parts of the FSAP, including MiFID. Four sectors within the financial service industry in the EU are taken into account: (1) banks and financial conglomerates, (2) asset managers, (3) investment banks and (4) financial markets. Comparing the one-off costs among the different directives and sectors, reveals that MiFID can widely be seen as a driver of substantive cost. MiFID is not only a driver of one-off costs; it is also an important driver of ongoing costs. All in all, the participants identify MiFID as being one of the most significant cause of regulatory-driven increased cost in recent times (Europe Economics Chancery House, 2009).

Other critics argue that the benefits of a single market might not outweigh the costs. Casey and Lannoo (2006) argue that the proposals of MiFID are too cumbersome and may end up hurting smaller banks. This is because the new rules are too onerous to absorb and too demanding that firms, especially smaller brokers, might prefer to stay out of certain business lines. Nevertheless, bigger banks will benefit from MiFID, since its proposals will allow them to compete with exchanges on the continent. The view that MiFID will hit medium sized companies the hardest is supported by The Economist (Sept. 7th, 2006). Under MiFID, businesses can operate across the EU under authorisation of their home regulator. This increased competition will negatively affect middle-market financial

firms, since they will have difficulty competing with big investment banks. As a result, the promises of MiFID to improve competition and transparency might not have the desired effect.

3. Hypotheses

Supported by the literature studies, it can be concluded that securities market regulation is an important factor dividing stock exchanges. Differences in enforcement, penalties, interpretation and definition of trading rules exist across exchanges. In addition, there is an ongoing debate concerning the role and impact of securities regulation on market efficiency. Opposing views exist on whether financial market regulation is required and, if it is, whether it has the desired effect. This study continues the research on the impact of securities regulation. Specifically, it examines whether the differences in exchange trading rules can explain the differences in stock exchange efficiency across states. Consequently, the following hypothesis is tested:

Hypothesis 1: Stronger securities regulation is positively related to market efficiency.

The implementation of MiFID is used as a natural experiment to assess the impact of exchange rule restrictions. MiFID has fostered competition between stock exchanges and alternative trading systems, leading to a more fragmented market. This fragmentation can result in less liquid and less efficient markets (Mendelson, 1987; Bennet & Wei, 2006). However, MiFID is found to have a positive effect on market liquidity and price efficiency (Cumming et al., 2011; Riordan et al., 2010). The London Stock Exchange already had trading rules in place that were analogous to the new rules in MiFID. While others, such as the Austrian Exchange, had significantly less detailed rules prior to MiFID. Since MiFID only affects countries in the European Union, it creates a natural experiment to assess the impact of exchange rule restrictions. In addition, it is part of the European Union's Financial Services Action Plan (FSAP); therefore, endogeneity issues that relate rule changes to market outcomes are minimized. This study examines whether the implementation of MiFID, across European financial markets, has led to more efficient market. As a result, the second hypothesis is formulated as:

Hypothesis 2: The implementation of MiFID in European Financial markets is positively related to market efficiency.

4. Data description

The following paragraph describes the data used to test the above mentioned hypotheses. Firstly, paragraph 4.1. discusses the sample and investigated period. The included variables are addressed in paragraph 4.2. The section is concluded with descriptive statistics of the included variables in paragraph 4.3.

4.1 Sample

The sample is made up of 41 exchanges worldwide that are members of the World Federation of Exchanges and whose trading data is included in commonly used data sources such as Bloomberg. The sample covers Argentina, Australia, Austria, Bermuda, Brazil, Canada, China (Shanghai and Shenzhen), Chile, Colombia, Egypt, Euronext (France, England, The Netherlands, Portugal and Belgium), Germany, Greece, Hong Kong, India (Bombay and the National Stock Exchange of India), Indonesia, Ireland, Israel, Italy, Japan, Korea, Malaysia, Mexico, New Zealand, Norway, Peru, Philippines, OMX (Sweden, Finland, Denmark), Singapore, Slovenia, Spain, Sri Lanka, Switzerland, Taiwan, Thailand, Turkey, the UK, and the US (Nasdaq and NYSE).

The investigated time period runs from January 2006 up to and including December 2008. The performance of an exchange is proxied by an index, reflecting an adequate representation of the underlying consistuent stocks[2]. Bloomberg is consulted to extract weekly last price data and returns are calculated accordingly. All variables are expressed in US dollars.

4.2 Variable description

This paragraph discusses the included variables and indices that measure exchange trading rules (4.2.1), market efficiency (4.2.2), enforcement of trading rules (4.2.3) and exchange characteristics (4.2.4).

4.2.1 Trading rules indices

The regulation and rules that regulate the activities within a stock market and the conduct of its participants are captured in trading rules. Different indices are established to study the differences in regulation across the exchanges. This study focuses on three main indices pertaining to market manipulation, insider trading and the broker-agency conflict. Market manipulation is referred to as trading practices that distort prices and enables manipulators to profit at the expense of other market participants. Insider trading is referred to as acting on material nonpublic information. Lastly, broker-agency conflict is referred to as the actions that brokers could take that benefits himself at the expense of the client or the market. All while acting as the agent of a client (Cumming et al., 2011).

Every stock exchange outlines membership requirements, trading rules and prohibited trading practices. The three indices are created by summing up the number of specific provisions in each country[3]. As a result, every rule is equally weighted and perceived as equally important and a higher value is associated with stronger regulation. Although certain rules might be relatively more important, the results of Cumming et al. (2011) were not altered when the weights were adjusted. Therefore, this study continues with the equally weighted indices. Data on the specific trading rules are found on each exchange's webpage, with the exception of China. The pertinent trading rules for

[2] Appendix, Table 1
[3] Appendix, Table 2, 3 and 4

the Shanghai and Shenzhen exchange are obtained from the China Securities and Regulatory Commission. The Canadian trading rules are found in the independent regulatory body known as the Investment Industry Regulatory Commission of Canada (Cumming et al., 2011).

4.2.2 Measure of market efficiency

This study complements previous research that has examined the weak form market efficiency hypothesis. In particular, it examines whether information is immediately reflected in stock prices and if price changes are independent. If so, stock price changes represent random departures from previous prices, hence they follow a random walk. Past movements in prices cannot be used to predict future movements, making it impossible to outperform the market without assuming additional risk. Nevertheless, predictable patterns, enabling investors to earn excess rates of return, have been discovered.

Market efficiency is measured by the weak form variance ratio test of Lo and Mackinlay (1988). The variance ratio methodology tests the random walk hypothesis against stationary alternatives. If P_t denotes the stock price at time t, then $X_t \equiv ln(P_t)$ denotes the log-price process. The main hypothesis can, therefore, be stated as:

$$X_t = \pi + X_{t-1} + \epsilon_t$$

where π represents an arbitrary drift parameter and ϵ_t the random disturbance term. Under the random walk hypothesis, increments in asset price series are serially uncorrelated. Therefore, the variance of the increments increases linearly in the sampling intervals. Specifically, the sample variance of the k-period return (or k-period differences), $X_t - X_{t-k}$, is k times the sample variance of one-period return (or the first difference), $X_t - X_{t-1}$ (Charles & Darné, 2009). The variance ratio at lag k is defined as:

$$V(k) = \frac{\frac{1}{k}[\sigma^2(X_t - X_{t-k})]}{\sigma^2(X_t - X_{t-1})}$$

Following Wright (2000) the variance ratio statistic (VR statistic) can be written as:

$$VR(x;k) = \frac{(Tk)^{-1}\sum_{t=k}^{T}(X_t - X_{t-k} - k\hat{\mu})^2}{T^{-1}\sum_{t=1}^{T}(X_t - X_{t-1} - \hat{\mu})^2}$$

with $\hat{\mu}$ the estimated mean of $X_t - X_{t-1}$. Under the null-hypothesis of a random walk, $VR(k)$ should equal unity. If returns, $X_t - X_{t-1}$, are positively (negatively) correlated autocorrelated, the $VR(x;k)$ should be higher (lower) than unity (Poterba & Summers, 1988).

Lo and Mackinlay (1988) argue that financial time series often possess time-varying volatilities and deviate from normality. Therefore, they propose a test statistic which is robust to many forms of heteroskedasticity and nonnormality but sensitive to correlated price changes. Assuming that k is fixed when $T \to \infty$, the test statistic is defined by:

$$M_2(k) = \frac{VR(X;k) - 1}{\phi^*(k)^{1/2}}$$

Under the null hypothesis that $V(k) = 1$, the test statistic $M_2(k)$ is asymptotically standard normal distribution. Where

$$\phi^*(k) = \sum_{j=1}^{k-1} \left[\frac{2(k-j)}{k}\right]^2 \delta(j)$$

$$\delta(j) = \frac{\sum_{t=j+1}^{T}(\gamma_t - \hat{\mu})^2\left(\gamma_{t-j} - \hat{\mu}\right)^2}{[\sum_{t=1}^{T}(\gamma_t - \hat{\mu})^2]^2}$$

with $j = 1, .., T-1$ and $\gamma_t = X_t - X_{t-1}$. A few assumptions underlying the variance ratio test have to be addressed. The variance ratio test depends on the essential property of the random walk, stated as:

$$E(\epsilon_t) = 0 \text{ and } E(\epsilon_t \epsilon_{t-1}) = 0 \text{ for any } \tau \neq 0 \quad \text{(A1)}$$

Furthermore, the allowed degree of dependence and heterogeneity is restricted to

$$\{\epsilon_t\} \text{ is } \phi(m)\text{-mixing with coefficients } \phi(m) \text{ of size } \frac{r}{(2r-1)}, \quad \text{(A2)}$$

$$\text{or is } \alpha\text{-mixing with coefficients } \alpha(m) \text{ of size } \frac{r}{(r-1)},$$

$$\text{where } r > 1, \text{ such that for all } t \text{ and for any } \tau \geq 0,$$

$$\text{there exists some } \delta > 0 \text{ for which } E|\epsilon_t \epsilon_{t-\tau}|^{2(r+\delta)} < \Delta < \infty$$

and

$$\lim_{T\to\infty} T^{-1} \sum_{t=1}^{T} E(\epsilon_t^2) = \sigma_0^2 < \infty \quad \text{(A3)}$$

For a sequence of the random vector ϵ_t, the mixing coefficients $\phi(m)$ and $\alpha(m)$ are defined as:

$$\phi(m) \equiv sup_n \phi(\mathcal{B}_{-\infty}^{\infty}, \mathcal{B}_{n+m}^{\infty})$$

$$\alpha(m) \equiv sup_n \alpha(\mathcal{B}_{-\infty}^{\infty}, \mathcal{B}_{n+m}^{\infty})$$

where $\mathcal{B}$ denotes the Borel field[4] generated by ϵ_t with $t = n, .., n+m$. The sequence, ϵ_t, is called ϕ-mixing if $\phi(m) \to 0$ as $m \to \infty$ and ϵ_t is called α-mixing if $\alpha(m) \to 0$ as $m \to \infty$. The mixing coefficients $\phi(m)$ and $\alpha(m)$ measure how much dependence exists between events seperated by at least m time periods. As $r \to \infty$, the sequence exibits more and more dependence, while as $r \to 1$ it exhibits less dependence (White, 2014). Both assumptions allow for general forms of heteroskedacticity; including deterministic changes in the variance of the error term as well as ARCH procesess, published by Engle (1982). The final assumption implies that the sample autocorrelations of ϵ_t are asymptotically uncorrelated.

$$\text{For all } t\ E(\epsilon_t \epsilon_{t-j}\ \epsilon_t \epsilon_{t-i}) = 0 \text{ for any } j, i > 0 \text{ and } j \neq i \quad \text{(A4)}$$

This study estimates the variance ratio test in a rolling matter, defined as the absolute value of the variance of monthly returns divided by four times the variance of weekly returns minus one. A higher

[4] A field is defined as a Borel field if it has the property that the sets $A_1, \ldots, A_n$ belong to it, and the sets $A_1 + \cdots + A_n$ and also $A_1 \cdots A_n$, (Papoulis, 1984).

variance ratio indicates lower market efficiency, as the return process deviates more from a random walk. Previous research by Chang, Luo and Ren (2014) and Saffi and Sigurdsson (2010) estimates the variance ratio in a similar matter.

4.2.3 Enforcement of trading rules

Securities market regulation is only effective if it is well enforced by regulatory commissions. The intuitive is that if regulatory institutions are weak, there is inadequate enforcement of securities laws. This rationale is supported by Bhattacharya and Daouk (2009) who state that no law can be superior to a good law that is not enforced. In addition, Cumming et al. (2015) find supporting evidence that stronger rules/laws are most effective if enforcement is also strong. Specifically, they find that exchange trading rules are complements with the home country institutional environment, measured by country-level governance standards. Therefore, the enforcement of the trading rules should also be considered.

Following Cumming et al. (2015), the enforcement of exchange trading rules is analyzed by the joint importance of trading rules and sovereign governance. Data on country governance is obtained from the World Bank governance indicators. The World Bank ranks countries on six dimensions of governance. It measures and ranks a government's effectiveness, corruption, political stability and absence of violence/terrorism, regulatory quality, voice and accountability and rule of law. These measures combine the views of a large number of firms, citizens and expert survey respondents in industrial and developing countries. The data sources are generated by a variety of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms (Kaufmann, Kraay, & Mastruzzi, 2011). An equal weighted average rank is computed using the six dimensions of governance, where a high score indicates better governance.

Furthermore, the board of directors is central to corporate governance mechanisms. It is presumed to carry out the monitoring function on behalf of shareholders. Its effectiveness in monitoring is determined by its independence, size and composition (John & Senbet, 1998). Some exchanges have two separate boards, an executive board and a supervisory board (i.e. two-tier system). The executive board operates as the everyday head of the business, while being supervised by the supervisory board. Other exchanges have only one body (i.e. one-tier system) representing both the leadership (executive directors) of the company and its supervision (non-executive directors). The necessity of independent directors, board composition and board committees are widely debated. It is argued that a two-tier board is more independent than a one-tier board, since its supervisory board is entirely composed of directors with no executive responsibilities (John & Senbet, 1998). Therefore, the enforcement and effectiveness of trading rules might be influenced by the board structure of the exchange. A distinction between a one-tier or a two-tier board is made using the BoardEx database. The BoardEx database contains biographical information on most board members and senior executives around the world.

4.2.4 Exchange characteristics

Differences among exchanges are also important to take into account when measuring market efficiency. In addition, the impact of securities regulation could depend on the characteristics of the exchange itself. For example, market liquidity is found to have an effect on market efficiency. In particular, the forecastibility of returns from lagged order flows are diminished in a liquid market. Moreover, variance ratio tests indicate that prices are closer to random walks in a more liquid regime (Chordia, Roll & Subrahmanyam, 2008). Besides its impact on efficiency, it is also found to be an important determinant of securities market regulation. Across exchanges, detailed trading rules are positively associated with velocity and negatively associated with volatility and bid-ask spreads. Therefore, securities market regulation in the form of trading rules increase market liquidity (Cumming et al., 2011). Both effects of liquidity should be accounted for. Following Cumming et al. (2011), liquidity is measured by trading velocity. Trading velocity is defined as the domestic share turnover per domestic market capitalization. High velocity is associated with high turnover of stock, meaning that shares change hands more frequently, which implies a more liquid market. Monthly values of trading velocity are extracted from the World Federation of Exchanges database.

Trading rules have a relatively large impact on a stock exchange where many stocks are traded. This implies that the size of the market should be reckoned with. Two variables are used to capture the size of the market: (1) market capitalization and (2) value of share trading. The value of share trading is commonly used as a measure of liquidity. The market capitalization of a stock exchange equals the total number of issued shares of domestic and foreign listed companies, multiplied by their respective prices at a given time. Only foreign companies that are exclusively listed on an exchange are considered in the market capitalization measure. The total value of shares traded equals the total number of shares trades, both foreign and domestic, multiplied by their respective matching prices. The figures are single counted (i.e. only one side of the transaction is considered). Both measures are available monthly at the World Federation of Exchanges database. Their values are converted into logarithms.

Furthermore, the investigated sample period is largely influenced by the recent financial crisis of 2007 – 2008, which might alter the results and conclusion. The impact of the financial downturn is taken into account by including year dummy variables.

4.3. Summary statistics

This paragraph provides a first impression of the data. Firstly, the index values for the trading rules for each exchange are explained. Secondly, the presence of outliers is discussed. Followed by a summary of the variables descriptive statistics. Finally, some prelimary tests are performed on the raw data.

Table 1 summarizes the index values for the trading rules for each exchange. The values are reported based on legal origin. As discussed, the indices are created by summing up the number of specific provisions in the exchange trading rules in each country.

Table 1.
This table presents the index values for the trading rules for each exchange, as defined in Table 2 - 4 in the Appendix.

	MM Index prior to MiFID	MM post MiFID	IT Index prior to MiFID	IT Index post MiFID	BA Index prior to MiFID	BA Index post MiFID
English legal origin						
Australia	6	6	2	2	0	0
Bermuda	5	5	2	2	2	2
Bombay	3	3	2	2	3	3
Canada	12	12	2	2	1	1
Hong Kong	7	7	0	0	0	0
India NSE	6	6	3	3	3	3
Ireland	12	2	2	0	0	0
Israel	3	3	1	1	0	0
London	13	12	3	2	0	0
Malaysia	2	2	7	7	2	2
NASDAQ	11	11	10	10	5	5
New Zealand	4	4	3	3	3	3
NYSE	13	13	7	7	3	3
Singapore	7	7	2	2	2	2
Sri Lanka	4	4	4	4	2	2
Thailand	8	8	1	1	0	0
Average	7.25	6.56	3.19	3	1.63	1.63
French legal origin						
Argentina	3	3	3	3	1	1
Brazil	1	1	1	1	0	0
Chile	0	0	0	0	0	0
Colombia	2	2	0	0	0	0
Egypt	2	2	0	0	0	0
Euronext	13	5	2	0	0	0
Greece	12	3	3	2	0	0
Indonesia	3	3	2	2	1	1
Italy	12	2	3	1	0	0
Mexico	6	6	2	2	0	0
Peru	0	0	0	0	0	0
Philippines	0	0	0	0	0	0
Spain	12	2	4	4	0	0
Turkey	0	0	0	0	0	0
Average	4.53	2.07	1.67	1.33	0.33	0.33

German legal origin						
Austria	12	1	2	0	0	0
Germany	12	1	3	2	0	1
Korea	9	9	3	3	2	2
Shanghai	5	5	2	2	0	0
Shenzhen	5	5	2	2	0	0
Slovenia	13	8	3	2	0	0
Switzerland	12	5	3	2	1	1
Taiwan	2	2	0	0	0	0
Tokyo	2	2	1	1	0	0
Average	8	4.22	2.11	1.56	0.33	0.44
Scandinavian legal origin						
OMX	12	6	5	4	2	2
Oslo	12	4	4	3	0	0
Average	12	5	4.50	3.50	1	1

Source: Cumming, Johan and Li (2011). MM Index denotes the Market Manipulation Rules Index, IT the Insider Trading Rules Index and BA the Broker-Agency Conflict Rules Index.

The table shows that, prior to MiFID, the Market Manipulation Rules Index ranges between zero (for Chile, Peru, Philippines, and Turkey) and 13 (for London, NYSE, Euronext Paris, and Slovenia). After the introduction of MiFID, the Market Manipulation Rules Index varies between zero (for Chile, Peru, Philippines, and Turkey) and 13 (for the NYSE). Therefore, MiFID has reduced the specific provisions pertaining to market manipulation. The Insider Trading Rules Index varies from a low value of zero (for Hong Kong, Chile, Colombia, Egypt, Peru, Philippines, Turkey and Taiwan) to ten (For NASDAQ) in the period preceding MiFID. After MiFID took its effect, the prohibitions on insider trading decreased for every European stock exchange, with the sole exception of Spain. Lastly, the Broker-Agency Conflict Rules Index, prior to MiFID, fluctuates between a low value of zero (for a number of exchanges shown in Table 1) and five (for NASDAQ). The implementation of MiFID increased the specific provisions pertaining to the broker-agency conflict in Germany, while leaving the other exchanges unchanged.

The examination of the data led to the discovery of one outlier in the variance ratio across countries. The Italian exchange, Borsa Italiana, experienced an unusually low return in October 2006, causing the variance ratio to increase over 51 points. Only one such value is observed in the entire dataset. To ensure that the results are not largely affected by this outlier, its value has been set to the mean value of the variance ratio of the Borsa Italiana[5]. The variable value of share trading, measuring the size of the exchange, is possibly subject to measurement error in December 2007. The World Federation of Exchanges reports that no shares were traded on the Bermuda Stock Exchange for the

[5] The outlier has a relative large impact on the correlation coefficients of the variance ratio. Specifically, every correlation coefficient is reduced.

reported month, which is highly unlikely. Therefore, this specific value is set to the average value of share trading of the Bermuda Stock Exchange. No large deviations are detected in the other variables.

Table 2.
This table summarises the descriptive statistics of the included variables for the entire sample. It presents statistics for the full sample of country-month observations in the data. The data span the months from January 2006 to December 2008.

Variable	Mean	Median	Std. Dev.	Min	Max	N
Variance ratio	0.380	0.244	0.530	0.000	8.581	1,476
Insider Trading Rules index	2.272	2	2.082	0	10	1,476
Market Manipulation Rules Index	5.870	5	4.328	0	13	1,476
Broker-Agency Conflict Rules Index	0.814	0	1.232	0	5	1,476
Governance	0.660	0.815	0.833	-0.634	1.824	1,476
Two tier board	0.512		0.500	0	1	1,476
Log(market cap)	12.765	12.789	1.788	7.556	16.625	1,476
Log(value of share trading)	9.711	10.139	2.759	-3.912	14.993	1,476
Velocity	0.895	0.658	0.967	0.010	12.158	1,472

The summary statistics of the included variables are shown in Table 2. As shown, the average monthly variance ratio is 0.38 with a median value of 0.24. It ranges from 0 to 8.58. The governance indicator fluctuates between -0.63 and 1.82, with a mean value of 0.66. The average value of the logarithm of market capitalization equals 12.77. It varies between 7.56 and 16.63. Velocity ranges between 1% and 1216% with a mean value of 89.5%. The logarithm of value of share trading varies from a low value of -3.91 to a high value of approximately 15, with an average value of 9.71. The Bermudan Stock Exchange does not report velocity at different points in time, therefore reducing its number of observations. Furthermore, the board structure of exchanges is roughly split in half between two tier boards and one tier boards. The graphical representation of both the variance ratio and the explanatory variables is plotted in Figure 1-4 in the Appendix.

Relatively large deviations are found in the velocity variable when comparing the descriptive statistics with the descriptive statistics of Cumming et al. (2011). At least part of the difference can be assigned to the sample period; Cumming et al. (2011) examine a smaller sample period from February 2006 to October 2008. In addition, this study does not take the Amman Stock Exchange of Jordan into account since its data is only available after December 2007. It is, however, included in the study of Cumming et al. (2011). Both differences could contribute to the dissimilarities in descriptive statistics.

Examining the data per exchange reveals that the NYSE is the most efficient with an average variance ratio of 0.24[6]. In contrast, the Colombo Stock Exchange is the least efficient with an average variance ratio of 0.61. Based on insider trading, market manipulation and the broker-agency conflict, the NYSE has stricter regulations compared to the Colombo Stock Exchange. This premature result provides support for the positive relationship between regulation and market efficiency. However, both exchanges differ substantially with respect to size, board structure and velocity.

[6] Appendix, Table 5 - 45

4.3.1 Preliminary tests

Table 3 provides a comparison of mean and median tests in relation to different cut-off values, which are the mean values of the legal indices. It presents the differences in means and medians of the variance ratio for the full sample and the subsample in which MiFID applies. The data reveals a conflicting result regarding the Insider Trading Rules Index. The average (median) variance ratio is 0.38 (0.23) for exchanges with two or more insider trading rules and is 0.38 (0.25) for exchanges with values of zero or one in the Insider Trading Rules Index. This implies that a higher value in the Insider Trading Rules Index decreases the median of the variance ratio, while leaving the mean of the variance ratio unchanged. However, the differences in medians are not statistically significant. In contrast, a higher value of the Market Manipulation Rules Index is associated with a lower variance ratio. The differences in medians is statistically significant; however, the differences in means are not. Similar results are obtained for differences in the Broker-Agency Conflict Rules Index. The group of countries with more than one rule pertaining to the broker-agency conflict is more efficient than the group of countries with one or less broker-agency rules. Nevertheless, no significant result is retrieved when both means and medians are compared.

The data of the subsample, consisting of countries subject to MiFID, indicates that a higher value of the Insider Trading Rules Index is associated with a higher variance ratio, implying lower efficiency. This result is not in line with the first hypothesis. The average (median) variance ratio is 0.42 (0.23) for exchanges with two or more insider trading rules and is 0.37 (0.23) for exchanges with values of zero or one in the Insider Trading Rules Index. Considering the Market Manipulation Rules Index and the Broker-Agency Rules Index, the same conclusion is reached as when the whole sample is studied. Therefore, stronger regulation pertaining to market manipulation and the broker-agency conflict seems to be associated with a more efficient market. In contrast, stricter trading rules reducing the probability of insider trading, have an ambiguous effect on market efficiency. Though only a significant difference is found for the Market Manipulation Index, all other differences are insignificant.

Table 4 presents the differences in means and medians of the variance ratio for the pre- and post-MiFID time periods for both the exchanges affected by MiFID and exchanges not affected by MiFID. Both groups of countries experience an increase in the mean values of their variance ratio after the introduction of MiFID. The results also show that the variance ratio is not significantly altered after the implementation of MiFID. In particular, neither the differences in means nor the differences in medians are significantly different pre- and post-November 2007 (averages were 0.39 and 0.40 and medians were 0.23 and 0.24, respectively). The conclusion remains unchanged when the non-MiFID exchanges are considered. Taken together, these statistics suggest that there is no material effect of MiFID on market efficiency as measured by the variance ratio. This is inconsistent with the hypothesis that MiFID is positively related with market efficiency.

Table 3.
This table presents the comparison of mean and median tests for the variance ratio for different cut-off values of the trading rules indices.

Statistics	Insider Trading Rules Index		Market Manipulation Rules Index		Broker-Agency Conflict Rules Index	
	>2	≤2	>6	≤6	>1	≤1
All countries						
Number of observations	528	948	544	932	396	1080
Mean	0.382	0.379	0.361	0.392	0.356	0.389
Standard deviation	0.566	0.509	0.583	0.497	0.441	0.599
Median	0.233	0.253	0.231	0.256	0.239	0.246
Difference in mean	0.089		1.073		-1.061	
Difference in median	1.400		2.287*		1.054	
Subset of MiFID exchanges						
Number of observations	240	192	292	140	36	396
Mean	0.415	0.370	0.393	0.400	0.348	0.399
Standard deviation	0.661	0.653	0.753	0.392	0.328	0.679
Median	0.232	0.228	0.224	0.259	0.222	0.232
Difference in mean	-0.708		0.116		-0.448	
Difference in median	0.324		2.084*		0.087	

Note: ** and * denote significance at the 1% and 5% levels, respectively. The 'MiFID exchanges' are exchanges subject to MiFID.

Table 4.
This table presents the comparison of mean and median tests for the variance ratio pre- and post MiFID. It separates the sample into exchanges subject to MiFID and other exchanges.

	Non-MiFID exchanges		MiFID exchanges	
	Post MiFID	Pre MiFID	Post MiFID	Pre MiFID
Pre-MiFID versus Post-MiFID				
Number of observations	406	638	168	264
Mean	0.375	0.373	0.398	0.393
Standard deviation	0.361	0.525	0.405	0.777
Median	0.249	0.256	0.243	0.225
Difference in mean	-0.077		0.082	
Difference in median	0.366		1.839	

Note: ** and * denote significance at the 1% and 5% levels, respectively. The pre-MiFID time period includes data from January 2006 to November 2007. The post-MiFID time period includes data from November 2007 up to and including December 2008. The 'MiFID exchanges' are exchanges subject to MiFID and the other exchanges are 'non-MiFID exchanges'.

5. Methodology

This section discusses the methodology used to test both hypotheses. Paragraph 5.1.1 explains the model used to test the first hypothesis, followed by paragraph 5.1.2, in which the analysis used to test hypothesis two is explained. The section ends with a discussion on the assumptions onderlying both models in paragraph 5.2.

5.1 Emprical strategy

An Ordinary Least Squares (OLS) approach is taken to examine whether trading rules are a source of international differences in stock exchange efficiency and to what extent a material change in trading rules affects market efficiency.

5.1.1 Fixed effects approach

The regression equation to test the first hypothesis is stated as follows:

$$Y_{i,t} = \beta^{(0)} + \beta^{(1)} Rules_{i,t} + \beta^{(2)} Rules_{i,t} * Governance_{i,t} + \beta^{(3)} Control_{i,t} + \delta_t + \upsilon_i + \varepsilon_{i,t} \qquad (1)$$

Where $Y_{i,t}$ equals the absolute value of the variance ratio minus one for exchange i in month t. The trading rules indices are represented by $Rules_{i,t}$. It denotes variously one of the exchange rules indices pertaining to market manipulation, insider trading and the broker-agency conflict. The enforcement of exchange trading rules is analyzed by the joint importance of trading rules and sovereign governance, represented by the interaction term of $Rules_{i,t} * Governance_{i,t}$, wherein $Governance_{i,t}$ reflects the World Bank equally weighted governance indicator. $Control_{i,t}^{j}$ is a vector of exchange characteristics including velocity, board structure, total value of share trading as well as market capitalization. Furthermore, both year and exchange fixed effects, δ_t and υ_i respectively, are included to control for specific exchange and year factors. The error term is denoted by $\varepsilon_{i,t}$. If the relation between regulation and market efficiency is indeed positive, the associated coefficient of $Rules_{i,t}$, $\beta^{(1)}$, should be statistically smaller than zero.

5.1.2. Difference-in-difference approach

Furthermore, the dynamics of market efficiency is examined around the implementation of MiFID. Following Cumming et al. (2011), a Difference-In-Difference (DID) regression is performed to estimate whether MiFID has an impact on market efficiency and which legal factors are most closely associated with cross-sectional differences in efficiency. The DID regression seperates the exchanges into two groups: (1) the European countries that were subject to MiFID and (2) the other countries. It uses a control group (i.e. the other countries) to substract other changes at the same time of MiFID, and therefore, assesses the impact of MiFID, assuming these other changes were identical between

both groups. To examine the changes around the implementation of MiFID, both the means and medians of the variance ratio of the two categories is plotted across time in Figure 1 and 2, respectively.

Figure 1.

Graph of the mean of the two groups of countries; subject to MiFID and the other countries.

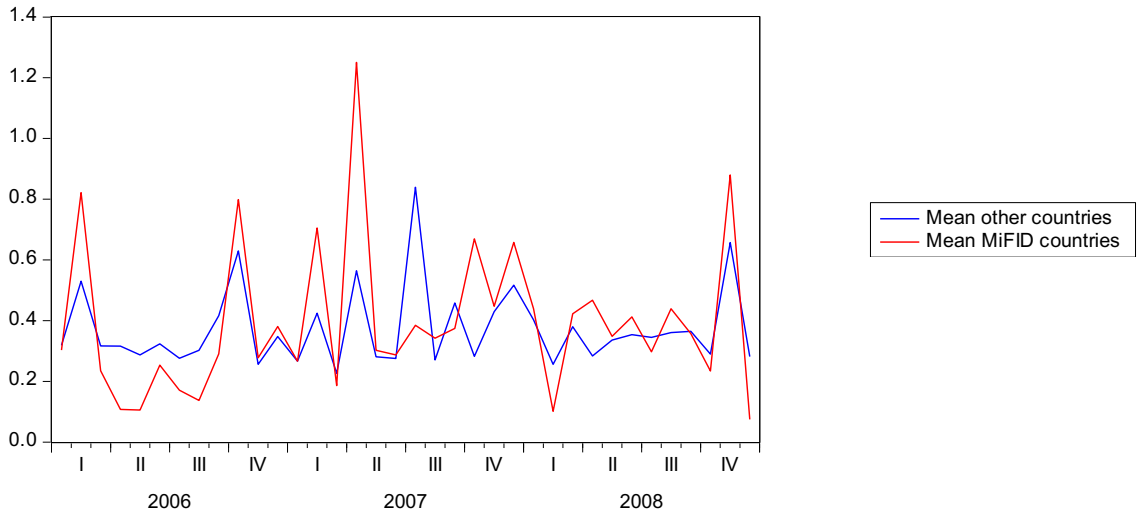
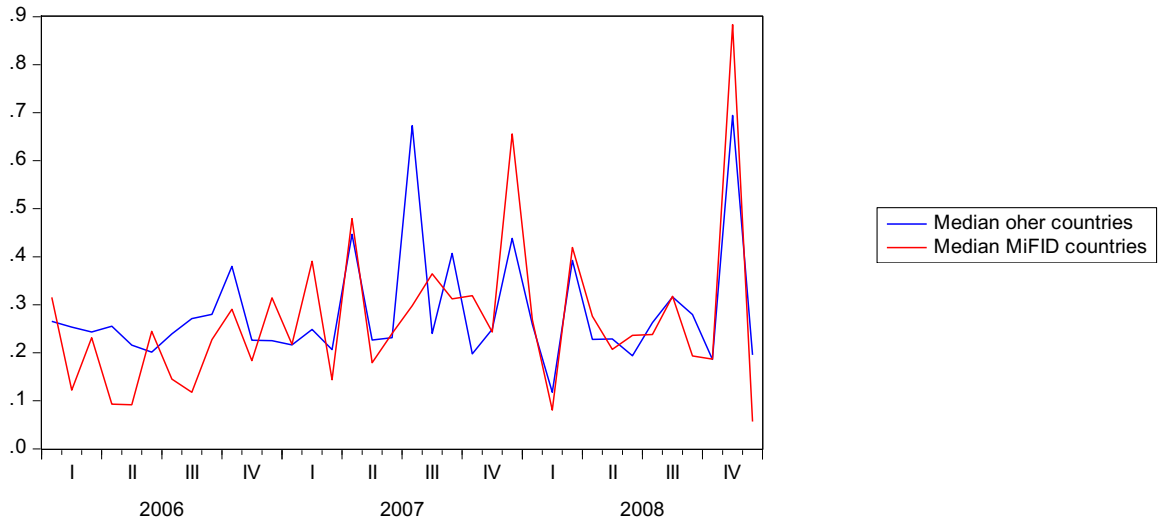


Figure 2.

Graph of the median of the two groups of countries; subject to MiFID and the other countries.



The graphs reveal that both groups of countries experience a relatively large decline in mean and median values at the end of 2007 (i.e. right after MiFID took its effect). The decline in mean and median values for countries subject to MiFID, however, appears to be of larger magnitute. Nevertheless, by the beginning of 2008, both drops in value are evaporated. The graphs also show that both groups of countries generally reflect the same trend after the implementation of MiFID.

Therefore, the assumption underlying the DID regression is assumed to be met. The regression equation is then stated as follows:

$$Y_{i,t} = \alpha^{(0)} + \alpha^{(1)}Treat_i + \alpha^{(2)}After_t + \alpha^{(3)}Treat_i * After_t + \alpha^{(4)}Control_{i,t} + \delta_t + \upsilon_i + \omega_{i,t} \quad (2)$$

The dependent and included control variables are both identical to the first regression. The indicator $After$ equals one in November 2007 and every month thereafter and zero in all prior months. $Treat$ is set to one for exchanges subject to MiFID. The interaction term $Treat * After$ is the key variable, where its coefficient measures the impact of MiFID. If its associated coefficient is statistically negative, MiFID is found to have improved market efficiency. As with the first regression, both year and exchange fixed effects, δ_t and υ_i respectively, are included. The error term is denoted by $\omega_{i,t}$.

5.2 Assumptions

Whether or not the OLS estimators provide a good approximation depends upon the assumptions that are made on the distribution of the error term and its relation with the independent variables. Both regression equations include exchange fixed effects, which transform the OLS estimator to the 'within estimator' or 'fixed effects estimator'. Exactly the same estimator is obtained if the regression includes dummy variables for each exchange separately. The fixed effects approach transforms equation (1) into a regression model in deviations from individual means, implying that the individual effects μ_i are eliminated. This transformation is called the 'within transformation'. The fixed estimator concentrates on differences 'within' exchanges. Therefore, it is assumed that a change in one of the explanatory variables (ceteris paribus) has the same effect from one individual to another (Verbeek, 2012).

The DID approach is very similar to the fixed effects estimator. It only employs the 'first-difference' transformation rather than the 'within' transformation. The estimator of the difference-in-difference regression, the 'difference-in-difference' estimator, estimates the time difference for the treated and untreated groups and, subsequently, takes the difference between the two. Both regressions are practically subject to the same assumptions underlying the OLS approach. For consistency, the fixed effects estimator is required to be strictly exogenous, meaning that the explanatory variables are uncorrelated with the error terms (Verbeek, 2012).

$$E\{x_{i,t}\varepsilon_{i,t}\} = 0$$

Where $x_{i,t}$ represents a vector including all explanatory variables and $\varepsilon_{i,t}$ the error term. In contrast, the consistency criterion in the difference-in-difference approach allows for some correlation between the explanatory variables and the error term.

$$E\{(x_{i,t} - x_{i,t-1})(\omega_{i,t} - \omega_{i,t-1})\} = 0$$

Where $x_{i,t}$ again represents a vector including all explanatory variables and $\omega_{i,t}$ the error term. Furthermore, the DID approach assumes that the changes occurring at the same time of MiFID are identical between the exchanges subject to MiFID and those who are not. This means that the time effects δ_t are common across both groups of exchanges (Verbeek, 2012).

The presence of omitted variable bias and measurement error can generate an inconsistent estimator. Whereas multicollinearity, autocorrelation and heteroskedasticity alters the standard error of the estimator, resulting in invalid inferences. To test whether the sample suffers from multicollinearity, Pearson correlation coefficients are calculated. The correlation matrix is presented in Table 5. As predicted, a negative correlation exists between the variance ratio and the trading rules indices. Among the different trading rules indices, the variance ratio experiences the largest correlation with the Broker-Agency Conflict Rules Index. The correlation matrix also reveals a strong postivive correlation between the Insider Trading Rules Index and the Broker-Agency Conflict Rules Index. Furthermore, the two measures of the size of an exchange are highly correlated; the Pearson correlation coefficient equals 0.97. To make sure that the OLS regression does not suffer from multicolinearity, one of the two size measures is incorporated in the regression. As a supplement to the Pearson correlation coefficients, the variance inflation factor (VIF) is calculated. Subsequently to the model estimation, the VIF is determinded. A VIF larger than ten indicates multicolinearity. The results reveal that the VIF is smaller than ten for every regression estimation[7].

Table 5.
This table presents Pearson correlation coefficients for the entire sample.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Variance ratio	1								
(2) Insider Trading Rules Index	-0.03	1							
(3) Market Manipulation Rules Index	-0.02	0.50	1						
(4) Broker-Agency Conflict Rules Index	-0.04	0.71	0.17	1					
(5) Governance	0.00	0.24	0.51	0.12	1				
(6) Log (market cap.)	-0.08	0.27	0.38	0.10	0.35	1			
(7) Velocity	-0.06	0.41	0.25	0.24	0.13	0.49	1		
(8) Log (value of share trading)	-0.08	0.28	0.37	0.08	0.31	0.97	0.63	1	
(9) Two tier board	-0.04	0.39	0.44	0.09	0.26	0.39	0.16	0.37	1

Another possible misspecification of the model stems from omitted variables. The presence of omitted variables leads to inconsistent estimators. Both a statistical test and relevant literature is used to reduce the omitted variables problem. Previous and relevant literature is used to find appropriate variables, which are then added to the model. In addition, the Ramsey (1969) regression specification-error test is also performed to test for omitted variables. The results reveal that the null hypothesis of no omitted variables bias cannot be rejected in any of the regression estimations[8]. To mitigate inconsistency arising from measurement error, only data from commonly used and accurate data

[7] Appendix, Tables 46 - 51
[8] Appendix, Tables 46 – 51

sources, such as Bloomberg and BoardEX, is collected. Furthermore, and as mentioned, highly unlikely values (i.e. outliers) are adjusted to mean values.

Both autocorrelation and heteroskedasticity reduces the standard errors of the coefficients, resulting in invalid inferences. To test whether the error terms of the regression are subject to serial correlation, a Wooldridge test for autocorrelation in panel-data models is performed (Wooldridge, 2010). The null hypothesis of no serial correlation cannot be rejected in each of the regression specifications[9]. Since financial time series data often possess time-varying volatilities, both an heteroskedastic variance ratio test statistic and heteroskedasticity-consistent (HC) standard errors are implemented. Furthermore, financial data might not behave in accordance with the normal distribution. Therefore, the two measures of the size of an exchange are converted into logarithms. The variance ratio test statistic is also robust to deviations from normality.

6. Results

In this section the results of the different model specifications are presented. Using a fixed effects regression, it is examined whether trading rules are a source of international differences in stock markets. After which it is investigated whether the implementation of MiFID has improved market efficiency across European exchanges.

To start with the analysis of the impact of securities regulation on market efficiency, a simple fixed effects model is estimated. In this case, all the differences that exist among the exchanges are captured in the exchange dummy variables. These dummy variables remain the same throughout the investigated years. The results are reported in Table 6. It reveals that both the Insider Trading Rules Index and the Market Manipulation Rules Index do not significantly affect the variance ratio, meaning that stricter regulation in either category does not influence market efficiency. In contrast, the Broker-Agency Conflict Rules Index is negatively related to the variance ratio with an associated coefficient of -0.05, which is significant at the five percent level. Therefore, and in line with the first hypothesis, stricter trading rules pertaining to the broker-agency conflict increases market efficiency. The overall performance of the model is evaluated using an F-test. It tests the null hypothesis that all the coefficients, except the constant term, are zero. The variables are not able to explain the variation in the variance ratio in the first two regression models. On the other hand, the coefficients of the variables in the model including the Broker-Agency Conflict Rules Index are significantly different from zero.

Next, the exchange characteristics as well as the enforcement of trading rules are added as explanatory variables to the regression specification. The corresponding coefficients are presented in Table 7. The results lead to a different conclusion as compared to the simple model. The Broker-Agency-Conflict Rules Index is no longer significantly related to the variance ratio. The interaction

[9] Appendix, Tables 46 – 51

term, however, is, meaning that it is not the level of trading rules per se that is important to market efficiency but rather its combination with proper governance. Its associated coefficient is, in all regression specifications, equal to -0.03, which is significant at the five percent level. This result also implies that market surveillance and an integer legal environment are indeed important measures to tackle the broker-agency conflict (Porta et al. 1998). Furthermore, it adds to previous research stating that securities market regulation is only effective if it is enforced by regulatory commissions (Cumming et al., 2015).

Table 6.
This table presents the simple Ordinary Least Squares fixed effects regressions of market efficiency in the cross-section across countries.

Variable	(1)	(2)	(3)
Insider Trading Rules Index	-0.016		
	(0.03)		
Market Manipulation Rules Index		-0.002	
		(0.01)	
Broker-Agency Conflict Rules Index			-0.054*
			(0.02)
2007	0.078	0.078	0.079
	(0.04)	(0.04)	(0.04)
2008	0.008	0.009	0.015
	(0.03)	(0.03)	(0.03)
Constant	0.388**	0.365**	0.393**
	(0.08)	(0.04)	(0.02)
N	1476	1476	1476
F-statistic	2.065	1.948	2.322
p-value	0.120	0.137	0.000

Note: Standard errors in parentheses. ** and * denote significance at the 1% and 5% levels, respectively.

In contrast, no significant relationship between either the Market Manipulation Rules Index or its interaction term with governance on market efficiency is found, leading to a rejection of the first hypothesis. A postive significant influence of the interaction term of the Insider Trading Rules Index is detected in two out of the six regression models. Stricter regulation with respect to insider trading, when either the Market Manipulation Rules Index or the Broker Agency Conflict Rules Index is included, increases the variance ratio with 0.01 and 0.02, respectively. This result is counterintuitive and in contrast to the first hypothesis. It could mean that insider trading leads to more informationally efficient stock prices (Manne, 1966). For instance, McGee (2008) argues that insider trading makes the market more efficient because it serves as a means of communicating market information. When insiders are trading their stock, it acts as a signal to others that a stock's price will likely move in a certain direction. However, an investor is not able to observe who traded that particular stock. According to McGee (2008) this is not necessary; an increase (or decrease) in demand for a particular stock will be noticed by the market, and the price will move accordingly. When an insider expects

that the price of a stock will increase he will purchase it, increasing its demand. In contast, when an insider bellieves that the price of a stock will fall he will sell it for today's price, decreasing its demand. Therefore, additional prohibitions on insider trading blocking this flow of information prevents the market from learning valuable information, hence decreasing efficiency.

Table 7.
This table presents the full Ordinary Least Squares fixed effects regressions of market efficiency in the cross-section across countries.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Insider Trading Rules Index	-0.008	-0.009				
	(0.01)	(0.01)				
Market Manipulation Rules Index			-0.005	-0.005		
			(0.01)	(0.01)		
Broker-Agency Conflict Rules Index					-0.005	-0.007
					(0.01)	(0.01)
Governance * Insider Trading Rules Index	0.021	0.021	0.014*	0.014	0.015*	0.015
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Governance * Market Manipulation Rules Index	0.001	0.000	0.004	0.003	0.001	0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Governance * Broker-Agency Conflict Rules Index	-0.032**	-0.033**	-0.031**	-0.031**	-0.027*	-0.027*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Velocity	-0.008	0.000	-0.006	0.002	-0.010	-0.002
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Log(market cap)	-0.029**		-0.029**		-0.029**	
	(0.01)		(0.01)		(0.01)	
Log(value of share trading)		-0.019*		-0.019*		-0.018*
		(0.01)		(0.01)		(0.01)
Two tier board	-0.017	-0.020	-0.010	-0.014	-0.016	-0.018
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
2007	0.094*	0.091*	0.093*	0.090*	0.094*	0.091*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
2008	0.034	0.031	0.031	0.028	0.036	0.033
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Constant	0.719**	0.530**	0.724**	0.528**	0.706**	0.518**
	(0.11)	(0.07)	(0.11)	(0.07)	(0.10)	(0.07)
N	1472	1472	1472	1472	1472	1472
Chi-squared	35.074	29.514	33.884	28.129	37.836	30.927
p-value	0.000	0.000	0.000	0.000	0.000	0.000

Note: Standard errors in parentheses. ** and * denote significance at the 1% and 5% levels, respectively.

Table 7 also shows that the size of the exchange, measured by either the value of share trading or its market capitalization is negatively related to the variance ratio. As a result, a relatively large exchange is more efficient than a relatively small exchange, ceteris paribus. The board structure, a one- or two-tier system, does not have an impact on the variance ratio. Dividing the board in a supervisory and an executive committee or combining it into a single body does not significantly influence market efficiency. It should be noted that velocity, measuring the liquidity of an exchange, is not able to significantly influence the variance ratio. This is striking since a connection exists between the size of an exchange and its liquidity. In addition, the value of share trading is commonly used as a measure of liquidity. The contradicting result could be attributable to the measure of liquidity, implying that it does not fully capture the degree of liquidity of an exchange. Together with the deviating descriptive statistics as compared to the research of Cumming et al. (2011), this could have led to diverging results. Nevertheless, the inclusion of the control variables adds to the explanatory power of the model, concluding that change occurs during the sample period. Therefore, exchange dummy variables alone are not sufficient to determine the differences among the exchanges. In addition, the dummy variable of 2007 is significant in all the different model specifications. The impact of the recent financial crisis is expressed in this dummy variable and has, as expected, a positive effect on the variance ratio (i.e. it decreases market efficiency). Finally, the dynamics of the variance ratio are sufficiently explained by the included variables.

To paint a more detailed picture of the impact of trading rules on market efficiency, the cross section is also examined. Considering this, neither year nor exchange dummy variables are included. Tables 8 through 10 present each years regression estimates. The results reveal that the three trading rules indices are not significantly related to market efficiency; the coefficients of the Insider Trading Rules Index, the Market Manipulation Rules Index and the Broker-Agency Conflict Rules Index are not significantly different from zero. Nevertheless, large differences among the impact of trading rules exist across the years. In 2006, for example, no influence of trading rules or their interaction terms on market efficiency is detected. However, a clear negative relationship between the interaction term of the Broker-Agency Conflict Rules Index and the variance ratio is found in 2007. Its associated coefficients are all significantly different from zero and are even larger than when the full sample is considered; -0.03 for the full sample compared to approximately -0.07 in 2007. After 2007, a less distinct relationship between the interaction term of the broker-agency conflict and market efficiency exists. As mentioned, the impact of the recent financial crisis is especially pronounced in 2007. The relatively large impact of the Broker-Agency Conflict Rules Index with governance is therefore noteworthy. The financial crisis was a period characterized by high uncertainty. The development of accurate prices was difficult because tomorrow's universe could be completely different from today's. From this it can be argued that trading rules, ensuring that a broker acts on behalf of its clients, are of particular importance in uncertain times.

In addition, it is striking that both the coefficient of the Broker-Agency Conflict Rules Index and its interaction with governance shifts from positive to negative in 2006 and 2007, respectively. The former coefficient is measured with more precision in each consecutive year (i.e. standard errors decrease). In addition, its coefficient increases in value from 2007 to 2008. This could imply that MiFID has successfully aligned the interests of the broker with the interests of its client, which in turn contributes to a more efficient market.

Table 8.
This table presents the Ordinary Least Squares regressions of market efficiency in 2006.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Insider Trading Rules Index	-0.014	-0.014				
	(0.03)	(0.03)				
Market Manipulation Rules Index			-0.009	-0.008		
			(0.01)	(0.01)		
Broker-Agency Conflict Rules Index					0.018	0.016
					(0.03)	(0.03)
Governance * Insider Trading Rules Index	0.011	0.010	-0.001	-0.002	-0.004	-0.005
	(0.03)	(0.02)	(0.04)	(0.02)	(0.02)	(0.02)
Governance * Market Manipulation Rules Index	-0.001	-0.002	0.005	0.004	0.002	0.001
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Governance * Broker-Agency Conflict Rules Index	0.005	0.006	0.006	0.007	0.000	0.002
	(0.03)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)
Velocity	-0.026	-0.031	-0.016	-0.021	-0.023	-0.029
	(0.04)	(0.06)	(0.05)	(0.07)	(0.04)	(0.06)
Log(market cap)	-0.014		-0.015		-0.014	
	(0.02)		(0.02)		(0.02)	
Log(value of share trading)		-0.005		-0.006		-0.004
		(0.02)		(0.02)		(0.02)
Two tier board	-0.047	-0.053	-0.032	-0.040	-0.053	-0.058
	(0.07)	(0.07)	(0.08)	(0.08)	-0.07)	(0.08)
Constant	0.580**	0.464**	0.600**	0.467**	0.552**	0.430**
	(0.22)	(0.14)	(0.23)	(0.13)	(0.20)	(0.12)
N	492	492	492	492	492	492
Chi-squared	4.870	4.470	7.190	6.646	5.887	5.024
p-value	0.676	0.724	0.409	0.467	0.553	0.676

Note: Standard errors in parentheses. ** and * denote significance at the 1% and 5% levels, respectively.

Table 9.
This table presents the Ordinary Least Squares regressions of market efficiency in 2007.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Insider Trading Rules Index	-0.007	-0.009				
	(0.02)	(0.02)				
Market Manipulation Rules Index			-0.010	-0.011		
			(0.01)	(0.01)		
Broker-Agency Conflict Rules Index					-0.014	-0.017
					(0.02)	(0.02)
Governance * Insider Trading Rules Index	0.037	0.040	0.031	0.033	0.033	0.034
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Governance * Market Manipulation Rules Index	0.002	0.001	0.007	0.007	0.002	0.001
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Governance * Broker-Agency Conflict Rules Index	-0.072**	-0.075**	-0.073**	-0.076**	-0.062**	-0.063**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)
Velocity	0.003	0.023	0.013	0.035	-0.001	0.018
	(0.01)	(0.02)	(0.02)	(0.03)	(0.01)	(0.02)
Log(market cap)	-0.040**		-0.042**		-0.039**	
	(0.01)		(0.02)		(0.01)	
Log(value of share trading)		-0.030**		-0.032*		-0.030*
		(0.01)		(0.01)		(0.01)
Two tier board	-0.026	-0.025	-0.008	-0.006	-0.024	-0.022
	(0.05)	(0.05)	(0.07)	(0.07)	(0.05)	(0.05)
Constant	0.932**	0.705**	0.972**	0.728**	0.698**	0.920**
	(0.18)	(0.01)	(0.02)	(0.11)	(0.01)	(0.17)
N	491	491	491	491	491	491
Chi-squared	29.233	22.975	31.876	24.495	24.242	30.005
p-value	0.000	0.002	0.000	0.001	0.001	0.000

Note: Standard errors in parentheses. ** and * denote significance at the 1% and 5% levels, respectively.

The results of the cross section, regarding restrictions on market manipulation, reveal an ambiguous impact on market efficiency. In the entire sample, the coefficient of the Market Manipulation Rules Index is negative, though insignificant. In 2006 and 2007 this observation remains unchanged. However, in 2008 the sign of the coefficient is positive, which is in contrast to the previous findings. Considering its interaction term with governance, the same conclusion holds; the sign of the coefficient is arbitrary altered throughout the investigated sample periods. Hence, trading rules restricting market manipulation have no clear effect on market efficiency. Furthermore, the positive impact of insider trading rules on market efficiency is not as reflected in the cross section,

as it was in the whole sample. However, the size of an exchange remains an important characteristic influencing market efficiency.

Table 10.
This table presents the Ordinary Least Squares regressions of market efficiency in 2008.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Insider Trading Rules Index	-0.003	-0.004				
	(0.01)	(0.01)				
Market Manipulation Rules Index			0.007	0.007		
			(0.01)	(0.01)		
Broker-Agency Conflict Rules Index					-0.017	-0.020
					(0.01)	(0.01)
Governance * Insider Trading Rules Index	0.017	0.018	0.018	0.017	0.015	0.015
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Governance * Market Manipulation Rules Index	0.002	0.001	-0.001	-0.002	0.001	0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Governance * Broker-Agency Conflict Rules Index	-0.033*	-0.033	-0.034*	-0.034*	-0.023	-0.022
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Velocity	-0.010	-0.003	-0.014	-0.008	-0.009	-0.001
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Log(market cap)	-0.032**		-0.032**		-0.032**	
	(0.01)		(0.01)		(0.01)	
Log(value of share trading)		-0.020**		-0.020**		-0.021**
		(0.01)		(0.01)		(0.01)
Two tier board	0.024	0.021	0.020	0.018	0.027	0.025
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Constant	0.761**	0.549**	0.743**	0.527**	0.769**	0.558**
	(0.11)	(0.07)	(0.10)	(0.06)	(0.10)	(0.06)
N	489	489	489	489	489	489
Chi-squared	47.471	44.791	70.401	60.659	36.750	43.225
p-value	0.000	0.000	0.000	0.000	0.000	0.000

Note: Standard errors in parentheses. ** and * denote significance at the 1% and 5% levels, respectively.

The results of the Difference-In-Difference regression are reported in Table 11. As with the full sample regression, the control variables are initially excluded. The coefficient associated with the interation term of interest ($Treat_i * After_t$) is 0.00 which is not significant at the five percent level. However, the hypothesis that the coefficients associated with the variables are equal to zero cannot be rejected. Therefore, the model is not a good fit for the data. Including the control variables in Table

12, does not alter the implications; no difference in market efficiency after the introduction of MiFID is observed. This model specification does a better job in capturing all the variation in the dependent variable. The coefficient of the $Treat_i * After_t$ variable equals -0.00 when the market capitalization is considered and 0.00 when the value of share trading is considered. Both coefficients are not significantly different from zero. As a result, it can be concluded that MiFID did not contritbute to market efficiency, rejecting the second hypothesis that the implementation of MiFID is positively related with market efficiency.

Table 11.
This table presents the simple DID regressions of the impact of MiFID on market efficiency.

Variable	(1)
Treat	0.020
	(0.05)
After	0.081
	(0.05)
Treat * After	0.003
	(0.06)
2007	0.065
	(0.04)
2008	-0.068
	(0.05)
Constant	0.343**
	(0.03)
N	1476
Chi-squared	7.562
p-value	0.182

Note: Standard errors in parentheses. ** and * denote significance at the 1% and 5% levels, respectively.

The Directive acted as an accelerator for evolution, resulting in a proliferation of new trading platforms, such as MTF's. This increase in trading platforms, induced competition between stock exchanges and alternative trading systems. However, larger fragmentation did not contribute to market efficiency; market efficiency is approximately equal both before and after the implementation of MiFID. The ability to trade through a variety of platforms, which have the obligation to publicly disclose post- and pre-trade information, has not led to a more efficient price formation process. The level playing field could be hindered by the costs incurred to access multiple sources of data as well as its quality and reliability (Preece, 2011). This is because MiFID does not have a formal consolidated data system to centralise reporting of quote and trade data; every platform must be consulted seperately. As a consequence, the strengthened transparency requirements together with the increase in competition, did not produce the desired result. Furthermore, the European regulatory framework operates in a decentralised fashion, allowing national authorities to determine certain aspects of mircosture. This decentralised nature may accentuate the issues related to fragmentation

(Chartered Financial Analyst, 2009). The implementation of MiFID does not constitute as a straight line throughout the European financial market, which contributes at least in part to its unobserved effect.

Lastly, it could be that the opposite is true; MiFID has increased efficiency, however, it is unobservable. In this scenario, non-MiFID exchanges have also altered their standards for stocks trading on the corresponding exchange, meaning that non-MiFID exchanges 'copy' the imposed rules of MiFID. Considering the graphs of the mean and median values of both groups of countries, represented in Figure 5 and 6 in the Appendix, this scenario could be correct. In particular, the median values after the implementation of MiFID are very similar. However, the mean values do not converge more closely after November 2007 as they did prior to November 2007. All in all, 'copy-cat' behavior of non-MiFID exchanges could lead to incorrect inference.

Table 12.
This table presents the Difference-in-Difference regressions of the impact of MiFID on market efficiency.

Variable	(1)	(2)
Treat	0.040	0.040
	(0.05)	(0.05)
After	0.091	0.088
	(0.05)	(0.05)
Treat * After	-0.004	0.000
	(0.06)	(0.06)
Velocity	-0.011	-0.006
	(0.01)	(0.01)
Log(market cap)	-0.023**	
	(0.01)	
Log(value of share trading)		-0.014*
		(0.01)
Two tier board	-0.011	-0.017
	(0.03)	(0.03)
2007	0.075	0.074
	(0.04)	(0.04)
2008	-0.067	-0.066
	(0.05)	(0.05)
Constant	0.644**	0.487**
	(0.11)	(0.07)
N	1472	1472
Chi-squared	35.045	32.172
p-value	0.000	0.000

Note: Standard errors in parentheses. ** and * denote significance at the 1% and 5% levels, respectively.

7. Conclusion

This study examines whether stronger trading rules improve market efficiency by ensuring that information is immediately reflected in stock prices. As a result, price changes should be independent. Different trading rules indices are established to study the differences in regulation across the exchanges, with a focus on market manipulation, insider trading and the broker-agency conflict. Furthermore, the implementation of MiFID is used as a natural experiment to assess the impact of exchange rule restrictions.

Considering the whole sample, the regression results reveal that trading rules limiting the broker-agency conflict increase market efficiency. Therefore, support is found for the hypothesis stating that stronger securities regulation is positively related to market efficiency. In addition, broker-agency conflict rules in combination with good enforcement, increase market efficiency. Consequently, it can be concluded that the quality of law enforcement is of particular importance in reducing the broker-agency conflict. Adequate governance in combination with broker-agency conflict trading rules are especially important to market efficiency during the recent financial crisis, in 2007. The financial crisis was a period characterized by high uncertainty. From this it can be argued that trading rules, ensuring that a broker acts on behalf of its clients, are especially important in uncertain times. As a result, in the future, securities regulation should focus on reducing the conflict of interest between the broker and its client.

In contrast, restrictions on insider trading have a less clear impact on market efficiency. The regression results reveal a positive relationship between the Insider Trading Rules Index and market efficiency, although insignificant. The positive relationship holds when the cross section is studied. In contrast, prohibitions on insider trading together with good governance have a negative impact on market efficiency (i.e. decreases market efficiency). The adverse impact of prohibitions on insider trading, raises the question what the impact of insider trading on market efficiency actually is and to what extend insider trading rules are enforced. It could mean that insider trading serves as a means of communicating market information, leading to more informationally efficient stock prices. As a result, prohibitions on insider trading, blocking this flow of information, prevents the market from learning valuable information, hence reducing efficiency. On the other hand, it could also imply that the trading rules are not properly enforced. A positive relation between the Insider Trading Rules Index and market efficiency is observed throughout the different model specifications, while its interaction with governance suggests the opposite. Therefore, it could be that trading rules restricting insider trading increase market efficiency when they are properly enforced; however, they are not. The focus of the regulator might be on the large transactions, leading to excessive profits, overlooking the relatively small trades. In addition, the enforcement of insider trading rules might be too ambitious, leaving space for investors to exploit it.

Furthermore, exchange trading rules preventing manipulators to distort prices at the expense of other market participants have an ambiguous impact on market efficiency. The impact of both the

Market Manipulation Rules Index and its interaction term with governance on market efficiency changes from positive to negative throughout the investigated sample periods. On the one hand, this could imply that trading rules restricting market manipulation are of less importance to market efficiency. Or, on the other hand, due to its 'open' interpretation, trading rules could be difficult to quantify. This is because market manipulation is not explicitly defined in regulatory statutes. In addition, limited empirical research exists on its implications, because only a fraction of manipulation is detected and only a subset is prosecuted. All in all, it is difficult to draw definite conclusions on its importance in securities market regulations.

The objective of MiFID is to increase both investor protection and competition in European financial markets by creating a single market for investment services and activities. However, fragmentation, increased competition and strengthened transparency did not improve market efficiency. The results of the Difference-in-Difference regression show no material change in efficiency after the implementation of MiFID, contradicting the second hypothesis. The unobserved material effect of MiFID on market efficiency could be caused by a number of factors. For example, it could be that the implementation of MiFID was surrounded by uncertainty regarding its implications. At first, the new trading rules could have been unclear and improperly specified. However, the results do not point in this direction; the standard errors have either been reduced or have remained the same.

In addition, a consequence of larger fragmentation is higher costs; investors have to access multiple sources of data. The transparency requirements instruct trading platforms to publicly disclose post- and pre-trade information due to the strengthened transparency requirements. However, even with these requirements in place, the quality, consistency, and reliability of reported data may differ. The results indeed indicate that the transparency requirements have not led to a more efficient price formation process. In addition, previous research already revealed no significant trend towards the transparent markets after MiFID became effective. Both factors could have hindered the level playing field that MiFID tried to establish. Lastly, the unobserved effect could also be caused by 'copy-cat' behavior of non-MiFID exchanges. In response to the stricter regulation of European exchanges, they could have altered their standards accordingly, leading to an insignificant effect.

It should be noted that previous research of Cumming et al. (2011) finds both a significant effect of trading rules on liquidity and a significant effect of MiFID on liquidity. Both are difficult to reconcile with the results of this study. It could be that there is less to gain from securities regulation with respect to the weak form efficiency hypothesis. The increased availability of technology might already ensure a relative quick incorporation of information in stock prices. Nevertheless, trading rules could have an impact on efficiency measured by the semi-strong or strong form efficiency hypothesis. The focus of securities regulation is indeed more emphasised on the latter hypothesis creating a level playing field for all investors. The impact of trading rules on market efficiency measured by either the semi-strong or the strong form hypothesis is a fruitful research topic for the future. Another future research topic could consider the impact of MiFID on market efficiency by

considering cross listed stocks. The focus should lie on stocks that trade in both MiFID and non-MiFID countries. In this way, the impact of MiFID can be studied in more detail. It could be that, due to the transparency requirements of MiFID, the price efficiency of these particular stocks improves, in the sense that arbitrage opportunities will disappear.

To summarize, the impact of securities market regulation on market efficiency remains ambiguous. Trading rules directly protecting the investor by ensuring that a broker acts on behalf of its clients, are most effective in improving market efficiency. Market manipulation cannot be defined with precision, consequently, the resulting trading rules are difficult to quantify. As a result, no definite conclusions regarding both its impact on market efficiency and its importance in securities regulation can be drawn. Furthermore, the impact of prohibitions on insider trading has not had the desired effect. Trading rules limiting insider trading are too cumbersome and trading rules preventing market manipulation have an ambiguous impact on market efficiency. Therefore, securities regulation and trading rules accordingly should emphasize more on the conflict of interest between the broker and its client, since there is a lot to gain in terms of market efficiency. In addition, the intended goal of MiFID to increase market efficiency was not achieved. The decentralised fashion of the European regulatory framework may accentuate the factors above, resulting in the unobserved effect. Therefore, a revision and strenghtening of the MiFID requirements combined with proper enforcement is needed. This is exactly what is set out in the second version of MiFID (MiFID II) to be accomplished.

8. Literature

Antoniou, A., Ergul, N., & Holmes, P. (1997). Market efficiency, thin trading and non-linear behaviour: evidence from an emerging market. *European Financial Management, 3*(2), 175-190.

Banz, R. W. (1981). The relationship between return and market value of common stocks. *Journal of Financial Economics, 9*, 3-18.

Bennett, P., & Wei, L. (2006). Market structure, fragmentation, and market quality. *Journal of Financial Markets, 9*(1), 49-78.

Bhattacharya, U., & Daouk, H. (2009). When no law is better than a good law. *Review of Finance, 13*(4), 577-627.

Bromberg, L., Gilligan, G., & Ramsay, I. (2016). Enforcement of financial market manipulation laws: an international comparison of sanctions. *Working paper*.

Casey, J. P., & Lannoo, K. (2006). *The MiFID implementing measures: excessive detail or level playing field?* Center for European Policy Studies.

Chang, E. C., Luo, Y., & Ren, J. (2014). Short-selling, margin-trading, and price efficiency: evidence from the Chinese market. *Journal of Banking and Finance, 48*(1), 411-424.

Charles, A., & Darné, O. (2009). Variance-ratio tests of random walk: an overview. *Journal of Economic Surveys, 23*(3), 503-527.

Chartered Financial Analyst. (2009). *The impact of fragmentation under the markets in financial instruments directive.* Charlottesville: CFA Centre for Financial Market Integrity.

Chordia, T., Roll, R., & Subrahmanyam, A. (2008). Liquidity and market efficiency. *Journal of Financial Economics, 87*(2), 249-268.

Comerton-Forde, C., & Putniņš, T. J. (2011). Measuring closing price manipulation. *Journal of Financial Intermediation, 20*(2), 135-158.

Corwin, S. A. (2014, March). *Notre Dame Research.* Retrieved from University of Notre Dame: https://www3.nd.edu/~scorwin/documents/DealingwithNegativeValues.pdf

Cumming, D., Hou, W., & Wu, E. (2015). Exchange trading rules, governance, and trading location of cross-listed stocks. *The European Journal of Finance*, 1-37.

Cumming, D., Johan, S., & Li, D. (2011). Exchange trading rules and stock market liquidity. *Journal of Financial Economics*, 651-671.

Economist, T. (2006a, September 6). *Day of the MiFID.* Retrieved from The Economist: http://www.economist.com/node/7884663

Economist, T. (2006b, November 16). *Miffed with MiFID.* Retrieved from The Economist: http://www.economist.com/node/8131795

Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. *Econometrica: Journal of the Econometric Society*, 987-1007.

Europe Economics Chancery House. (2009, January 5). *Study on the Cost of Compliance with Selected FSAP Measures.* Retrieved from www.europe-economics.com : http://ec.europa.eu/internal_market/finances/docs/actionplan/index/090707_cost_of_compliance_en.pdf

European Securities and Markets Authority. (2017, June). *MiFID (II) and MiFIR*. Retrieved from ESMA Europe: https://www.esma.europa.eu/policy-rules/mifid-ii-and-mifir#title-paragrah-1

Fama , E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics, 33*(1), 3-56.

Fama, E. F. (1965b). The behavior of stock-market prices. *Journal of Business, 38*(1), 34-105.

Fama, E. F. (1991). Efficient capital markets: II. *The Journal of Finance, 46*(5), 1575-1617.

Fama, E. F., & French, K. R. (2008). Dissecting anomalies. *The Journal of Finance, 63*(4), 1653-1678.

Fama, E. F., Fisher, L., Jensen, M. C., & Roll, R. (1969). The adjustment of stock prices to new information. *International Economic Review, 10*(1), 1-21.

Fischel, D. R., & Ross, D. J. (1991). Should the law prohibit "manipulation" in financial markets? *Harvard Law Review, 105*(2), 503-553.

Gerace, D., Chew, C., Whittaker, C., & Mazzola, P. (2014). Stock market manipulation on the Hong Kong Stock Exchange. *Australasian Accounting Business & Finance Journal, 8*(4), 105-140.

Glosten, L. R., & Milgrom, P. R. (1985). Bid, ask and transaction prices in a specialist market with heterogeneously informed traders. *Journal of Financial Economics, 14*(1), 71-100.

Grossman, S. J., & Stiglitz, J. E. (1980). On the impossibility of informationally efficient markets. *The American Economic Review, 70*(3), 393-408.

Hail, L., & Leuz, C. (2006). International differences in the cost of equity capital: do legal institutions and securities regulation matter? *Journal of Accounting Research, 44*(3), 485-531.

Harris, L. (1990). Statistical properties of the Roll serial covariance bid/ask spread estimator. *The Journal of Finance, 45*(2), 579-590.

Hou, K., & Moskowitz, T. J. (2005). Market frictions, price delay, and the cross-section of expected returns. *The Review of Financial Studies, 18*(3), 981-1020.

Jegadeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: implications for stock market efficiency. *The Journal of Finance, 48*(1), 65-91.

John, K., & Senbet, L. W. (1998). Corporate governance and board effectiveness. *Journal of Banking & Finance, 22*(4), 371-403.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2011). The worldwide governance indicators: methodology and analytical issues. *Hague Journal on the Rule of Law, 3*(2), 220-246.

Kyle, A. S., & Viswanathan, S. (2008). How to define illegal price manipulation. *The American Economic Review,, 98*(2), 274-279.

Lo, A. W., & MacKinlay, A. C. (1988). Stock market prices do not follow random walks: evidence from a simple specification test. *The Review of Financial studies*, 41-66.

Lo, A. W., & MacKinlay, A. C. (2002). *A non-random walk down Wall Street.* Princeton: Princeton University Press.

Malkhiel, B. G., & Fama, E. F. (1970). Efficient capital markets: a review of theory and empirical work. *The Journal of Finance, 25*(2), 383-417.

Malkiel, B. G. (2003). The efficient market hypothesis and its critics. *The Journal of Economic Perspectives, 17*(1), 59-82.

Manne, H. G. (1966). *Insider trading and the stock market.* New York: The Free Press.

McGee, R. W. (2008). Applying ethics to insider trading. *Journal of Business Ethics, 77*(2), 205-217.

Mendelson, H. (1987). Consolidation, fragmentation, and market performance. *Journal of Financial and Quantitative Analysis, 22*(2), 189-207.

Nicholson, S. F. (1960). Price-earnings ratios. *Financial Analysts Journal, 16*(4), 43-45.

Niederhoffer, V., & Osborne, M. F. (1966). Market making and reversal on the stock exchange. *Journal of the American Statistical Association, 61*(316), 897-916.

Papoulis, A. (1984). *Probability, Random Variables, and Stochastic Processes.* New York: McGraw-Hil.

Porta, R. L., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1998). Law and finance. *Journal of Political Economy, 106*(6), 1113-1155.

Poterba , J. M., & Summers, L. H. (1988). Mean reversion in stock prices: evidence and implications. *Journal of Financial Economics, 22*(1), 27-59.

Preece, R. (2011). *The Structure, Regulation, and Transparency of European Equity Markets under MiFID.* CFA Centre publications.

Ramsey, J. B. (1969). Tests for specification errors in classical linear least-squares regression analysis. *Journal of the Royal Statistical Society*, 350-371.

Rath, S. (2004, July). *JASSA: The Finsia Journal of Applied Finance.* Retrieved from Finsia: http://www.finsia.com/docs/default-source/jassa-new/jassa-2004/4_2004_costs_trade.pdf?sfvrsn=692dde93_6

Riordan, R., Storkenmaier, A., & Wagener, M. (2010). Fragmentation, competition and market quality: A post-mifid analysis.

Roll, R. (1984). A simple implicit measure of the effective bid-ask spread in an efficient market. *The Journal of Finance, 39*(4), 1127-1139.

Saffi, P. A., & Sigurdsson, K. (2010). Price efficiency and short selling. *The Review of Financial Studies, 24*(3), 821-852.

Shiller, R. J. (1981). The use of volatility measures in assessing market efficiency. *The Journal of Finance, 36*(2), 291-304.

Stigler, G. G. (1964). Public regulation of the securities markets. *The Journal of Business*, 117-142.

Stout, L. A. (1988). The unimportance of being efficient: an economic analysis of stock market pricing and securities regulation. *Michigan Law Review, 87*(3), 613-709.

Thompson, J. H. (2013). A global comparison of insider trading regulations. *International Journal of Accounting and Financial Reporting, 3*(1), 2162-3082.

Verbeek, M. (2012). *A Guide to Modern Econometrics.* Rotterdam: John Wiley & Sons.

Verrecchia, R. E. (2001). Essays on disclosure. *Journal of Accounting and Economics, 32*(1), 97-180.

White, H. (2014). *Asymptotic theory for econometricians.* New York: Academic press.

Wooldridge, J. M. (2009). *Introductory Econometrics: A Modern Approach* . Mason: Thomson South-Western.

Wooldridge, J. M. (2010). Econometric analysis of cross section and panel data. *MIT press*.

Wright, J. H. (2000). Alternative variance-ratio tests using ranks and signs. *Journal of Business & Economic Statistics, 18*(1), 1-9.

8. Appendix

Table 1.
This table summarizes the included stock exchanges and their associated indices. The method used to obtain the index as well as its base date and value is reported.

Country	Stock exchange	Name of Index	Methodology of the Index	Base date and value
Argentina	Bolsa de Comercio de Buenos Aires	Merval Index	Index is a basket weighted index. It is the market value of a stock portfolio, selected according to participation in the Buenos Aires Stock Exchange, number of transactions of the past 6 months and trading value.	June 30, 1986 = $0.01
Australia	Australian Securities Exchange	ASX/S&P All Ordinaries Index	Index is based on domestic market capitalization and is calculated by Standard and Poor's.	December 31, 1979 = 515.32
Austria	Wiener Borse	WBI - Wiener Börse Index Index	Index is based on domestic market capitalization and is calculated by the exchange.	December 31, 1967 = 100
Bermuda	Bermuda Stock Exchange	RG/BSX Index	Index is based on domestic market capitalization.	February 23, 1993 = 1,000
Brazil	BM&FBOVESPA S.A.	IBOVESPA	Index is based on free float and is calculated by the exchange.	January 2, 1968 = 100
Canada	TMX Group	S&P/TSX Composite Index	Index is based on market capitalization and is calculated by Standard and Poor's.	1975 = 1,000
China	Shanghai Stock Exchange	SSE Composite Index	Index is based on domestic market capitalization.	December 19, 1990 = 100
	Shenzhen Stock Exchange	SZSE Component Index	Index is based on market capitalization.	April 3, 1991 = 100
Chile	Bolsa de Comercio de Santiago	IGPA Index	Index is based on free float and domestic market capitalization and is calculated by the exchange.	December 31, 1988 = 100
Colombia	Bolsa de Valores de Colombia	IGBC Index	Index is based on market capitalization..	Mid 2001 = 100
Egypt	The Egyptian Exchange	EGX 30 Index	Index is based on free float and domestic market capitalization and is calculated by the exchange.	January 1, 1998 = 1,000
France, England, The Netherlands, Portugal and	Euronext	Euronext 100	Index is based on free float and market capitalization.	December 31, 2001 = 1,000

Belgium.				
Germany	Deutsche Boerse AG	CDAX Price Index	Index is based on free float and market capitalization and is calculated by STOXX.	December 30, 1987 = 100
Greece	Athens Stock Exchange (ATHEX)	ATHEX Composite Share Price Index	Index is based on domestic market capitalization and is calculated by the exchange.	December 31, 1980 = 100
Hong Kong	Hong Kong Exchanges and Clearing	S&P/HKEx Large Cap Index LargeCap Index	Index is based on free-float and is calculated by the provider.	February 28, 2003 = 10,000
India	National Stock Exchange of India Limited	CNX 500	Index is based on free-float and is calculated by the India Index Services & Products Ltd.	January 1, 1995 = 1,000
	BSE India Limited	BSE 500 Index	Index is based on free float.	February 1, 1999 = 1,000
Indonesia	Indonesia Stock Exchange	Jakarta Composite Stock Price Index	Index is based on domestic market capitalization.	August 10, 1982 = 100
Ireland	Irish Stock Exchange	ISEQ Overall Index	Index is based on free float and is calculated by STOXX.	December 31, 2004 = 1,000
Israel	Tel-Aviv Stock Exchange	General Share Index	Index is based on domestic market capitalization and is calculated by the exchange.	December 31, 1991 = 100
Italy	Borsa Italiana	FTSE MIB	Index is based on free-float and market capitalization.	October 31, 2003 = 10,644
Japan	Japan Exchange Group - Tokyo	TOPIX	Index is based on free float and is calculated by the exchange.	January 4, 1968 = 100
Korea	Korea Exchange	KOSPI	Index is based on domestic market capitalization and is calculated by the exchange.	January 4, 1980 = 100
Malaysia	Bursa Malaysia	FBM EMAS	Index is based on free-float and domestic market capitalization and is calculated by FTSE.	March 31, 2006 = 310
Mexico	Bolsa Mexicana de Valores	S&P/BMV IPC	Index is based on market capitalization and is calculated by Standard and Poor's.	October 30, 1978 = 100
New Zealand	NZX Limited	The New Zealand All Ordinaries Index	Index is a capitalization-weighted index of all domestic stocks traded on the New Zealand Exchange Limited. Calculated by Standard and Poor's.	July 1, 1986 = 1,000

Norway	Oslo Bors	Oslo Børs Benchmark Price Index	Index is based on free float and is calculated by the exchange.	January 1, 1996 = 100
Peru	Bolsa de Valores de Lima	Indice General	Index is calculated by the exchange.	December 30, 1991 = 100
Philippines	Philippine Stock Exchange	Philippines Stock Exchange PSEi Index	Index is based on free float and is calculated by the exchange.	February 28, 2000 = 1,022.045
Sweden, Finland and Denmark	Nasdaq Nordic Exchanges	OMX 30	Index is a market weighted price index.	September 30, 1986 = 125
Singapore	Singapore Exchange	FTSE Straits Times Index	Index is based on domestic market capitalization.	January 9, 2008
Slovenia	Ljubljana Stock Exchange	Ljubljana Stock Exchange Composite Index	Index is the Ljubljana Stock Exchange total market index, measuring the performance of the entire Slovene organised securities markets.	July 1, 2000=100
Spain	BME Spanish Exchanges	IBEX 35	Index is based on free float and is calculated by the exchange.	December 29, 1989 = 3000
Sri Lanka	Colombo Stock Exchange	Sri Lanka Colombo Stock Exchange All Share Index	Index is based on domestic market capitalization.	January 2, 1985 = 100
Switzerland	SIX Swiss Exchange	Swiss Performance Index	Index is based on free float and market capitalization.	June 6, 1987 = 1,000
Taiwan	Taiwan Stock Exchange	TAIEX	Index is based on domestic market capitalization and is calculated by TWSE.	1966 = 100
Thailand	The Stock Exchange of Thailand	SET Index	Index is based on domestic market capitalization.	April 30, 1975 = 100
Turkey	Borsa Istanbul	Borsa Istanbul 100 Index	Index is based on free float and is calculated by the exchange.	January 1, 1986 = 1
The UK	London Stock Exchange	FTSE 100	Index is a capitalization-weighted index of the 100 most highly capitalized companies traded on the London Stock Exchange.	December 30, 1983 = 1,000
The US	Nasdaq	Nasdaq Composite	Index is based on domestic market capitalization.	February 5, 1971 = 100
	NYSE	NYSE Composite	Index is a float-adjusted market-capitalization weighted index which includes all common stocks listed on the NYSE	December 31, 2002 = 5,000

Source: World Federation of Exchanges and Bloomberg.

Table 2.
This table summarizes the definition and composition of the Insider Trading Rules Index.

Variable	Definition
Insider trading rules	
Front-running	A dummy variable equal to one if the trading rules explicitly prohibit a broker's house or employee account from buying or selling in a period shortly prior to significant buying or selling by a client.
Client Precedence	A dummy variable equal to one if the trading rules explicitly prohibit a broker from violating the time priority of client orders.
Trading ahead of research reports	A dummy variable equal to one if the trading rules explicitly prohibit brokers with proprietary access to research reports from trading ahead of the release of the research report.
Separation of research and trading	A dummy variable equal to one if the trading rules specify that research departments and trading departments must have a Chinese wall separating these departments.
Broker ownership limit	A dummy variable equal to one if the trading rules specify maximum ownership limits for brokerages or employees with respect to any given security.
Restrictions on affiliation	A dummy variable equal to one if the trading rules specify limits or restrictions on affiliation between exchange members and member companies.
Restrictions on communications	A dummy variable equal to one if the trading rules specify limits or restrictions on brokerages' communications with the public.
Investment company securities	A dummy variable equal to one if the trading rules specify restrictions or bans on the trading of members' own or affiliated investment company securities.
Influencing or rewarding employees of others	A dummy variable equal to one if the trading rules specify bans on any means of influencing or rewarding employees of other members or member companies.
Anti-intimidation/coordination	A dummy variable equal to one if the trading rules specify bans on any form of intimidation of or coordination with other members or member companies.
Insider Trading Rules Index	Sum of dummy variables for Front-running, Client precedence, Trading ahead of research reports, Separation of research and trading, Broker ownership limit, Restrictions on affiliation, Restrictions on communications, Investment company securities, Influencing or rewarding the employees of others, and Anti-intimidation/coordination.

Source: Cumming, Johan and Li (2011)

Table 3.
This table summarizes the definition and composition of the Market Manipulation Rules Index.

Variable	Definition
Market manipulation rules	
Marking the open	A dummy variable equal to one if the trading rules explicitly prohibit the placing of purchase orders at slightly higher prices or sale orders at lower prices to drive up or suppress the price of the securities when the market opens.
Marking the close	A dummy variable equal to one if the trading rules explicitly prohibit the buying or selling of securities at the close of the market in an effort to alter the closing price of the security.
Misleading end of the month/quarter/year trades	A dummy variable equal to one if the trading rules explicitly prohibit transactions executed at a particular date to establish gains or losses or conceal portfolio losses or true positions in connection with end of the month, quarter or year.
Intraday ramping/gouging	A dummy variable equal to one if the trading rules explicitly prohibit the execution of a series of trades over a short time period that generates a price movement over that period in which it is unusual, given the trading history of the security.
Market setting	A dummy variable equal to one if the trading rules explicitly prohibit market setting by crossing in the short term, high or low. For example, this could be done to set the VWAP (volume weighted average price) or cross market (setting the price in one market to justify crossing in the follow-on market).
Pre-arranged trades	A dummy variable equal to one if the trading rules explicitly prohibit pre-arranged trades within an extremely short time period whereby the client broker and another broker enter a bid and ask for the same volume and price, which then generates a trade between the two brokers for the whole of the volume. The volume of the order must be significant given the trading history of the security.
Domination and control	A dummy variable equal to one if the trading rules explicitly prohibit a broker or client from generating significantly greater price changes in a security, possibly for corners (securing control of the bid/demand-side of both the derivative and the underlying asset, and explaining the dominant position to manipulate the price of the derivative or the asset), squeezes (taking advantage of a shortage in an asset by controlling the demand-side and exploiting market congestion during such shortages in a way as to create artificial prices), and mini-manipulations (trading in the underlying security of an option to manipulate its price so that the options become in-the-money).
Price Manipulation Rules Index	Sum of dummy variables for marking the open, marking the close, misleading end of the month/ quarter/year trades, intraday ramping/gouging, market setting, pre-arranged trades, and domination and control.
Churning	A dummy variable equal to one if the trading rules explicitly prohibit excessive buying and selling of stocks by a trader such as a broker to generate large commission fees (in the case of churning client accounts) or the appearance of significant volume (in the case of churning house accounts or churning client accounts).
Wash trade	A dummy variable equal to one if the trading rules explicitly prohibit the same client reference on both sides of a trade.
Volume Manipulation Rules Index	Sum of dummy variables for Churning and Wash trade.

Giving up priority	A dummy variable equal to one if the trading rules explicitly prohibit brokers from giving up priority, such as entering a bid-ask for a significant quantity at a price away from priority and then both cancelling this order as it approaches priority, and re-entering the order shortly thereafter at a price level further away from priority.
Switch	A dummy variable equal to one if the trading rules explicitly prohibit brokers from entering fictitious orders, such as entering a significant quantity at or close to priority, then completing a trade on the opposite side of the market, and thereafter deleting the original order shortly after the completion of the opposite order
Layering of bids/asks	A dummy variable equal to one if the trading rules explicitly prohibit brokers from layering bids-asks, such as stagger orders from the same client reference at different price and volume levels, with the intent of giving a false or misleading appearance with respect to the market for the security.
Spoofing Rules Index	Sum of dummy variables for Giving up priority, Switch, and Layering of bids-asks.
Dissemination of false and misleading information	A dummy variable equal to one if the trading rules explicitly prohibit the dissemination of false or misleading market information
Parking or warehousing	A dummy variable equal to one if the trading rules explicitly prohibit hiding the true ownership of securities by creating a set of fictitious transactions and trades.
False Disclosure Rules Index	Sum of dummy variables for Dissemination of false and misleading information and Parking or warehousing.
Market Manipulation Rules Index	Sum of Price Manipulation Rules Index, Volume Manipulation Rules Index, Spoofing Rules Index, and False Disclosure Rules Index.

Source: Cumming, Johan and Li (2011)

Table 4.
This table summarizes the definition and composition of the Broker-Agency Index.

Variable	Definition
Broker-agency rules	
Trade through	A dummy variable equal to one if the trading rules explicitly prohibit the completion of a client's order at a price inferior to the best posted bid or ask; e.g., the market maker who received the order is unable or unwilling to fill it at the best posted bid or ask price and, hence, the trade is instead executed at the market maker's price.
Improper execution	A dummy variable equal to one if the trading rules explicitly prohibit brokers from charging fees for completing a client order, which are unwarranted given the circumstances.
Restrictions on member use of exchange name	A dummy variable equal to one if the trading rules specify restrictions on exchange members' use of the exchange name.
Restrictions on sales materials and telemarketing	A dummy variable equal to one if the trading rules specify restrictions on exchange members' nature of sales and telemarketing.
Fair dealing with customers	A dummy variable equal to one if the trading rules specify details with respect to the ''know your client rule'' that requires brokerages to not make trades that do not fit within the clients interest, no delays in the handling of client orders, and the like.
Broker-Agency Index	Sum of dummy variables for Trade through, Improper execution, Restrictions on member use of exchange name, Restrictions on sales materials and telemarketing, and Fair dealing with customers.

Source: Cumming, Johan and Li (2011)

Table 5.
This table summarises the descriptive statistics of the included variables for the stock exchange of Argentina.

Variable	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.36	0.26	1.37	0.01	0.30	36.00
Insider Trading Rules Index	3.00	3.00	3.00	3.00	0.00	36.00
Market Manipulation Rules Index	3.00	3.00	3.00	3.00	0.00	36.00
Broker-Agency Conflict Rules Index	1.00	1.00	1.00	1.00	0.00	36.00
Governance	-0.23	-0.20	-0.19	-0.30	0.05	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	10.83	10.85	11.02	10.55	0.12	36.00
Log(value of share trading)	6.23	6.26	6.91	5.43	0.35	36.00
Velocity	0.08	0.08	0.13	0.03	0.02	36.00

Table 6.
This table summarises the descriptive statistics of the included variables for the stock exchange of Australia.

Variable	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.56	0.32	3.29	0.05	0.65	36.00
Insider Trading Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Market Manipulation Rules Index	6.00	6.00	6.00	6.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	1.60	1.60	1.62	1.58	0.02	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	13.89	13.93	14.19	13.36	0.22	36.00
Log(value of share trading)	11.39	11.43	11.83	10.73	0.30	36.00
Velocity	0.95	0.93	1.22	0.72	0.13	36.00

Table 7.
This table summarises the descriptive statistics of the included variables for the stock exchange of Austria.

Variable	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.55	0.24	8.25	0.00	1.36	36.00
Insider Trading Rules Index	1.22	2.00	2.00	0.00	0.99	36.00
Market Manipulation Rules Index	7.72	12.00	12.00	1.00	5.44	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	1.67	1.66	1.72	1.64	0.03	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	12.08	12.18	12.44	11.16	0.32	36.00
Log(value of share trading)	9.03	9.12	9.56	7.95	0.37	36.00
Velocity	0.57	0.52	1.14	0.37	0.18	36.00

Table 8.
This table summarises the descriptive statistics of the included variables for the stock exchange of Bermuda.

Bermuda	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.46	0.31	1.49	0.01	0.37	36.00
Insider Trading Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Market Manipulation Rules Index	5.00	5.00	5.00	5.00	0.00	36.00
Broker-Agency Conflict Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Governance	1.06	1.06	1.07	1.06	0.01	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	7.86	7.91	7.99	7.56	0.11	36.00
Log(value of share trading)	1.90	2.21	3.81	-3.91	1.51	36.00
Velocity	0.06	0.04	0.20	0.01	0.04	32.00

Table 9.
This table summarises the descriptive statistics of the included variables for the stock exchange of Brazil.

Brazil	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.30	0.21	1.02	0.00	0.27	36.00
Insider Trading Rules Index	1.00	1.00	1.00	1.00	0.00	36.00
Market Manipulation Rules Index	1.00	1.00	1.00	1.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	-0.09	-0.11	-0.03	-0.11	0.04	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	13.68	13.61	14.27	13.25	0.37	36.00
Log(value of share trading)	10.61	10.64	11.32	9.73	0.50	36.00
Velocity	0.56	0.56	1.04	0.35	0.13	36.00

Table 10.
This table summarises the descriptive statistics of the included variables for the stock exchange of Canada.

Canada	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.38	0.32	1.08	0.05	0.28	36.00
Insider Trading Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Market Manipulation Rules Index	12.00	12.00	12.00	12.00	0.00	36.00
Broker-Agency Conflict Rules Index	1.00	1.00	1.00	1.00	0.00	36.00
Governance	1.60	1.61	1.61	1.58	0.01	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	14.37	14.40	14.65	13.85	0.18	36.00
Log(value of share trading)	11.75	11.71	12.10	11.42	0.21	36.00
Velocity	0.88	0.83	1.53	0.64	0.19	36.00

Table 11.
This table summarises the descriptive statistics of the included variables for the Shanghai stock exchange.

Shanghai Stock Exchange	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.38	0.28	1.58	0.02	0.31	36.00
Insider Trading Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Market Manipulation Rules Index	5.00	5.00	5.00	5.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	-0.53	-0.53	-0.49	-0.57	0.03	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	14.02	14.24	15.12	12.64	0.81	36.00
Log(value of share trading)	11.92	12.13	13.15	10.22	0.86	36.00
Velocity	1.61	1.37	3.44	0.74	0.72	36.00

Table 12.
This table summarises the descriptive statistics of the included variables for the Shenzhen stock exchange.

Shenzhen Stock Exchange	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.31	0.28	0.78	0.01	0.20	36.00
Insider Trading Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Market Manipulation Rules Index	5.00	5.00	5.00	5.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	-0.53	-0.53	-0.49	-0.57	0.03	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	12.75	12.83	13.57	11.73	0.63	36.00
Log(value of share trading)	11.26	11.39	12.46	9.72	0.80	36.00
Velocity	2.92	2.68	6.02	1.48	1.25	36.00

Table 13.
This table summarises the descriptive statistics of the included variables for the stock exchange of Chile.

Chile	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.40	0.29	1.96	0.06	0.39	36.00
Insider Trading Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Market Manipulation Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	1.14	1.14	1.15	1.12	0.02	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	12.09	12.11	12.35	11.77	0.20	36.00
Log(value of share trading)	7.92	7.92	8.61	7.26	0.39	36.00
Velocity	0.19	0.19	0.33	0.11	0.06	36.00

Table 14.
This table summarises the descriptive statistics of the included variables for the stock exchange of Colombia.

Colombia	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.59	0.30	8.58	0.04	1.40	36.00
Insider Trading Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Market Manipulation Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	-0.42	-0.40	-0.40	-0.44	0.02	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	11.18	11.09	11.81	10.59	0.35	36.00
Log(value of share trading)	7.24	7.27	7.80	6.62	0.30	36.00
Velocity	0.24	0.21	0.42	0.14	0.07	36.00

Table 15.
This table summarises the descriptive statistics of the included variables for the stock exchange of Egypt.

Egypt	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.37	0.26	1.72	0.08	0.30	36.00
Insider Trading Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Market Manipulation Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	-0.56	-0.54	-0.50	-0.63	0.06	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	11.56	11.48	12.01	11.09	0.27	36.00
Log(value of share trading)	8.50	8.36	9.88	7.58	0.50	36.00
Velocity	0.60	0.54	1.56	0.31	0.23	36.00

Table 16.
This table summarises the descriptive statistics of the included variables for the Euronext stock exchange.

Euronext	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.26	0.19	0.89	0.00	0.22	36.00
Insider Trading Rules Index	1.22	2.00	2.00	0.00	0.99	36.00
Market Manipulation Rules Index	9.89	13.00	13.00	5.00	3.96	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	1.33	1.33	1.34	1.32	0.01	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	15.05	15.10	15.30	14.48	0.20	36.00
Log(value of share trading)	12.62	12.68	13.11	11.93	0.28	36.00
Velocity	1.08	1.04	1.88	0.76	0.25	36.00

Table 17.
This table summarises the descriptive statistics of the included variables for the stock exchange of Germany.

Germany	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.33	0.21	1.68	0.01	0.35	36.00
Insider Trading Rules Index	2.61	3.00	3.00	2.00	0.49	36.00
Market Manipulation Rules Index	7.72	12.00	12.00	1.00	5.44	36.00
Broker-Agency Conflict Rules Index	0.39	0.00	1.00	0.00	0.49	36.00
Governance	1.49	1.51	1.52	1.46	0.03	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	14.30	14.33	14.57	13.80	0.20	36.00
Log(value of share trading)	12.33	12.35	13.00	11.83	0.32	36.00
Velocity	1.67	1.60	3.44	1.09	0.49	36.00

Table 18.
This table summarises the descriptive statistics of the included variables for the stock exchange of Greece.

Greece	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.27	0.19	0.92	0.00	0.26	36.00
Insider Trading Rules Index	2.61	3.00	3.00	2.00	0.49	36.00
Market Manipulation Rules Index	8.50	12.00	12.00	3.00	4.45	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	0.66	0.67	0.72	0.60	0.05	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	12.14	12.20	12.50	11.37	0.28	36.00
Log(value of share trading)	9.02	9.06	9.58	8.15	0.33	36.00
Velocity	0.51	0.50	0.89	0.31	0.12	36.00

Table 19.
This table summarises the descriptive statistics of the included variables for the stock exchange of Hong Kong.

Hong Kong	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.34	0.24	1.09	0.02	0.29	36.00
Insider Trading Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Market Manipulation Rules Index	7.00	7.00	7.00	7.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	1.47	1.47	1.48	1.45	0.01	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	14.37	14.36	14.91	13.95	0.28	36.00
Log(value of share trading)	11.57	11.60	12.69	10.65	0.51	36.00
Velocity	0.76	0.71	1.30	0.39	0.23	36.00

Table 20.
This table summarises the descriptive statistics of the included variables for the National stock exchange of India.

National Stock Exchange of India Limited	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.32	0.23	1.48	0.00	0.31	36.00
Insider Trading Rules Index	3.00	3.00	3.00	3.00	0.00	36.00
Market Manipulation Rules Index	6.00	6.00	6.00	6.00	0.00	36.00
Broker-Agency Conflict Rules Index	3.00	3.00	3.00	3.00	0.00	36.00
Governance	-0.19	-0.20	-0.17	-0.22	0.02	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	13.66	13.62	14.32	13.18	0.34	36.00
Log(value of share trading)	10.81	10.72	11.66	10.14	0.39	36.00
Velocity	0.70	0.65	1.01	0.53	0.13	36.00

Table 21.
This table summarises the descriptive statistics of the included variables for the BSE India limited stock exchange.

BSE India Limited	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.33	0.23	1.94	0.03	0.35	36.00
Insider Trading Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Market Manipulation Rules Index	3.00	3.00	3.00	3.00	0.00	36.00
Broker-Agency Conflict Rules Index	3.00	3.00	3.00	3.00	0.00	36.00
Governance	-0.19	-0.20	-0.17	-0.22	0.02	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	13.73	13.68	14.41	13.24	0.35	36.00
Log(value of share trading)	10.03	10.03	10.83	9.37	0.36	36.00
Velocity	0.30	0.29	0.47	0.24	0.05	36.00

Table 22.
This table summarises the descriptive statistics of the included variables for the stock exchange of Indonesia.

Indonesia	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.35	0.26	1.34	0.00	0.33	36.00
Insider Trading Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Market Manipulation Rules Index	3.00	3.00	3.00	3.00	0.00	36.00
Broker-Agency Conflict Rules Index	1.00	1.00	1.00	1.00	0.00	36.00
Governance	-0.54	-0.52	-0.48	-0.62	0.06	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	11.87	11.90	12.30	11.32	0.30	36.00
Log(value of share trading)	8.60	8.68	9.57	7.76	0.55	36.00
Velocity	0.48	0.45	0.84	0.27	0.14	36.00

Table 23.
This table summarises the descriptive statistics of the included variables for the stock exchange of Ireland.

Ireland	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.32	0.26	1.03	0.00	0.25	36.00
Insider Trading Rules Index	1.22	2.00	2.00	0.00	0.99	36.00
Market Manipulation Rules Index	8.11	12.00	12.00	2.00	4.94	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	1.57	1.58	1.58	1.57	0.00	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	11.76	11.85	12.11	10.79	0.34	36.00
Log(value of share trading)	7.24	7.27	7.99	6.55	0.39	36.00
Velocity	0.14	0.14	0.28	0.06	0.05	36.00

Table 24.
This table summarises the descriptive statistics of the included variables for the stock exchange of Israel.

Israel	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.43	0.23	1.60	0.01	0.47	36.00
Insider Trading Rules Index	1.00	1.00	1.00	1.00	0.00	36.00
Market Manipulation Rules Index	3.00	3.00	3.00	3.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	0.59	0.59	0.61	0.57	0.01	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	12.09	12.14	12.46	11.59	0.24	36.00
Log(value of share trading)	8.82	8.82	9.47	8.23	0.32	36.00
Velocity	0.47	0.47	0.69	0.29	0.09	36.00

Table 25.
This table summarises the descriptive statistics of the included variables for the stock exchange of Italy.

Italy	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.36	0.26	1.75	0.00	0.34	36.00
Insider Trading Rules Index	2.22	3.00	3.00	1.00	0.99	36.00
Market Manipulation Rules Index	8.11	12.00	12.00	2.00	4.94	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	0.59	0.58	0.62	0.57	0.02	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	13.73	13.77	13.95	13.10	0.21	36.00
Log(value of share trading)	11.81	11.89	12.41	10.64	0.38	36.00
Velocity	1.74	1.75	2.74	0.93	0.45	36.00

Table 26.
This table summarises the descriptive statistics of the included variables for the stock exchange of Japan.

Japan	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.26	0.17	1.02	0.02	0.26	36.00
Insider Trading Rules Index	1.00	1.00	1.00	1.00	0.00	36.00
Market Manipulation Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	1.20	1.17	1.25	1.17	0.04	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	15.27	15.32	15.41	14.87	0.14	36.00
Log(value of share trading)	13.03	13.06	13.35	12.65	0.15	36.00
Velocity	1.30	1.29	2.07	1.02	0.20	36.00

Table 27.
This table summarises the descriptive statistics of the included variables for the stock exchange of Korea.

Korea	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.30	0.25	0.85	0.00	0.24	36.00
Insider Trading Rules Index	3.00	3.00	3.00	3.00	0.00	36.00
Market Manipulation Rules Index	9.00	9.00	9.00	9.00	0.00	36.00
Broker-Agency Conflict Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Governance	0.71	0.67	0.81	0.66	0.07	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	13.64	13.64	14.04	12.91	0.25	36.00
Log(value of share trading)	11.73	11.65	12.43	11.24	0.30	36.00
Velocity	1.82	1.78	2.87	1.07	0.45	36.00

Table 28.
This table summarises the descriptive statistics of the included variables for the stock exchange of Malaysia.

Malaysia	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.35	0.24	1.68	0.00	0.35	36.00
Insider Trading Rules Index	7.00	7.00	7.00	7.00	0.00	36.00
Market Manipulation Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Broker-Agency Conflict Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Governance	0.33	0.36	0.39	0.22	0.08	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	12.41	12.47	12.69	12.08	0.21	36.00
Log(value of share trading)	8.96	9.00	9.75	7.98	0.49	36.00
Velocity	0.40	0.36	0.78	0.18	0.14	36.00

Table 29.
This table summarises the descriptive statistics of the included variables for the stock exchange of Mexico.

Mexico	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.32	0.19	2.14	0.00	0.40	36.00
Insider Trading Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Market Manipulation Rules Index	6.00	6.00	6.00	6.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	-0.15	-0.15	-0.12	-0.19	0.03	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	12.72	12.81	13.01	12.32	0.22	36.00
Log(value of share trading)	9.10	9.15	9.55	8.53	0.24	36.00
Velocity	0.30	0.29	0.46	0.20	0.05	36.00

Table 30.
This table summarises the descriptive statistics of the included variables for the stock exchange of New Zealand.

New Zealand	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.38	0.26	2.27	0.00	0.42	36.00
Insider Trading Rules Index	3.00	3.00	3.00	3.00	0.00	36.00
Market Manipulation Rules Index	4.00	4.00	4.00	4.00	0.00	36.00
Broker-Agency Conflict Rules Index	3.00	3.00	3.00	3.00	0.00	36.00
Governance	1.71	1.71	1.72	1.71	0.00	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	10.60	10.63	10.86	10.04	0.20	36.00
Log(value of share trading)	6.05	6.02	6.52	5.28	0.26	36.00
Velocity	0.12	0.12	0.21	0.09	0.02	36.00

Table 31.
This table summarises the descriptive statistics of the included variables for the stock exchange of Norway.

Norway	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.53	0.25	4.13	0.01	0.80	36.00
Insider Trading Rules Index	3.61	4.00	4.00	3.00	0.49	36.00
Market Manipulation Rules Index	8.89	12.00	12.00	4.00	3.96	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	1.66	1.66	1.67	1.65	0.01	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	12.51	12.58	12.82	11.74	0.26	36.00
Log(value of share trading)	10.34	10.33	10.88	9.40	0.33	36.00
Velocity	1.20	1.20	1.85	0.68	0.25	36.00

Table 32.
This table summarises the descriptive statistics of the included variables for the stock exchange of Peru.

Peru	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.30	0.21	1.08	0.02	0.27	36.00
Insider Trading Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Market Manipulation Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	-0.33	-0.33	-0.29	-0.37	0.03	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	10.76	10.84	11.19	10.06	0.37	36.00
Log(value of share trading)	6.15	6.17	7.11	5.23	0.49	36.00
Velocity	0.11	0.09	0.34	0.04	0.07	36.00

Table 33.
This table summarises the descriptive statistics of the included variables for the stock exchange of Philippines.

Philippines	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.45	0.35	1.77	0.00	0.44	36.00
Insider Trading Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Market Manipulation Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	-0.52	-0.53	-0.49	-0.54	0.02	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	11.13	11.20	11.54	10.65	0.28	36.00
Log(value of share trading)	7.03	7.06	7.84	6.06	0.54	36.00
Velocity	0.21	0.20	0.33	0.10	0.06	36.00

Table 34.
This table summarises the descriptive statistics of the included variables for the Nasdaq Nordic Exchanges.

Nasdaq Nordic Exchanges	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.35	0.22	1.39	0.03	0.33	36.00
Insider Trading Rules Index	4.61	5.00	5.00	4.00	0.49	36.00
Market Manipulation Rules Index	9.67	12.00	12.00	6.00	2.97	36.00
Broker-Agency Conflict Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Governance	1.82	1.82	1.82	1.81	0.01	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	13.83	13.89	14.14	13.18	0.24	36.00
Log(value of share trading)	11.48	11.53	11.94	10.71	0.28	36.00
Velocity	1.10	1.06	1.85	0.74	0.23	36.00

Table 35.
This table summarises the descriptive statistics of the included variables for the stock exchange of Singapore.

Singapore	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.31	0.22	1.04	0.01	0.28	36.00
Insider Trading Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Market Manipulation Rules Index	7.00	7.00	7.00	7.00	0.00	36.00
Broker-Agency Conflict Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Governance	1.48	1.48	1.54	1.43	0.04	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	12.88	12.94	13.25	12.41	0.26	36.00
Log(value of share trading)	9.96	9.99	10.76	9.29	0.39	36.00
Velocity	0.67	0.63	0.99	0.46	0.15	36.00

Table 36.
This table summarises the descriptive statistics of the included variables for the stock exchange of Slovenia.

Slovenia	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.45	0.24	2.36	0.08	0.56	36.00
Insider Trading Rules Index	2.61	3.00	3.00	2.00	0.49	36.00
Market Manipulation Rules Index	11.06	13.00	13.00	8.00	2.47	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	0.98	0.96	1.01	0.96	0.02	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	9.72	9.77	10.27	9.00	0.42	36.00
Log(value of share trading)	4.82	4.72	5.83	3.84	0.58	36.00
Velocity	0.09	0.10	0.15	0.03	0.03	36.00

Table 37.
This table summarises the descriptive statistics of the included variables for the stock exchange of Spain.

Spain	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.42	0.23	2.51	0.00	0.49	36.00
Insider Trading Rules Index	4.00	4.00	4.00	4.00	0.00	36.00
Market Manipulation Rules Index	8.11	12.00	12.00	2.00	4.94	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	0.86	0.86	0.87	0.85	0.01	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	14.12	14.13	14.42	13.67	0.21	36.00
Log(value of share trading)	11.91	11.94	12.51	11.34	0.30	36.00
Velocity	1.34	1.35	2.02	0.80	0.29	36.00

Table 38.
This table summarises the descriptive statistics of the included variables for the stock exchange of Sri Lanka.

Sri Lanka	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.61	0.19	5.90	0.01	1.06	36.00
Insider Trading Rules Index	4.00	4.00	4.00	4.00	0.00	36.00
Market Manipulation Rules Index	4.00	4.00	4.00	4.00	0.00	36.00
Broker-Agency Conflict Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Governance	-0.41	-0.41	-0.35	-0.48	0.05	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	8.86	8.89	9.05	8.36	0.14	36.00
Log(value of share trading)	4.20	4.24	6.06	2.46	0.64	36.00
Velocity	0.14	0.11	0.65	0.03	0.11	36.00

Table 39.
This table summarises the descriptive statistics of the included variables for the stock exchange of Switzerland.

Switzerland	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.56	0.24	7.13	0.04	1.19	36.00
Insider Trading Rules Index	2.61	3.00	3.00	2.00	0.49	36.00
Market Manipulation Rules Index	9.28	12.00	12.00	5.00	3.46	36.00
Broker-Agency Conflict Rules Index	1.00	1.00	1.00	1.00	0.00	36.00
Governance	1.73	1.73	1.75	1.72	0.01	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	13.95	14.00	14.11	13.58	0.13	36.00
Log(value of share trading)	11.49	11.48	12.10	10.96	0.31	36.00
Velocity	0.78	0.89	1.78	0.05	0.56	36.00

Table 40.
This table summarises the descriptive statistics of the included variables for the stock exchange of Taiwan.

Taiwan	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.38	0.32	1.38	0.00	0.31	36.00
Insider Trading Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Market Manipulation Rules Index	2.00	2.00	2.00	2.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	0.78	0.77	0.82	0.76	0.02	36.00
Two tier board	0.00	0.00	0.00	0.00	0.00	36.00
Log(market cap)	13.25	13.28	13.52	12.74	0.20	36.00
Log(value of share trading)	11.12	11.12	11.93	10.41	0.35	36.00
Velocity	1.46	1.46	2.58	0.67	0.34	36.00

Table 41.
This table summarises the descriptive statistics of the included variables for the stock exchange of Thailand.

Thailand	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.43	0.31	1.38	0.01	0.38	36.00
Insider Trading Rules Index	1.00	1.00	1.00	1.00	0.00	36.00
Market Manipulation Rules Index	8.00	8.00	8.00	8.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	-0.28	-0.27	-0.26	-0.31	0.02	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	11.95	11.93	12.25	11.41	0.21	36.00
Log(value of share trading)	9.03	8.98	9.80	8.42	0.32	36.00
Velocity	0.67	0.66	1.20	0.36	0.18	36.00

Table 42.
This table summarises the descriptive statistics of the included variables for the stock exchange of Turkey.

Turkey	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.35	0.20	1.79	0.01	0.38	36.00
Insider Trading Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Market Manipulation Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	-0.03	-0.03	-0.03	-0.03	0.00	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	12.13	12.14	12.57	11.62	0.26	36.00
Log(value of share trading)	9.94	9.95	10.48	9.30	0.26	36.00
Velocity	1.37	1.35	1.87	0.75	0.26	36.00

Table 43.
This table summarises the descriptive statistics of the included variables for the stock exchange of The UK.

The UK	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.34	0.20	2.33	0.00	0.44	36.00
Insider Trading Rules Index	2.61	3.00	3.00	2.00	0.49	36.00
Market Manipulation Rules Index	12.61	13.00	13.00	12.00	0.49	36.00
Broker-Agency Conflict Rules Index	0.00	0.00	0.00	0.00	0.00	36.00
Governance	1.47	1.47	1.52	1.42	0.04	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	15.03	15.06	15.25	14.44	0.20	36.00
Log(value of share trading)	12.59	12.61	13.08	11.75	0.30	36.00
Velocity	0.99	0.94	1.64	0.64	0.27	36.00

Table 44.
This table summarises the descriptive statistics of the included variables for the NASDAQ stock exchange.

NASDAQ	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.27	0.24	0.69	0.01	0.18	36.00
Insider Trading Rules Index	10.00	10.00	10.00	10.00	0.00	36.00
Market Manipulation Rules Index	11.00	11.00	11.00	11.00	0.00	36.00
Broker-Agency Conflict Rules Index	5.00	5.00	5.00	5.00	0.00	36.00
Governance	1.28	1.28	1.31	1.25	0.02	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	15.08	15.14	15.29	14.60	0.17	36.00
Log(value of share trading)	14.04	13.93	14.78	13.54	0.37	36.00
Velocity	4.37	3.08	12.16	2.39	2.48	36.00

Table 45.
This table summarises the descriptive statistics of the included variables for the NYSE.

NYSE	Mean	Median	Max	Min	Std. Dev.	N
Variance ratio	0.24	0.22	0.76	0.01	0.19	36.00
Insider Trading Rules Index	7.00	7.00	7.00	7.00	0.00	36.00
Market Manipulation Rules Index	13.00	13.00	13.00	13.00	0.00	36.00
Broker-Agency Conflict Rules Index	3.00	3.00	3.00	3.00	0.00	36.00
Governance	1.28	1.28	1.31	1.25	0.02	36.00
Two tier board	1.00	1.00	1.00	1.00	0.00	36.00
Log(market cap)	16.48	16.50	16.63	16.03	0.14	36.00
Log(value of share trading)	14.58	14.55	14.99	14.29	0.20	36.00
Velocity	1.67	1.56	2.91	1.18	0.38	36.00

Table 46.
This table presents the variance inflation factor of the regression including the market capitalization measure as the size measure of an exchange.

Variable	VIF	1/VIF
Governance * Insider Trading Rules Index	7.64	0.13
Governance * Broker-Agency Conflict Rules Index	4.7	0.21
Governance * Market Manipulation Rules Index	3.55	0.28
Broker-Agency Conflict Rules Index	2.22	0.45
Log(market cap)	1.68	0.60
Velocity	1.64	0.61
Two tier board	1.28	0.78
Mean VIF	3.24	
Ramsey RESET test for omitted variable bias	0.79	
Wooldridge test for autocorrelation	1.72	

Note: ** and * denote significance at the 1% and 5% levels, respectively.

Table 47.
This table presents the variance inflation factor of the regression including the market capitalization measure as the size measure of an exchange.

Variable	VIF	1/VIF
Governance * Insider Trading Rules Index	9.34	0.09
Governance * Market Manipulation Rules Index	3.76	0.27
Governance * Broker-Agency Conflict Rules Index	3.73	0.27
Insider Trading Rules Index	2.63	0.38
Log(market cap)	1.68	0.59
Velocity	1.64	0.61
Two tier board	1.27	0.79
Mean VIF	3.72	
Ramsey RESET test for omitted variable bias	0.57	
Wooldridge test for autocorrelation	1.70	

Note: ** and * denote significance at the 1% and 5% levels, respectively.

Table 48.
This table presents the variance inflation factor of the regression including the market capitalization measure as the size measure of an exchange.

Variable	VIF	1/VIF
Governance * Insider Trading Rules Index	7.54	0.13
Governance * Market Manipulation Rules Index	5.97	0.17
Market Manipulation Rules Index	3.71	0.27
Governance * Broker-Agency Conflict Rules Index	3.65	0.27
Velocity	1.73	0.58
Log(market cap)	1.69	0.59
Two tier board	1.35	0.74
Mean VIF	3.66	
Ramsey RESET test for omitted variable bias	0.76	
Wooldridge test for autocorrelation	1.70	

Note: ** and * denote significance at the 1% and 5% levels, respectively.

Table 49.
This table presents the variance inflation factor of the regression including the value of share trading measure as the size measure of an exchange.

Variable	VIF	1/VIF
Governance * Insider Trading Rules Index	7.66	0.13
Governance * Broker-Agency Conflict Rules Index	4.71	0.21
Governance * Market Manipulation Rules Index	3.52	0.28
Broker-Agency Conflict Rules Index	2.22	0.45
Log(value of share trading)	2.1	0.48
Velocity	2.06	0.48
Two tier board	1.28	0.78
Mean VIF	3.37	
Ramsey RESET test for omitted variable bias	0.72	
Wooldridge test for autocorrelation	1.74	

Note: ** and * denote significance at the 1% and 5% levels, respectively.

Table 50.
This table presents the variance inflation factor of the regression including the value of share trading measure as the size measure of an exchange.

Variable	VIF	1/VIF
Governance * Insider Trading Rules Index	9.4	0.09
Governance * Broker-Agency Conflict Rules Index	3.78	0.26
Governance * Market Manipulation Rules Index	3.74	0.27
Insider Trading Rules Index	2.64	0.38
Log(value of share trading)	2.11	0.47
Velocity	2.08	0.48
Two tier board	1.26	0.79
Mean VIF	3.86	
Ramsey RESET test for omitted variable bias	0.46	
Wooldridge test for autocorrelation	1.72	

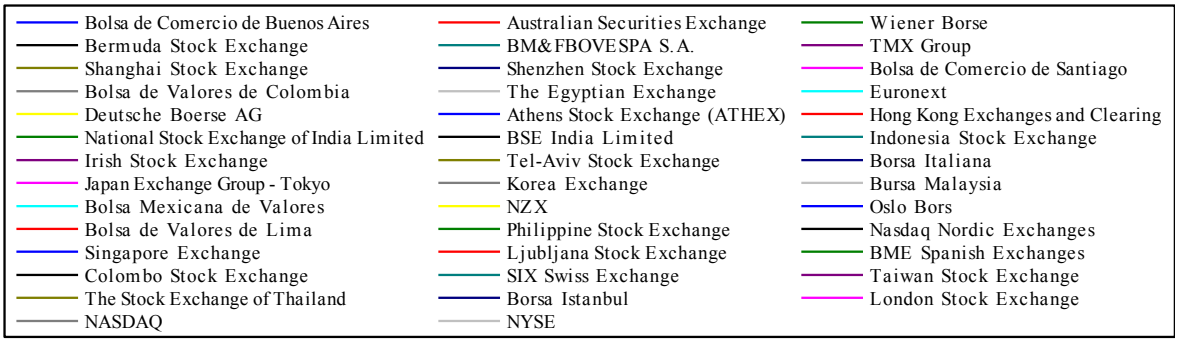
Note: ** and * denote significance at the 1% and 5% levels, respectively.

Table 51.
This table presents the variance inflation factor of the regression including the value of share trading measure as the size measure of an exchange.

Variable	VIF	1/VIF
Governance * Insider Trading Rules Index	7.55	0.13
Governance * Market Manipulation Rules Index	5.94	0.17
Market Manipulation Rules Index	3.7	0.27
Governance * Broker-Agency Conflict Rules Index	3.7	0.27
Velocity	2.17	0.46
Log(value of share trading)	2.11	0.47
Two tier board	1.35	0.74
Mean VIF	3.79	
Ramsey RESET test for omitted variable bias	0.68	
Wooldridge test for autocorrelation	1.72	

Note: ** and * denote significance at the 1% and 5% levels, respectively.

The following figures (Figure 1-4) can be interpreted using the following legend:



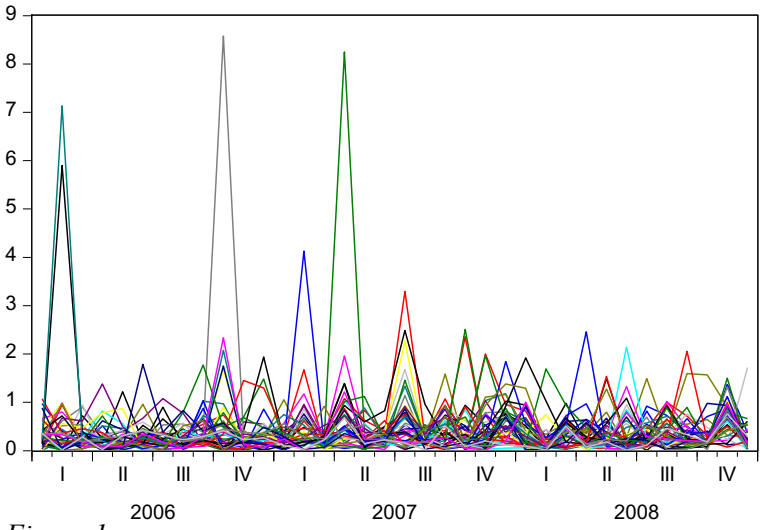


Figure 1.
Graph of the variance ratio across time.

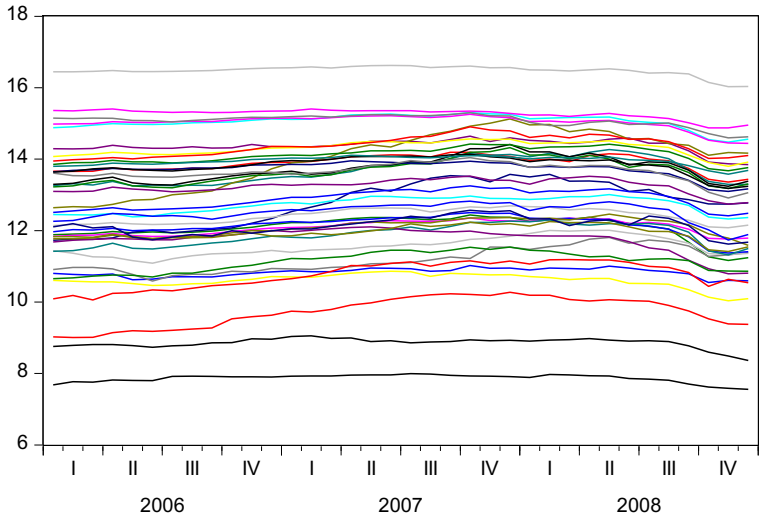


Figure 2.
Graph of the logarithm of market capitalization across time.

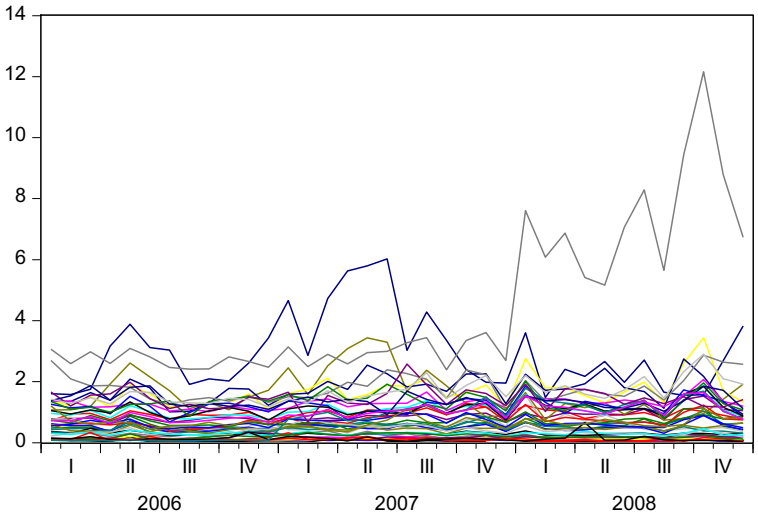


Figure 3.
Graph of velocity across time.

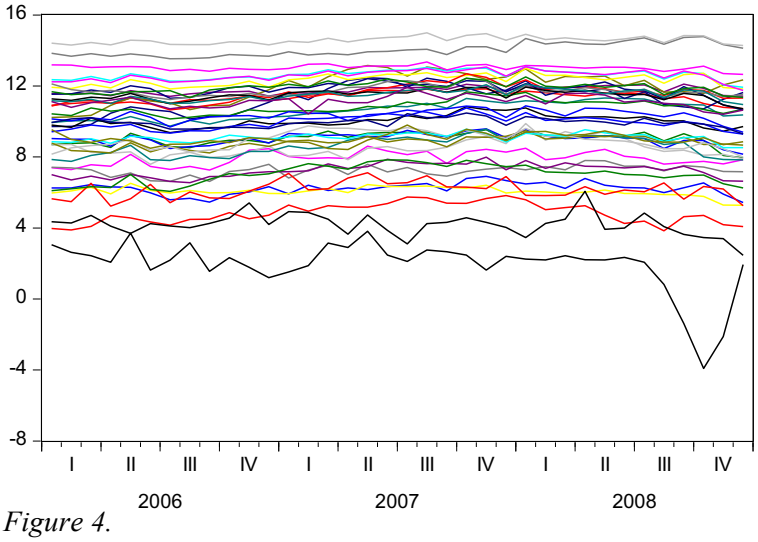


Figure 4.
Graph of the logarithm of value of share trading across time.