

Louvain School of Management

Comparative study of the impact of the Global Financial Crisis on IPOs underpricing and long-term performance in London and Singapore.

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“The redaction of this master thesis is closing my time at university. It would have been impossible – or at least much more difficult – without the help and the support of several people.

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INTRODUCTION

The objective of this thesis is to study the impact of the 2008 financial crisis on IPOs. We will focus on two main topics: the first day underpricing of IPOs and their long-term performance compared to the market.

We will also study the differences and similarities between IPOs floating on two stock exchanges: the Singapore Exchange and the London Stock Exchange. Furthermore, the comparison of two countries will allow us to analyze which similarities and/or differences have been spotted in their reaction to the crisis.

We found out that the reaction of both countries was identical in terms of underpricing with both exchanges experiencing a lower underpricing after the crisis. However, the results concerning the long-term performance of both markets are diverging. New listings on SGX showed a stable performance while LSE new listings saw their performance worsened with the crisis.

We have also run an analysis on the origin of IPOs which gave interesting although not significant results.

We used the Buy-and-Hold abnormal returns as well as a wealth relative measure in order to compute long-term performance and compared it with the performance of the small-caps indexes of the SGX Mainboard and the LSE Main Market. We also used a Market-Adjusted measure of underpricing. We looked at companies having entered the main markets of both exchanges from 2004 until 2012.

The motivation of this study is related to its innovative nature. Indeed, a worldwide event such as the financial crisis does not happen every year. Furthermore this event was closely related to financial markets. In order to study IPOs long-term performance in a correct way, a minimum of 2-3 years of financial data is needed. Therefore, this thesis is, to our best knowledge, one of the first to study the impact of the crisis on IPOs underpricing and long-term performance. Furthermore, the comparison of two countries adds a bit more innovation to this thesis since most researches are limited to the study of long-term performance on a single financial market.

LITERATURE REVIEW

IPOs

Definition, Pros and Cons

Given that IPOs will be the basic component of this thesis, it can be useful to briefly define it. Initial public offerings or IPOs are terms used to define the first time a firm decides to sell stock to the public. The important part of this definition is that an IPO is a first offering for the company. Nevertheless, the previous definition will be completed as follow: "... to the public on a given market". This thesis will therefore not deal with Seasoned Equity Offering (SEO) but well with cross-listings¹. SEOs are similar to IPOs except that new shares are issued by a publicly traded company (Sensagent, n.d.).

Two measures are usually used when looking at the IPO market: counts and proceeds. IPO counts are the number of IPOs on a given period of time while IPO proceeds are the amounts raised on that period of time. Looking at the graphs in appendix A, it can be seen that the evolution of IPO counts and IPO proceeds has not been exactly the same from 1990 and 2007².

According to Doidge, Karolyi and Stulz (2013), the number of IPOs grew from less than 1,000 in 1990 to 1,850 in 2007 with a peak of 3,100 in 1996. It can also be seen that the start of the 21st century was marked by a very low number of IPOs (less than 1,000). Concerning the total annual proceeds, it rose steadily from \$29.6 billion in 1990 to \$278.6 billion in 2007 which was the higher amount recorded at the time.

The biggest IPO markets vary depending on the measure which is under examination. The following table shows the five biggest markets for each measure according to Doidge et al. (2013). This means that in some countries (e.g. UK or France) there are fewer companies entering the market but when they do, they tend to raise a higher amount of capital.

¹ Cross-listing will be further discussed later in the thesis.

² Everything that happened after 2008 and the financial crisis will be discussed later.

Table 1: IPO counts and proceeds – Top countries

IPO counts		IPO Proceeds (in billions)	
United States	6,126	United States	\$647.7
India	4,867	China	\$254.6
Japan	2,234	Japan	\$204.1
Canada	2,225	United Kingdom	\$196.3
China	1,650	France	\$122.3

Doidge, Karolyi and Stulz, 2013

Going public is a choice, not a fate. Some companies which fulfill IPO requirements may decide to stay private for various reasons (Pagano, Panetta and Zingales, 1998). Hayes (n.d.) and Pagano, Panetta and Zingales (1998) listed a series of advantages and disadvantages resulting from going public. These can be found in the following table.

Table 2: Pros and Cons to going public

Pros	Cons
More capital than other options	More transparency
Lower cost of capital and greater bargaining power with banks	Higher legal, accounting and marketing costs
Better brand awareness	More time needed for reporting
Better staff incentives	Higher risk due to public valuation
Easier acquisition by other firms	Less control
Window of opportunity	More difficult for small and younger firms (Adverse selection)

Pagano, Panetta and Zingales, 1998 and Hayes (n.d.)

Pagano et al. (1998) also suggest that reasons to go public vary between Europe and the US. Indeed his results seem to indicate that companies go public in the US in order to finance investment and growth. On the contrary, when the paper came to press, companies going public in Europe were willing to rebalance their accounts after having invested or grown subsequently.

Introduction methods

According to Ljungqvist (2007) there are three parties at stake during an IPO: the issuing firm, the bank (also known as underwriter) and the investors.

Referring to the article of Engelen and van Essen (2010), there exist three main introduction methods in the literature which can be mixed in order to create hybrid strategies. These methods are useful to determine the offer price of the shares.

The first and most straightforward method is the fixed price one. The underwriter will set a fixed price for the share and investors will order a certain amount of shares without any possibility to negotiate or influence the price.

The second method is the auction (also called Dutch auction). In this case, investors will submit their order prior to the pricing decision. Their order will consist of an amount of shares and a price. These orders are called “binding” because once it is set, an investor cannot withdraw it. Once all investors have placed their order, an auction is held and shares are allocated amongst investors. An example of auction can be found in appendix B.

The last method is more complicated and is called the bookbuilding process. According to Ljungqvist (2007) it is the most used method in the US and we will refer to his paper in order to explain it:

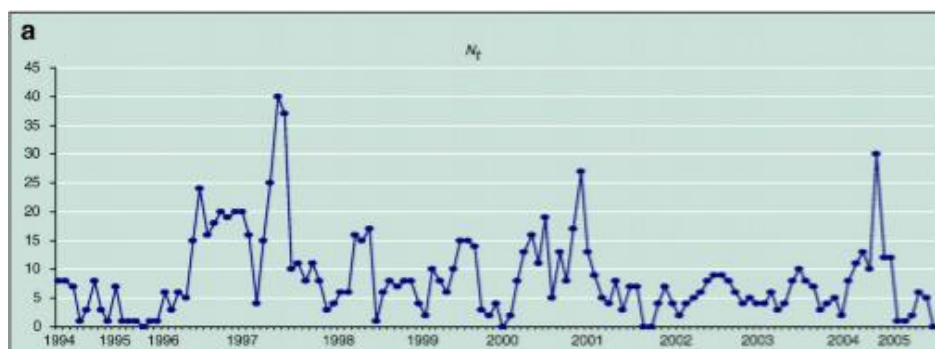
“Having chosen an investment bank to lead-manage its IPO, the company first files a registration (or S-1) statement with the Securities and Exchange Commission, containing descriptive and accounting information about the company’s history, business model, performance, and so on. The S.E.C. vets the information for misstatements and omissions, a process which takes several weeks. Once the S.E.C. declares the offer ‘effective’, the investment bank introduces the company to institutional investors on a so called ‘road show’. The managers pitch the company’s investment case, and the investors provide feedback in the form of more or less explicit, but always non-binding, indications of interest. On the basis of these indications of interest, which are recorded in a ‘book’, and the state of the market, the investment bank proposes an offer price to the company. Once priced, investors are asked to confirm their indications of interest, shares are allocated, and a few hours later, trading begins.” (Ljungqvist, 2007, p.378)

Hot and cold markets

When looking at the distribution of IPOs throughout the months or years, we can observe that decisions of going public are not uniformly distributed. Instead, it appears that there are more IPOs at some points in time. This distribution in “waves” is called the Hot and Cold markets phenomenon. According to Kanungo (2010), when companies going public experience high returns, more companies are likely to follow them. Inversely, when returns are bad, fewer companies will be willing to enter the market.

Guo, Brooks and Shami (2010) define a hot market as a “combination of large volumes of IPOs, high initial returns and positive market conditions”. Chemmanur and He (2011) define positive market conditions as a market where expected market returns are low while the uncertainty prior to the IPO and the profitability are high. The following figure shows the number of IPOs from January 1994 to May 2006 on the Chinese A-share market. The hot and cold market phenomenon can be easily observed.

Figure 1: Number of IPOs from 1994 to 2006 on the China A-share market



Guo, Brooks and Shami, 2010, p.201

IPO cycles led to a discussion amongst academics. The idea was to determine whether managers could time the market or not. Two hypotheses were competing against each other. Either, managers can effectively time the market and enter at the best time to get higher returns; either they face a phenomenon called pseudo-market timing.

The difference between both hypotheses is explained by Butler, Grullon and Weston (2005) and can be summed up in the following table:

Table 3: Hot and Cold markets debate

	Management timing hypothesis	Pseudo-market timing hypothesis
Debt	Increases (decreases) when managers think the market is overvalued (undervalued)	Increases (decreases) when the market is performing well (bad)
Equity	Decreases (increases) when managers think the market is overvalued (undervalued)	Increases (decreases) when market is performing well (bad)

Butler, Grullon and Weston, 2005

Their results seem to support the pseudo-market timing hypothesis. A lot of other papers supporting pseudo-market timing appeared in the literature. Batnini and Hammami (2015) concluded that managers were looking attentively at market yields during 2 years prior to taking the decision of launching the IPO or postponing it. They have therefore observed a high correlation between IPO waves and market performance.

Tran and Jeon (2011) studied the influence of macroeconomic variables and found out that the number of IPOs was positively related to S&P500 but negatively with market volatility. This means that companies prefer to go public when returns are good but choose to remain private if uncertainty is high. These findings are supported by Boeh and Dunbar (2015).

It has been observed that IPOs characteristics vary depending on their timing. Bustamante (2012) noticed that older firms tend to go public during cold markets. Furthermore, firms having a better S&P ranking decide to go public earlier during cold markets and later in hot markets. These companies also issue fewer shares compared to lower ranked firms. Çolak and Günay (2011) add that, during hot markets, companies of better quality wait for several firms of their industry (3-4) to go public before floating.

Waves are, most of the time, industry concentrated. Since returns of companies tend to be correlated among an industry, companies belonging to a high returns industry will be willing to go public at the same time. This process participates in the emergence of the hot and cold market phenomenon (Benninga, Helmantel and Sarig, 2005). These results are also supported by Helwege and Liang (2004).

Cross-listings

The time where companies were only going public in their own country is far away. Cross-listing is defined as “the listing of a company's common shares on a different exchange than its primary and original stock exchange” (Investopedia, n.d.). It has several advantages: improving corporate governance system, competing on several or more efficient markets, accessing more capital/investors, overcoming barriers to international investment. However, it complicates the price discovery process (Karolyi, 2006; Doidge et al., 2009). The following table shows the stock exchanges with the highest number of foreign firms in 2006.

Table 4: Cross-listings – Top countries

# of foreign listed firms	Fraction of total listings
NYSE (459)	Mexico (53%)
London (351)	Swiss Exchange (31%)
Nasdaq (340)	Euronext (25.1%)

Karolyi, 2006

This distinction is important since local and foreign IPOs may not share the same features and therefore lead to different results in this study.

Underpricing

Definition

Underpricing is a market phenomenon linked to IPOs. It is the fact that, on average, new listed stock prices increase by several hundreds or even thousands of basis points by the end of the first trading day (Ljungqvist, 2007).

It is important to note that underpricing is shown by the average increase of stock prices. All IPOs do not experience underpricing and some may even experience negative returns on their first trading day. According to Fauzi, Wellalage and Locke (2012) only 15% of US IPOs are underpriced while in New-Zealand the number reaches 28%.

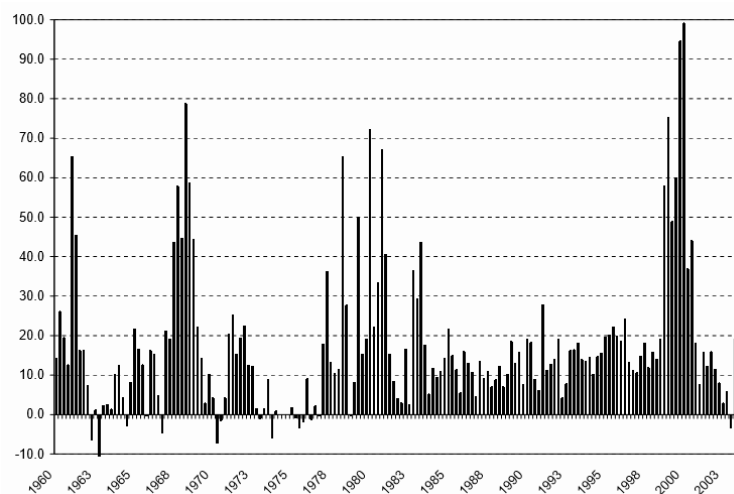
According to Solomon (2011), underpricing is a “worldwide phenomenon”. Furthermore it varies with time. The following table and graph show the average underpricing in the US for different periods of time.

Table 5: US underpricing across time

Period	Underpricing
1990-1998	14.8%
1999-2000	51.4%
2001-2009	12.1%

Solomon, 2011

Figure 2: US underpricing through the years (in %)



Ljungqvist, 2007, p.380

Even though underpricing is worldwide, its importance differs from one country to another. From 2000 to 2006, the average underpricing in 36 studied countries (see appendix C) was around 29% (Dai, Banerjee and Shrestha, 2011). However among those countries, some had very low underpricing (e.g. Norway, Italy, Russia) while some had extremely high first day returns (e.g. China, South Korea, Indonesia). Furthermore, some countries very close to each other experienced very different levels of underpricing (e.g. Norway (4.33%), Finland (14.61%) and Sweden (21.79%)).

Underpricing is mostly observed during the first trading day in “well-developed capital markets and in the absence of restrictions on how much prices are allowed to fluctuate from day to day” (Ljungqvist, 2007, p.379). However it can continue to rise afterwards. Ho (2016), noted that stock prices of new listings in Hong-Kong was increasing by 26% on the first day and reached a 32% increase by the end of the month. It can therefore be seen that a very large part of underpricing is limited to the first trading day.

Explanations

Underpricing is a very intriguing phenomenon. Indeed, it has been known and studied for decades but is still present everywhere around the globe. Furthermore, underpricing is similar to money left on the table by the owners of the company since they could have raised more capital by pricing their IPO correctly. In the US only, several billions dollars are left each year on the table (Ljungqvist, 2007)

According to Ljungqvist (2007) theories explaining underpricing can be classified as the following:

- Behavioral approaches
- Institutional reasons
- Control considerations
- Asymmetric information

Each class contains several theories with more or less empirical evidence. The class benefiting from the most significance is the asymmetric information one. The other ones either have low significance, or are too recent to really have been proved right or wrong. However some of the theories that have drawn the most attention will be quickly discuss.

Winner's curse (Rock, 1986)

The following explanation of Rock's model is inspired by the paper of Ljungqvist (2007). This model starts with the assumption that there are two types of investors: informed and uninformed. The difference is that informed investors can differentiate between good and bad IPOs while uninformed investors can't.

Informed investors can therefore bid only for good stocks. On the contrary, uninformed investors will bid for both good and bad stocks. This will lead to a full allocation of uninformed investors to bad IPOs and partial (or no) allocation to good IPOs since informed investors will heavily bid on it. Given this, uninformed investors will constantly earn negative average returns and will exit the market.

Underpricing is therefore deliberately set in order to ensure uninformed investors' participation in the IPO market. Indeed, informed investors are not numerous enough or willing to invest in all IPOs (good and bad).

Avoid being sued (Tiniç 1988)

Another theory was proposed by Tiniç in 1988. According to his paper, underwriters underprice IPOs in order to avoid being sued. Indeed, when an issuer asks an underwriter for pricing, it is expected that the value of the firm is not going to decrease right after entering the market. In case it is discovered the IPO has been overvalued, there is a risk for the bank of being sued and losing money.

Therefore, underwriters underprice the IPO so that it maximizes the probability of an increase in the stock value after the IPO.

Signalling (Allen and Faulhaber, 1989)

This theory is another asymmetric information theory. According to Cornanic and Novak (2015), issuers know something that investors ignore: the true value of the firm. High quality firms are therefore trying to convince investors of their quality thanks to underpricing.

High quality firms can underprice more because they can allow themselves to leave more money on the table while lower quality firms can't. Therefore underpricing is used as a signal to disclose the quality of the firm to investors.

Cascade hypothesis (Welch, 1992)

According to Welch (1992), investors can jointly perfectly determine the value of a firm. Especially, a small number of investors is sufficient to do so. Furthermore, investors act as an information cascade. This means that investors will set their private information aside in order to look at purchasing decision of earlier investors.

This theory states that underpricing is due to these information cascades. If some investors think the firm is priced under its true value when entering the market, they will buy it. The stock price will increase and other investors will join and buy shares, involving a price rise and so on. This will make the price rise a lot on the first trading day.

Pricing the IPO a little too high (low) can therefore determine the failure (success) of an IPO. Underwriters therefore have an incentive to price the IPO at a lower price to create an information cascade (Hsu and Shiu, 2004).

Dispersion of ownership (Brennan and Franks, 1997)

Brennan and Franks (1997) studied the relationship between underpricing and oversubscription. They observed that high underpricing tend to be related with high oversubscription.

Since a large number of shares is issued, the issuer wants to make sure a single investor cannot buy all the shares and take control of the company. Therefore, underpricing is used so that the demand for the stock is higher than the offered number of shares. This allows the issuer to ration and discriminate between potential buyers and have a dispersion of ownership among smaller investors (Brennan and Franks, 1997).

Other theories

Only a few theories have been discussed so far. However many others exist: Baron (1982), Benveniste and Spindt (1989), etc. The important point is that even today, none of these theories has been proved to be the only right one. It is likely that underpricing is due to a combination of effects and not limited to a single explanation.

Variations

It has already been said that the level of underpricing varies with time and countries. However, many other factors have an impact on it. Some of those will be discussed in this section.

Uncertainty

Uncertainty has a significant impact on the level of underpricing and can appear under several forms. The first one is the uncertainty linked to age or size of the company. Engelen and van Essen (2010) have shown that older and bigger firms are less underpriced than younger and smaller ones. Ellul and Pagano (2006) classify those characteristics under the expression “fundamental risk” of the stock. They have also shown an influence of this fundamental risk on the level of underpricing.

Furthermore, uncertainty can vary according to the sector a firm belongs to. Loughran and Ritter (2004) studied to variation in underpricing across time in the US. Their findings were that firms from technological sectors, which are seen riskier, experience a higher underpricing and a bigger variation across time. These results were also observed by Henrick (2012) in his thesis on the US sectors.

Uncertainty can also vary depending on the method used to determine price (Ritter and Welch, 2002). Indeed, when differentiating between auctions, fixed-price and bookbuilding IPOs, Engelen and van Essen (2010) stated that auctions are more efficient and lead to less underpricing. Bookbuilding comes after and fixed-priced method gives the higher level of underpricing.

Uncertainty is also influenced by how easy it is to access information about a firm. Labégorre (2003) found out that firms coming from sectors where information is more difficult to access, experience higher level of underpricing. This is supported by Lundtofte (2010) who states that underpricing increases with fraction of informed investors.

Underpricing of foreign IPOs can also be looked into through the prism of information asymmetry. Investors on a specific market will find easier to inform about domestic firms than foreign firms. Therefore uncertainty around foreign firms is higher and results in higher level of underpricing (Francis, Hasan and Li, 2001).

Finally, uncertainty can vary according to the parties taking part in the IPO. It has been shown that hiring a prestigious underwriter leads to reducing the underpricing because of the reduction of associated uncertainty (Rahman and Yung, 1999). On the contrary, being backed by venture capital firms results in a higher underpricing (Lee and Wahal, 2004). Their explanation is that VC firms need to signal their quality and establish a reputation. This makes them more likely to back riskier firms.

Price clustering

The price clustering phenomenon is the fact that IPOs tend to be priced on special numbers. It comes from price uncertainty and the need of minimizing negotiation costs (Ap Gwilym and Verousis, 2010). Ap Gwilym and Verousis state that 94.7% of US IPOs are priced on $\{.00; .50; .25\}$ and that 75% of IPOs are priced on integers. When IPO price is an integer, underpricing is three times bigger than when it is not.

Country/Origin

In order to explain why underpricing differs with geographical origin of IPOs, many academics have tried to explain underpricing thanks to cultural differences. Costa, Crawford and Jakob (2013) studied the influence of several culture related variables on underpricing. They found out that the degree of inequality (PDI), the feeling towards uncertainty (UAI) and the long term orientation (LTO) of a country allowed explaining 39.2% of the underpricing variation. When adding a market metric (Stock Market Cap/GDP) and anti-director rights variables, the explained variation rose to 56.5%³.

Another way of studying impact of cultural differences on underpricing is to look at the difference between local and foreign IPOs. Cai and Zhu (2014) found out that firms from countries whose cultures are far away from the US one tend to be more underpriced.

Studying the legal system of a country is another way to express differences among countries that could lead to differences in underpricing. Engelen and van Essen (2010) discovered that the better a country's legal enforcement (efficiency of the judiciary system), the lower the level of underpricing. They also studied whether the family a legal system belongs to (German, French, Scandinavian or common law/English), influenced the level of

³ Interpretation of significant variables can be found in appendix D

underpricing. They found out that IPOs from countries with a German legal system were on average more underpriced than IPOs from countries belonging to the three others.

When looking at the impact of institutional quality on underpricing, it can be observed that IPOs from high institutional quality countries experience a higher underpricing than IPOs from low institutional quality countries (Autore, Boulton, Smart and Zutter, 2014). These results have also been observed by Boulton, Smart and Zutter (2010).

Hot & Cold markets

Yung, Çolak and Wang (2008) observed a positive correlation between the number of firms entering the market during a quarter and the average level of underpricing of those firms. It seems that when more firms enter the market (during hot markets), they tend to be more underpriced. These results have also been observed by Warganegara and Warganegara (2014) on the Indonesian stock exchange, Zaier and Abdelmoula (2014) on the Tunisian stock exchange or Agathee, Brooks and Sannasse (2012) on the stock exchange of Mauritius.

However, in their study, Dhamija and Arora (2017) did not find any significant difference in terms of underpricing between IPOs issued during hot and cold markets. Doeswijk, Hemmes and Venekamp (2006) concluded in the same way when studying the Dutch market. Either the hot and cold markets have not impact on underpricing level in those markets, either the authors used a different proxy to determinate the state of the market which led to different results.

Promotion

According to Habib and Ljungqvist (2001), promotion prior to the IPO has two effects on wealth of issuers. A first direct one is the loss of wealth due to promotion costs. The second indirect one is an increase of IPO wealth because of the reduction of underpricing. Therefore the optimal amount of promotion that should be incurred by the firm should be decided.

Furthermore they also state that the more shares are issued, the higher loss due to the underpricing. This means that when more shares are to be issued, a firm has more incentives to invest in promotion so as to decrease the loss due to underpricing.

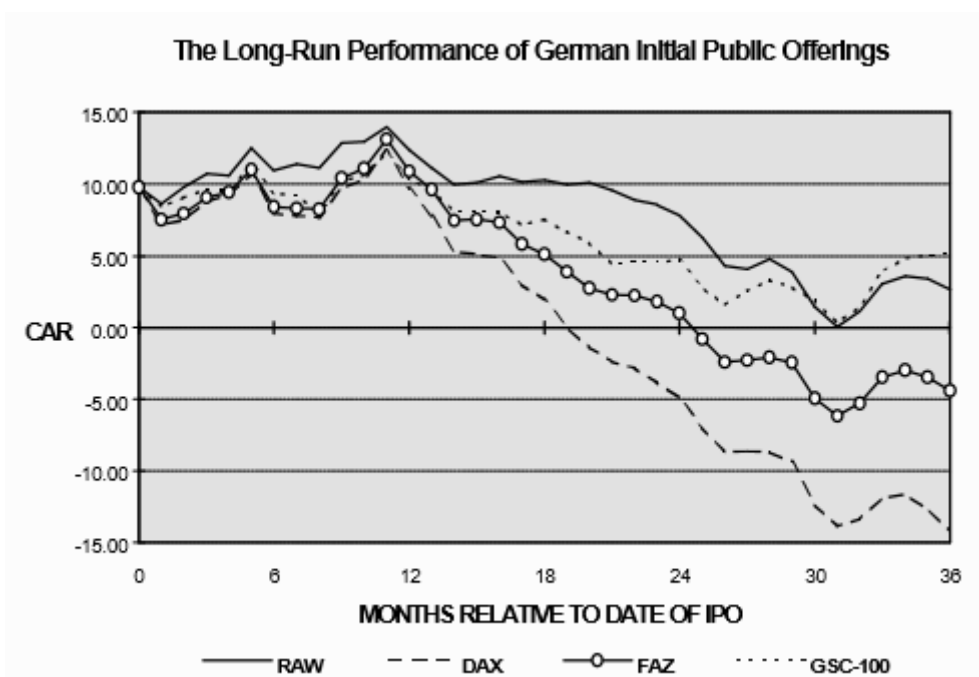
Long-term Performance

Definition

Another interesting phenomenon around IPOs consists in their long-term/-run performance. Many studies have been conducted in order to determine whether IPOs significantly underperform the market or similar firms on the long-term.

Benninga, Helmantel and Sarig (2005) stated that from 1980 to 2000, new listed firms in the US underperformed the market during the first three or five years (depending on the methodology used). In the same way, an underperformance of 16% was observed in the US insurance industry from 1983 to 1990 (Rahman and Yung, 1999). The following graph shows the underperformance of German IPOs from 1988 to 1992 (Schuster, 1996).

Figure 3: German IPOs long-term performance



Schuster, 1996, p.12

More recently, Gao, Ritter and Zhu (2013) found out that US IPOs underperformed a style-matched portfolio by 7.2% after three years between 1980 and 2009. Another interesting point in their study is that this underperformance seems to be limited to smaller companies. Indeed, small companies underperformed by 17.3% while bigger ones outperformed by 3.1%.

Comparable results were observed by Vismara, Paleari and Ritter (2012) when looking at the difference in long-run performance between Main and Secondary markets. They found out that from 1995 to 2006, main markets companies outperformed the market by 12.3% after three years. Companies from secondary markets, on the other hand, experienced an underperformance of 19%.

However, contrarily to underpricing, underperformance does not seem to be observed everywhere and all the time. Doeswijk et al. (2006) studied Dutch IPOs for 25 years but did not find a significant underperformance, even though negative excess returns were observed. Agathee et al. (2012), on the other hand, observed positive excess returns on the long-run but results weren't significant either.

These differences can be partially explained by the methodology used. On the contrary of underpricing which is relatively easy to compute, there is no single way of computing long-term performance. Several methodologies exist and each one has pros- and cons. This will be one of the topics discussed later, in the methodology part of this thesis.

Explanation

A few theories have tried to explain this possible underperformance. Switzer and Bourdon (2011) listed three theories that grew up in order to explain IPOs underperformance:

- Investor exuberance
- (Pseudo-)Market timing
- Earnings Management

The first two are close to each other and linked to hot and cold markets while the third one is linked to the management practices. However, the common point of all theories is that the underperformance is linked to the initial good performance of IPOs when they enter the market. All those theories will be quickly discussed in this section.

Investor Exuberance

This explanation is a behavioral explanation. The hypothesis is that new issues receive too much optimism from investors. Therefore, after some time, the optimism goes down as well as the stock price (Zaier and Abdelmoula, 2014). This leads to an underperformance of new listings. This theory builds a link between underpricing and underperformance. It states that

hot markets issues show a higher underpricing and therefore underperform the market while cold markets show less underpricing and lead to an outperformance of the firms.

This hypothesis is contradicted by Doeswijk et al. (2006) who haven't found any relation between underpricing and long-run performance.

Pseudo-market timing

It has already been dealt with pseudo-market timing in the "hot & cold markets" part. According to Schultz (2003) this phenomenon may explain the observed long-term underperformance of some studies. In this case, "the underperformance may be a statistical illusion caused by the clustering of IPOs after a period of unusually high abnormal returns for previous IPOs" (Dahlquist and De Jong, 2008, pp.547-548).

However, this explanation came up against a strong opposition from other academics. Dahlquist and De Jong (2008) assessed that it was unlikely that IPOs underperformance was due to pseudo-market timing. Gregory, Guermat and Al-Shawawreh (2010) study of the London Stock Exchange also resulted in a rejection of this hypothesis.

Earnings Management

Because of the large amount of cash at stake during an IPO and the large asymmetry of information among the different parties, there are lots of incentives for managers to manipulate earnings (Gounopoulos and Pham, 2017). They add that earnings are the easiest way for investors to value a company and many managers use accruals in order to boost earnings prior to the IPO. "Accruals are earned revenues and incurred expenses that have an overall impact on an income statement" (Investopedia, n.d.). Using them allows managers to postpone expenses or to anticipate income in order to offer a better image of the firm to investors.

Support to this hypothesis has flourished in the literature. Already in 1994, Jain and Kini found out that "investors appear to value firms going public based on expectations that earnings growth will continue, while in reality the pre-IPO earnings levels on which expectations are formed are not even sustained" (Jain and Kini, 1994, p.1700).

These earnings management practices have an impact on long-term performance of new listings. Indeed, "aggressive earnings management companies, with high income-increasing

accruals in the IPO year, experience poorer stock return performance in the three years post-IPO than conservative earnings management companies” (Ahmad-Zaluki, Campbell and Goodacre, 2011, p.117).

This can be easily explained. Since managers use window-dressing strategies previous to the IPOs, the delayed expenses or anticipated incomes have to be regularized in the next years. Performance is therefore hurt and investor optimism falls leading to an underperformance (Gao, Cong and Evans, 2015).

As it can be observed, this theory is supported by many recent studies. It is therefore the best way to explain new listing underperformance up to now.

Variations

Some factors may impact the underperformance of firms. Tupper (2016) stated that the three following characteristics could reduce it: prestigious underwriters, venture capitalists support and strong family involvement.

Tam, Chang, Lin and Wong (2010) also studied determinants of new listings performance. They found out that the main determinant was the Price/Earnings ratio. The higher the P/E ratio is, the worse the performance. They also found out that underwriter reputation had a positive impact on post-IPO performance while board size had the opposite one.

On the opposite of underpricing, the long-run underperformance may not only be due to new listings. Indeed, Tupper stated that the long-run underperformance was “the byproduct of a firm being small and having a low book-to-market ratio” (Tupper, 2016, p.35). Given this, a firm may be able to improve its performance by growing more before entering the market.

This closes the part about the different phenomenon which will be looked into in this thesis. It is now time to set the scene in which this study will take place: the 2008 financial crisis.

Global Financial Crisis

History

Origins of the crisis

The Global Financial Crisis (GFC) is also known as the 2008 Financial Crisis or Subprime Crisis. However its effects are not limited to 2008 at all. Fauzi et al. (2012) assess its very beginning to be in 2006 with the default of mortgages in the US. If we want to better understand how the GFC happened, it is important to look back at the roots of the US financial industry and the “American Dream”.

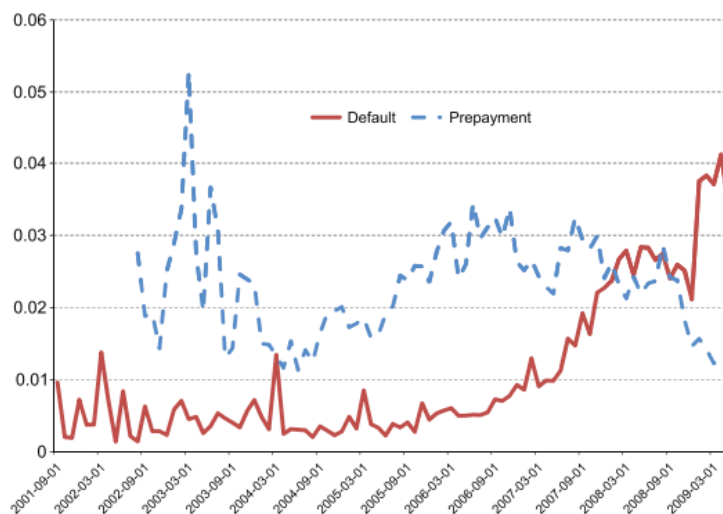
Part of the “American Dream” lies in being the owner of a house. It makes people proud and allows them to be integrated into a community’s life (Pritchard, 2017). However, owning a house is not in everybody’s hands because it asks for a huge amount of money.

It did not take much time before the US financial world saw in this ideal a way of making good and easy money. Everything started with subprime mortgages. Several definitions of subprime mortgages exist but the most common is the following: a loan issued to individuals whose credit ratings should not allow them to borrow money from the bank (Bhardwaj and Sengupta, 2012). These loans are often issued with high premiums since premiums are positively related to the credit risk.

Even though such loans had existed for many years, they grew up at an impressive rate during the 90’s. In 1994, subprime loans represented 1.4% of the total loans but in 2002 it increased to 18.7% (Danis and Pennington-Cross, 2008). The growth was initiated by deregulation acts in the 80’s and 90’s (Bhardwaj and Sengupta, 2012).

At first glance, this growth seems unsustainable. However nothing wrong happened before 2006 where the whole system started to collapse. The following figure is important so as to understand this collapse. It shows the percentage of defaulted and prepaid loans across the years.

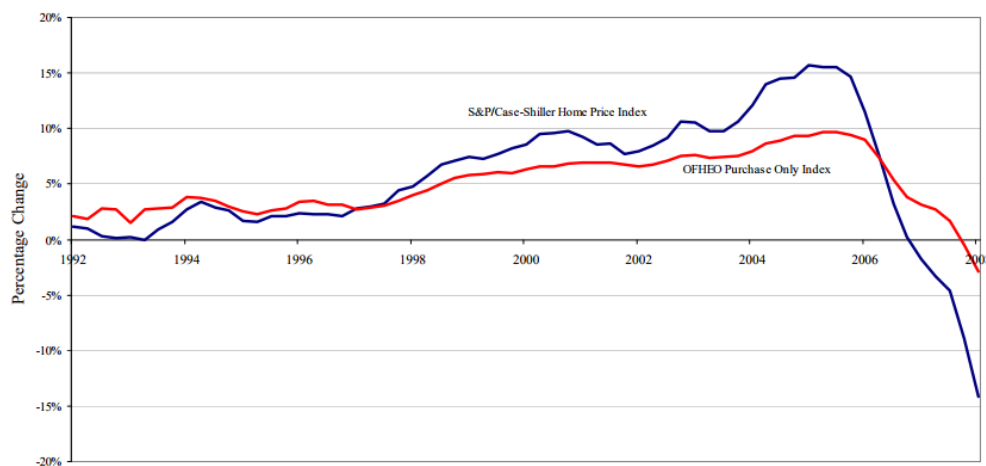
Figure 4: US default and prepayment rates evolution (as a proportion of total loans)



Kau, Keenan, Lyubimov and Slawson, 2011, p.82

Two things can be noted: an increasing default rate and a decreasing prepayment rate. Bhardwaj and Sengupta (2008) found out that the default rate is tightly related to the prepayment rate. Furthermore the prepayment rate is directly linked to the variation of housing prices. The following graph shows the evolution of US house prices indexes from 1992 to 2008.

Figure 5: US house prices indexes evolution



Bhardwaj and Sengupta, 2008

At this point, everything is in place to help us understand the subprime market collapse. From 1992 to 2005, house prices rose and gave birth to a housing bubble. This bubble became an incentive for lenders to issue subprime mortgages (Brueckner, Calem and Nalamura, 2012). Indeed, when a borrower was unable to pay its mortgage back, it could prepay it either by

using cash-out refinance⁴, either by selling the house at a better price than the initial one (Bhardwaj and Sengupta, 2008). However, in 2006, house prices started to plunge. Prepayment was no longer possible and the number of default skyrocketed, leading to the collapse of the subprime market.

Now that the origin of the subprime crisis has been explained, there is still one unanswered question. Why has this crisis affected the whole US economy, and subsequently the whole world?

Spread of the crisis

Banks knew that subprime mortgages were risky. Therefore they had to protect themselves against credit risk. This led to a heavy securitization of mortgages using Residential Mortgage Backed Securities (RMBS) and Collateralized Debt Obligations (CDOs) (Jaiswal-Dale, 2010). The process is the following and a diagram can be found in appendix E.

“A residential mortgage backed security is created when several thousand loans of different lenders, purchased and packaged forms a residential mortgage backed security of sub-prime loans (RMBS). ... From the repackaged RMBS bonds, a subset of bonds plus other mortgage linked investments are packaged into a single CDO, carrying a rating of triple B, boosting the yield but also making it vulnerable to losses. A mortgage CDO can own pieces of a hundred or so bonds, each of which in turn contain hundreds of individual mortgages. Several big banks and about 11,000 investment firms are the holders of these mortgages. This original CDO from the RMBS could in turn form a new CDO, mixing and matching bonds, providing another set of ratings from A to Bs” (Jaiswal-Dale, 2012, pp.128-129).

These derivative products were sold all over the world or at least in developed countries. European Banks were, for example, big investors in the CDOs market (Business Think, 2015). Adding to CDOs other derivatives such as Credit Default Swaps (CDS) allowed investors to “protect against the default or decline in value of mortgage-related securities backed by risky loans” (The Financial Crisis Inquiry Commission, 2011, p.XXIV). Furthermore most of those financial products were given AAA ratings (the highest possible)

⁴ “A cash-out refinance allows the borrower to convert home equity into cash by creating a new mortgage for a larger amount than the original” (Investopedia, n.d).

by rating agencies even though they should not have. (The Financial Crisis Inquiry Commission, 2011).

Last but not least, many behavioral factors have played a role in the crisis (Vasile, Sebastian and Radu, 2011). One of those is that in many investment banks “employees and executives compensation system was based largely on return on equity, creating incentives to use excessive leverage and to focus on short-term gains such as annual growth goals” (The financial crisis inquiry commission, 2011, p.291).

The whole system had become a time bomb which exploded when the housing bubble burst and led to the collapse of the whole US financial system, leading to a recession in the US economy and more generally in all developed economies⁵. For example, Sensoy and Tabak (2015) found out that efficiency on European stock markets decreased because of the crisis.

Furthermore, by studying correlations between markets Melvin and Taylor (2009) mathematically proved the global spread of the crisis. O’Rourke and Eichengreen (2009) added that trade flows, capital flows and commodity prices have been important actors to the spread of the subprime crisis.

The following table inspired by the paper of Aleksashenko (2009) represents some of the major events leading to the propagation of the crisis.

Table 6: Major events leading to the Global Financial Crisis

Date	Event
Spring 2007	First rumors in the press saying that several American mortgage banks were in trouble because of their investments
Mid-August 2007	First defaults and collapse in many Mortgage Backed Securities (MBS) quotes
Early 2008	Big institutions such as Bear Stearns are in trouble leading to the setup of the “Paulson plan ⁶ ” by the US administration
15th September 2008	Lehman Brothers bankruptcy (Anagnostidis et al., 2016)
Mid-October 2008	Europe follow US and start injecting capital into the banking system

Aleksashenko, 2009 and Anagnostidis, Varsakelis and Emmanouilides, 2016

A whole thesis could be written on the financial crisis but many books and movies talked about it. The history won’t be further studied here. Interested readers can refer to the movies

⁵ Several major stock indexes can be found in appendix F

⁶ Plan recommending the government to buy toxic assets from banks in order to contain the crisis (Gatinois, 2008)

“Inside Job” or “The Big Short” or the paper “No place to hide: The Global crisis in equity markets in 2008/2009” (Bartram and Bodnar, 2009) which contains a full timeline of the subprime crisis events.

Crisis period

An important point that we need to consider in this thesis is to know the moment in which financial markets started being impacted by the crisis and the duration of the GFC. According to Tupper (2016), the crisis began in March 2007 and ended in April 2009.

A more precise description can be found in the paper of Kenourgios and Dimitriou (2015). They broke the crisis down into four periods which are represented in the following table.

Table 7: Breaking down the 2008 financial crisis

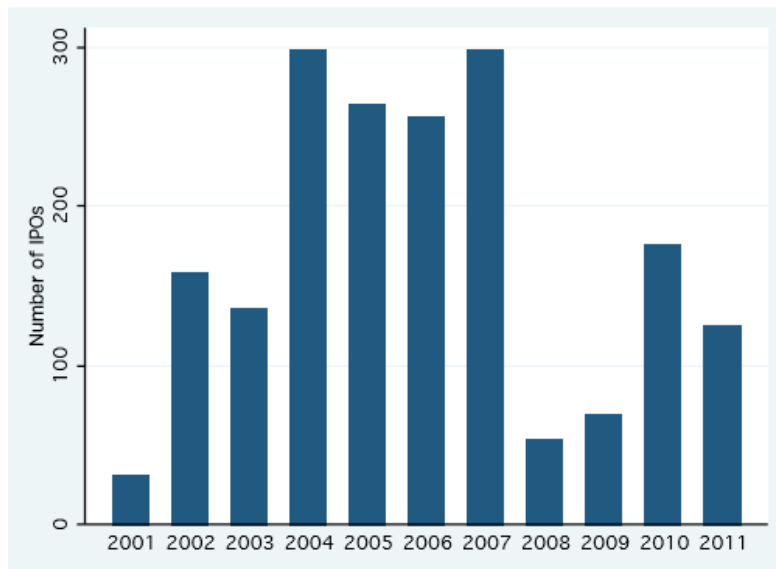
Period	Phase
1 st August 2007 – 15 th September 2008	“Initial Financial Turmoil”
16 th September 2008 – 31 st December 2008	“Sharp Financial Market Deterioration”
1 st January 2009 – 31 st March 2009	“Macroeconomic deterioration”
1 st April 2009 onwards	“Stabilization and tentative signs of recovery”

Kenourgios and Dimitriou, 2015

Finally, mixing two different methodologies (one based on events and another on excess volatility), Baur (2012) identified the crisis period from July 2007 to March 2009. This period being more scientifically supported than the two previous ones, it will be used in this thesis to separate crisis IPOs and non-crisis IPOs.

Impact on IPOs

A first impact of the crisis (and economic slowdown in general) is that IPOs tend to be riskier and costlier (Çolak and Günay, 2011). Henry and Gregoriou (2014) found out that IPO activity decreased during the crisis and had to wait February/March 2009 before growing up again. They also noticed that new listed firms were significantly bigger after 2009. This is due to the “increased level of scrutiny of new issues by both investors and regulators” (Henry and Gregoriou, 2014, p.68) which made the IPO process harder to complete. Similar results are observed by Lewellyn and Bao (2014). The following graph represents the number of IPOs from 2001 to 2011 in the US.

Figure 6: Number of US IPOs from 2001 to 2011

Henrick, 2012, p.30

Henry and Gregoriou (2014) also studied the difference in industry concentration between pre- and post-crisis periods. Their results showed no difference. Before the crisis, the top 11 industries represented 74.4% of IPOs against 75.2% after. Furthermore, the top 5 industries are the same in both periods.

Concerning the performance of new listings, Fauzi et al. (2012) tried to run a regression of the 20 and 60 days performance depending on the year of listing on the New-Zealand market. They discovered that from 2006 to 2010, only 2008 and 2009 experienced negative coefficients. This means that short-term performance was worst during the crisis.

The same impact has been observed on long term-performance. Ahmad-Zaluki, Campbell and Goodacre (2011) studied Malaysian IPOs and observed a long-term underperformance on a three years period of 33.02% for crisis IPOs against 25.60% for non-crisis IPOs. However, the opposite impact has been recorded by King and Banderet in 2014. Their results showed that companies going public in 2008 and 2009 performed 38.2% better than IPOs from non-crisis years. This difference may be due to the different methodologies used in the papers.

The subprime crisis also impacted underpricing. Looking at Thailand, Vithessonthi (2014) observed lower level of underpricing during the crisis (see appendix G). This phenomenon is not inherent to Thailand since identical results were obtained by Hsu, Yu and Wen (2013) when studying variation in US underpricing across years. However, contradictory results have been observed by King and Banderet (2014) while studying the same market. According to

their thesis there is no significant difference in underpricing between crisis and non-crisis years. They go further by saying that underpricing decreased in 2008 (6.93%) because uninformed investors left the market but rose in 2009 (15.25%) when those were feeling confident again. Still studying the US market, Georgieva (2011) found out that the underpricing increased during the crisis.

These differences in measures are surprising but it shows it is difficult to forecast the impact of the crisis on the underpricing. Nevertheless, Ritter (2016), specialist of IPOs and underpricing, observed a decrease in terms of underpricing on the US market.

The crisis also influenced other aspects of IPOs. For example King and Banderet (2014) found out that during the crisis only 31% of IPOs were venture capitalists backed while the percentage reaches 49% during non-crisis years. Tupper (2016) also observed a better performance of US firms compared to foreign firms in the post-crisis period.

Today's IPO market

According to Shen (2016) the IPO market has changed since the crisis. More and more owners prefer selling their company after a period of growth than going public. However, the number of IPOs had returned to its pre-crisis level in 2013 (Ritter, 2016). But the IPO market has currently been decreasing since 2014. According to Driebusch (2016), 2016 was even competing to be the worst year since the Global Financial Crisis when article came to press.

The post-crisis period in the US also experienced higher levels of underpricing compare to the pre-crisis period. This can be observed in the following table from Ritter (2016).

Table 8: Evolution of the US underpricing during the crisis

Period	Underpricing (%)
2001-2007	11.96
2008-2009	7.75
2010-2015	15.98

Ritter, 2016

It is more difficult to obtain information about long-term performance of IPOs after the crisis. The reason is that three years of financial data are usually needed. Hopefully Ritter already computed those for the US. He found out that while IPOs underperformed style matched portfolio before the crisis and from 2009 to 2011, they have outperformed since then (Ritter, 2016).

Exchanges comparison

Exchanges

The objective of this thesis is to compare the impact of the financial crisis on two different financial exchanges: the Singapore Exchange (SGX) and the London Stock Exchange (LSE).

In order to compare those two markets, we will follow the following steps:

1. Presentation of the London Stock Exchange
2. Presentation of the Singapore Exchange
3. Similarities and differences of both markets/countries
 - a. Culture and institutions
 - b. Behavior during the crisis
 - c. Underpricing

London Stock Exchange

Facts

The London Stock Exchange is one of the biggest stock exchanges in the world. It is the fifth biggest in terms of market capitalization with around \$3.61 trillion (Stockmarketclock.com, n.d.) and hosts a bit less than 2,300 companies (Statista, 2016). It is also the biggest non-US based stock exchange in the world. However, these numbers vary across the web. For example, Desjardins (2017) gives LSE the third place of biggest exchanges with a market capitalization of \$6.1 trillion with more than 3,000 listed companies.

It was founded in 1801 which makes it the fourth oldest stock exchanges in the world after Amsterdam, Paris and Philadelphia (Finmarketguru, 2015). Several indexes allow tracking the performance of the market. The best known ones are (TradeCrowd, 2014):

- FTSE 100 Index
- FTSE 250 Index
- FTSE 350 Index
- FTSE Small Cap Index
- FTSE All-share Index

An interesting and important fact about LSE is that it is strangely priced. Indeed, issue prices, when quoted in local currency are either quoted in British Pounds or British Pences (100 pences in 1 pound). In order to differentiate both, LSE uses a quotation in GBX for Pence and GBP for Pounds (Buy-Stocks.com, n.d.). However this quotation differentiation is not used everywhere. For example stocks are quoted in Pences on Bloomberg but the currency indicator is GBp (see figure below where LSE Group is used as an example).

Figure 7: Normal quotation (above) vs Bloomberg quotation (below)



Markets

LSE is divided in several markets in order to better fit with entering companies characteristics. Those markets will be quickly presented.

Main Market

As its name states, the LSE Main Market (which is the central point of this study) is the UK primary market. It hosts the biggest companies and is stricter concerning the admission of new companies. Inside the LSE Main Market, several sub-markets or segments can be found (London Stock Exchange, n.d.):

- Premium segment: only open to equity shares of trading companies and closed-/open-ended funds. Requirements are the highest that can be found on LSE.
- Standard segment: open to equity shares, Global Depository Receipts (GDRs), debt securities and securitized derivatives. Requirements are still strict but less than for the Premium Segment.
- High Growth Segment (HGS): open to high growth companies expecting to move to the premium market after some time. Requirements have been relaxed for this specific segment compared to Premium or standard listing.
- Specialist Fund Segment (SFS): this segment is a former market (Specialist Fund Market) which has been integrated to the Main Market. It is reserved to highly specialized investments.

Alternative Investment Market (AIM)

The AIM hosts smaller growing companies than the Main Market. It also has “a simplified regulatory environment” (PWC, 2012, p.5). It has been set up in 1995 and has hosted more than 3,600 companies since then (London Stock Exchange, n.d.). The table showing a comparison of requirements between the Main Market and the AIM can be found in appendix H. The AIM has its specific set of indexes:

- FTSE AIM 50 UK Index
- FTSE AIM 100 Index
- FTSE AIM All-Share Index
- FTSE AIM All-Share Supersector Index

Professional Securities Market (PSM)

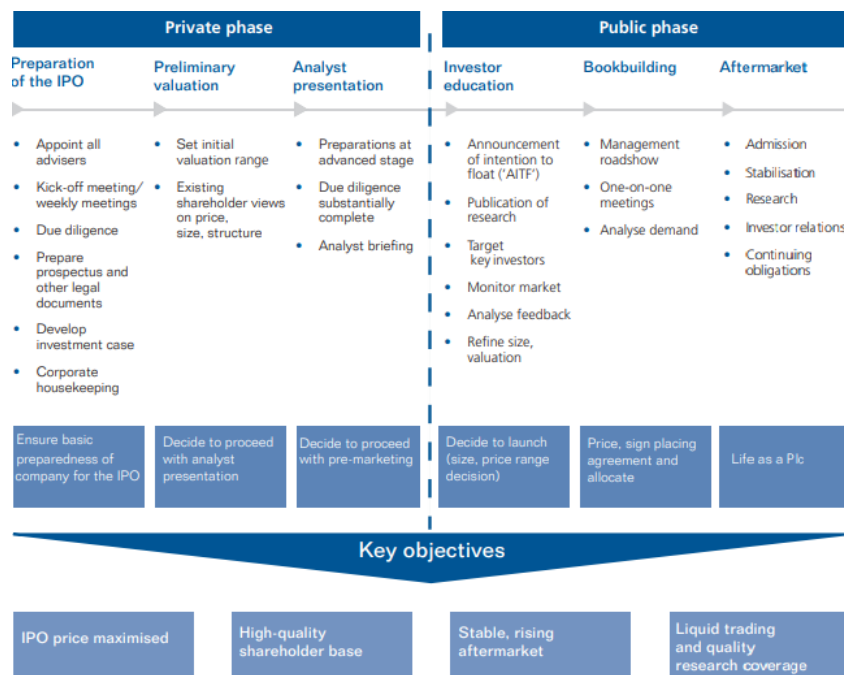
This market hosts specialized securities (debt and DRs for example) which are sold to professional investors. The PSM has more flexible requirements and companies can use their own domestic accounting standards instead of following IFRS rules (London Stock Exchange, n.d.).

Listing Process

Here, we will only talk about the listing process of the Main Market since it is what we are interested in for this thesis.

If a company wants to list on the LSE Main Market, it has to fill in two applications. The first one is sent to the UK Listing Authority (UKLA) and the second one to the London Stock Exchange. The UKLA will decide whether the company is allowed to list or not whereas the LSE will decide whether the requirements to enter the Main Market are fulfilled (London Stock Exchange, n.d.).

The listing process usually takes 15 to 20 weeks. The different steps for listings are the followings but more details can be found in appendix I (London Stock Exchange, 2010):

Figure 8: Listing procedure of the London Stock Exchange

London Stock Exchange, 2010, p.26

Singapore Exchange

Facts

The Singapore Exchange is a smaller stock exchange. With a market capitalization of around \$680 billion, it is the 21st biggest exchange in the world (stockmarketclock.com, n.d.). Between 700 and 800 companies are currently listed on the exchange (Sustainable Stock Exchanges Initiative, n.d.).

The Singapore Exchange has been formed in 1999 by merging three institutions: Stock Exchange of Singapore (SES), Singapore International Monetary Exchange (SIMEX) and Securities Clearing and Computer Services (SCCS) and is very famous for its derivative market (Nikkei Asian Review, 2018). According to Investopedia it is the "Asia-Pacific's first publicly traded exchange" (Investopedia, n.d.).

Several indexes exist to track the performance of the Singaporean market. The main ones are (Yeo, 2013):

- Straits Times Index
- FTSE ST Mid Cap Index
- FTSE ST Small Cap Index

Markets

Mainboard

The Mainboard is the original and main segment of the Singapore Exchange. This segment is the one studied in this thesis and is the equivalent to the LSE Main Market. It hosts bigger companies as well as companies previously listed on the Catalist (see below), previously called SESDAQ.

Catalist

The Catalist was launched in 2007 and replaced the SESDAQ segment. It is the equivalent of the AIM segment for LSE. It is the “most liquid international growth platform” (Singapore Exchange, n.d.). Smaller companies looking for growth opportunities can enter the Catalist and experience less regulation at the moment of listing. 197 companies are listed in the Catalist with a total market capitalization of S\$11.5 billion (Singapore Exchange, n.d.). An index has been specially set up for the Catalist: FTSE ST Catalist Index (Singapore Exchange, n.d.).

Listing Process

Before the IPO

Several steps are needed before a firm is officially listed on the Singapore Exchange (Singapore Exchange, n.d.). The major part of the listing process consists in the filling of an admission pack composed of two distinct parts. More details about the listing process on the SGX can be found in appendix I.

After the IPO - Watchlist

On the Singapore Exchange, a company is still not safe once it has been listed, and this is because of the Watchlist.

The Watchlist has been introduced in 2008 and concerns companies listed on the Mainboard. A quarterly review is conducted on most companies (not the ones listed less than 6 months before, investment funds, ETF, GDR, etc.) of the Mainboard in March, June, September and December in order to verify whether their quality is still in line with SGX requirements (Singapore Exchange, n.d.). Two requirements are verified (Value Invest Asia, 2014):

- Pre-tax losses during the last three years
- Average daily market capitalization < S\$40 million during the last 120 trading days.

In the case some companies do not fulfill the requirements, they are placed on the Watchlist. Companies which entered the Watchlist before 01/03/2016 have a three year period to meet the requirements whereas companies which entered afterwards are only granted a two year period (Singapore Exchange, n.d.). After that time, if the company has not met the requirements and has not obtained any time extension, it is delisted or the trading of its shares is suspended (often followed by a delisting) (Value Invest Asia, 2014).

Firms listed on the SGX Mainboard must therefore always be careful about their financial health in order to avoid such a situation.

LSE vs SGX

Culture and institutions

Some studies have been looking at institutional and cultural differences among countries. Looking at cultural variables, Costa et al. (2013) give several values allowing a comparison between SGX and LSE. The following table represents the value for variables studied in their paper (a description of some of these variables has already been made in appendix D). Minimum and maximum values allow assessing the importance of the differences.

Table 9: Cultural comparison of Singapore and UK

Variable	LSE	SGX	Min	Max
Power distance index	35	74	11	104
Uncertainty avoidance index	35	8	8	112
Individualism	89	20	14	91
Masculinity	66	48	5	95
Long term orientation	51.13	71.54	20.4	100
Indulgence versus restraint	69.42	45.54	15.8	97.3

Costa, Crawford and Jakob, 2013, p.119

It can be seen that Singapore and UK are culturally very different. For example, Singapore tries to avoid uncertainty much more and thinks more on a long term basis than the United Kingdom.

Concerning institutions, Autore, Boulton, Smart and Zutter (2014) compare the quality of several countries institutions, including values for Singapore and UK. They looked at six variables and found the following results:

Table 10: Institutional comparison of Singapore and UK

Variable	LSE	SGX	Min	Max
Voice and accountability ⁷	1.416	-0.022	-1.510	1.615
Political stability	0.678	1.195	-1.386	1.400
Government effectiveness	1.859	2.245	-0.476	2.245
Regulatory quality	1.758	1.880	-0.380	1.880
Rule of law ⁸	1.675	1.624	-0.778	1.949
Control of corruption	1.968	2.238	-0.880	2.317

Autore, Boulton, Smart and Zutter, 2014, pp.77-78

The main difference is that Singapore allows less freedom of expression than UK. A smaller difference is that Singapore is slightly more politically stable than UK. Beyond those two differences both countries are quite similar on all variables.

Finally, Porta, Lopez-De-Silanes and Shleifer (2006) compared securities regulation across several countries. Their results show that Singapore and UK are very similar on a certain bunch of variables (which can be retrieved in the article). Furthermore, both countries share a common legal origin (English).

As a conclusion, we can find a lot of common points as well as differences between both countries. Common points mainly relate to institutional environment, regulation and origin of the legal system. The differences are more cultural ones.

The institutional similarity is probably due to the fact that Singapore was an English colony from 1867 to 1959 (even though there was a Japanese occupation during WW2) (Lambert, 2017). Concerning the cultural differences, those are probably linked to the geographic position of both countries. Indeed, Singapore being located in South-East Asia and UK in Western Europe, it is logical that huge cultural differences have been found between the two countries.

⁷ “Extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media” (World Bank, n.d.).

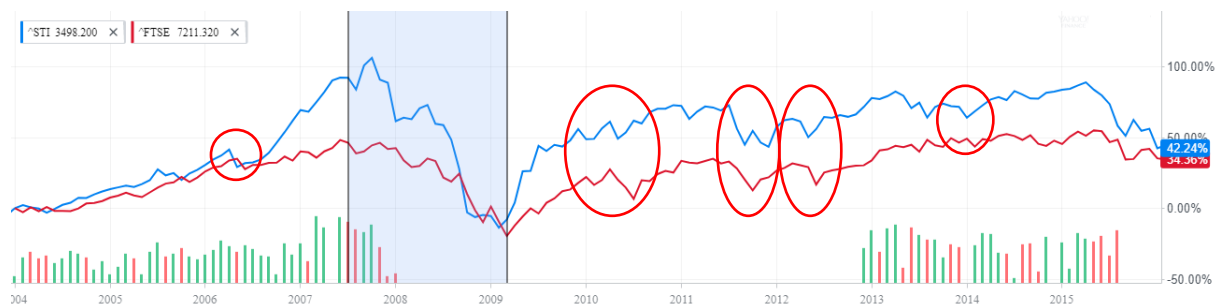
⁸ “The principle that all people and institutions are subject to and accountable to law that is fairly applied and enforced” (Dictionary, n.d.).

It is also interesting to note that both countries stock exchanges are quite related. For example, in 2012, LSE and SGX signed a “cross-quotation agreement” allowing each exchange to trade the biggest stocks of the other exchange (London Stock Exchange Group, 2012).

Crisis Period

The way both markets reacted to the financial crisis is quite similar. The following figure shows the monthly evolution of LSE and SGX main indexes (FTSE 100 and STI) from 1st January 2004 to 31st January 2016 which is the studied period (see methodology part).

Figure 9: SGX and LSE main index evolution



The blue line represents the STI (Straits Times Index), the red line the FTSE 100. Both indexes have been set to zero on 31st December 2003. The blue part of the graph indicates the crisis period which has been determined earlier (July 2007 to March 2009).

First of all, we can easily see that both indexes are evolving closely. The magnitude of variations is not the same but when one of the markets is increasing/decreasing, so is the second one. It even seems like the FTSE is following the STI (red circles are highlighting a few occurrences of this phenomenon).

Furthermore, it appears that the chosen period for studying the financial crisis is fitting pretty well to those markets if we look at indexes. Indeed, it can be seen that a first decrease of the indexes happened from July to August 2007. It recovered a bit after August 2007, until November 2007, when the crash started and both indexes fell sharply. Both indexes reached their lowest point around February-March 2009 before starting to recover from the crisis.

Finally, looking more specifically to the crisis period, it seems that the Singaporean market suffered more than the British one. The following figure shows the weekly variation during the crisis period (both indexes have been set to 0 at the start of the crisis period). The FTSE

100 lost 39.41% while the STI decreased by 48.88%. There is almost 10% difference between both market indexes which is not negligible.

Figure 10: Evolution of FTSE 100 and STI during the crisis



Underpricing

Several papers have studied underpricing differences amongst several countries. The following table shows the different studies comparing underpricing in Singapore and UK, the period of study and the results observed.

Table 11: Underpricing comparison between Singapore and UK

Paper	Period	LSE	SGX
Boulton, Smart and Zutter (2010)	2000-2004	19.9%	22.7%
Dai, Banerjee and Shrestha (2011)	2000-2006	23.3%	24.9%
Costa, Crawford and Jakob (2013)	?	16.3%	27.4%
Autore, Boulton, Smart and Zutter et al. (2014)	1998-2008	17.7%	27.1%

Boulton et al., 2010, Dai et al., 2011, Costa et al., 2013 and Autore et al., 2014

Even if some variations can be observed between the papers, it appears that SGX experiences a higher level of underpricing than LSE. This difference is sometimes bigger than 10%, sometimes smaller than 2% but is however still present.

Long term performance

Unfortunately, no paper has compared long term performance of Singaporean and British IPOs yet (at least to our best knowledge). This may be due to the difficulty of comparing many countries at the same time given the calculations needed (unlike underpricing which is easier to analyze). Furthermore, since Singapore is not one of the biggest exchanges in the world, it is probably not the first one which comes to mind when academics want to compare cross-country IPOs long term performance.

EMPIRICAL STUDY

Presentation of the study

This thesis is meant to study the impact of the financial crisis of 2008 on two phenomena related to IPOs. The first one is the first day returns, also known as underpricing. We decided to limit our study to the first trading day, given that Ho (2016) has found out that most of the underpricing appeared on that day. The second phenomenon is the long-term performance of new listings compared to the performance of the market. Furthermore, we will compare the impact of the crisis on the London Stock Exchange and the Singapore Exchange so as to try to see if some variations may have happened worldwide or are clustered to one single market.

Data

In order to study the impact of the financial crisis, we limited our study to companies entering the London Stock Exchange (LSE) Main Market and the Singapore Exchange (SGX) Mainboard from 01/01/2004 to 31/12/2012.

This gives us the possibility to study three periods summarized in the following table:

Table 12: Breaking down of the studied period in three sub-periods

Period name	Start and End Dates
Pre-crisis	01/01/2004 – 30/06/2007
Crisis	01/07/2007 – 31/03/2009
Post-Crisis	01/04/2009 – 31/12/2012

The following steps were conducted in order to retrieve the data needed:

1. Identify listings on the two exchanges taking place inside the study's timeframe
 - 1.1. London Stock Exchange posts all entries (IPO and non-IPO) on a publicly available Excel sheet⁹.
 - 1.2. Singapore Exchange lists all IPOs on its website. Companies were extracted directly from it¹⁰.
2. Clean the dataset from certain types of companies. In line with the literature (e.g. Gregory, Guermat and Al-Shawawreh, 2010; Gao, Ritter and Zhu, 2013; Henry & Gregoriou, 2014; etc.) we exclude the following companies in both markets: Venture Capitalist Trusts, Real Estate Investment Trusts (REITs), Investment Entities, Investment Companies and Investment Services Firms.
3. Identify all companies tickers in order to extract them on Bloomberg
4. Extract needed data from Bloomberg
 - 4.1. For underpricing: IPO offer price (split-adjusted) and first day closing price
 - 4.2. For long-term performance: monthly prices on a three years period (see explanation in the methodology part)
 - 4.3. Common: day-to-day variation of chosen indexes from 01/01/2004 to 31/01/2016

A problem related to our data is that IPO prices are very small in both countries (since LSE is quoted in British pences). In many studies (e.g. Butler, Keefe and Kieschnick, 2014)

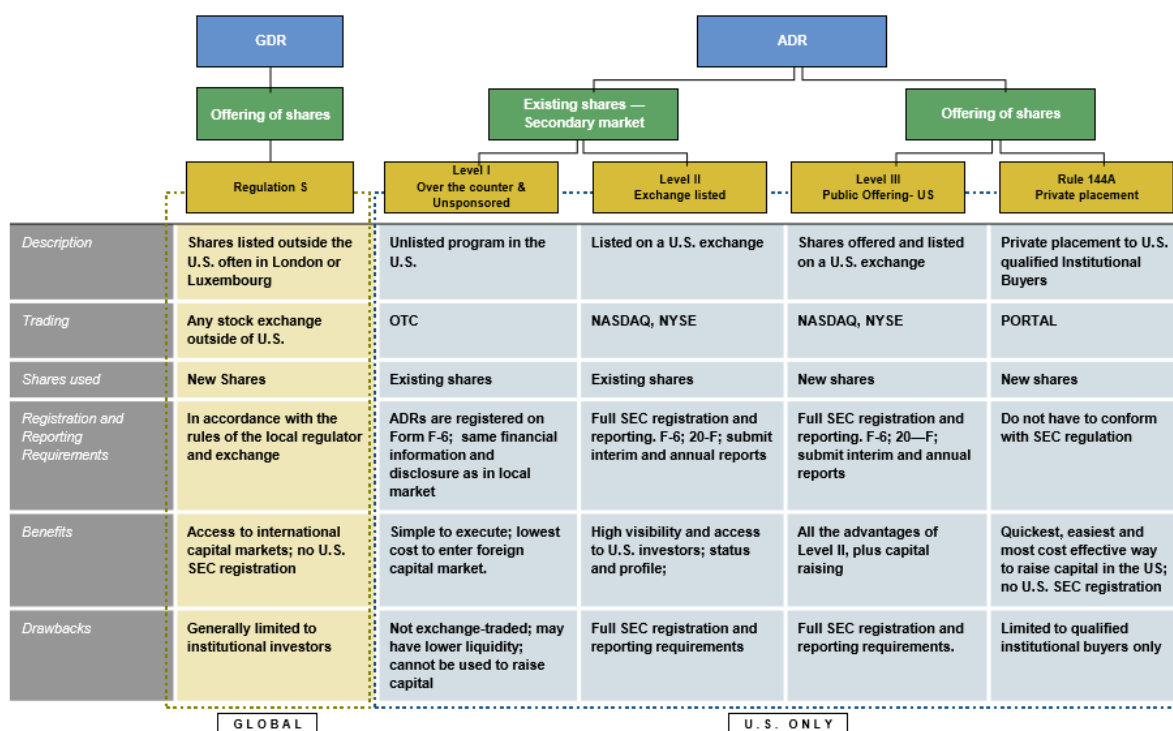
⁹ Can be found here: <http://www.londonstockexchange.com/statistics/new-issues-further-issues/new-issues.xls>

¹⁰ Can be found here: http://www.sgx.com/wps/portal/sgxweb/home/company_disclosure/ipos/ipo_performance

researchers choose to leave out offer prices smaller than 5\$. This is something that cannot be done here since this would lead to leave out most of our observations.

Another problem we encountered was the treatment of Depositary Receipts (DRs). According to J.P. Morgan Chase and Co., a Depositary Receipt “represents ownership of equity shares in a foreign company. These shares are issued against ordinary shares held in custody in the issuer's home market” (J.P. Morgan Chase and Co., n.d). Several types of DRs can be found: American Depositary Receipts (ADRs) and Global Depositary Receipts (GDRs). Differences are explained in the figure below:

Figure 11: ADRs and GDRs - Differences



J.P. Morgan Chase and Co., n.d.

In this study, we only met GDRs since we are not studying US stock exchanges. Because of this, we feel sure that the DRs we encountered were related to the issuance of new shares and therefore corresponding to foreign IPOs. We therefore decided to keep them in the dataset.

This led us to extract a dataset of 182 companies for the LSE Main Market and 251 companies for the SGX Mainboard. A presentation of these data can be found in appendix J.

Methodology

Underpricing

Usually, the calculation of underpricing is quite straightforward and can be represented by the following formula:

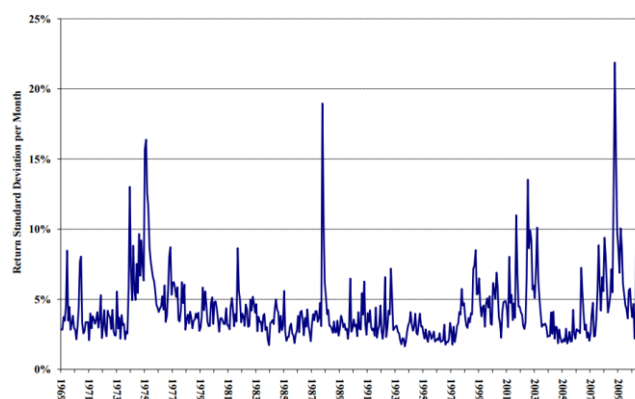
$$UP_i = \frac{(P_{i,closing} - P_{i,opening})}{P_{i,opening}} * 100$$

Where UP_i is the firm's underpricing, $P_{i,closing}$ the first day of trading closing price and $P_{i,opening}$ the opening price or introduction price. The multiplication by 100 only allows showing the underpricing as a percentage.

However, this is not the formula which will be used in this thesis. According to Agathee et al. (2012), this measure is not optimal in case of highly volatile markets. Since we are namely studying the impact of the financial crisis on underpricing, it can be assumed that a measure taking its volatile aspect into account will be more appropriate than the abovementioned one.

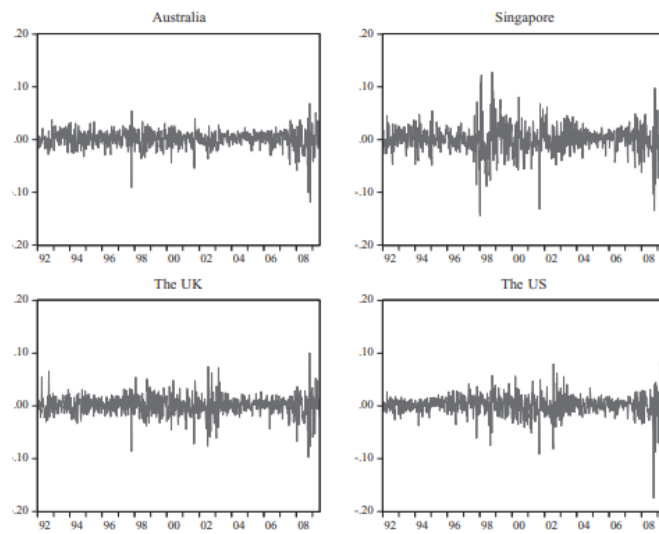
The following figures represent the historical volatility of the FTSE index. It can be seen that during the period of the financial crisis, standard deviation of stock returns experienced a huge increase.

Figure 12: Evolution of FTSE volatility



Schwert, 2011, p.800

Furthermore, Karunanayake, Valadkhani and O'Brien et al. (2010) studied historical weekly volatility of four countries, including Singapore and the UK. The results can be found in the following figure. It can be seen that all countries have observed an increase in volatility around the financial crisis.

Figure 13: Evolution of market volatility around the world

Karunanayake, Valadkhani and O'Brien, 2010, p.213

These two studies strengthen the idea that a better fitted measure of underpricing should be used. The new one is quite similar to the first one but the only difference is that it is market-adjusted. The formula is the following:

$$MAUP_i = \left\{ \left[\frac{(1 + R_i)}{(1 + R_m)} \right] - 1 \right\} * 100$$

Where $MAUP_i$ is the market-adjusted underpricing, R_i the previously calculated underpricing and R_m the market return on the first trading day. This measure won't be biased by the state of the market. An example of the impact of this new measure can be found in appendix K.

Long-term performance

Unlike underpricing, there is no real consensus around a single methodology that should be used to compute long term performance of an IPO. Several methodologies exist, each one having its pros and cons in the literature.

The three most popular methodologies are the following (Gao et al., 2015):

- Buy-and-hold abnormal returns (BHAR)
- Cumulative average adjusted return (CAR)
- Fama-French model

In this study, we will compute buy-and-hold abnormal returns. This is, according to Schultz (2003), the measure which is mainly used for long-term performance studies. Indeed, “they measure returns earned by investors following a buy-and-hold strategy” (Schultz, 2003, p.498).

According to Liu and Strong (2008), using BHAR avoids having a rebalancing bias. Some methodologies keep weights of stocks in their portfolio fixed while the benchmark portfolio is usually rebalanced each month. This leads to a bias which is not present in BHAR. Furthermore, Lyon et al. (1999) showed that CAR are “biased predictors of BHAR” (Lyon et al., 1999, p.192).

The computation of BHAR is relatively easy compared to other methodologies (e.g. Fama-French or CAR). The formula is the following:

$$BHAR_i = \left[\prod_{t=1}^T (1 + R_{it}) - 1 \right] - \left[\prod_{t=1}^T (1 + R_{mt}) - 1 \right]$$

Where $BHAR_i$ is the Buy-and-hold abnormal returns of firm i , R_{it} the return of firm i on period t and R_{mt} the return of the benchmark portfolio on period t .

Returns will be retrieved on a monthly basis and the total period of study will be three years starting from the beginning of the month following the introduction. For example, if a firm floated on 05/10/2005, we will start computing the returns in November 2005. This decision has been motivated by the use of Bloomberg terminals as the database used for this study. When retrieving monthly data of IPOs, the terminal gives us end-of-the-month data and (to our best knowledge) it is not possible to retrieve monthly data on other dates. It is therefore easier to retrieve end-of-the-month data than day-to-day data for each stock and then compounding the monthly data by ourselves.

Concerning the benchmark portfolio, we will use market indexes as in many studies. However, since firms going public are often smaller, namely in terms of market capitalization, we will go for small capitalization indexes instead of general ones (Schuster, 1996). The two indexes used will therefore be the FTSE Small Cap index (LSE (Institute and Faculty of Actuaries, 2003)) and the FTSE ST Small Cap index (SGX (FTSE, 2018)).

In order to represent long-term performance in another way, the “Wealth Relative” of different IPOs or groups of IPOs will be used (Levis, 1993).

$$WR = \frac{1 + \text{average 3 year total returns on IPOs}}{1 + \text{average 3 year total return on a market benchmark}}$$

If WR is bigger than 1, the company or group of companies is outperforming the market benchmark while it is underperforming if WR is smaller than 1. Since this formula does need the same computation compared to BHAR, it will allow us having an alternative view of the performance of IPOs.

Hypotheses

Underpricing

Crisis

Several previous studies can help us build our hypothesis concerning the impact of the GFC on underpricing.

First of all, several studies (namely Autore et al., 2014 and Boulton et al., 2010) have shown that a country's institutional quality is positively related with a higher underpricing. The crisis has impacted financial markets in such a way that institutions have been reinforced in order to limit the risk of another financial collapse (Reyes, 2013). These facts are in favor of an increase of the underpricing (at least) after the crisis.

Furthermore, Çolak and Günay (2011) stated in their paper that IPOs tend to be riskier and costlier because of the economic slowdown involved by the GFC. Since more risk/uncertainty is a factor increasing IPOs underpricing, this is an argument in favor of an increase in underpricing during the crisis.

However, many studies (see “underpricing” chapter) have shown a positive relation between the number of firms floating on an exchange and the average underpricing on that same market. Since the global number of IPOs decreased during the crisis, it is likely that the average underpricing has followed the same trend.

Finally, Henry and Gregoriou (2014) have observed that firms entering the US market were bigger after 2009 than before. This may be the same for other exchanges all over the world. Since Engelen and van Essen (2010) have shown that bigger and older firms experienced a lower underpricing than smaller and younger firms, we could think that the average level of underpricing has decreased after the crisis.

As we can see, several studies support different possible evolutions of the average level of underpricing. This shows that we can find explanations for both an increase and a decrease in the underpricing level during and after the crisis.

It is therefore difficult to state how the crisis has impacted underpricing. Our hypothesis is that the crisis will modify the level of underpricing. Therefore the null and alternative hypotheses can be written as:

Hypothesis 1:

$$H0: MAUP_B = MAUP_D = MAUP_A$$

$$H1: \exists MAUP_i \neq MAUP_j$$

Where B , D and A are used to identify underpricing before, during and after the crisis. Also, since we are looking at three periods of time instead of two, the previous hypothesis allows us to write all hypotheses in a unique one. Otherwise we would have had to write one hypothesis for each combination of two periods, meaning a total of three hypotheses.

Exchanges

It is tricky to guess the differences in underpricing variation between both countries. However, we know from several papers that the underpricing in Singapore has historically been higher than in UK.

Furthermore we have compared both countries on several variables in the “exchanges comparison” chapter. We have seen that they are culturally quite different (Costa et al., 2013). However it is unlikely that this difference has been much influenced by the crisis, meaning that this factor should not have modified the difference in underpricing over time.

We have also seen that both countries are quite similar when looking at institutional quality and securities regulations (Autore et al., 2014 and Porta et al., 2006). As we have no clue on how those factors have evolved during the crisis, our hypothesis will be that both countries have evolved in the same way (as most developed countries) by strengthening their institutions and regulations.

Therefore our hypothesis will be that the historical difference in underpricing has persisted with the crisis. We will write it as the following:

Hypothesis 2:

$$H0: MAUP_{SGXi} = MAUP_{LSEi}$$

$$H1: MAUP_{SGXi} > MAUP_{LSEi}$$

Where i is differentiating each period of the study.

Long-term performance

Crisis

As we have seen in the ‘long-term performance’ chapter, cold markets tend to lead to a better performance of newly entered firms (Zaier and Abdelmoula, 2014). Since the financial crisis has all characteristics of a huge cold market state, the performance of IPOs should have increased.

In the same way, Gao et al. (2013) have shown that long-term performance of bigger firms was better than the one of smaller firms. This would mean that IPOs performance has improved after the crisis.

It may also be said that during the crisis, there was a stronger interest for firms to use earnings management before their IPO. Indeed, given the bad state of the market, it would have allowed firms to improve their short-term performance but it would have hurt them on the long-term, leading to a lower performance. However, recent studies reject this hypothesis for European and Australian listed firms (Filip and Raffournier, 2014 and Aldamen and Duncan, 2016). Nevertheless, these studies look at listed firms and not IPOs, the behavior of floating firms may be totally different.

Finally, several papers we mentioned in that chapter have obtained diverging results. One of them has observed a better performance during the crisis (King and Banderet, 2014) and another one found a worse performance (Ahmad-Zaluki et al., 2011). Ritter (2016) observed an improvement in US new listings performance after the crisis. Even though several factors seem to drive us towards the hypothesis of an improved performance of firms during and after the crisis, empirical studies do not seem to unanimously agree on the topic.

Therefore, our hypothesis will be the following:

Hypothesis 3:

$$H0: BHAR_B = BHAR_D = BHAR_A$$

$$H1: \exists BHAR_i \neq BHAR_j$$

Exchanges

We could not find any paper allowing us to compare long-term performance of IPOs on LSE and SGX. We will therefore analyze the various criteria in our possession which could help us determine how IPOs long-term performance could vary on both exchanges.

First, we have not found any study saying that IPOs long-term performance is impacted by cultural factors.

However, national culture has an impact on the use of earnings management practices namely individualism and uncertainty avoidance which we have already mentioned (Doupnik, 2008). When a country scores high on “uncertainty avoidance”, it tends to use more earnings management practices while the opposite holds for “individualism”. We have some figures comparing Singapore and UK on those variables (see “exchanges comparison” chapter). According to those, IPOs in UK should at the same time use more earnings management than in Singapore (uncertainty avoidance is higher) but also less (individualism is higher).

This means that, in the current state of the literature, the cultural gap between Singapore and UK should not play any role on a potential difference in their new listings performance.

We can also look at the impact of institutional quality of both countries. As for the cultural part, we have not found any paper making a direct relation between long-term performance and institutions.

However, in his paper, Doupnik also relates institutional quality to earnings management. He found out that outside investor rights, securities regulations and the legal system have an impact on the use of earnings management in one country. Nevertheless, Singapore and UK, as stated earlier and confirmed in his paper, are very close on those variables. This should therefore not impact the long-term performance of their new listings.

Finally, Doupnik calculated earnings management for several countries and it appears that Singapore makes more use of these practices than UK (21.625 vs 7.000). This should mean that IPOs long-run performance is worse on SGX than on LSE. But as for underpricing, we have no clue on the potential evolution during the crisis.

Since we do not have any reliable method to know which country could perform best, our hypothesis will be as simple as possible in order to avoid any bias during the analysis. The hypothesis will therefore be the following:

Hypothesis 4:

$$H0: BHAR_{SGXi} = BHAR_{LSEi}$$

$$H1: BHAR_{SGXi} \neq BHAR_{LSEj}$$

Descriptive analysis

When downloading the data from Bloomberg, some companies data could not be fully/correctly extracted. Therefore, we had to remove these companies from the dataset. This concerns 36 companies (17 – 6.77% – on the SGX and 19 – 10.44% – on the LSE) and let us with 397 companies. The list of removed companies can be found in appendix L.

Furthermore, when downloading the data of both indexes, we found out that no closing and opening prices were available for the Singapore Small-Caps index. In order to deal with this issue, we calculated daily variations for underpricing adjusted measure as the variation from $t-1$ to t where t is the day of the listing.

Underpricing

Global

Overall, the distribution of MAUP is the following:

Figure 14: Distribution of MAUP

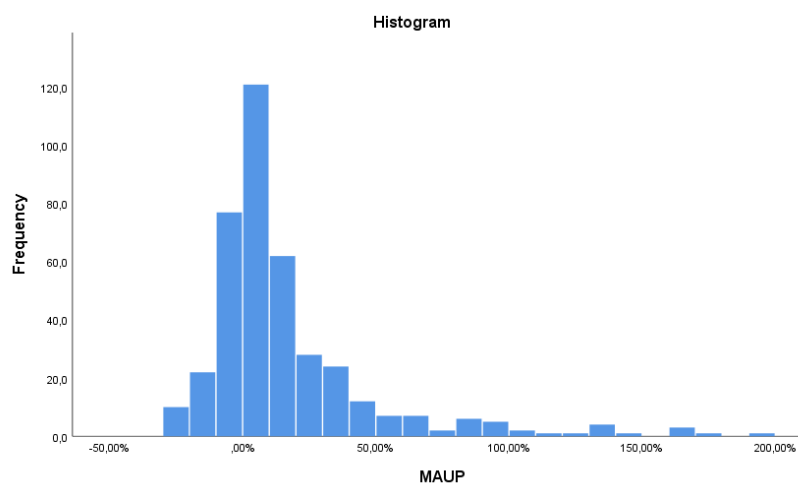


Table 13: Descriptive statistics of MAUP

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
MAUP	397	-27.22%	198.35%	16.75%	33.26%

The mean of the MAUP variable among all observations is 16.75%. As it could be predicted, the distribution of the data is not following a normal distribution but more a log-normal one. This will need to be taken into account for further analyses.

SGX

Concerning the underpricing in Singapore, the distribution and descriptive statistics can be found hereunder:

Figure 15: Distribution of MAUP in Singapore

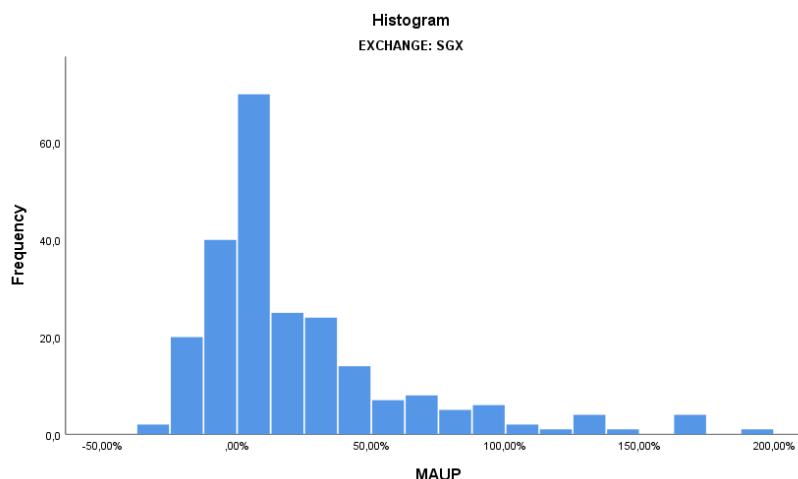
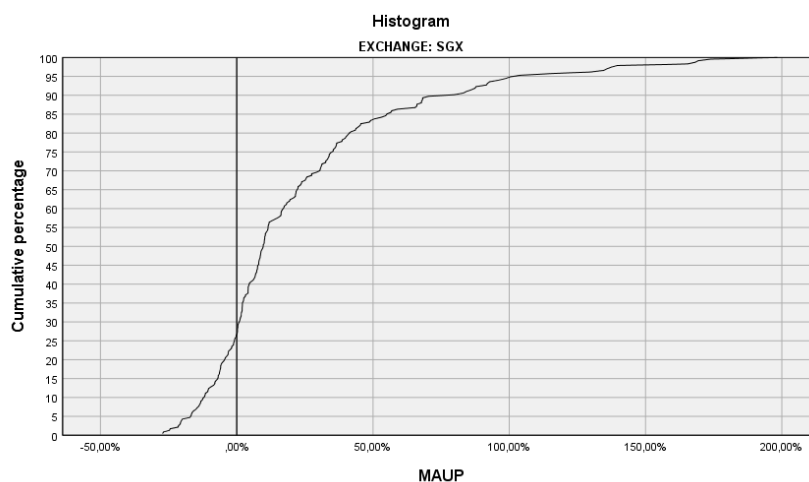


Table 14: Descriptive statistics of MAUP in Singapore

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
MAUP	234	-27.22%	198.35%	23.08%	40.05%

It appears that the mean underpricing in Singapore (23%) is higher than the global underpricing. This level of underpricing is in line with previous studies, where it ranged between 22% and 27%. According to the following graph, around 25% of IPOs on SGX are not underpriced.

Figure 16: Percentage of underpriced IPOs in Singapore



LSE

Compared to the global (and Singaporean) underpricing, it can be seen on the following graph that observations are more clustered around zero.

Figure 17: Distribution of MAUP in London

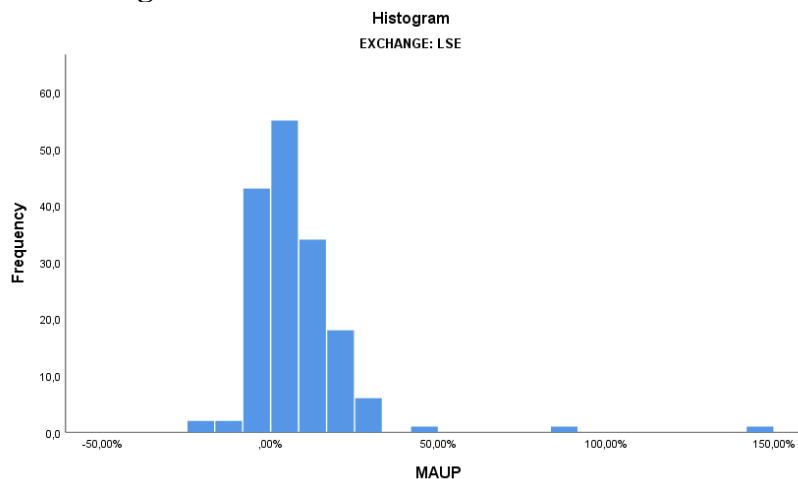
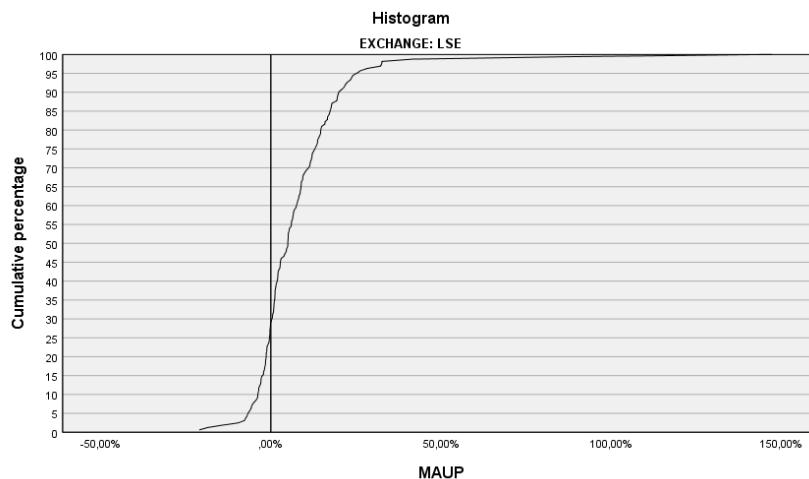


Table 15: Descriptive statistics of MAUP in London

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
MAUP	163	-21.01%	147.08%	7.68%	16.03%

Furthermore, the level of underpricing (7.68%) is very low compared to previous studies where it was usually situated between 16% and 23%. It also appears that the percentage of IPOs which did not experience any underpricing is higher than on SGX, reaching around 30%.

Figure 18: Percentage of underpriced IPOs in London



Crisis

The following boxplot shows the means of Market Adjusted Underpricing amongst the three periods composing the financial crisis of 2008.

Figure 19: Evolution of underpricing during the period of study

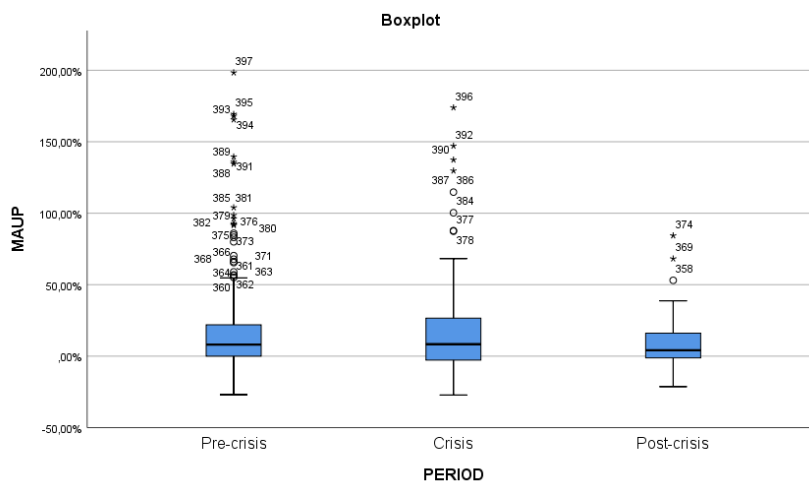


Table 16: Breakdown of underpricing during the period of study

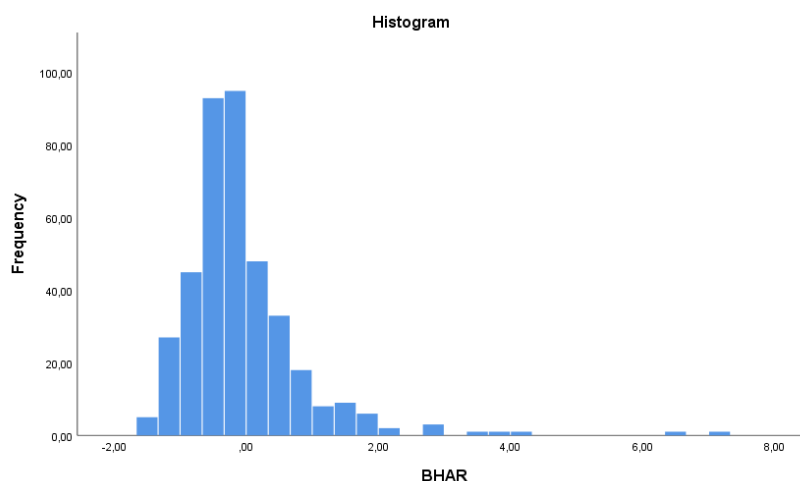
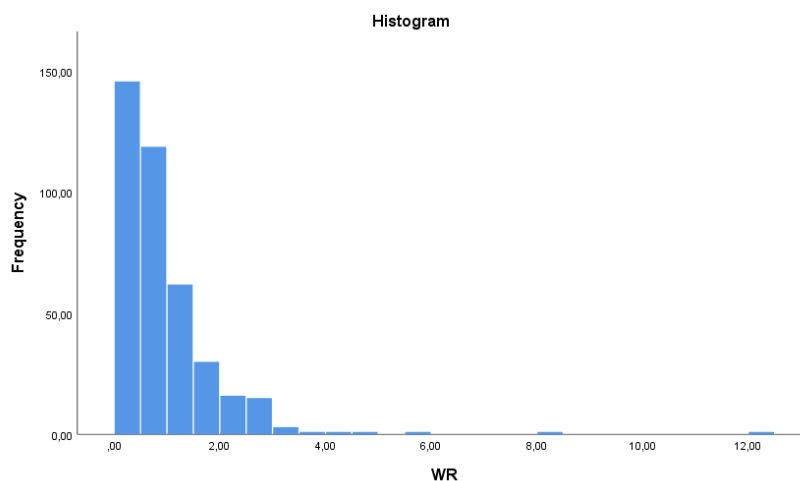
Descriptive Statistics						
PERIOD		N	Minimum	Maximum	Mean	Std. Deviation
Pre-crisis	MAUP	244	-26.92%	198.35%	17.93%	33.89%
Crisis	MAUP	76	-27.22%	173.87%	20.81%	41.27%
Post-crisis	MAUP	77	-21.36%	84.33%	9.00%	18.17%

It appears that underpricing seems to be higher during the crisis than in any other period. Furthermore, while the pre-crisis level of underpricing is close to the crisis level, the post-crisis one is much lower.

Long-Term Performance

Global

Overall, the distribution of BHAR and WR is the following.

Figure 20: Distribution of BHAR**Figure 21: Distribution of WR****Table 17: Descriptive statistics of BHAR and WR**

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
BHAR	397	-1.58	7.28	-0.07	0.93
WR	397	0.003	12.41	0.97	1.05

It can be seen that IPOs have slightly underperformed the Small-Cap indexes of SGX and LSE. According to the BHAR, new listings perform on average 7% worse than other companies on a three-year period. Up to now, we are using both measures (BHAR and WR) because they are similar and none of them follows a normal distribution. Therefore, we will first look at which variable can be better transformed into a normal distribution.

SGX

The following table and graph represents the 3-year performance of new listings compared to the FTSE ST Small Cap index.

Figure 22: Distribution of BHAR in Singapore

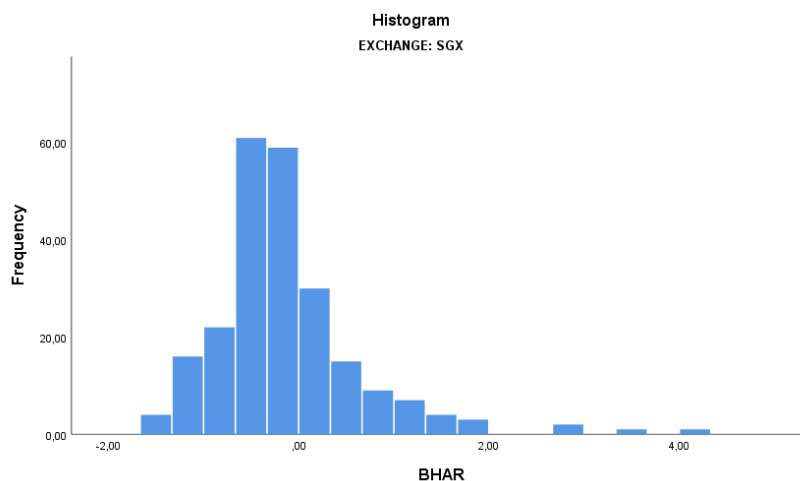


Figure 23: Distribution of WR in Singapore

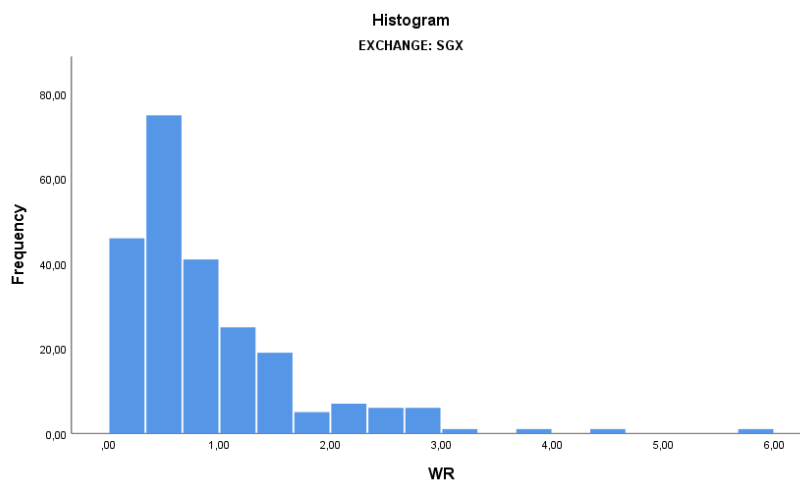
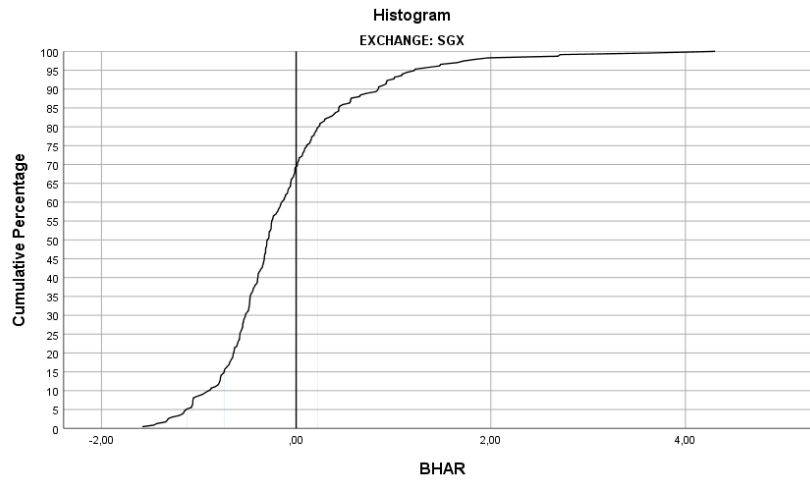


Table 18: Descriptive statistics of BHAR and WR in Singapore

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
BHAR	234	-1.58	4.30	-0.13	0.78
WR	234	0.07	5.86	0.91	0.80

Our results indicate that, on average, IPOs taking place on the SGX underperformed the index by 13% after three year. This is more than the general underperformance previously found. This should mean that the new listings on the LSE have experienced a better performance.

Figure 24: Percentage of underperforming IPOs in Singapore



This graph indicates that around 70% of companies underperform the market in Singapore.

LSE

Figure 25: Distribution of BHAR in London

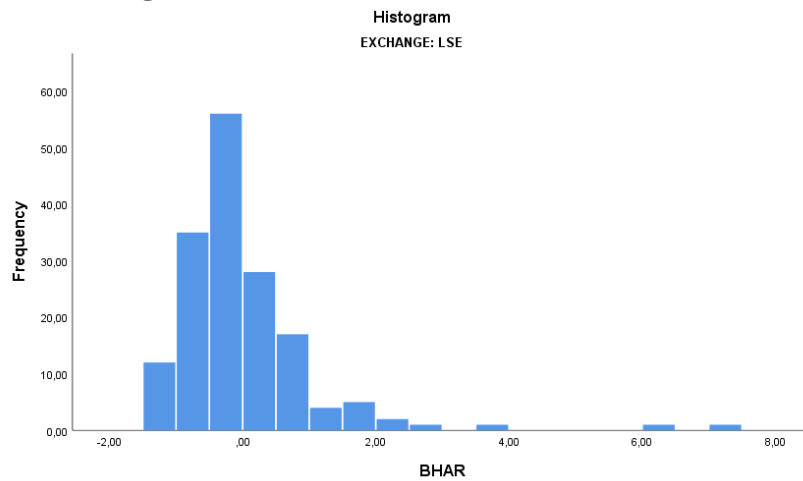


Figure 26: Distribution of WR in London

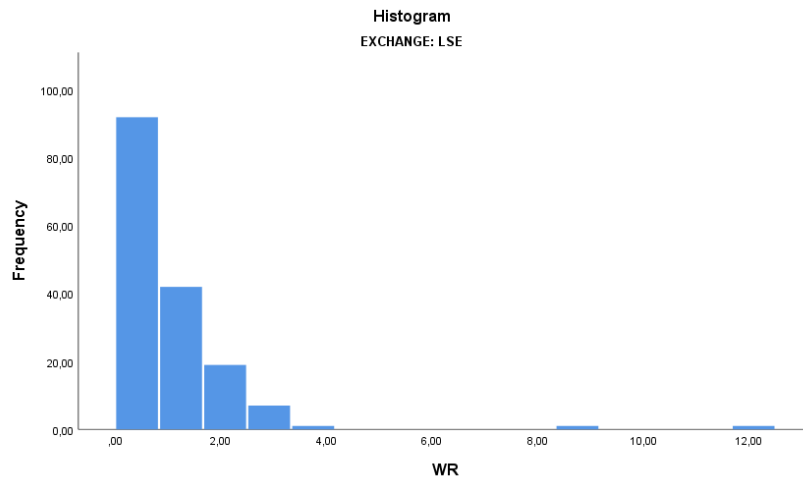
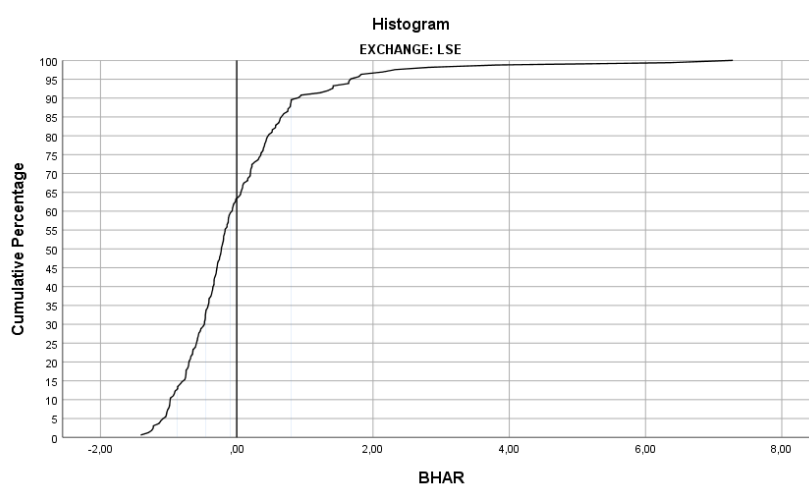


Table 19: Descriptive statistics of BHAR and WR in London

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
BHAR	163	-1.41	7.28	0.17	1.11
WR	163	0.003	12.41	1.06	1.31

According to the previous table and graph, it seems that new listed firms on the LSE perform better than the market after three years. However, it seems that most IPOs (65%) end up performing worse than the market.

Figure 27: Percentage of underperforming IPOs in London

Crisis

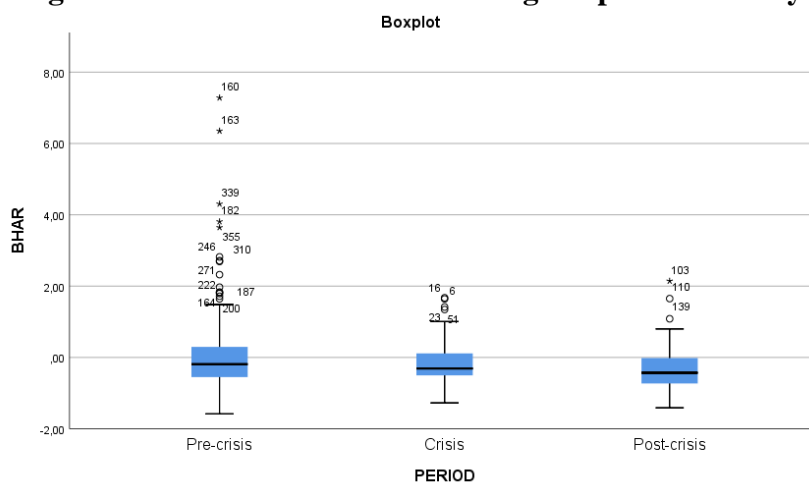
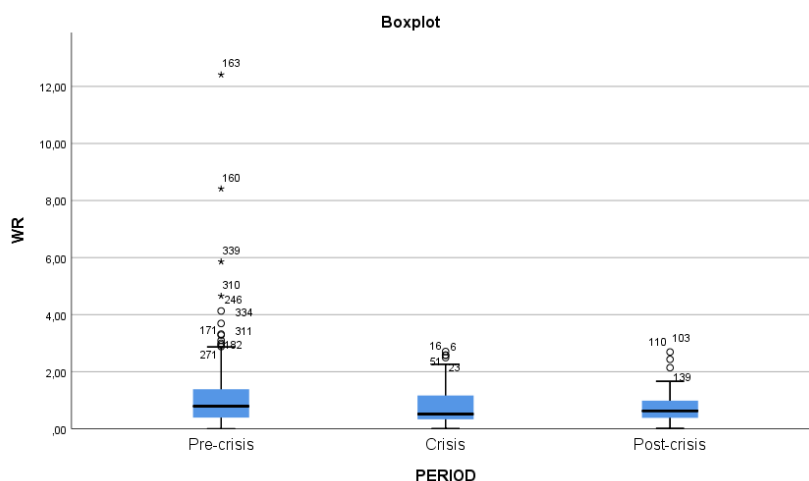
Figure 28: Evolution of BHAR during the period of study

Figure 29: Evolution of WR during the period of study**Table 20: Breakdown of IPOs performance during the period of study**

		Descriptive Statistics				
Period		N	Minimum	Maximum	Mean	Std. Deviation
Pre-Crisis	BHAR	244	-1.580	7.280	0.028	1.070
	WR	244	0.004	12.411	1.090	1.228
Crisis	BHAR	76	-1.274	1.672	-0.120	0.613
	WR	76	0.010	2.706	0.828	0.696
Post-Crisis	BHAR	77	-1.411	2.143	-0.342	0.633
	WR	77	0.011	2.690	0.727	0.518

At first glance, it seems that the performance of new listings was better before than during and after the crisis. However, it can be observed in the boxplots that there are many outliers in the pre-crisis period.

Results

Evolution of the number of listings across time

In order to look at the impact of the crisis on the number of IPOs, we ran a monthly analysis of the number of listing during the study period. Given the huge variation in the data, we calculated a moving average of 6 month to make the evolution clearer. A linear regression has also been conducted in order to study the global trend of the data. The results are the following:

Figure 30: Monthly number of IPOs in Singapore

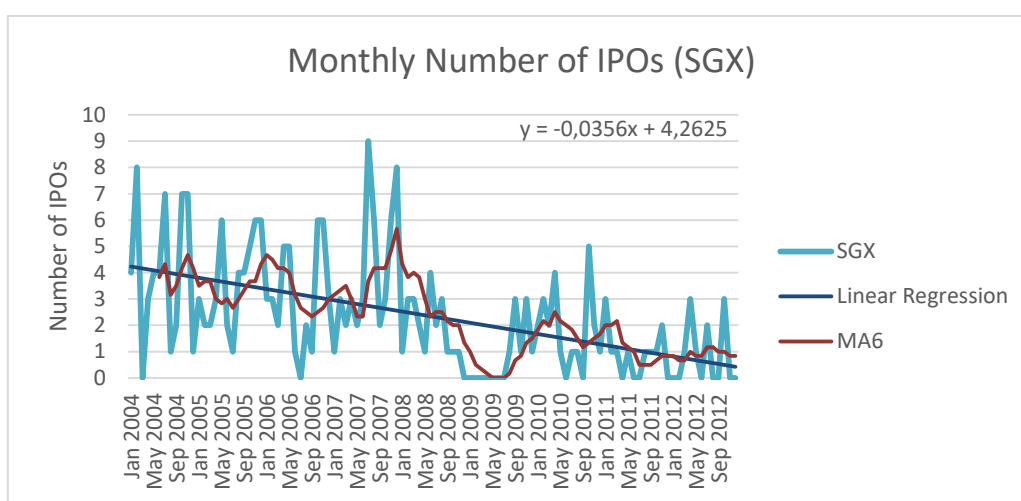
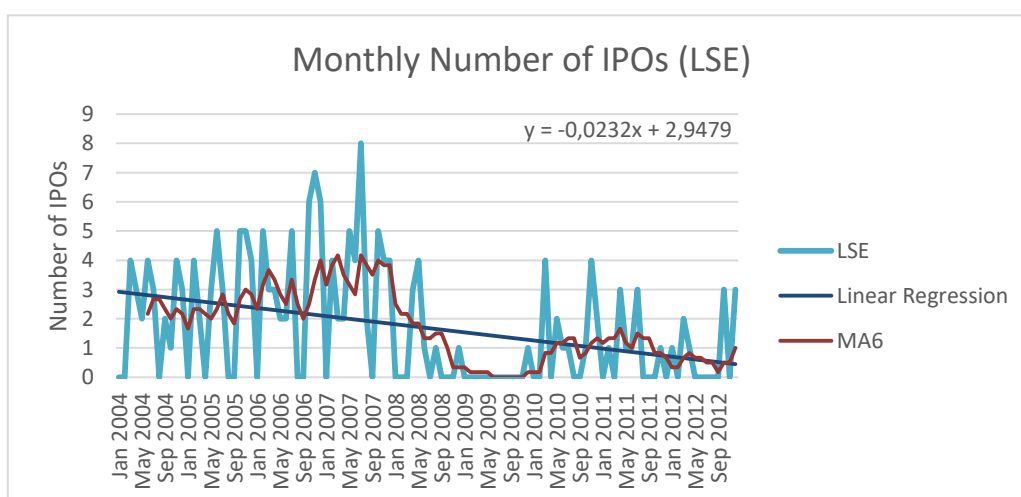


Figure 31: Monthly number of IPOs in London



LSE and SGX show two different patterns and will therefore be studied separately. Concerning SGX, the number of IPO stayed quite stable between January 2004 and December

2007, averaging 3.69 IPOs a month. From January 2008 until July 2009, the number of IPOs dropped and no company listed from January 2009 until July 2009. After that period, the number of listing recovered and averaged 1.82 IPOs a month from August 2009 until December 2010 before decreasing again until December 2012 (0.875 IPOs a month).

On LSE, the period from January 2004 until December 2005 is stable, averaging 2.375 IPOs per month. Then a steady increase in the number of listings took place from January 2006 until December 2007 is marked by a steady increase in the monthly number of IPOs, even though the number of IPOs reached a maximum in July 2007 and stabilized after (averaging 3.83 IPOs per month during those 6 months). Overall, the period averaged 2.83 IPOs per month. The number of IPOs suddenly dropped until the end of 2009. The only IPO of 2009 took place in December. December 2009 indicates the start of the recovery period for the IPO market and the number of listings stayed quite stable from December 2009 to July 2011 (1.25 IPOs a month) before a slight decrease until the end of 2012 with an average of 0.65 IPOs per month.

In both markets, the crisis obviously led to a sharp decrease of listings which only recovered in the last months of 2009 and stabilized under its original level. In both markets, a small decrease can be observed at the end of the study period. Looking at both linear regressions indicates that the decreasing trend in the number of listing was much bigger for the SGX than the LSE (slope of -0.0356 vs -0.0232).

Underpricing and Long-Term performance

Underpricing

SGX

In order to statistically test whether there was an underpricing on the Singapore Exchange, we could not work with the MAUP variable. Indeed, mean comparisons have to be done on datasets following a normal distribution. Therefore, we transformed the MAUP variable into a new variable LOG_MAUP which is calculated as follows:

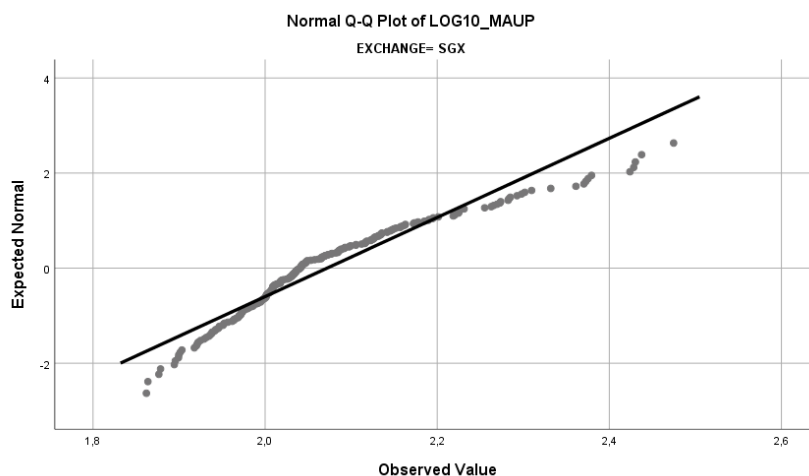
$$LOG_MAUP = LOG_{10}(MAUP + 100)$$

The addition of 100 is used in order to compensate for negative values which Log would not exist. “100” has been chosen for two reasons. First, the MAUP variable cannot go under -100

since this would mean the company has lost more than all its value on the first trading day. Secondly, the base 10 logarithm of 100 is easy to compute and is 2.

Even though Shappiro-Wilk test, meant to assess the normality of the distribution reject the hypothesis of normality for the new variable, this test is really hard to satisfy and the analysis of the QQ-plot shows that the variable is not far away from a normal distribution.

Figure 32: QQ-plot of LOG_MAUP in Singapore



The test therefore looked whether the mean of LOG_MAUP is different from 2 and the results can be found in the following table.

Table 21: One-sample statistics for underpricing in Singapore

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
LOG_MAUP	234	2.072	0.120	0.008

Table 22: One-sample test for underpricing in Singapore

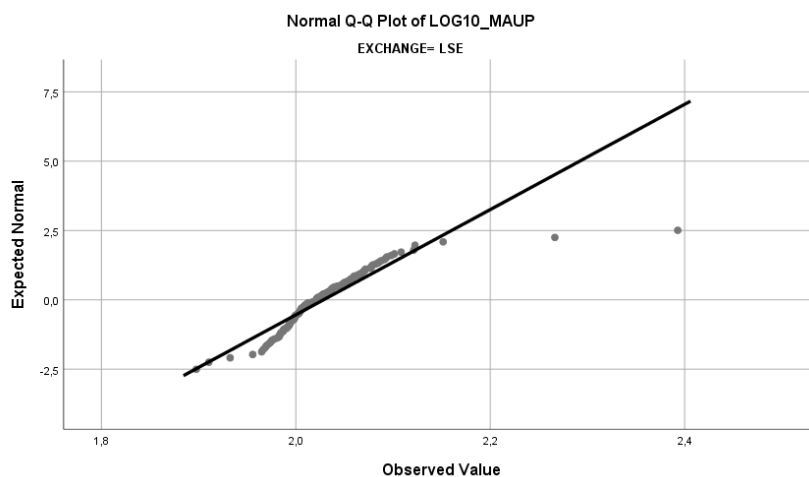
One-Sample Test						
Test Value = 2						
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
LOG_MAUP	9.164	233	0.001	0.072	0.056	0.087

As it can be seen, there is a significant underpricing on the Singapore Exchange for the period 2004-2012.

LSE

As we did for the SGX, we transformed the variable into a better fitted one, closer to the normal distribution.

Figure 33: QQ-plot of LOG_MAUP in London



The following table contains the results of the test for the existence of underpricing on the LSE.

Table 23: One-sample statistics for underpricing in London

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
LOG_MAUP	163	2.028	0.053	0.004

Table 24: One-sample test for underpricing in London

One-Sample Test						
Test Value = 2						
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
LOG_MAUP	6.907	162	0.001	0.029	0.020	0.037

As for the SGX, there is a significant underpricing on the London Stock Exchange from 2004 to 2012.

Difference of underpricing between SGX and LSE

The comparison of both countries underpricing level resulted in the following table.

Table 25: Test for the comparison of underpricing in both countries (1)

Independent Samples Test (1)						
Levene's Test for Equality of Variances						
		F	Sig.	t	df	Sig. (2-tailed)
LOG_MAUP	Equal variances assumed	78.338	0.001	4.336	395	0.001
	Equal variances not assumed			4.898	341.997	0.001

Table 26: Test for the comparison of underpricing in both countries (2)

Independent Sample Test (2)					
		t-Test for Equality of Means		95% Confidence Interval of the Difference	
		Mean Difference	Std. Error Difference	Lower	Upper
LOG_MAUP	Equal variances assumed	0.0434	0.100	0.024	0.063
	Equal variances not assumed	0.0434	0.009	0.026	0.061

There is a significant difference in terms of underpricing between the SGX and the LSE. Furthermore, the underpricing is higher in Singapore than in the UK for the period studied which validates “Hypothesis 2” (even though we still need to do the same test for the different periods).

Crisis

The following table shows the results of the test looking at differences in the level of underpricing among the three periods we have decided to study.

Table 27: Test of homogeneity of variances between the three periods

Test of Homogeneity of Variances					
		Levene Statistic	df1	df2	Sig.
LOG_MAUP	Based on Mean	7.52	2	394	0.001

Table 28: ANOVA on the underpricing difference between the three periods

ANOVA					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	0.047	2	0.023	2.344	0.097
Within Groups	3.946	394	0.010		
Total	3.993	396			

Looking at the table we obtained from our ANOVA analysis, we can observe that the difference between the three periods is not significant at the 95% level. However, the Levene's test reveals that the homogeneity of variances is not respected, meaning that we should use a more robust test. The following table represents the Welch test which is used in order to deal with heterogeneity of variances.

Table 29: Robust test of equality of underpricing between the three periods

Robust Tests of Equality of Means				
	Statistic	Df1	Df2	Sig.
Welch	3.990	2	159.397	0.020

Using a more robust test, we observe a significant difference between the three periods. In order to find which groups differ from others, we have used the Tamhane test which is robust for the case of heterogeneity of variances and group sizes. The results are the following:

Table 30: Tamhane test for underpricing comparison (* = significant at 95% level)

Multiple Comparisons							
	(I) PERIOD	(J) PERIOD	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tamhane	Pre-crisis	Crisis	-0.004	0.016	0,991	-0.042	0.034
		Post-Crisis	0.026*	0.010	0,026	0.002	0.0501
	Crisis	Pre-Crisis	0.004	0.016	0,991	-0.034	0.042
		Post-Crisis	0.030	0.016	0,175	-0.009	0.069
	Post-Crisis	Pre-Crisis	-0.026*	0.010	0,026	-0.0501	-0.002
		Crisis	-0.030	0.016	0,175	-0.069	0.009

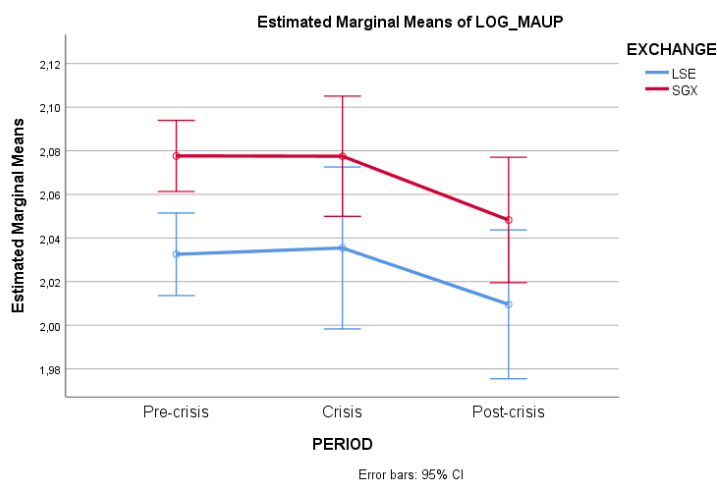
It appears that the only significant difference is between Pre-crisis and Post-crisis level of underpricing. However, it is possible that the difference between the Crisis and the Post-crisis

level of underpricing would also be significant if the number of records was higher. These findings lead to the general validation of our “Hypothesis 1”.

Crisis and Exchange

It appears that the PERIOD variable and the EXCHANGE one separately have an impact on underpricing. However, there is no interaction between those two variables meaning that both exchanges experienced the same variation in terms of underpricing during the crisis.

Figure 34: Interaction between the period and the exchange on underpricing



This is very interesting. It means that even though those exchanges are really far away from each other and culturally very different, the variation of their underpricing seems to be driven by the financial crisis in the exact same way. In order to give a better understanding of these numbers, here is a table comparing both exchanges underpricing through the various periods.

Table 31: Comparison of underpricing in Singapore and London

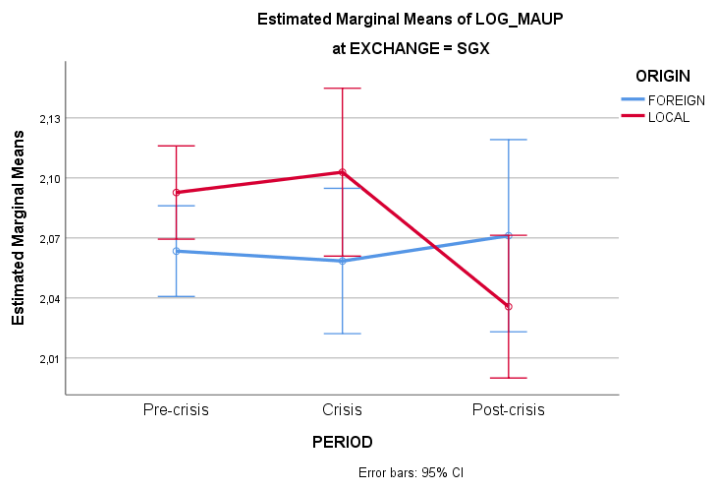
	SGX	LSE
Pre-crisis	25.07%	8.32%
Crisis	26.15%	11.11%
Post-crisis	13.53%	2.63%
Total	23.07%	7.67%

Origin

As mentioned in the “underpricing” chapter, local and foreign IPOs often experience different levels of underpricing. We decided to verify this fact and analyze for each exchange whether the level of underpricing varied over time according to their origin. However, given the small

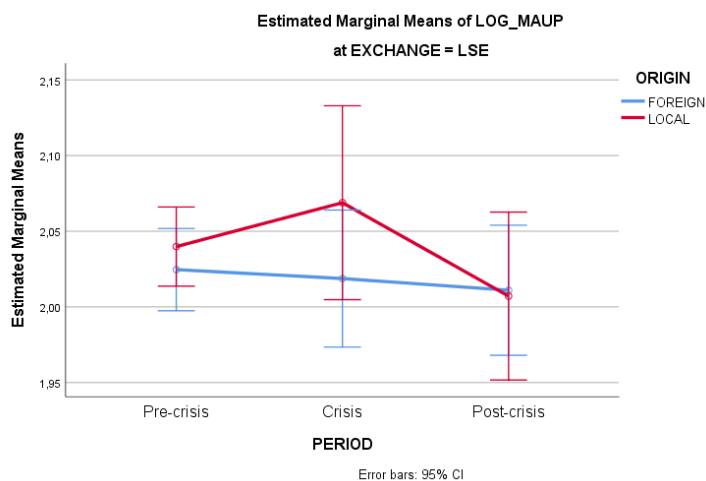
number of data fulfilling all the same conditions (market + period + origin); none of the observed results are significant. We will therefore only have a look at a few graphs.

Figure 35: Evolution of local and foreign IPOs underpricing in Singapore



It appears that the foreign underpricing suffered much less from the crisis than the local one. It stayed stable over the three periods which is not the case for local underpricing which decreased after the crisis.

Figure 36: Evolution of local and foreign IPOs underpricing in London



Concerning LSE, both local and foreign IPOs seem to have followed the same trend from their pre-crisis levels to their post-crisis levels. However while the underpricing of foreign IPOs was already decreasing during the crisis, the underpricing of local IPOs increased.

Furthermore, it seems that in both Singapore and London, local underpricing was higher before and during the crisis but lower or equal afterwards.

Long-Term Performance

SGX

As we mentioned earlier, none of the variables we can use to analyze long-term performance are normally distributed. We transformed both variables and compared both newly created variables so that we could choose the better suited one (more details can be found in appendix M). We decided to use the variable LOG_WR. The following tables contain the results of the test meant to verify the presence of long-term performance on the Singapore Exchange.

Table 32: One-sample statistics for the performance of IPOs in Singapore

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
LOG_WR	234	-0.180	0.348	0.023

Table 33: One-sample test for the performance of IPOs in Singapore

One-Sample Test						
Test Value = 0						
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
LOG_WR	-7.906	233	0.001	-0.180	-0.225	-0.1352

The results indicate that IPOs taking place on SGX from 2004 to 2012 performed significantly worse than the market on a three-year period.

LSE

The following table represents the t-test on LOG_WR in order to test for under/overperformance on LSE.

Table 34: One-sample statistics for the performance of IPOs in London

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
LOG_WR	163	-0.214	0.548	0.043

Table 35: One-sample test for the performance of IPOs in London

One-Sample Test						
Test Value = 0						
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
LOG_WR	-4.983	162	0.001	-0.214	-0.299	-0.1292

The results are very interesting. It appears that when normalizing the variable in order to conduct the test, new listings on LSE significantly underperform the market. This is probably due to the presence of many outliers. These outliers have a really powerful impact but when normalizing the data, their power decreases, leading to a better image of what's really happening on the market.

Difference of Long-Term Performance between SGX and LSE

The comparison of both markets performance resulted in the following table.

Table 36: Test for the comparison of performance in both countries (1)

Independent Samples Test (1)						
Levene's Test for Equality of Variances						
		F	Sig.	t	df	Sig. (2-tailed)
LOG_WR	Equal variances assumed	13.096	0.001	0.755	395	0.451
	Equal variances not assumed			0.699	252.023	0.485

Table 37: Test for the comparison of performance in both countries (2)

Independent Sample Test (2)					
t-Test for Equality of Means				95% Confidence Interval of the Difference	
		Mean Difference	Std. Error Difference	Lower	Upper
LOG_WR	Equal variances assumed	0.034	0.045	-0.055	0.123
	Equal variances not assumed	0.034	0.049	-0.062	0.130

It appears that we do not observe any significant difference between new listings on SGX and new listings on LSE. Therefore, we cannot reject the null hypothesis of our “Hypothesis 4” stating that both groups have a similar Long-Term Performance.

Crisis

The following tables show the results of the test looking at difference in long-term performance between the three periods.

Table 38: Test of homogeneity of variances between the three periods

Levene's Test of Equality of Error Variances					
		Levene Statistic	df1	df2	Sig.
LOG_WR	Based on Mean	1.709	2	394	0.182

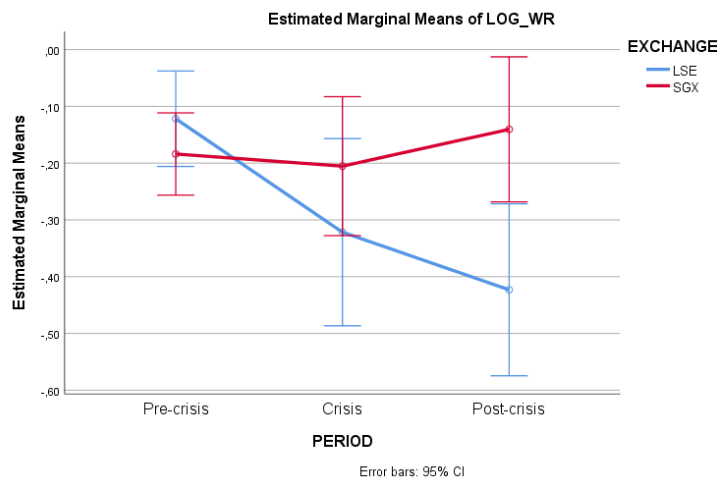
Table 39: Test for different performance of IPOs between the three periods

Test of Between-Subject Effects						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	0.852	2	0.426	2.200	0.112	0.011
Intercept	14.491	1	14.491	74.877	0.001	0.011
PERIOD	0.852	2	0.426	2.200	0.112	0.011
Error	76.250	394	0.194			
Total	92.043	397				
Corrected Total	77.101	396				

It can be seen that the model is not significant. This means that we cannot reject the hypothesis that the period has no impact on the long-term performance of new listings. Our “Hypothesis 3” is therefore not supported.

Crisis and Exchange

The following graph shows the variation of the long-term performance according to the period and the exchange of the observation.

Figure 37: Interaction between the period and the exchange on performance

Concerning the difference between exchanges, the only significant difference happened after the crisis, SGX experiencing a better performance than LSE.

For the differences between periods, the two significant differences are the ones between Pre-crisis and Crisis/Post-Crisis performance on the London Stock Exchange. The two markets experienced a very different evolution. LSE had a better performance before the crisis but then it decreased when the crisis happened. It even further decreased once the crisis was over. On the other side, the performance on SGX remained more or less stable during the period under examination. For each period and exchange the BHAR are the following:

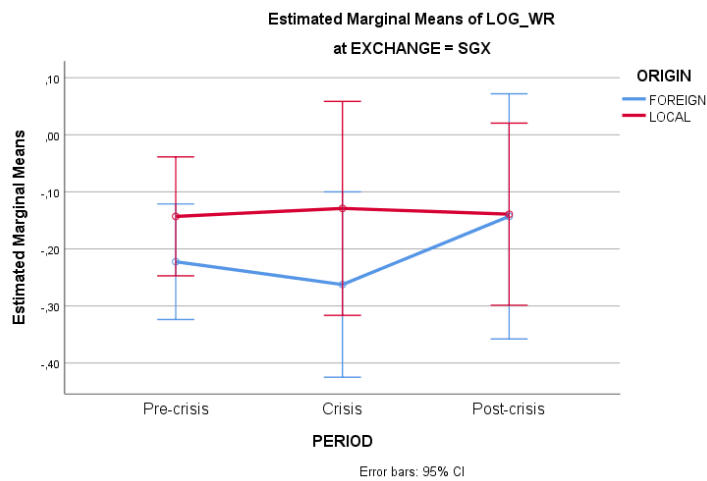
Table 40: IPOs performance compared to the market in Singapore and London

	SGX	LSE
Pre-Crisis	-13.01%	24.14%
Crisis	-12.27%	-11.63%
Post-Crisis	-15.76%	-60.13%

Origin

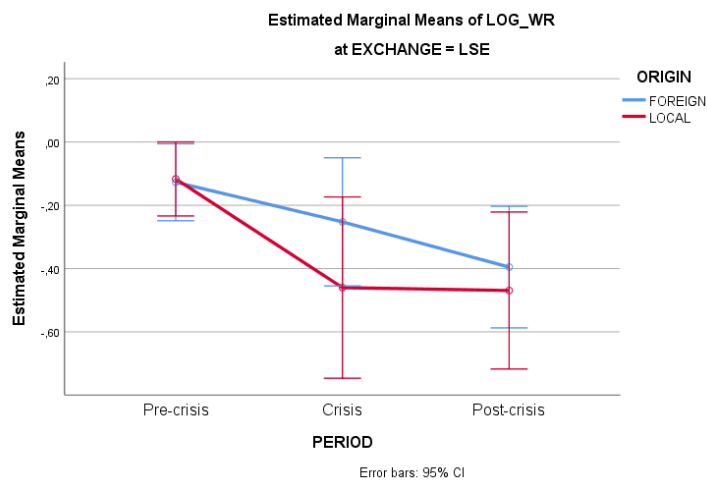
Similarly to underpricing, no significant results could be found for the impact of the origin of a firm on long-term performance. We will again look at a few graphs in order to find some possible trends in our data.

Figure 38: Evolution of local and foreign IPOs performance in Singapore



It appears that local IPOs performance stayed stable over time while foreign IPOs performance, initially worse, improved after the crisis and reached the same level as local IPOs performance.

Figure 39: Evolution of local and foreign IPOs performance in London



In London, foreign and local IPOs seem to have followed the same trend: a decreasing long-term performance. The decrease was more limited to the crisis period for local IPOs while it was equally distributed on both the crisis and post-crisis periods for foreign IPOs.

Interpretation

IPO activity

As previous studies have already found out, we observed a huge decrease in the IPO activity of both markets during the crisis. Before the crisis, the speculative bubble around house mortgage led to booming financial markets which seemed very attractive to investors and therefore to companies. IPO markets were flourishing all over the world until the end of 2007 when markets started to collapse and entered into the financial crisis.

Investors had flown away from markets and especially the IPO market, being surrounded by more uncertainty. IPOs did not directly stop for a simple reason. Entering a stock exchange is not something you can decide in two days as it is explained in the listing process of both SGX and LSE. Therefore, when the crisis happened, it is very likely that many companies were already planning to issue shares to the public and some of them decided to float anyway.

End of 2009, the IPO activity started to rally but never (at least until end of 2012) managed to come back to its pre-crisis level. Probably more because pre-crisis activity was abnormally high and that after the crisis, the activity returned to a more normal level. Furthermore, companies and investors should have learned about their recent mistakes and the market is more and more regulated.

Underpricing

First of all, both markets experienced the phenomenon of underpricing. This result was very likely to happen since it is commonly accepted that underpricing is a worldwide phenomenon affecting all markets.

It also appears that over the 2004-2012 period, IPOs taking place on SGX are, on average, more underpriced than IPOs taking place on LSE. This difference had already been observed in a few studies and this is therefore not surprising. Most studies use cultural and institutional factors in order to explain cross-country differences. However as we have seen, Singapore and UK have quite similar institutional characteristics. It is therefore likely that this difference may be better explained by cultural and geographical differences between both countries than institutional ones.

Concerning the impact of the crisis, the observed phenomenon is a slight increase in the level of underpricing during the crisis. A sharp decrease has then been observed during the post-crisis period. However, only the post-crisis decrease has been found significant compared to the pre-crisis level of underpricing. As previously expressed another significant difference could probably have been found between the crisis and post-crisis levels with more data.

Several causes may have led to this decrease. For example, the crisis has modified the type of companies going public. After the crisis (see “global financial crisis” chapter) larger firms tend to enter the market in the US, which is known to be a factor reducing underpricing, the same may have happened in Singapore and UK. Furthermore, since the speculative bubble has exploded during the crisis, firms floating after the crisis may have been of better quality than firms floating before the crisis. This has already been proved to be another factor reducing the level of underpricing.

However, when trying to find an interaction between the exchange and the period, we were not able to find any significant result. This means that IPOs on SGX and IPOs on LSE experienced similar variations during the crisis. Even if those two exchanges experienced a similar behavior, we cannot try to generalize this behavior to exchanges all over the world. Indeed, a paper presented in the “global financial crisis” chapter and studying IPOs on the US stock exchange found a different behavior (decrease during the GFC and increase afterwards). However the definition of the Crisis period used in their study is not the same as the one we used here. This may have impacted the results.

Therefore, we can say that either the similar behavior is only due to a coincidence, either some characteristics shared by both exchanges can be used to explain this similarity. A reason that could be thought about is the institutional characteristics shared by both countries which may have impacted the reaction of both markets to the crisis.

Long-Term Performance

A first result we have found is that IPOs on both markets underperformed their respective small-cap index on the 2004-2012 period. However we could not find evidence that one exchange outperformed the other one. The findings may indicate that the underperformance of IPOs (compared to the performance of an index) is a worldwide phenomenon shared by multiple markets. Unlike underpricing, long-term underperformance is not unanimously

approved by the academic community. This thesis therefore positions itself as one more evidence supporting the existence of this underperformance.

Concerning the lack of differences between the performance on SGX and LSE, an explanation could be the similarity between firms on both markets. Indeed, it was found that the Price/Earnings ratio was a strong determinant of the long-term performance (see long-term performance part). Since both SGX and LSE have small quotations (since LSE is quoted in pences), the Price/Earnings ratios of the companies they host may be quite similar, leading to a similar performance. However, underperformance is a phenomenon still difficult to explain and only suppositions can be made to explain these results.

Another interesting finding is that the crisis does not seem to have had any impact on the long-term performance of companies. This may further support the evidence towards existence of an underperformance of IPOs. Indeed, this shows that even when the market is varying, the underperformance is still the same. This means that new listings follow the index while always experiencing a worse performance.

However when we tried to see whether both exchanges behaved similarly during the window of study, we observed that this finding is only valid for SGX. LSE, on the other hand, showed a worse performance during and after the crisis than before. Furthermore, after the crisis, the performance of IPOs on SGX was significantly higher than the performance of IPOs on LSE.

This may result from some changes in regulation initiated by one or the other country. For example the Watchlist (see “exchanges comparison” chapter) was introduced by SGX in 2008. This threat of being delisted may have made companies more careful when entering the stock market and therefore making less earnings management since this would be reflected into a worse performance afterwards. Such a system not being in place on LSE, its companies could have continued to use aggressive earnings management practices to go through the crisis and lead them to worsen their long-term performance.

Origin

The origin of the firm does not seem to be a significant factor in order to explain the variation of underpricing and long-term performance observed in this thesis. However, the amount of data fulfilling all conditions being quite small, this lack of signification may be due to the limited available data. We therefore decided to further study the impact of the origin of firms.

For LSE, we observed the same behavior for local and foreign firms in terms of underpricing and long-term performance. Some variations can be observed, however all firms, local and foreign ones, seem to have reacted in the same way. The underpricing level as well as the long-term performance decreased between the pre- and post-crisis periods as well as performance.

Companies floating on SGX showed a different behavior. Concerning the underpricing level, foreign IPOs experienced a stable underpricing. On the contrary, the underpricing level of local firms slightly increased during the crisis before plunging in the post-crisis area.

In terms of long-term performance (in Singapore), local IPOs did not experience any variation. On the other hand, foreign IPOs have seen their performance improving after the crisis.

It is difficult to find any reason for such behaviors since no tests have been able to give significant results. The observed trends may only be due to the limited number of records for each category. Further research would be needed to strengthen or counter our findings.

Limitations and further research

A first limitation of our study is easy to find. This thesis has found out an answer to how the crisis has impacted the underpricing and the long-term performance of new listings on SGX and LSE. However, we have been unable to fully answer the question why the crisis has influenced IPOs in such a way. We could only give some pieces of interpretation of our results given our knowledge of the topic but no scientific research is supporting them. This question could be used for further research since we did not retrieve enough data about each IPO so as to allow us comparing them in further details.

Furthermore, this study is only focusing on two financial markets and it could be interesting to generalize the methodology used in this thesis to other markets. This would allow comparing many markets in order to find which ones share some similarities and be able to get a better understanding of how markets have reacted to the crisis and which factors and characteristics are shared among markets having reacted in similar ways.

Finally, in order to test the robustness of this study, other methodologies, especially for long-term performance, could be used. This would give the opportunity to strengthen our results or on the contrary to discover that they are driven by biases related to the methodology used.

CONCLUSION

As a conclusion, this thesis has come up with several interesting results. First of all, both underpricing and long-term underperformance have been proven to exist on both SGX and LSE. We also observed that the IPO market shrunk during the crisis and recovered afterwards. However it never came back to its pre-crisis level.

Secondly, the historical difference in terms of underpricing between Singapore and the UK has been verified. Furthermore, we were not able to conclude that the crisis has had an impact on this difference.

Thirdly, even though we observe underperformance on both markets, we cannot conclude that one of the markets performed better/worse than the other one.

Furthermore, both markets have experienced a very dissimilar influence of the crisis on their long-term performance. While new listings on SGX have shown a constant performance, listings on LSE have seen their performance decreasing with the crisis.

Finally, we have also run a few analyses looking at the impact of the origin of firms. Even if some interesting results have been observed, the lack of significance does not allow us to draw any further conclusion. However it seems that LSE has been more homogeneously impacted by the crisis than SGX.

Further research could seek to explain these results with more variables in order to develop a better understanding of the factors driving the reaction of IPOs markets to the crisis. It would also be interesting to analyze other markets so as to try to generalize our findings to the worldwide IPO market.

In order to test the robustness of our findings, other methodologies could be tried on this dataset. This could already help to generalize these results or on the contrary, to discuss them.

BIBLIOGRAPHY

Agathee, U. S., Brooks, C., & Sannasee, R. J. (2012). Hot and cold IPO markets: The case of the Stock Exchange of Mauritius. *Journal of Multinational Financial Management*, 22(4), 168-192. doi:10.1016/j.mulfin.2012.06.004

Ahmad-Zaluki, N. A., Campbell, K., & Goodacre, A. (2011). Earnings management in malaysian IPOs: The east asian crisis, ownership control, and post-IPO performance. *The International Journal of Accounting*, 46(2), 111-145.

Aldamen, H., & Duncan, K. (2016). Does good corporate governance enhance accruals quality during financial crises? *Managerial Auditing Journal*, 31(4/5), 434-457. doi:10.1108/MAJ-06-2015-1206

Aleksashenko, S. (2009). Crisis 2008. *Problems of Economic Transition*, 51(9), 33-50. doi:10.2753/PET1061-1991510902

Anagnostidis, P., Varsakelis, C., & Emmanouilides, C. J. (2016). Has the 2008 financial crisis affected stock market efficiency? the case of eurozone. *Physica A: Statistical Mechanics and its Applications*, 447, 116-128. doi:10.1016/j.physa.2015.12.017

Ap Gwilym, O., Verousis, T. (2010), Price clustering and underpricing in the IPO aftermarket, *International Review of Financial Analysis*, 19(2), 89-97. doi:10.1016/j.irfa.2010.01.007

Autore, D. M., Boulton, T. J., Smart, S. B., & Zutter, C. J. (2014). The impact of institutional quality on initial public offerings. *Journal of Economics and Business*, 73, 65-96. doi:10.1016/j.jeconbus.2014.01.002

Batnini, F., & Hammami, M. (2015). IPO waves: How market performances influence the market timing of IPO? *Journal of Applied Business Research*, 31(5), 1679-1692.

Bartram, S. M., & Bodnar, G. M. (2009). No place to hide: The global crisis in equity markets in 2008/2009. *Journal of International Money and Finance*, 28(8), 1246-1292. doi:10.1016/j.jimonfin.2009.08.005

Baur, D. G. (2012). Financial contagion and the real economy. *Journal of Banking & Finance*, 36(10), 2680-2692. doi:10.1016/j.jbankfin.2011.05.019

- Benninga, S., Helmantel, M., & Sarig, O. (2005). The timing of initial public offerings. *Journal of Financial Economics*, 75(1), 115-132. doi:10.1016/j.jfineco.2003.04.002
- Bhardwaj, G., & Sengupta, R. (2008). *Did prepayments sustain the subprime market?* Available at <https://core.ac.uk/download/pdf/6651327.pdf>, Consulted on 25/01/2018.
- Bhardwaj, G., & Sengupta, R. (2012). Subprime mortgage design. *Journal of Banking and Finance*, 36(5), 1503-1519. doi:10.1016/j.jbankfin.2011.12.012
- Boeh, K., & Dunbar, C. (2014). IPO waves and the issuance process. *Journal of Corporate Finance*, 25, 455-473. doi:10.1016/j.jcorpfin.2014.02.001
- Boulton, T. J., Smart, S. B., & Zutter, C. J. (2010). IPO underpricing and international corporate governance. *Journal of International Business Studies*, 41(2), 206-222. doi:10.1057/jibs.2009.38
- Brennan, M. J., & Franks, J. (1997). Underpricing, ownership and control in initial public offerings of equity securities in the UK. *Journal of Financial Economics*, 45(3), 391-413. doi:10.1016/S0304-405X(97)00022-6
- Brueckner, J. K., Calem, P. S., & Nakamura, L. I. (2012). Subprime mortgages and the housing bubble. *Journal of Urban Economics*, 71(2), 230-243. doi:10.1016/j.jue.2011.09.002
- Business Think (2015). *Contagion effect: How financial crises spread across borders.* Available at <https://www.businessthink.unsw.edu.au/pages/contagion-effect-how-financial-crises-spread-across-borders.aspx/>, Consulted on 25/01/2018.
- Bustamante, M. C. (2012). The dynamics of going public. *Review of Finance*, 16(2), 577-618.
- Butler, A., Grullon, G., & Weston, J. (2005). Can Managers Forecast Aggregate Market Returns? *The Journal of Finance*, 60(2), 963-986. doi:10.1111/j.1540-6261.2005.00752.x
- Butler, A. W., Keefe, M. O., & Kieschnick, R. (2014). Robust determinants of IPO underpricing and their implications for IPO research. *Journal of Corporate Finance*, 27, 367-383. doi:10.1016/j.jcorpfin.2014.06.002
- Buy-Stocks.com (n.d). London Stock Exchange. Available at <https://www.buy-stocks.com/london-stock-exchange.html>, Consulted on 04/04/2012.

Cai, K., & Zhu, H. (2014). Cultural distance and foreign IPO underpricing variations. *Journal of Multinational Financial Management*, 29, 99-114. doi:10.1016/j.mulfin.2014.11.003

Chemmanur, T. J., He, J. (2011). IPO waves, product market competition, and the going public decision: Theory and evidence. *Journal of Financial Economics*, 101(2) 382-412. doi:10.1016/j.jfineco.2011.03.009

Çolak, G., & Günay, H. (2011). Strategic waiting in the IPO markets, *Journal of Corporate Finance*, 17(3), 555-583. doi:10.1016/j.jcorpfin.2011.02.007

Cornanic, A., & Novak, J. (2015). Signaling by underpricing the initial public offerings of primary listings in an emerging market. *Finance a Uver*, 65(4), 307-335.

Costa, B. A., Crawford, A., & Jakob, K. (2013). Does culture influence IPO underpricing? *Journal of Multinational Financial Management*, 23(1-2), 113-123. doi:10.1016/j.mulfin.2012.12.001

Dahlquist, M., & De Jong, F. (2008). Pseudo Market Timing: A Reappraisal. *The Journal of Financial and Quantitative Analysis*, 43(3), 547-579. doi:10.1017/S002210900000421X

Dai, L., Banerjee, S., & Shrestha, K. (2011). Cross-country IPOs: What explains differences in underpricing? *Journal of Corporate Finance*, 17(5), 1289-1305. doi:10.1016/j.jcorpfin.2011.06.004

Danis, M. A., & Pennington-Cross, A. (2008). The delinquency of subprime mortgages. *Journal of Economics and Business*, 60(1), 67-90. doi:10.1016/j.jeconbus.2007.08.005

Dawkins, W., Russell, S. (2012). *Foreign Listings in London*. Available at <https://www.spencerstuart.com/research-and-insight/foreign-listings-in-london>, Consulted on 02/05/2018.

Desjardins, J. (2017) *The 20 Largest Stock Exchanges in the World*. Available at <http://www.visualcapitalist.com/20-largest-stock-exchanges-world/>. Consulted on 10/03/2018.

Dictionary (n.d). *Rule of law*. Available at <http://www.dictionary.com/browse/rule-of-law>, Consulted on 01/05/2018

- Doeswijk, R. Q., Hemmes, H. S. K., & Venekamp, R. H. (2006). 25 years of dutch ipos: An examination of frequently cited ipo anomalies within main sectors and during hot- and cold-issue periods. *De Economist*, 154(3), 405-427. doi:10.1007/s10645-006-9017-y
- Doidge, C., Karolyi, G. A., & Stulz, R. M. (2009). Has new york become less competitive than london in global markets? evaluating foreign listing choices over time. *Journal of Financial Economics*, 91(3), 253-277. doi:10.1016/j.jfineco.2008.02.010
- Doidge, C., Karolyi, G. A., Stulz, R. M. (2013). The U.S left behind? Financial globalization and the rise of IPOs outside the US *Journal of financial economics*, 110(3), 546-573. doi:10.1016/j.jfineco.2013.08.008
- Doupnik, T. S. (2008). Influence of culture on earnings management: A note. *Abacus*, 44(3), 317-340. doi:10.1111/j.1467-6281.2008.00265.x
- Dhamija, S., & Arora, R. K. (2017). Impact of quality certification on IPO underpricing: Evidence from India. *Global Business Review*, 18(2), 428-444. doi:10.1177/0972150916668611
- Driebusch, C. (2016) *What's Juicing the IPO Market? Lower Expectations; Even though 2016 is still on pace to be the worst year for US stock debuts since the financial crisis, the second quarter saw more companies willing to take the plunge.* Available at <https://www.wsj.com/articles/whats-juicing-the-ipo-market-lower-expectations-1467315926>, Consulted on 10/07/2017.
- Ellul, A., & Pagano, M. (2006). IPO Underpricing and After-Market Liquidity. *The Review of Financial Studies*, 19(2), 381-421. doi:10.1093/rfs/hhj018
- Engelen, P., & van Essen, M. (2010). Underpricing of IPOs: Firm-, issue- and country-specific characteristics. *Journal of Banking and Finance*, 34(8), 1958-1969. doi:10.1016/j.jbankfin.2010.01.002
- Fauzi, F., Wellalage, N. H., & Locke, S. (2012). The global financial crisis' impact on short-term performance of IPO: The case study of new zealand firms' IPOs. *Asian Journal of Finance & Accounting*, 4(2), 180-198.

Filip, A. & Raffournier, B. (2014). Financial crisis and earnings management: the European evidence, *The International Journal of Accounting*, 49(4), 455-478. doi:10.1016/j.intacc.2014.10.004

Finmarketguru (2015). *10 oldest stock exchanges in the world*. Available at <http://www.finmarketguru.com/10-oldest-stock-exchanges-in-the-world/>, Consulted on 02/04/2018.

Francis, B., Hasan, I., & Li, F. (2001). Underpricing of foreign and domestic IPOs in the US market: Empirical evidence. *Financial Markets, Institutions & Instruments*, 10(1), 1-18. doi:10.1111/1468-0416.00040

FTSE (2018). *FTSE ST Index Series*. Available at <http://www.ftse.com/Analytics/FactSheets/Home/DownloadSingleIssue?issueName=SGXSE RIES>, Consulted on 24/03/2018.

Gao, J., Cong, L. M., & Evans, J. (2015). Earnings management, IPO underpricing, and post-issue stock performance of chinese SMEs. *The Chinese Economy*, 48(5), 351-371. doi:10.1080/10971475.2015.1067085

Gao, X., Ritter, J. R., & Zhu, Z. (2013). Where have all the IPOs gone? *Journal of Financial and Quantitative Analysis*, 48(6), 1663-1692. doi:10.1017/S0022109014000015

Gatinois, C. (2008). *Comment va s'appliquer le plan Paulson*. Available at http://www.lemonde.fr/economie/article/2008/09/29/le-plan-paulson-mode-d-emploi_1100626_3234.html, Consulted on 26/01/2018.

Georgieva, K. (2011). *The issue of underpricing in Initial Public Offerings*.

Gounopoulos, D., & Pham, H. (2017). Credit ratings and earnings management around IPOs. *Journal of Business Finance & Accounting*, 44(1-2), 154-195. doi:10.1111/jbfa.12228

Gregory, A., Guermat, C., & Al-Shawawreh, F. (2010). UK IPOs: Long run returns, behavioural timing and pseudo timing. *Journal of Business Finance & Accounting*, 37(5), 612-647. doi:10.1111/j.1468-5957.2010.02182.x

Guo, H., Brooks, R., & Shami, R. (2010). Detecting hot and cold cycles using a markov regime switching model—Evidence from the chinese A-share IPO market. *International Review of Economics and Finance*, 19(2), 196-210. doi:10.1016/j.iref.2009.10.002

Habib, M., & Ljungqvist, A. (2001). Underpricing and Entrepreneurial Wealth Losses in IPOs: Theory and Evidence. *The Review of Financial Studies*, 14(2), 433-458. doi:10.1093/rfs/14.2.433

Hayes, A. (n.d). *IPO Basics: Getting In On An IPO*. Available at <http://www.investopedia.com/university/ipo/ipo1.asp>, Consulted on 05/07/2017

Hayes, A. (n.d). *IPO Basics: What Is An IPO?* Available at <http://www.investopedia.com/university/ipo/ipo.asp?ad=dirN&qo=investopediaSiteSearch&qsrc=0&o=40186>, Consulted on 05/07/2017

Helwege, J., & Liang, N. (2004). Initial Public Offerings in Hot and Cold Markets. *The Journal of Financial and Quantitative Analysis*, 39(3), 541-569. doi:10.1017/S0022109000004026

Henrick, B. (2012). *The Role of Industry Affiliation in the Underpricing of US IPOs*.

Henry, S. C., & Gregoriou, G. N. (2014). IPO firm characteristics pre-and post-financial crisis. *Academy of Accounting and Financial Studies Journal*, 18(2), 67-83.

Ho, H. (2016). A comparative study of initial public offerings in hong kong, singapore and malaysia. *Nang Yan Business Journal*, 4(1), 1-12.

Hsu, Y., & Shiu, C-Y. (2004). *Public Information and Cascades in IPOs: Evidence from Taiwan*.

Hsu, C., Yu, J., & Wen, S. (2013). The analysts' forecast of IPO firms during the global financial crisis. *International Journal of Economics and Financial Issues*, 3(3), 673-682.

Institute and Faculty of Actuaries (2003). Ftse-indices. Available at <https://www.actuaries.org.uk/documents/ftse-indices>, Consulted on 24/03/2018.

Investopedia (n.d). *Accruals*. Available at <https://www.investopedia.com/terms/a/accruals.asp>, Consulted on 21/01/2018.

Investopedia (n.d). *Cash-out Refinance*. Available at https://www.investopedia.com/terms/c/cashout_refinance.asp, Consulted on 25/01/2018.

Investopedia (n.d). *Cross-listing*. Available at <https://www.investopedia.com/terms/c/cross-listing.asp>, Consulted on 17/01/2018.

Investopedia (n.d). *Holding Company*. Available at <https://www.investopedia.com/terms/h/holdingcompany.asp>, Consulted on 19/04/2018.

Investopedia (n.d). *Initial Public Offering – IPO*. Available at <http://www.investopedia.com/terms/i/ipo.asp>, Consulted on 01/03/2017.

Investopedia (n.d). *Singapore Exchange - SGX*. Available at https://www.investopedia.com/terms/s/singapore_exchange.asp, Consulted on 04/04/2018.

Jain, B. A., & Kini, O. (1994). The post-issue operating performance of IPO firms. *The Journal of Finance*, 49(5), 1699-1726. doi:10.1111/j.1540-6261.1994.tb04778.x

Jaiswal-Dale, A. (2010). Facilitating student understanding of the sub-prime mortgage crisis: Systematic risk, CDO, and contagion. *Journal of International Business Education*, 5, 117-144.

J.P. Morgan Chase and Co. (n.d). *Find out about DRs*. Available at <https://www.adr.com/Investors/FindOutAboutDRs>. Consulted on 26/03/2018.

Kanungo, R. (2010), Pseudo Market Timing of Premium and Standard Listing IPOs. *Journal of Finance and Risk Perspectives*, 2(1), 25-37.

Karolyi, G. A. (2006). The world of cross-listings and cross-listings of the world: Challenging conventional wisdom. *Review of Finance*, 10(1), 99-152. doi:10.1007/s10679-006-6980-8

Karunanayake, I., Valadkhani, A. & O'Brien, M. (2010). Financial crises and international stock market volatility transmission: International stock market volatility transmission. *Australian Economic Papers*, 49(3), 209-221. doi:10.1111/j.1467-8454.2010.00397.x

Kau, J. B., Keenan, D. C., Lyubimov, C., & Slawson, V. C. (2011). Subprime mortgage default. *Journal of Urban Economics*, 70(2), 75-87. doi:10.1016/j.jue.2011.05.001

Kenourgios, D., & Dimitriou, D. (2015). Contagion of the global financial crisis and the real economy: A regional analysis. *Economic Modelling*, 44, 283-293. doi:10.1016/j.econmod.2014.10.048

King, E., & Banderet, L. (2014). *IPO stock performance and the financial crisis*.

Labégorre, F. (2003). Introduction en bourse: Mesure et déterminants de la richesse de l'environnement informationnel. *La Revue Des Sciences De Gestion : Direction Et Gestion*, (203), 19-36.

Lambert, T. (2017). *A brief history of Singapore*. Available at <http://www.localhistories.org/singapore.html>, Consulted on 02/05/2018.

Lee, P. M., & Wahal, S. (2004). Grandstanding, certification and the underpricing of venture capital backed IPOs. *Journal of Financial Economics*, 73(2), 375-407. doi:10.1016/j.jfineco.2003.09.003

Levis, M. (1993). The long-run performance of initial public offerings: The UK experience 1980-1988. *Financial Management*, 22(1), 28-41. doi:10.2307/3665963

Lewellyn, K. B., & Bao, S. (2014). A cross-national investigation of IPO activity: The role of formal institutions and national culture. *International Business Review*, 23(6), 1167-1178. doi:10.1016/j.ibusrev.2014.03.010

Li, M. (2007). A better understanding of the initial public offering process: Evidence from google. *Financier*, 13/14, 8-18.

Liu, W., & Strong, N. (2008). Biases in decomposing holding-period portfolio returns. *The Review of Financial Studies*, 21(5), 2243-2274. doi:10.1093/rfs/hhl034

Ljungqvist, A. (2007). IPO Underpricing. In B. E. Eckbo (dir.), *Handbook of Corporate Finance : Empirical Corporate Finance* (1st ed.n vol. 2, p. 375-422). Amsterdam, Netherland: Elsevier.

London Stock Exchange (n.d). *About the Main Market*. Available at <http://www.londonstockexchange.com/companies-and-advisors/main-market/main/market.htm>, Consulted on 02/04/2018.

London Stock Exchange (n.d). *About the Professional Securities Market*. Available at <http://www.londonstockexchange.com/companies-and-advisors/psm/about/psm-about.htm>, Consulted on 02/04/2018.

London Stock Exchange (n.d). *AIM*. Available at <http://www.londonstockexchange.com/companies-and-advisors/aim/aim/aim.htm>, Consulted on 02/04/2018.

London Stock Exchange (n.d). *Listing Process*. Available at <http://www.londonstockexchange.com/companies-and-advisors/main-market/companies/listing/process.htm>, Consulted on 02/04/2018.

London Stock Exchange (2010). *Main Market: A guide to listing on London Stock Exchange*. Available at <http://www.londonstockexchange.com/companies-and-advisors/main-market/documents/gudetolisting.pdf>, Consulted on 02/04/2018.

London Stock Exchange Group (2012). *London stock exchange and Singapore exchange sign cross quotation agreement*, Available at <https://www.lseg.com/media-centre/news/news-across-group/london-stock-exchange-and-singapore-exchange-sign-cross>, Consulted on 02/05/2018.

Loughran, T., & Ritter, J. (2004). Why Has IPO Underpricing Changed over Time? *Financial Management*, 33(3), 5-37.

Lundtofte, F. (2010). A note on the pricing of IPOs. *Economics Letters*, 106(2), 105-107. doi:10.1016/j.econlet.2009.10.014

Lyon, J. D., Barber, B. M., & Tsai, C. (1999). Improved methods for tests of long-run abnormal stock returns. *The Journal of Finance*, 54(1), 165-201. doi:10.1111/0022-1082.00101

Melvin, M., & Taylor, M. P. (2009). The global financial crisis: Causes, threats and opportunities. introduction and overview. *Journal of International Money and Finance*, 28(8), 1243-1245. doi:10.1016/j.jimonfin.2009.08.002

Nikkei Asian Review (2018). *Singapore Exchange ltd*. Available at <https://asia.nikkei.com/Companies/Singapore-Exchange-Ltd>, Consulted on 04/04/2018.

O'Rourke, K. H., & Eichengreen, B. (2009). A tale of two depressions. *Chartered Accountants Journal of New Zealand*, 88(4), 70-71.

Pagano, M., Panetta, F., & Zingales, L. (1998). Why Do Companies Go Public? An Empirical Analysis. *The Journal of Finance*, 53(1), 27-64. doi:10.1111/0022-1082.25448

Porta, R. L., Lopez-De-Silanes, F., & Shleifer, A. (2006). What works in securities laws? *The Journal of Finance*, 61(1), 1-32. doi:10.1111/j.1540-6261.2006.00828.x

Pritchard, J. (2017), *The Mortgage Crisis Explained*, Available at <https://www.thebalance.com/mortgage-crisis-overview-315684>, Consulted on 24/01/2018.

PWC (2012). *Listing in London: A guide to premium and standard listings of equity and flotation on AIM*. Available at https://www.pwc.com/mn/en/capital-markets/assets/mn_successful_listing_in_london_eng.pdf, Consulted on 02/04/2018.

Rahman, H., & Yung, K. (1999). Insurance IPOs--a test of the underpricing theories. *Journal of Insurance Issues*, 22(1), 61-77.

Reyes (2013). *The Financial Crisis Five Years Later: Response, Reform, and Progress in Charts*. Available at <https://www.treasury.gov/connect/blog/Pages/The-Financial-Crisis-Five-Years-Later.aspx>, Consulted on 25/05/2018.

Ritter (2016). *Initial Public Offerings: Updated Statistics*. Available at <https://site.warrington.ufl.edu/ritter/files/2016/03/Initial-Public-Offerings-Updated-Statistics-2016-03-08.pdf>, Consulted on 26/01/2018.

Ritter, J., & Welch, I. (2002). A Review of IPO Activity, Pricing, and Allocations. *The Journal of Finance*, 57(4), 1795-1828. doi:10.1111/1540-6261.00478

Schultz, P. (2003). Pseudo Market Timing and the Long-Run Underperformance of IPOs. *The Journal of Finance*, 58(2), 483-517. doi:10.1111/1540-6261.00535

Schuster, J. (1996). *Underpricing and crises - IPO performance in Germany*.

Schwert, G. W. (2011). Stock volatility during the recent financial crisis. *European Financial Management*, 17(5), 789-805. doi:10.1111/j.1468-036X.2011.00620.x

Sensagent (n.d), *Seasoned Equity Offering*, Available at <http://dictionary.sensagent.com/Seasoned%20equity%20offering/en-en/>, Consulted on 11/01/2018.

Sensoy, A., & Tabak, B. M. (2015). Time-varying long term memory in the european union stock markets. *Physica A: Statistical Mechanics and its Applications*, 436, 147-158. doi:10.1016/j.physa.2015.05.034

Shen, L. (2016). *IPO Market Is Worst Since the Financial Crisis*. Available at <http://fortune.com/2016/08/01/ipo-drought-sorry-private-equity/>, Consulted on 05/07/2017.

Singapore Exchange (n.d). *Catalist celebrates 10 years of high growth*. Available at <http://www.sgx.com/wps/portal/sgxweb/home/listings/catalist10>, Consulted on 04/04/2018.

Singapore Exchange (n.d). *Companies in the watchlist*. Available at http://www.sgx.com/wps/portal/sgxweb/home/company_disclosure/watchlist, Consulted on 04/04/2018.

Singapore Exchange (n.d). *Equity Index*. Available at <http://www.sgx.com/wps/portal/sgxweb/home/marketinfo/indices/indices>, Consulted on 04/04/2018.

Singapore Exchange (n.d). *How to get listed on SGX Mainboard*. Available at <http://www.sgx.com/wps/wcm/connect/9a3e9abd-465e-4242-ba06-9c14e9a4ea3a/HOW+TO+GET+LISTED+ON+SGX+MAINBOARD+Final+for+upload+%28LAC%29+-+7Oct.pdf?MOD=AJPERES>, Consulted on 04/04/2018.

Solomon, S. D. (2011). *Why I.P.O's get underpriced*. Available at <https://dealbook.nytimes.com/2011/05/27/why-i-p-o-s-get-underpriced/>, Consulted on 14/07/2017.

Statista (2018). *Number of companies trading monthly on the London Stock Exchange from January 2015 to January 2017*. Available at <https://www.statista.com/statistics/324547/uk-number-of-companies-lse/>, Consulted on 04/04/2018.

Stockmarketclock.com (n.d). *List of Stock Exchanges*. Available at <https://www.stockmarketclock.com/exchanges>, Consulted on 04/04/2018

Sustainable Stock Exchange Initiative (n.d). *Singapore Exchange*. Available at <http://www.sseinitiative.org/fact-sheet/singapore-exchange/>, Consulted on 04/04/2018.

Switzer, L. N., & Bourdon, J. (2011). Management quality and operating performance: Evidence for canadian IPOs. *International Journal of Business*, 16(2), 133-149.

Tam, L. H. K., Chang, X., Lin, S. H., & Wong, G. (2010). Cross-sectional determinants of post-IPO stock performance: Evidence from china. *Accounting & Finance*, 50(3), 581-603. doi:10.1111/j.1467-629X.2009.00333.x

Taulli, T. (2012), *How a Dutch auction IPO works*, Available at <https://investorplace.com/ipo-playbook/how-a-dutch-auction-ipo-works-facebook/#.WldosqjiaM8>, Consulted on 11/01/2018.

The Financial Crisis Inquiry Commission (2011), *The financial crisis inquiry report*. Available at <https://www.gpo.gov/fdsys/pkg/GPO-FCIC/pdf/GPO-FCIC.pdf>, Consulted on 25/01/2018.

Tiniç, S. M. (1988). Anatomy of initial public offerings of common stock. *The Journal of Finance*, 43(4), 789-822. doi:10.1111/j.1540-6261.1988.tb02606.x

TradeCrowd (2014) *A history of London Stock Exchange*. Available at https://tradecrowd.com/learn-to-trade/stocks/history-of-london-stock-exchange/#.WsHy_ohuaM8, Consulted on 02/04/2018.

Tran, A. L., & Jeon, B. N. (2011). The dynamic impact of macroeconomic factors on initial public offerings: Evidence from time-series analysis. *Applied Economics*, 43(23), 3187-3201. doi:10.1080/00036840903493267

Tupper, C. H. (2016). Crisis conditions and performance of IPO firms: Impact of founder-CEOs and foreign listings. *The Journal of Applied Management and Entrepreneurship*, 21(1), 32-52. doi:10.9774/GLEAF.3709.2016.ja.00005

Value Invest Asia (2014). *Implications Of Being On Singapore Exchange Limited (SGX:S68) Watchlist*. Available at <https://valueinvestasia.com/implications-singapore-exchange-limited-sgxs68-watchlist/>, Consulted on 04/04/2018.

Vasile, D., Sebastian, T. C., & Radu, T. (2011). A behavioral approach to the global financial crisis. *Annals of the University of Oradea: Economic Science*, 20(2), 340-346.

Vismara, S., Paleari, S., & Ritter, J. R. (2012). Europe's second markets for small companies. *European Financial Management*, 18(3), 352-388. doi:10.1111/j.1468-036X.2012.00641.x

Vithessonthi, C. (2014). What explains the initial return of initial public offerings after the 1997 asian financial crisis? evidence from thailand. *Journal of Multinational Financial Management*, 27, 89-113. doi:10.1016/j.mulfin.2014.05.002

Warganegara, D. S., & Warganegara, D. L. (2014). Do IPO hot and cold markets exist at the indonesia stock exchange? *Binus Business Review*, 5(2), 484-496. doi:10.21512/bbr.v5i2.1007

Welch, I. (1992). Sequential sales, learning, and cascades. *The Journal of Finance*, 47(2), 695-732. doi:10.1111/j.1540-6261.1992.tb04406.x

World Bank (n.d). *Voice and accountability*. Available at <http://info.worldbank.org/governance/wgi/pdf/va.pdf>, Consulted on 01/05/2018

Yeo, J. (2013). *The 3 Main Indices in Singapore*. Available at <https://www.fool.sg/2013/06/24/the-3-main-indices-in-singapore/>, Consulted on 04/04/2018.

Yung, C., Çolak, G., Wang, W. (2008), Cycles in the IPO market, *Journal of Financial Economics*, 89(1), 192-208. doi:10.1016/j.jfineco.2007.06.007

Zaier, L. H., & Abdelmoula, A. K. (2014). Hot and cold cycles for african emerging share IPO market evidence from tunisia. *Asian Economic and Financial Review*, 4(11), 1691-1704.