



MSc Management (Finance)

The Aftermarket Performance of Initial Public Offerings in Taiwan: Before and After the 2008 Global Financial Crisis

Anonymous code: Z0963939

Declaration

This dissertation is the result of my own work. Material from the published or unpublished work of others, which is referred to in the dissertation, is credited to the author in question in the text. The dissertation is 10,874 words in length. Research ethics issues have been considered and handled appropriately within the Durham Business School guidelines and procedures.

Abstract

The purpose of this study is to empirically investigate the aftermarket performance of initial public offerings in Taiwan before and after the 2008 global financial crisis. There have been many researchers such as (Prasad et al, 2006; Ritter et al, 1994; Aggarwal et al, 1993; Chen & Ritter, 2000; Yi-Hsu et al, 2013; Yuan Leon Li et al, 2007; Abraham et al 2016) that concluded systematic short-run under-pricing and long-run underperformance of IPOs. The objective of this study is to see if, given the 2008 global economic crisis and Taiwan's highly exporting nature, the average returns would produce similar results to past studies. The data samples consist of 233 IPOs, ranging from 2005 to 2011. The study then divides the sample size by different crisis periods: pre-crisis, crisis, and post-crisis or recovery period. The crisis periods are further subdivided by industries to explore potential anomalies in the returns. Methodologies were adopted from (Aggarwal, et al., 1993) and (Wen and Cao, 2013) to calculate the short-run initial return (under-pricing), and the three-year long-run return. The findings presented in this research, correlated with the ones found in past studies. However, behavior and sentiment theories were used in this project, instead of asymmetric information theories, to explain the under-pricing phenomenon. In addition, long-run performances did not correlate with past studies, because they did not show an underperformance. The sample size long-run positive performance was linked to the response of the Taiwan's Government to the 2008 global financial crisis, and investors sentiment towards it. Taiwan, being a part of the Four Asian Tiger Countries, has shown consistent growth over the past three decades. This study attempts to provide an in-depth analysis of the Taiwan's dynamic IPO market, which can later be used by investors as a guidance in case of recessions in the future.

Keywords; Under-pricing, Taiwan IPOs, long-run underperformance, abnormal returns, market-adjusted returns, global financial crisis, investor sentiment, asymmetric information

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Chapter I – Introduction

1.1 Significance and Purpose of the Research

There is an abundant amount of research and empirical evidence that have been recognised over the years, regarding the aftermarket performance of initial public offerings. Researches conducted by (Prasad et al, 2006; Ritter et al, 1994; Aggarwal et al, 1993; Chen & Ritter, 2000; Yi-Hsu et al, 2013; Yuan Leon Li et al, 2007; Abraham et al 2016) have all concluded that IPOs are systematically under-priced from developed to developing economies all over the world. However, under-pricing doesn't seem to be the case when it comes to long-term performance. There has been an ample amount of research conducted by many scholars about the reasons why under-pricing takes place in a vast number of economies. (Ljungqvist, 2007) dedicated a full chapter in which he discusses theories such as institutional explanations, asymmetric information models, ownership and control, and behavioural explanations. (Chang, et al., 2016: 01) states 'Whether such under-pricing is fair compensation for investors to compensate them for risk-bearing or providing information, or is excessive and is driven by agency problems between issuers and underwriters, is the most important debate in the IPO literature.' An underwriter, in most economies, is simply an entity that gets paid a hefty sum to allocate and price IPOs. (Ritter, 2011) argues that the academic literature that rules under-pricing model theories is that of asymmetric information with the non-existence of agency problems. However, Ritter believes that it's not the most important order of explanation. Ritter has confidence that evidence suggests 'agency problems between issuers and investment bankers are of first-order importance' (Ritter, 2011:348) in the explanation of under-pricing.

Nevertheless, when it comes to the long-run performance of IPOs in the U.S. (Aggarwal, et al., 1993: 42) stated, 'what appears to be under-pricing in the short-run may be overpricing when one focuses on the long-run.' (Abraham, et al., 2016) and (Ibbotson, 1975) both reported IPOs to be overpriced or underperform in the long-term from research conducted in both U.S. and international markets, meaning that no matter what the decade, one may question the efficacy of IPO international markets. Although, according to (Chen, 2001), when it comes to long-run performance, Taiwan has produced mixed results when applying different models. For instance, he argues that the IPOs perform better when using the market adjusted return and under-perform when book-to-market and size are taken into account. (Yong, 2007) conducted a study in which he reviewed the research of IPO performances in Asian markets and concluded that long-term IPO returns are not consistent with under-performance results observed in the United States. (Yong, 2007) also stated that IPO long-term performances can best be explained through Earnings Management

Hypothesis, Fad Hypothesis, Agency-Cost Hypothesis and, among others, through his on his own analysis and past research.

This dissertation's main purpose is to investigate the aftermarket performance of initial public offerings in the Taiwan Economy. There have been past studies such as (Huang, 1999), in which Huang examined the stock behaviour of IPOs from the Taiwan Stock Exchange during the years of 1971-1995. (Leon Li, et al., 2007) conducted a study, in which they investigate abnormal initial and long-run returns from a sample size of IPOs that consists of only the high-tech industry between 1995-2005. (Sherman, et al., 2010) studied price behaviours and returns of both institutional and retail investors from 1995-2005. (Lim, et al., 2008) conducted a study in which they empirically investigate the efficiency of IPOs in eight Asian stock markets (Taiwan included) before and after the 1997 financial crisis in Asia. Lastly, (Wen & Cao, 2013) researched the short-run and long-run performance of IPOs from the Taiwan stock market from the period between 2005 and 2007.

1.2 Objectives of the Research

This study will differ from past papers by empirically investigating the short-run and long-run performance of initial public offerings of the Taiwan economy in the context of the 2008 global financial crisis. The timeline will consist from 2005 to 2011 and will be divided into three groups: pre-crisis period, crisis period, and post-crisis (recovery) period. Each period will be subdivided by different industries in the Taiwan economy. There has been no prior research conducted on the aftermarket performance on IPOs in Taiwan within the time range between 2005 and 2011 within the 2008 global financial crisis context. Sample data will be extracted from both the Taiwan Stock Exchange (TWSE) and the Taipei Stock Exchange (TPEX), once known as GreTai Securities Market (GTSM). This research will attempt to expand on both past and recent IPO literature in both international and the Taiwanese economy. There will also be an effort to expand on literature on IPO markets with relevance to the 2008 global financial crisis, as well as adopt similar methodologies from past studies from other economies with a stock exchange that went through the same ordeal the Taiwan market did.

1.2.1 Research Objectives:

- To observe the degree of under-pricing of IPOs before, during, and after the 2008 global financial crisis in the Taiwan Markets.
- To additionally observe the aftermarket performance of the IPOs in a time window of three years.
- To see if there are any anomalies of under-pricing and long-run performance between industries before, during, an after the 2008 global crisis.

1.3 Structure

The structure of this dissertation is divided into chapters consisting of historical background, literature review, data & methodology, results, ending with conclusion, and discussion.

Chapter II of the dissertation presents a historical background of initial public offerings and explains why they are vital to both investors and the firms who launched them. Then followed by a brief background and description of what the economy of Taiwan is comprised of. Afterwards, a transitory introduction and description of the 2008 sub-prime mortgage financial crisis that started in the U.S. and how it affected world markets.

Chapter III contains relevant literature review introducing empirical evidence of under-pricing, short-run and long run performances in international markets. Followed by literature regarding brief description and explanations of both under-pricing and long-run performances of IPOs. Furthermore, supported by literature on the process of going public in the Taiwan economy. Lastly, applicable literature is used on the aftermarket performance of IPOs in the Taiwan economy.

Chapter IV covers how and which data was extracted to obtain the sample size, as well as a brief explanation to why this specific data was chosen. This section also contains methodologies used to calculate the short-run and long-run performance of the sample size.

Chapter V contains the empirical findings of the aftermarket performance from the data sample. This chapter will also include a brief discussion of the returns from both the TWSE and TPEx as well as their crisis timeline subsection and industries.

Chapter VI contains the conclusion to this study as well as further research recommendations.

Chapter II – Background

2.1 Initial Public Offerings

Initial public offerings, also known as IPOs, have outwardly become an attractive area for both entrepreneurs and investors over the past century. For an entrepreneur, an IPO is a significant symbol and an important milestone in the progress and life-cycle of a company or firm. When a firm launches its IPO, it is not only the first time the stock of a private company becomes public and is now sold on a securities exchange, but also the first time the firm enters the world of equity financing. IPOs are appealing and sometimes highly lucrative for investors, who can start buying and selling them, and take advantage of short-term profits in a “bullish” market. As mentioned before, there is no mistake that there have been several types of research concluded, after empirical evidence, short-run under-pricing of IPOs is common in many economies around the world. In a study conducted by Ritter et al. (1994), empirical research has found that short-term under-pricing was present or relevant to at least 25 different economies, as well as evidence of long-run performances of IPOs in international markets. Each Securities Exchange around the world has a different set of requirements before a firm can go public. Hence, making research on IPO markets more complicated.

2.2 Taiwan Economy

The economy of Taiwan is known to be part of the “Little Dragons” or the “Four Asian Tigers” countries, which consist of Singapore, Hong Kong, South Korea and Taiwan. According to (Jin & Shih, 1995), the Four Asian Tiger economies were considered third world countries in the late 1950’s and early 1960’s. And ever since then, Hong Kong and Singapore have been undergoing an average GDP growth rate of 7.1 percent, while both Korea and Taiwan have experienced even more growth over the past decades. Although much of East Asia and the Four Asian Tiger economies were affected by the 1997 Asian Financial Crisis, Taiwan demonstrated relative isolation from the financial shockwave, and was affected the least out of the Four Asian Tigers, experiencing a strong recovery (Pemple, 1999). Towards the end of 2015, Taiwan reached a novel breakthrough with Taipei’s Stock Exchange (TPEX) and Taiwan’s Stock Exchange (TWSE), totalling \$828.03B according to (World Federation of Exchanges, 2016). As reported by (Armanovica, 2013), The Republic of China (Taiwan) has the fifth largest economy in Asia. According to (International Monetary Fund, 2016), the World Economic Outlook report identifies Taiwan to be ranked 19th in the world in purchasing power parity (PPP) and 23rd in gross domestic product (GDP). One of the main reason that the economy of Taiwan has been able to flourish is due to their technological industry, in which electronic parts and personal computers play a vital role (Chen & Ku,

2002). (Skarica, 2010) added that the electronics sector is Taiwan's leading and most substantial industrial export sector. As stated before, Taiwan is an economy, in which both entrepreneurs and investors have vested interest in due to its constant growth and lucrative opportunities. However, there was a time in the 21st century when the Taiwanese Market wasn't so 'bullish.'

2.3 The Global Financial Crisis of 2008

September 15, 2008, was the date when Lehman Brothers Holdings Inc., a global financial service firm, filed for Chapter 11 bankruptcy protection, which was quickly followed by the Wall Street's subprime mortgage crisis that sparked the global financial crisis (Yi-Hsu, et al., 2013). The 2008 financial crisis caused a ripple effect that covered most economies around the world. (Vasile, et al., 2011) best explained the financial crisis as 'the collapse of ethical behaviour.' Mortgage agents were pressured to bring in as many mortgages as possible, and quantity was the incentive, not quality. Many mortgage agents were exclusively paid by the volume of contracts, which encouraged them to close contracts at all cost. (Hudson, 2013) best explained the atmosphere in which these mortgage agents conducted their business as 'gang of predatory lenders.' Hudson used the term 'bait and switch' to exemplify the act of lying to clients about the true cost of mortgages and fabricating documents. This practice became very common, and in some aspects, permissible or even celebrated. Mark Glover, a mortgage loan officer at Ameriquest Mortgage, had co-workers with an artistic aptitude for falsifying documents. He stated that 'They used scissors, tape, Wite-Out, and a photocopier to fabricate W-2s, the tax forms that indicate how much a wage earner makes each year. It was easy: Paste the name of a low-earning borrower onto a W-2 belonging to a higher-earning borrower and, like magic, a bad loan prospect suddenly looked much better' (Hudson, 2013: 3). The problem did not stop at manipulation of clients and fabrication of documents. As specified by (Vasile, et al., 2011), once the agents got paid after the signing and approval of the loan, they never had to see the borrowers again. Soon afterwards, the mortgage companies would sell the mortgages with the fictitious risk to investment firms that securitizes them in a pool. Furthermore, the lenders would also sell them as inventive financial products to domestic and foreign investors in order for the mortgage papers to get written off the balance sheet. Even Freddie Mac and Fannie May, which are Government Entities, invested in these risky loans as well as acquisitive and innocent institutional investors, making the profits 'privatised' and the risk 'nationalised' (Vasile, et al., 2011). With the inception of global crisis, Taiwan confronted economic issues due to their heavy dependency on exports and its positive correlation to world demand, hence, making the Taiwan economy susceptible to a bear market, a condition in which security prices fall and there is a downward spiral of the stock market that

lasts over a period of time. American consumers played a vital role in many export-oriented economies around the world. Therefore, many economies around the world were affected by the subprime mortgage crisis that ascended in the United States.

Chapter III – Literature Review

3.1 International Evidence on Initial Public Offerings Performance

The short-run and long-run performance of IPOs have been meticulously examined in the past in mutually developed and developing economies all over the globe. These are, in fact, the two-utmost central related subjects that have drawn the attention of many scholars and researchers. There is widely supported evidence of both short-run and long-run performances that seem to be consistent with international markets all over the world.

3.1.1 Short-Run Under-Pricing

Under-pricing is a term often used too loosely to describe the first-day returns. The terminology that will be employed in this section will be 'initial return' or 'short-run return' since 'under-pricing' strongly implies that there are large initial returns due to intentionally setting a lower price than the real market value of the IPO. Discoveries of literature on initial returns of IPOs in both developed and developing economies are found in (Loughran et al., 1994) which has since been updated on May 21, 2015, to provide the most recent empirical evidence. (Ibbotson et al., 1994) and (Ritter, 2016) accumulated 12,702 data samples from the United States from the years 1960 to 2014 and concluded an average of 16.9% initial return. There is a plethora of empirical evidence from past studies that reported similar abnormal initial returns performances in international markets. For instance, the updated version of (Loughran et al., 1994) collected 4,932 IPO samples from past research of the United Kingdom that consisted of years 1959 to 2012 and calculated an average initial return of 16.0%, which is consistent with the U.S. average. (Ljungqvist, 1997; Rocholl, 2005; Vismara, 2012) collected a total of 736 IPOs from the years 1978-2011 and estimated an average initial return of 24.2% in Germany.

Hong Kong's IPO samples of 1,486 were collected from the years 1980 to 2013 and concluded an average initial return of 15.8% (Loughran et al., 1994) 2015 updated version. In a study conducted by (Ma & Faff, 2007) and past studies found in (Loughran et al., 1994), China's 2,512 data sample gathered from 1990 to 2013 had an average initial return of 118.4%. It is evident that China has dealt with severe under-pricing or above normal initial returns compare to other economies that have been studied. (Hamao et al., 2000; Kaneko & Pettway, 2010; Ritter, 2016) amassed 3,236 IPOs in Japan and reported an average initial return of 41.7% from the years 1970 to 2013. (Aggarwal et al., 1993), among other studies gathered by (Ritter, 2016) investigated IPOs in Brazil, and reported an average initial return of 33.1% from the years 1971 to 2013. (Alqahtani, 2012) and (Alanazi & Liu, 2013) directed and examined IPOs from Saudi Arabia from the years 2003 to 2011 and the

80 IPO sample contained an average initial return of 239.8%, which is among the highest in the world. Russia, on the other hand, had an average initial return of 3.3% with a sample size of 64 IPOs between 1999 to 2013 (Dealogic, 2015). All information on international empirical evidence found on IPO short-run performance can be observed in Figure One, Appendix A section, in which countries, sources, sample sizes, time periods and average initial returns are present.

3.1.2 Long-Run Performance

There has been a rich variety of empirical studies on the long-run performance of initial public offerings. Long-run underperformance has been a consistent recurring phenomenon that has been widely accepted in the academic world in accordance to (Zielinski, 2013). (Loughran & Ritter, 1995) congregated 4,753 IPOs from the years 1970-1990 and reported a three-year excess return of -26.9% in the United States. (Ritter & Welch, 2002) observed a three-year excess return in the United States of -23.4% from the years 1980-2001 with a data sample of 6,249. When it comes to international markets, three-year abnormal returns remained consistent with that of the under-performance phenomenon. The IPO market in the United Kingdom had a very close resemblance to that of the United States. For example, (Gregory & Michou, 2009) conducted a study in which the authors collected 2,499 IPOs from the United Kingdom that were issued between 1975 and 2004 and found a -12.6% return over the span of three years. (Bessler & Thies, 2006) documented 218 German IPOs from the years 1977-1995 and reported a -12.7% three-year return. (Kirkulak, 2008) examined the IPO market in Japan and exposed stocks issued from 1998 to 2001 and concluded an average three-year return of -18.3%.

Long-run underperformance is still present in international developing markets as well. For instance, the examination of the Brazilian, Chilean and Mexican IPO markets carried out by (Aggarwal et al., 1993) revealed IPOs issued between 1979 to 1990 with an underperformance of -47.0%, -23.7% and -19.6% respectively. When it comes to the Polish IPO market, (Zielinski, 2013) noted a significant three-year underperformance of -28.65 during the periods between 1994 and 2005 from a sample size of 263 IPOs. Additionally, there has been empirical evidence of negative long-term performance in the Indonesian IPO market. According to (Emasari & Tamara, 2010), 112 IPOs have been thoroughly examined on the Jakarta Stock Exchange, and they reported a -68% performance between the years 1996 and 2001. Furthermore, there has been substantial evidence of a three-year IPO underperformance in the Thailand IPO market. According to (Komenkul et al., 2012), there was a total of 136 IPOs that were issued in the Thailand Stock Exchange between the years 2001 and 2012. In, addition, the authors reported an underperformance of -16.6% in the

Thailand IPO market. All information on international empirical evidence found on IPO long-run performance can be observed in Figure Two, Appendix A section, in which countries, sources, sample sizes, time periods and average three-year returns are present.

3.2 Short-run Under-pricing Explanation

Due to the vast amount of literature found on initial public offerings and under-pricing, this section will only cover a mere fraction of it. There has been many established theories and models that explain the magnitude of abnormal high short-run returns. (Ljungqvist, 2007) dedicated an unabridged chapter to debate these theories and test evidence. (Ljungqvist, 2007) stated that short-run under-pricing 'can be grouped under four broad headings: asymmetric information, institutional reasons, control considerations, and behavioural approaches.' Out of the four based models, asymmetric information is deemed to be the best, according to scholars. (Baron, 1982) suggested that there is an immense volume of under-pricing, due to information asymmetry. In other terms, asymmetric information states that one party has more information than the other. Baron implied that underwriters have greater information concerning the demand of IPOs, while on the other hand, issuers have little to no information regarding the efforts of their distribution. As specified by (Yong, 2007), this causes underwriters to diminish their efforts in vending the IPOs by proposing them at a discount price, hence the term under-pricing.

3.2.1 Asymmetric Information: Winner's Curse

Among the most widely accepted asymmetric information models is one known as winner's curse. According to the author that proposed this IPO under-pricing model, (Rock, 1986: 187), 'the argument depends upon the existence of a group of investors whose information is superior to that of the firm as well as that of all other investors.' For practicality, this scenario requires two types of investors: informed and uninformed. Each of the two investors may invest in a fixed quantity of an IPO. Then the entity that issues the IPO sets an offer price, as well as the number of shares that will be sold. Furthermore, if there is a surplus demand, shares will then be distributed on a 'pro rata' basis (Ritter, 2011). For example, if the offer is subscribed by a factor of three, every investor that requested shares receives one-third of the requested amount (Ritter, 2011:380). Additionally, investors that are informed, then create an undesirable externality to the uninformed investors, because they will only submit a purchase order (PO) when the offer price of an IPO is below or equal to the intrinsic value they know it to be, hence, creating an invisible dilemma for the uninformed investors, the winner's curse - receiving all the shares from an IPO that has an overpriced offer and only some under-priced.

3.2.2 Asymmetric Information: Dynamic Information Acquisition

The winner's curse is not the only model that is branded as an asymmetric information theory. To fully understand the next asymmetric information model, it is essential to define book building briefly. (Ritter, 2011:354) best describes book building as 'a procedure for selling securities in which underwriters conduct a marketing campaign and then canvas institutional investors to measure demand before setting the final offer price.' According to (Sherman, 2000), underwriters then have complete discretion in the allocation of shares if there is a surplus of demand at the price that is offered. In a paper by (Benveniste and Spindt, 1989), the authors designed a model that offers an outline to comprehend book building. They put forward an argument asserting that underwriters use their total allocating and pricing discretion in a way to persuade investors (institutional or informed) to candidly disclose their private information on the valuation of the firm that is going public. The degree of under-pricing depends on what kind of information the persuaded investor decides to give to the underwriter. If the disclosed information reveals to be positive, then the underwriter will revise the offer price upwards, which makes the offer under-priced. On the other hand, if investors unveil negative information, the reciprocal will happen, and there will be little to no under-pricing.

3.2.3 *Institutional Explanations: Lawsuit Avoidance Hypothesis*

Based on (Ljungqvist, 2007) survey, the second order of importance to explaining under-pricing is Institutional explanations. The first order of institutional theories would be the lawsuit avoidance hypothesis. This assumption, claimed by (Tinic, 1988; Hughes and Thankor, 1992), argues that issuing firms intentionally set the offer price at a discount to diminish the possibility of future lawsuits by shareholders if they are dissatisfied with the aftermarket performance of the IPO. A lawsuit can be damaging, not only in legal fees but the reputation to a company's capital. Henceforth, the fear of such litigation may cause deliberate under-pricing for insurance. Although (Ljungqvist, 2007) stated that the lawsuit avoidance hypothesis is mainly U.S. centric, (Ritter, 2011) categorises this theory as a 'Silly Academic Theory,' and goes far enough to say that it 'does not pass the common-sense test' (Ritter, 2011: 355). Ritter argues that the opportunity cost of the difference in proceeds between what is obtained and what could have been obtained is one dollar with projected benefits to be, at most, a few cents. In addition, there is no steadfast correlation between subsequent litigation risk and under-pricing in the U.S. IPOs according to a study conducted by (Hao, 2011) from 1996 to 2005.

3.2.4 *Institutional Explanations: Price Stabilisation*

The next order of importance in institutional explanation is the price stabilisation theory. Price stabilisation is one of many services that underwriters perform to reduce price

drops of IPOs aftermarket performance up to a couple of days or weeks. In a study conducted by (Ruud, 1993), the author took statistical symmetries as the first basis of an argument to claim that underwriters do not intentionally under-price IPOs. Instead, Ruud debated that IPOs are often priced at market value, but due to offerings falling short of the offer price, prices are then alleviated during first-day trading. Ruud claimed that this price stabilisation will have a tendency to diminish the 'left tail' of the distribution of initial returns, hence, given the impression that the IPOs are under-priced due to a positive price jump. Although Ruud stated that under-pricing is the by-product of price stabilisation, (Asquith, et al., 1998) research found that price stabilisation is not the only factor that determines under-pricing.

3.2.5 *Ownership and Control: Under-pricing to Retain Control*

When a firm goes public, in most cases, it is the stepping stone to the inevitability of separation between the owner and the firm. New owners arise from going public: the shareholders. In the world of corporate finance, agency problems form between managers and shareholders. Upper-level management might have different agendas or incentives to act against the best interest of the shareholders, which is maximising shareholder wealth. In a study by (Brennan & Franks, 1997), they were the first to develop models to shed light on the undergoing marvel of consistent under-pricing through the agency cost lens. Franks and Brennan conducted a study in the U.K. with 69 IPO sample size and stated 'under-pricing is used to ensure oversubscription and rationing in the share allocation process to allow owners to discriminate between applicants for shares and to reduce the block size of new shareholdings' (Brennan and Franks, 1997:391). The authors argued that managers would offer IPOs at a discount price to protect their self-interest and jobs when they take the firm public. In that case, shareholders would not scrutinise managers for not engaging in behaviours that do not maximise shareholder wealth. In a more recent study, (Field & Sheehan, 2004) concluded that the link between ownership structure and under-priced IPOs could be a feeble hypothesis.

3.2.6 *Behavioural Explanations: Informational Cascades*

Behavioural explanations are the last but viable order of importance when it comes to explaining systematic under-pricing. Initial returns increased drastically in the late 1990's and researchers have not been content with asymmetric information, institutional explanations, or ownership and control considerations to warrant the phenomenon of under-pricing (Ljungqvist, 2007). Hence, scholars have turned to behavioural theories to remove doubts. Behavioural theories adopt the notion that issuers are subject to behavioural predispositions which consequently, do not pressure underwriters to have under-pricing reduced or irrational

investors who bid the offer price above their actual value, leading to the information cascades model. (Welch, 1992) argued that investors, not only consider the information they have on an IPO but also ponder what other investors are purchasing. This may lead to investors not wanting to purchase an IPO regardless if they have positive information due to other investors not wanting to buy. Therefore, to counter this 'bandwagon effect,' issuers sell their IPOs at a discount to persuade first potential buyers to purchase the IPO, which then leads to other investors wanting to buy regardless of their own information, causing an information cascade of their own. Based on (Ljungqvist, 2007) surveys of IPO under-pricing, the information cascade theory remains the least explored explanation.

3.2.7 Behavioural Explanations: Prospect Theory

The final under-pricing theory this study will discuss is the prospect theory as first mentioned by (Kahneman and Tversky, 1979) and followed by (Loughran and Ritter, 2002). The prospect theory argues 'value is assigned to gains and losses rather than to final assets and in which probabilities are replaced by decision weights' (Kahneman and Tversky, 1979: 236). The authors argued that investors concentrate more on fluctuations in their wealth rather than their actual wealth. In a more recent study, (Loughran and Ritter, 2002) proposed that there is a behavioural bias between the decision makers of the issuing firm instead of bias between investors, arguing that upper-level management from the issuing company form an outlook by fixing on the mid-point of the IPOs price range. Furthermore, the upper-level management would be content if there was a high demand for the IPO before its offering date because of the price they fixed on. Thus, underwriters would capitalise on their mental attitude by not revising the offer price upwards when optimistic news arrive (Ritter, 2011). Hence under-pricing occurs. (Ljungqvist and Wilhelm, 2004) tested Loughran and Ritter's hypothesis and concluded that the model does not directly explain the under-pricing phenomenon but does explain the behavioural model.

3.2.8 Conclusion on Short-run Under-pricing

(Ljungqvist, 2007) and (Yong, 2007) conducted surveys of past literature of short-run under-pricing explanations in international markets and a focus on Asian markets, respectively. All the explanations mentioned above have been the most popular among scholars and academics. However, (Ritter, 2011) claimed that all the literature and theories mentioned, present an incomplete explanation of why underwriters under-price IPOs and why issuers put up with such under-pricing. (Ritter, 2011) recent study, argued that the popular theories and models show diminutive support, but the behavioural explanation framework is more unswerving with the facts. There is more research that should be done, before there is no definitive model or theory to fully describe the under-pricing phenomenon.

3.3 Long-run Underperformance Explanation.

The literature and theories to explaining the long-run underperformance are lavishly less as compared to short-run returns. This section of the dissertation will briefly discuss theories put out by (Miller, 1977: Ritter, 1991:) that provide a behavioural explanation for the consistent long-run underperformance. As well as the agency cost hypothesis as argued by (Jensen, 1986) and (Mikkelson, et al., 1997) Lastly, the most common among academics, the Window of Opportunity Hypothesis as argued by (Ritter, 1991) and (Loughran and Ritter, 1995).

3.3.1 Behavioural Explanation: Over-Optimism

The share price is set by the most optimistic investor according to (Miller, 1997) theory. The author proposed that there is a correlation between divergence of expectations and the inflow of information. While information increases with time, expectations decrease, hence causing a downward modification to the price. This hypothesis is problematic when it comes to testing because of the difficulty of measuring the divergence of expectation. Academics such as (Ritter, 1991) and (Rajan and Servaes, 1994) amongst several, debated that companies tend to go public when investors have high expectations of the performance of the IPO. According to this argument, investors, pay above the true value of the price. Nonetheless, as information becomes readily accessible, prices are marked down. Consequently, expected long-run performance of IPOs decreases along with investor attitude towards the IPO.

3.3.2 Agency Cost Hypothesis

According to agency theory, there are conflicts between shareholders and upper-level management. (Jensen, 1986) attempted to tie this theory to the long-run underperformance of IPOs. He suggested that upper-level management would rather choose, if available, to use proceeds from excess cash flows or proceeds from IPOs pertaining to shareholders to invest in projects at the shareholder's expense. (McLaughlin et al., 1996) supported this hypothesis consistency by finding the long-run decline of operating performance is larger in firms with higher free cash flows. However, (Mikkelson et al., 1997) found that ownership structure has no relevance to long-run IPO underperformance from data collected in the U.S. market.

3.3.3 Window of Opportunity Hypothesis

The window of opportunity hypothesis was developed from the manager's perspective. The hypothesis also established a correlation between the poor long-run performance of IPOs to the timing of the issue. Managers of the firm would issue equity when there is an over-valuation of the company to benefit from lowering the cost of capital

according to (Ritter, 1991) and (Loughran and Ritter, 1995). Therefore, by successfully issuing the IPO at the highest valuation period, investors would be yielding a low return in the long-run due to market adjustments to the real cost. However, (Yong, 2007) survey of past studies suggested that this hypothesis has cast doubt due to research in the Japanese market. (Yong, 2007: 259) stated that 'using market-to-book equity ratio as a proxy for over-valuation, underperformance persists even after the market-to-book equity ratio is controlled for.'

3.3.4 Conclusion on Long-Run Underperformance explanations

The theories mentioned above are among the most examined by academics. (Ritter, 1991) concluded that there are still unresolved issues regarding the long-run underperformance. (Yong, 2007) concluded, in regards to long-run underperformance, that there are still unresolved issues in accordance to surveys done in Asian markets. Although in a more recent study (Ritter, 2011) argued that there is not enough evidence that proves IPOs underperform in the long-run.

3.4 The Requirements and Process of Going Public in Taiwan

As mentioned before, at the end of 2015, Taiwan grasped a new milestone with Taipei's Stock Exchange (TPEX) or GTSM (GreTai Securities Market) and Taiwan's Stock Exchange (TWSE) totalling \$828.03B (World Federation of Exchanges, 2016). These two stock exchanges are among the most active in the world. The TWSE and TPEX are different from other markets in the world. For instance, in 2002, the TPEX created and operated a separate pre-IPO market called the Emerging Stock Market (ESM), according to TPEX website (www.tpex.org.tw). For a company to be listed on either the TWSE or TPEX, it first must be listed on the ESM for at least six months. It has been a mandatory requirement for both markets since January 2005. However, the firm is obligated to meet certain requirements to begin trading on the ESM. First, the firm is obliged to disclose both semi-annual and annual financial statements, audited to be precise. Furthermore, two or more equity firms must write letters of recommendation, where one will act as the primary advisory firm and will be the elected principal underwriter, in accordance the Company Act and the Financial Supervisory Commission. On the other hand, the TWSE and TPEX have a different set of requirements, in which the firm's age, size, profitability and number of shareholders are taken into consideration (Chang et al., 2016). Lastly, a firm must build a prospectus that discloses information about the company's background, history, management, the board of directors and financial statements upon registration to the ESM (Chang, et al., 2016). Afterwards, when applying to the main markets, the firm is obliged to produce a similar prospectus that contains the opinions of the company, IPO and its IPO valuation by the lead

underwriters. When it comes to IPO methods, Taiwan is no stranger to experimenting with various approaches. Through trial and error, since 2005, coincidentally, adopted the hybrid book building method as the leading approach. In a study conducted by (Chang et al., 2016), 94% of IPOs gathered in a sample size of 232 from 2005 to 2011 in the Taiwan markets adopted the hybrid book building method.

3.5 The Aftermarket Performance of IPOs in Taiwan.

This will be the last sub-section of the literature review in which this dissertation will briefly demonstrate empirical evidence of initial short-run returns and long-run performance in the Taiwan market. In a study by (Huang, 1999), 311 IPOs were examined between the years 1971 and 1995 and concluded an initial excess return of 42.6%. Huang also estimated a long-run performance of – 1.7% after one year, – 7.8%, – 17.1%, and – 23.9%, respectively, for years two, three and four. The aftermarket performance of IPOs from Taiwan in the period between 1971 and 1995 is consistent with the short-run under-pricing phenomenon and long-run underperformance found in both U.S. and international markets.

In a paper written by (Leon Li et al., 2007), there was a total of 458 IPOs that were observed from the years 1995 to 2003. This study is different, because only high-tech companies were gathered in the sample data. It is well established that a proportion of Taiwan's economy is heavily influenced by high-companies. The average abnormal initial return on the data sample gathered is 35.16%, while the three-year long-run abnormal return is – 12.16%. It is evident that these findings correlate with previous studies. Furthermore, Taiwan's high-tech IPO market suffers from both the systematic short-run under-pricing and long-run aftermarket under-performance.

In a more recent study, (Wen & Cao, 2013) accumulated a sample size of 121 IPOs from both the TWSE and TPEx from the years 2005 to 2007. The authors determined initial short-run return of 48.54% and an aftermarket performance of – 6.2%, – 34% and – 55% after one, three, and five years, respectively. These results presented by Wen and Cao are consistent with U.S. and international evidence of short-run under-pricing and long-run aftermarket performance.

As mentioned before, there have been no studies on the aftermarket performance of IPOs in the Taiwan market with the 2008 global financial crisis perspective. However, (Lim et al., 2008) empirically investigated Taiwan's stock market during the 1997 Asian financial crisis. The authors concluded, 'Taiwan is the only market that has recorded improved efficiency from the pre-crisis to post-crisis period' (Lim et al., 2008:574). (Chen & Kao, 2005) concluded that Taiwan's Market was considered as the least affected by the Asian financial crisis in 1997. (Sherman et al., 2010) conducted a study with a sample size of 84 IPOs from

the years 1995 to 2000 in the Taiwan market, and estimated an initial return of 8.34%. Short-run under-pricing is not as significant in these years as compared to Huang's study. The IPOs selected were specifically IPOs that used the hybrid auction method. Although, (Sherman et al., 2010:1225) concluded that 'auctions are under-priced'. Nevertheless, initial returns were 24.03%, .72%, 4.21% and 11.98% on the years 1996, 1997, 1998 and 1999 respectively. Hence, high abnormal short-run under-pricing was not present during the crisis years. No long-run performance analysis was conducted in the Sherman et al. study.

3.5.1 IPO Performances of Other Economies During Crisis Periods

There is, however, a study conducted by (Yi-Hsu et al., 2013), in which IPO behaviours were examined before and after the 2008 global financial crisis in the U.S. market. The sample was gathered from listed companies from the New York Stock Exchange (NYSE) and the NASDAQ. There was a total of 1851 IPOs observed from the years 2005 to 2011. The average initial return between those years was 3%. The average initial return between 2005 and 2007 was 8.5% while between 2007 to 2008 was 2.5%, meaning that short-run under-pricing was somewhat absent during the crisis period. In a published doctoral thesis paper by (King & Banderet, 2014), 588 IPOs were examined from the years 2003 to 2010, in which an adjusted average initial return and a three-year long-run performance analysis were performed. By specifically observing years 2003 to 2007, and 2010, known as the non-crisis period, the authors discovered evidence of an adjusted average return of 12.29%. In contrast, the crisis years between 2008 and 2009 had an adjusted average return of 9.61%. King and Banderet concluded a three-year average abnormal return of – 21.5% during the non-crisis years, and a 26% three-year average abnormal return during the crisis years. King and Banderet arrived at the conclusion that the global crisis did not have a substantial influence on the degree of short-run under-pricing. Regarding long-run performance, the authors argue that the IPO market overreacted to the crisis and heavily under-valued new issues, causing growth in the long-run.

In an article that is more relevant, this dissertation will examine (Mahmood et al., 2011) study, concentrated on short-run under-pricing of the performance of IPOs in the Chinese market during two time periods: the Asian financial crisis between 1997 to 1999, and the global economic crisis between 2007 and 2009. There was a total of 380 IPOs gathered during the Asian financial crisis period from both Shanghai and Shenzhen stock markets, and 246 IPOs from the global financial crisis period. There is a distinct difference in the amount of new issues between the two periods, 'which may be due to the high volatility of initial returns and instability of prices in the long run' (Mahmood et al., 2011: 231). The adjusted average initial return during the Asian financial crisis years was 135.73%, while the

global financial crisis was 145,2%. When the time periods were dissected year by year, Mahmood and et al. believed the level of under-pricing correlates with the amount of IPOs issued. For example, the number of IPOs issued in 1997 and 2007 was 188 and 126, respectively, while the adjusted average initial return during those years was 158.89% and 189.32%. During the tail end of the crisis period, the number of IPOs issued decreased to 97 and 43 on years 1999 and 2009, respectively, having an adjusted average initial return decreased to 110.89% and 62%. The authors concluded that investors were more informed during the Global crisis and are more psychologically affected by volatile movements, hence, forcing firms not to be publicly traded during a financial crisis environment.

Chapter IV – Data and Methodology

4.1 Data

The data gathered from the Taiwan Stock Exchange (TWSE) and Taipei Stock Exchange (TPEx) was obtained by the Market Observation Post System (MOPS). MOPS is a database that contains IPO history and listing date information for both stock exchanges. It is operated by TWSE and can be found at the TWSE website (<http://emops.twse.com.tw>). IPO and market index pricing were obtained from the Taiwan Economic Journal (TEJ).

Exhibit 1. Distributions of IPOs

<i>Panel A: Distribution of IPOs by Time Periods and Stock Exchanges</i>			
	<i>Time Periods</i>	<i>TWSE</i>	<i>TPEx</i>
Pre-Crisis:	01/07/2005 - 14/09/2008	33	91
Crisis:	15/09/2008 - 17/02/2009	5	8
Post-Crisis:	18/02/2009 - 01/07/2011	35	61
Total IPOs		73	160

<i>Panel B: Distribution of IPOs by Industry and Stock Exchanges</i>			
	<i>Industry</i>	<i>TWSE</i>	<i>TPEx</i>
	Biotechnology and Medical Care	4	16
	Building Material and Construction	1	2
	Chemical	2	1
	Communications and Internet	2	15
	Computer and Peripheral Equipment	4	15
	Cultural and Creative Industries	0	4
	Electric Machinery	3	5
	Electrical and Cable	1	1
	Electronic Parts/Components	12	28
	Electronic Products Distribution	2	2
	Financial	0	3
	Information Service	1	2
	Iron and Steel	2	4
	Optoelectronic	13	23
	Other	2	6
	Other Electronic	5	14
	Semiconductor	16	16
	Shipping and Transportation	2	1
	Textiles	0	1
	Tourism	1	1
Total IPOs		73	160

Source: <http://www.twse.cm.tw/en/>
<http://www.tpex.org.tw/web/index.php?l=en-us>
<http://emops.twse.com.tw/>

As present in Exhibit 1, this study collected 233 IPOs; 73 from the TWSE and 160 from the TPEX. Exhibit 1 also shows the distribution of IPOs by industries.

4.1.1 Data Crisis Time Range

The sample data time range is from July, 2005 to July 1, 2011. There are two important reasons why July 2005 was chosen as the starting date of the research. First, as of January 2005, a new regulation requires every IPO that wants to be offered at either TWSE or TPEX to trade on the ESM for at least six months. Hence, July 2005 would be exactly six months after the mandatory regulation date. The second important reason is the waiving of the seven percent rule. According to the TWSE website, there was a price fluctuation limit of seven percent before March 1, 2005. If investors believed that the actual value of an IPO was seven percent higher than the offer price, there would be an inept supply in the aftermarket. After March 1, 2005, the intrinsic value of the IPO could reflect investors true expectations, allowing the IPO to be analysed and traded freely without the seven percent fluctuation rule. The starting date chosen will reflect IPOs that have undergone the Emerging Stock Market and post-seven percent fluctuation control.

The 2008 collapse started before the crisis period mentioned in Exhibit 1. However, it was not until mid-September 2008, when the cruelty of the collapse began its rippling effect, stretching further than the western hemisphere. According to an article written by (Helleiner, 2011), there were three key developments that triggered the international wave. Firstly, Freddie Mac and Fannie Mae, lending agencies sponsored by the U.S. government, experienced heavy losses and were put on conservatorship. Afterwards, Lehman Brothers, one of the largest investment banks, was pushed to liquidation, on September 15, 2008. Lastly, AIG (American International Group), the largest insurance company in the world was bailed out and nationalised by American taxpayers and the U.S. government (Helleiner, 2011). The starting date chosen as the post-crisis, recovery, period is the same date President Barack Obama signed the 2009 Recovery Act, otherwise known as the Stimulus Package. Coincidentally, it is also the same date that the U.S. market began to recover, as seen in Figure Three, Appendix A section.

4.2 Methodology

This section of the study will explore the most effective and appropriate methods to measure the short-run under-pricing and long-run performance of the IPO samples this study accumulated.

4.2.1 Short-run Under-pricing Performance Measurement

The methodology chosen to examine the short-run under-pricing was adopted by (Ritter, 1991) (Aggarwal, et al., 1993), and (Wen & Cao, 2013). The first equation calculates the raw initial return of an IPO, a straightforward method as proposed by prior literature:

$$R_{it} = (P_{i,1} - P_{i,0})/P_{i,0} \quad (\text{Equation 1})$$

Where R_{it} is equal to the raw initial return for stock i on time t , while $P_{i,1}$ is equal to the first day closing price and P_0 is the offer price of the IPO.

Since Equation 1 only considers the difference in price with no standard comparison, there will be another method used to measure the extent of under-pricing. To accomplish this, Equation 1 should be adjusted to the return of an alternative investment, hence the market. Therefore, Equation 2 calculates the market-adjusted initial return of an IPO and is defined as:

$$MAIR_i = \left(\frac{P_{i,1} - P_{i,0}}{P_{i,0}} \right) - \left(\frac{M_{i,1} - M_{i,0}}{M_{i,0}} \right) \quad (\text{Equation 2})$$

$MAIR_i$ is the market-adjusted return (under-pricing) of IPO i , while $M_{i,1}$ is equal to the market index price on closing day of first day trading, and $M_{i,0}$ is the market index price at the closing day before the day the IPO was issued.

4.2.2 Long-run Performance Measurement

The market-adjusted abnormal return equation as employed by (Aggarwal, et al., 1993) will be used to measure the long-run performance of each IPO. The equation that will be applied is computed as:

$$AR_{it} = \left[\frac{(1+R_{it})}{1+R_{mt}} - 1 \right] \times 100 \quad (\text{Equation 3})$$

The market-adjusted abnormal return of the IPO is equal to AR_{it} on stock i at time t . R_{it} is the total return of IPO i from the offering date to t trading days after the initial offer date. The

total return of the market is equal to R_{mt} for the matching period. The TAIEX Total Return Index will be the market proxy for IPOs from the TWSE, while the TPEX Index will be the market proxy for TPEX IPOs. Both indexes are comparable to S&P 500 market capitalisation weight.

As employed by (Ritter, 1991) and (Aggarwal, et al., 1993), this study will also include wealth relative calculations. By calculating the wealth relatives, this research will be able to measure the performance and interpret the market-adjusted abnormal return. The wealth relative is defined as:

$$WR_{it} = \frac{1 + \frac{1}{N} \sum_{i=1}^N R_{it}}{1 + \frac{1}{N} \sum_{i=1}^N R_{mt}} \quad (\text{Equation 4})$$

R_{it} is equal to the total return of IPO i on month t from the date of offer; R_{mt} is the return of the benchmark or market index during the same time period; N is equal to the total IPOs in the sample size. The total number of IPOs outperform their benchmark when the wealth relative is great than one; IPOs underperform their benchmark when the wealth relative is less than one.

Chapter V – Empirical Results and Discussion

5.1 Short-run Performance of IPOs

Exhibit 2. Short-run Initial Return^a of IPOs in Taiwan, July 2005 - July 2011

Period	N ^b	Mean	Median	Standard Deviation	Min.	Max.	Wealth Relative
2005	18	15.17%	7.73%	25.90%	-6.56%	109.72%	1.15
2006	33	63.68%	43.69%	58.70%	-0.36%	299.57%	1.64
2007	49	68.07%	23.97%	119.65%	-12.06%	728.02%	1.69
2008	33	31.28%	22.73%	29.93%	-6.60%	120.05%	1.31
2009	34	89.43%	69.01%	81.49%	6.82%	445.95%	1.89
2010	41	49.72%	31.72%	47.55%	-2.48%	173.59%	1.50
2011	25	31.91%	30.56%	20.89%	-2.25%	87.61%	1.32
All	233	54.16%	32.92%	73.99%	-12.06%	728.02%	1.54

Notes:

^a Market-Adjusted Initial Return are calculated using (Equation 2). (Equation 4) was used to calculate Wealth Relatives.

^b Number of IPO Observations.

Exhibit 2 reports the short-run performance for 233 IPOs from the Taiwanese economy. The findings are consistent with the short-run under-pricing phenomenon found on (Loughran et al., 1994) international survey. The average short-run initial return on all IPOs accumulated was 54.16% and median return of 32.92%. As mentioned before, (Huang, 1999) and (Leon Li, et al., 2007) study reported to total average short-run initial return of 42.6% and 35.16%, respectively. One reason that can attribute to Leon et al and Huang's findings to be relatively lower, is due to the elimination of the "seven percent" fluctuation limit rule on March 2005. Hence investors true expectation of the value of the IPO. The wealth relative was above 1.00 every year which means that the average return of the IPOs outperformed the market.

Years 2005 and 2011 had low number of observations only because half were collected throughout the year. Although both years had a low number of observations, year 2005 had a considerably lower short-run initial return, median and wealth relative. This may be a result not only, again, to the elimination of the "seven percent" rule but in addition to the ESM market. All new issues in the sample that were examined were first listed on the ESM market for at least six months. According to (Chang et al., 2016), the pre-market price is very informative when it comes to the stocks value after the issue date, thus being advantageous when setting the offer price of the IPO. This information conveys that asymmetric information is minimized and it caused the year of 2005 to experience lower than average short-run initial returns. However, shortly after, the average short-run initial returns began to rise again. This finding can conclude that asymmetric models such as Rock's 1986 winner's

course model and Benveniste and Spindt's 1989 dynamic information acquisition model show little support in the explanation of Taiwan's short-run under-pricing dilemma.

The standard deviation measures the volatility of the IPO sample size. Exhibit 2 examines the standard deviation of each sample size within each year. It's clear that year 2007 displayed the most volatile year, reporting a standard deviation of 119.65% while the having lowest minimum and highest maximum, -12.06% and 728.02%, respectively. However, it was not the year with the highest average short-run initial return. Year 2009 reported the highest initial return although it did not have the highest volatility. Year 2008 reported the lowest initial return (excluding 2005 for reasons mention before) of 31.28% and displayed a standard deviation of 29.93%, among the lowest. There is no clear correlation between volatility and the short-run initial return. Nevertheless, Exhibit 3 paints a different picture.

Exhibit 3. Short-run Initial Return^a of IPOs by Crisis Timeline and Market

<i>Panel A: Pre-Crisis Period 01/07/2005 - 14/09/2008</i>							
Market	N ^b	Mean	Median	Standard Deviation	Min.	Max.	Wealth Relative
TWSE	33	44.43%	23.97%	65.67%	-12.06%	328.25%	1.44
TPEX	91	54.53%	30.99%	90.91%	-6.56%	728.02%	1.55

<i>Panel B: Crisis Period 15/09/2008 - 17/02/2009</i>							
Market	N ^b	Mean	Median	Standard Deviation	Min.	Max.	Wealth Relative
TWSE	5	58.74%	68.09%	36.47%	9.14%	105.30%	1.59
TPEX	8	21.43%	14.92%	20.31%	2.00%	58.76%	1.22

<i>Panel C: Post-Crisis (Recovery) Period 18/02/2008 - 01/07/2011</i>							
Market	N ^b	Mean	Median	Standard Deviation	Min.	Max.	Wealth Relative
TWSE	35	50.65%	31.15%	50.11%	-2.48%	180.18%	1.51
TPEX	61	64.81%	46.79%	67.78%	-0.81%	445.95%	1.65

<i>Panel D: Total Periods 01/07/2005 - 01/07/11</i>							
Market	N ^b	Mean	Median	Standard Deviation	Min.	Max.	Wealth Relative
TWSE	73	48.39%	28.75%	56.51%	-12.06%	328.25%	1.48
TPEX	160	56.79%	35.39%	80.75%	-6.56%	728.02%	1.57

Notes:

^a Market-Adjusted Initial Return are calculated using (Equation 2). (Equation 4) was used to calculate Wealth Relatives.

^b Number of IPO Observations.

Exhibit 3 displays the 233 IPO observations divided by the two stock markets in Taiwan; TWSE and TPEX. Around 68.5% of the total observations come from the TPEX, and 31.5% come from the TWSE. Each stock market was then divided into three subgroups; pre-crisis period, crisis-period, and post-crisis (recovery) period. Panel A of Exhibit 3 shows the data sample from the pre-crisis period. TWSE and TPEX had a short-run initial return of 44.43% and 54.53%, respectively, during the pre-crisis period. It is consistent with the short-run under-pricing phenomenon of previous studies in the U.S. and international market. The standard deviation of both markets on Panel A is moderately high when compared to the standard deviation of total periods in Panel D.

Panel B of Exhibit 3 demonstrates a short-run initial return during the crisis period of 58.74% and 21.43% on the TWSE and TPEX, respectively. The degree of short-run initial return is lower in the TPEX than the TWSE. Although, the standard deviation of both markets is significantly lower during the crisis periods, at 36.47% on the TWSE and 20.31% on the TPEX. Panel C on Exhibit 3 shows the recovery period of the crisis with a short-run initial return of 50.65% and 64.81%. Overall, the under-pricing dilemma is present in the Taiwanese economy.

Exhibit 4. Short-run Initial Return^a of IPOs by Crisis Timeline and Industries

TWSE & TPEX Industries	Pre-Crisis Period 01/07/2005 - 14/09/2008		Crisis Period 15/09/2008 - 17/02/2009		Post-Crisis Period 18/02/2008 - 01/07/2011	
	N ^b	Mean	N ^b	Mean	N ^b	Mean
Biotechnology and Medical Care	6	151.85%	1	46.39%	13	52.94%
Building Material and Construction	1	14.42%	0	N/A	2	105.12%
Chemical	1	138.58%	0	N/A	2	18.94%
Communications and Internet	9	36.11%	0	N/A	8	49.47%
Computer and Peripheral Equipment*	12	48.87%	2	42.49%	5	26.20%
Cultural and Creative Industries*	2	39.45%	0	N/A	2	45.39%
Electric Machinery*	5	31.38%	0	N/A	3	46.21%
Electrical and Cable*	0	N/A	0	N/A	2	1.50%
Electronic Parts/Components*	24	38.01%	1	13.52%	15	67.92%
Electronic Products Distribution*	3	21.82%	1	15.51%	0	N/A
Financial	2	-3.27%	0	N/A	1	65.99%
Information Service	1	94.89%	1	3.24%	1	51.75%
Iron and Steel	4	41.61%	1	68.09%	1	115.27%
Optoelectronic*	21	55.19%	2	71.89%	13	103.41%
Other	4	55.43%	0	N/A	4	29.61%
Other Electronic*	9	53.28%	1	17.67%	9	58.20%
Semiconductor*	20	56.20%	2	33.95%	10	55.19%
Shipping and Transportation	0	N/A	1	72.66%	2	14.62%
Textiles	0	N/A	0	N/A	1	55.64%
Tourism	0	N/A	0	N/A	2	77.71%

Notes:

^a Market-Adjusted Initial Return are calculated using (Equation 2).

^b Number of IPO Observations. * Electronic related Industries.

N/A is non-applicable because there was no IPO of that specific industry during the specific crisis period

Exhibit 4 displays the short-run initial return of 233 IPO data divided by the three crisis timeline periods which are then subdivided by industries. Fifty-three percent of the total observations come from the pre-crisis period, 6% from the crisis period, and 41% from the post-crisis period. The biotech medical care, iron and steel, and the optoelectronic industry displayed consistent short-run under-pricing throughout all three crisis periods. The biotech and medical care industry is heavily backed by the Taiwanese government and is geared more to the domestic market (Wong, 2015). Therefore, the fall of American consumption during the crisis did not affect investors positive outlook towards biotech and medical care IPOs.

The Iron and steel industry in Taiwan is quite different from counterparts, such as South Korea and Japan. For instance, according to (Sato, 2009: 25), 'Taiwan has no major steel-using industries such as automobiles and shipbuilding.' The steel industry in South Korea and Japan was affected because of the decrease American consumption of automobiles produced by their economies. Taiwan has no steel-using industries and heavily exports to other countries such as China as well. Investor sentiment may have held optimistic beliefs on IPOs from the iron and steel industry, thus the existing short-run under-pricing throughout the crisis and post-crisis periods.

The electronic related industry IPOs such as the semiconductor, electronic parts and components, and other electronic industry saw the biggest decline in number of observations and short-run initial returns. The semiconductor industry had 20 IPO observations during the pre-crisis period, one during the crisis period, and 10 during the post-crisis period, having a 56.2%, 33.95%, and 55.19% short-run initial return, respectively. The other electronics industry experienced a sharper decline in the short-run initial return. The other electronics industry displayed a 53.28%, 17.67% and 58.2% on the pre-crisis, crisis, and post crisis period, respectively. The electronic parts and components industry displayed a 96% decline in new issues during the crisis period. The short-run initial return for the electronic parts and components industry was 38.01%, 13.52%, and 67.92% during the pre-crisis, crisis, and post crisis, respectively. It is evident that American consumers play a large role to Taiwan's electronics sector for its Taiwan's leading and most substantial industrial export sector. Like (Mahmood, et al., 2011) evidence from China, the global financial crisis had a psychological effect on investor sentiment and behaviour, as well as, driving firms not to issue IPOs during fiscal uncertainties in the environment.

5.2 Long-run Performance of IPOs

Exhibit 5. The Aftermarket Performance of IPOs in the Taiwan Economy, 2005 - 2011^a

<i>Panel A: Taiwan Stock Exchange (TWSE)</i>					
Time	N ^b	Mean	Median	Standard Deviation	Wealth Relative
Short-run IR ^c	73	48.39%	29.17%	56.22%	1.48
Three-year Return ^d	73	4.69%	-29.52%	134.47%	1.05
<i>Panel B: Taipei Stock Exchange (TPEX)</i>					
Time	N ^b	Mean	Median	Standard Deviation	Wealth Relative
Short-run IR ^c	160	56.79%	35.72%	81.43%	1.57
Three-year Return ^d	159	20.41%	0.03%	81.37%	1.2
<i>Panel C: TWSE & TPEX</i>					
Time	N ^b	Mean	Median	Standard Deviation	Wealth Relative
Short-run IR ^c	233	54.16%	32.92%	73.99%	1.54
Three-year Return ^d	232	15.47%	-11.19%	101.09%	1.15

Notes:

^a From 01/07/2005 to 01/07/2011

^b Number of IPO Observations.

^c Market-Adjusted Initial Return are calculated using (Equation 2)

^d Market-Adjusted Abnormal Return are calculated using (Equation 3)

Exhibit 5 compares the short-run initial returns and the three-year long-run performance between the TWSE and the TPEX. As mentioned before, the findings are consistent with the short-run under-pricing phenomenon found on (Loughran et al., 1994) international survey. The long-run performance on the other hand does not correlate with the (Zielinski, 2013) survey on long-run underperformance. The three-year long-run performance of the 73 IPOs on the TWSE was 4.69%. Although the long-run performance is significantly lower than the initial return, it still did not show a negative performance. The volatility was abundantly higher during the third-year return of IPOs in the TWSE. The median for the three-year return was – 29.52%, which signifies most TWSE IPOs three-year returns underperformed. The volatility of data sample in the TPEX remained unhinged while the three-year performance decreased to 20.41%. One IPO in the TPEX was delisted after a year, thus having an IPO sample size of 159. The average three-year return for all 232 IPOs was 15.47%. These findings do not correlate with the long-run underperformance associated with other economies. Exhibit 6 below reveals the average three-year returns of the 232-sample size by their corresponding crisis timeline.

Exhibit 6. Long-run Performance^a of IPOs by Crisis Timeline and Market

<i>Panel A: Pre-Crisis Period 01/07/2005 - 14/09/2008</i>							
Market Period	N ^b	Mean	Median	Standard Deviation	Min.	Max.	Wealth Relative
TWSE							
Year 1	33	4.01%	-16.44%	86.68%	-60.75%	397.00%	1.04
Year 2	33	-26.10%	-45.25%	73.91%	-92.85%	253.44%	0.74
Year 3	33	1.43%	-34.79%	112.90%	-88.00%	429.75%	1.01
TPEX							
Year 1	91	40.53%	21.10%	90.39%	-63.94%	493.85%	1.41
Year 2	91	27.50%	3.94%	107.05%	-80.75%	621.85%	1.28
Year 3	91	16.43%	0.03%	84.71%	-85.39%	332.24%	1.16
<i>Panel B: Crisis Period 15/09/2008 - 17/02/2009</i>							
Market Period	N ^b	Mean	Median	Standard Deviation	Min.	Max.	Wealth Relative
TWSE							
Year 1	5	25.54%	26.57%	47.58%	-19.18%	95.86%	1.26
Year 2	5	-17.82%	-20.14%	43.90%	-63.64%	53.29%	0.82
Year 3	5	-27.87%	-36.53%	20.03%	-43.65%	5.37%	0.72
TPEX							
Year 1	8	64.80%	30.30%	92.28%	-32.90%	218.08%	1.65
Year 2	8	49.27%	16.40%	87.03%	-40.21%	203.13%	1.49
Year 3	8	18.85%	4.03%	48.36%	-39.46%	107.84%	1.19
<i>Panel C: Post-Crisis (Recovery) Period 18/02/2008 - 01/07/2011</i>							
Market Period	N ^b	Mean	Median	Standard Deviation	Min.	Max.	Wealth Relative
TWSE							
Year 1	35	23.60%	8.91%	64.18%	-51.75%	162.57%	1.24
Year 2	35	-26.16%	-48.67%	95.90%	-79.59%	504.58%	0.74
Year 3	35	12.42%	-25.64%	161.31%	-80.54%	891.38%	1.12
TPEX							
Year 1	60	43.20%	28.39%	68.00%	-49.31%	303.81%	1.43
Year 2	60	35.80%	6.27%	93.03%	-63.87%	459.55%	1.36
Year 3	60	26.66%	2.88%	80.28%	-74.85%	287.34%	1.27
<i>Panel D: Total Periods 01/07/2005 - 01/07/11</i>							
Market Period	N ^b	Mean	Median	Standard Deviation	Min.	Max.	Wealth Relative
TWSE							
Year 1	73	14.88%	-9.92%	74.22%	-60.75%	397.00%	1.15
Year 2	73	-25.56%	-45.12%	82.96%	-92.85%	504.58%	0.74
Year 3	73	4.69%	-29.52%	134.47%	-88.00%	891.38%	1.05
TPEX							
Year 1	159	42.76%	24.65%	82.37%	-63.94%	493.85%	1.43
Year 2	159	31.73%	6.05%	100.63%	-80.75%	621.85%	1.32
Year 3	159	20.41%	0.03%	81.37%	-85.39%	332.24%	1.2

Notes:

^a Market-Adjusted Abnormal Return are calculated using (Equation 3).^b Number of IPO Observations.

The TWSE experienced an aftermarket performance of 4.01%, – 26.10% and 1.43% after year 1, year 2, and year 3, respectively, during the pre-crisis period. The median throughout all three years were negative. Meaning that more than half of the IPOs underperformed during those years. The 33 IPO sample size experienced a constant increase in volatility as the years progressed on the TWSE. Year 2 was the only year in which the sample size on the TWSE displayed an underperformance in which the wealth relative was below 1.0. The sample size on the TPEX displayed an aftermarket performance of 40.53%, 27.5% and 16.43% after years 1, 2, and 3, respectively. Since the wealth relative of every year on the TPEX was above 1.0, meant that the sample size never underperformed.

The three-year average return of the sample sizes on the TWSE and TPEX was – 27.87% and 18.85%, respectively. The crisis period was the only period in which the TWSE displayed a three-year average return that underperformed. The global crisis may be a cause to why the sample size during this period was low. Contrary to the TWSE, the TPEX performed better during the crisis years than the pre-crisis years. Volatility gradually decreased as the years progressed in both the TWSE and the TPEX.

The three-year average return of the sample sizes on the TWSE and TPEX was 12.42% and 26.66%, respectively. There was an IPO that had a three-year return of 891.38% during the on the TWSE that may be the cause for having an abnormally high standard deviation of 161.31%. The sample sized increased substantially during the recovery period on both the TWSE and TPEX. The median was the lowest during the second-year return on the TWSE. Although the recovery period had the highest three-year average return for both stock exchanges, it is not higher than the average short-run initial returns.

A constant pattern that is present in all crisis timelines is that the average return of the IPO sample size from the TPEX outperforms the TWSE sample size. One key difference could be the sample size difference between the two. Volatility is relatively higher in the TWSE compared to the TWSE. As mentioned before, the long-run underperformance phenomenon of IPOs is not present in the Taiwan economy. (Wen & Cao, 2013) sample size consisted of only TWSE IPOs from 2005 to 2007 and reported a three-year return of – 34.04%. Wen and Cao's report may differ due to the absence of the TWSE recovery period. Exhibit 7 dissects the crisis time periods into industries to have an efficient understanding to which industries underperformed of outperformed the three-year long-run return.

Exhibit 7. Three-year Long-run Performance^a of IPOs by Crisis Timeline and Industries

TWSE & TPEX	Pre-Crisis Period 01/07/2005 - 14/09/2008		Crisis Period 15/09/2008 - 17/02/2009		Post-Crisis Period 18/02/2008 - 01/07/2011	
Industries	N ^b	Mean	N ^b	Mean	N ^b	Mean
Biotechnology and Medical Care	6	-46.23%	1	-18.47%	13	41.27%
Building Material and Construction	1	-3.16%	0	N/A	2	10.52%
Chemical	1	-34.79%	0	N/A	2	7.84%
Communications and Internet	9	64.18%	0	N/A	8	-27.00%
Computer and Peripheral Equipment*	12	0.01%	2	53.19%	5	-10.03%
Cultural and Creative Industries*	2	-56.28%	0	N/A	2	-9.11%
Electric Machinery*	5	11.46%	0	N/A	3	362.18%
Electrical and Cable*	0	N/A	0	N/A	2	-27.43%
Electronic Parts/Components*	24	-9.06%	1	-39.46%	15	-17.38%
Electronic Products Distribution*	3	90.73%	1	-4.02%	0	N/A
Financial	2	133.77%	0	N/A	1	-12.66%
Information Service	1	54.00%	1	27.37%	1	44.68%
Iron and Steel	4	15.61%	1	69.46%	1	-12.24%
Optoelectronic*	21	4.25%	2	-15.50%	13	8.92%
Other	4	47.09%	0	N/A	4	8.68%
Other Electronic*	9	6.15%	1	-24.01%	9	71.30%
Semiconductor*	20	28.18%	2	-40.09%	10	15.03%
Shipping and Transportation	0	N/A	1	5.37%	2	-21.31%
Textiles	0	N/A	0	N/A	1	-20.63%
Tourism	0	N/A	0	N/A	2	27.01%

Notes:

^a Market-Adjusted Abnormal Return are calculated using (Equation 3).

^b Number of IPO Observations. * Electronic related Industries.

N/A is non-applicable because there was no IPO of that specific industry during the specific crisis period

Exhibit 7 displays the average three-year long-run return of 232 IPO data divided by the three crisis timeline periods, which are then subdivided by industries. Fifty-three percent of the total observations come from the pre-crisis period, 6% from the crisis period, and 41% from the post-crisis period. The biotechnology and medical care, building material and construction, and chemical industries experienced similar price behaviours in their data samples. All three industries underperformed during the pre-crisis. The biotechnology and medical care industry had an underperformance of – 18.47% while building material and construction, and chemical industry had no issued during that period. All three industries displayed a positive average three-year return during the recovery period.

The electronics related industries all had underperformed during the crisis period besides computer and peripheral equipment. The electronic parts/components industry, Taiwan's biggest exporter, underperformed during the pre-crisis, crisis and post-crisis periods, reporting a – 9.06%, – 39.46% and – 17.38%, respectively. The optoelectronics, other electronic and semiconductor industry IPO samples had an 'inverted' bell curve performance throughout the total periods. Meaning a positive performance during the pre-crisis period, negative performance during the crisis period, and positive performance during

the post-crisis period, as reported on Exhibit 7. The data samples from the electric machinery industry had a performance of 11.46%, had no offering during the crisis period, and had an abnormal return of 362.18%.

The information service industry was the only industry to show positive performance during all the crisis periods but is not considered an anomaly due to low IPO data sample. Many industries shown in Exhibit 7 have either one or no IPO data samples during their time periods. With insufficient data sample, a proper analysis can't be completed.

Chapter VI – Conclusion

The motivation behind this study was to learn more about the ‘Four Asian Tigers’ economy of Taiwan and its IPO market. Taiwan’s high-tech industrialised economy and remarkably high economic growth rates sparked interest into investigating the aftermarket performance of its initial public offerings.

This dissertation does not attempt to provide a brand-new explanation for the first day under-pricing and long-run underperformance phenomenon, instead, it empirically investigates the short-run and long-run performance of initial public offerings in the Taiwanese economy in the context of the 2008 global financial crisis. There have been many studies in the past such as (Huang, 1999; Leon Li, et al., 2007; Lim, et al., Sherman, et al., 2010 and Wen & Cao, 2013) that conducted research on Taiwan’s IPO market and each investigation used different timelines. Virtually every study concluded that the Taiwan IPO market suffered from systematic short-run under-pricing and long-run underperformance and each tried to link their findings to an established hypothesis. This study adopted similar methodologies from past studies for calculating both the average short-run and long-run returns, while using a different timeline. The difference was the global economic environment in which the timeline took place. The objective of this study was to see if, given the 2008 global economic crisis and Taiwan’s highly exporting nature, the average returns would produce similar results to past studies.

The average short-run initial return of the total 233 IPO sample size from both the TWSE and the TPEX was 54.16% from July, 2005 to July, 2011. Thirty-one percent of the IPO sample size came from the TWSE while the other 69% came from the TPEX. The average short-run initial return from the TWSE from all time period was 48.39% while the TPEX sample size was 56.79%. The under-pricing phenomenon was present regardless of the crisis timeline period. Although, the under-pricing is present, this study concluded that asymmetric models such as Rock’s 1986 winner’s curse model, and Benveniste and Spindt’s 1989 dynamic information acquisition model, offer little support to the Taiwan’s short-run under-pricing dilemma. The reason this study arrived to that conclusion was due to the transparency that the EMS provided for investors before it got listed on either the TWSE or TPEX. The biggest difference between the crisis period and the pre-and post-crisis periods was the decline in the issued IPO, especially in the electronic parts and components industry. A decline in issuing conveyed that the global crisis had a psychological effect on issuer and investor sentiment and behaviour due to fiscal uncertainties in the environment.

The long-run performance of IPOs in Taiwan between July, 2005 and July 2011 produced a different outcome, compared to previous studies. The three-year average return for all 232 IPOs during all three crisis time periods was 15.47%. The three-year average return for the 73 IPO sample size on the TWSE was 4.69%, while the 160 IPO samples size from the TPEX was 20.41%. These findings are inconsistent with the international evidence from past studies. Nevertheless, when the IPO sample sizes are divided by their corresponding crisis timeline period, the outcome was different. The three-year average return for IPOs in the crisis period displayed the lowest of all the time periods, with TWSE reporting a – 27.87% return, and the TPEX reporting a 18.85% return. The electronic parts and components industry, the most export oriented industry, as well as the semiconductor industry reported the lowest return of – 39.46% and – 40.09%, respectively. The electronics related industry issues declined by 90% in the crisis period. It was evident that the 2008 global financial crisis affected American and global high-tech consumers, and had a negative effect on returns, causing firms to not be publicly traded. The post-crisis period experienced the highest three-year return out of all the timeline periods. Although the sample sizes in the post-crisis period experienced lower returns as the years progressed, it still did not show any underperformance at the end of the third year.

As with the Asian financial crisis of 1997, Taiwan experienced the strongest recovery out of all the Four Asian Tiger economies according to (Lin, et al., 2013). The biggest catalyst of the strong recovery in the Taiwan market was due to their Government. During the crisis period, Taiwan's economy and dynamic IPO market suffered. In response to the suffering of Taiwan's economy and its IPO market, the Taiwanese Government implemented a stimulus package in September of 2008, worth \$5.6 billion that had financial and investment incentives for medium and small-sized firms. In addition, the package aimed to increase export to new markets overseas (Lin, et al., 2013). In January of 2009, Taiwan's Government launched a second stimulus package worth \$14.9 billion, spread over the four following years (QFinance, 2011). The second stimulus package consisted of \$108 in shopping vouchers, sent to each resident of Taiwan as well as incentives to encourage private investments (Lin, et al., 2013).

This study concluded that the short-run initial return (under-pricing) was present in Taiwan regardless of the 2008 economic climate it was in. In addition, this research determined that asymmetric information models are not the most appropriate theories to explain the under-pricing dilemma in Taiwan. Investor behavioural and sentiment theories better describe the under-pricing in Taiwan during the crisis timelines. The long-run returns did not report under-performance. The 2008 global crisis, and Taiwan's Government approach to dealing with the crisis could be linked to the long-run return outperforming the

market. The electronic related industries did see the most variation during the crisis. The electronic parts and components industry IPOs suffered the most during the long-run, which was not a surprise, since it is Taiwan's most heavily exported industry that relies heavily on American consumers.

6.1 Further Research

Concrete anomalies between industries was difficult to find in this study. Although, it was interesting to explore the aftermarket performance of IPOs before and after the 2008 global financial crisis, further research could be done to have more visible anomalies. This dissertation subdivided each crisis time period into specific industries, but the research outcome could be improved even more if each industry was divided into smaller groups such as, size of the firm, market capitalisation, debt-to-equity ratio, return on assets, annual revenues and firm age. By subdividing the IPO sample size even more, a stronger evidence, of visible anomalies, if there are any, could be found, which can benefit individuals and institutions looking to invest in the Taiwan IPO market.

Appendix A

Figure 1: Short-run initial returns (First-day under-pricing) of 52 countries. (*Source: Loughran et al., 1994 updated 2015 version*)

Country	Source	Sample Size	Time Period	Avg. Initial Return
Argentina	Eijgenhuijsen & van der Valk; Dealogic	26	1991-2013	4.2%
Australia	Lee, Taylor & Walter; Woo; Pham; Ritter	1,562	1976-2011	21.8%
Austria	Aussenegg	103	1971-2013	6.4%
Belgium	Rogiers, Manigart & Ooghe; Manigart DuMortier; Ritter	114	1984-2006	13.5%
Brazil	Aggarwal, Leal & Hernandez; Saito; Ushisima	275	1979-2011	33.1%
Bulgaria	Nikolov	9	2004-2007	36.5%
Canada	Jog & Riding; Jog & Srivastava; Kryzanowski, Lazrak & Rakita; Ritter	720	1971-2013	6.5%
Chile	Aggarwal, Leal & Hernandez; Celis & Maturana; Dealogic	81	1982-2013	7.4%
China	Chen, Choi, & Jiang; Jia, Xie & Zhang	2,512	1990-2013	118.4%
Cyprus	Gounopoulos, Nounis, and Stylianides; Chandriotis	73	1997-2012	20.3%
Denmark	Jakobsen & Sorensen; Ritter	164	1984-2011	7.4%
Egypt	Omran; Hearn	62	1990-2010	10.4%
Finland	Keloharju	168	1971-2013	16.9%
France	Husson & Jacquillat; Leleux & Muzyka; Paliard & Belletante; Derrien & Womack; Chahine; Ritter; Vismara	697	1983-2010	10.5%
Germany	Ljungqvist; Rocholl; Ritter; Vismara	736	1978-2011	24.2%
Greece	Nounis, Kazantzis & Thomas; Thomadakis, Gounopoulos & Nounis	373	1976-2013	50.8%
Hong Kong	McGuinness; Zhao & Wu; Ljungqvist & Yu; Fung, Gul, and Radhakrishnan; Dealogic	1,486	1980-2013	15.8%
India	Marisetty and Subrahmanyam; Ritter	2,964	1990-2011	88.5%
Indonesia	Suherman	464	1990-2014	24.9%
Iran	Bagherzadeh	279	1991-2004	22.4%
Ireland	Dealogic	38	1991-2013	21.6%
Israel	Kandel, Sarig & Wohl; Amihud & Hauser; Ritter	348	1990-2006	13.8%
Italy	Arosio, Giudici & Paleari; Cassia, Paleari & Redondi; Vismara	312	1985-2013	15.2%
Japan	Fukuda; Dawson & Hiraki; Hebner & Hiraki; Pettway & Kaneko; Hamao, Packer, & Ritter; Kaneko & Pettway	3,236	1970-2013	41.7%
Jordan	Al-Ali and Braik	53	1999-2008	149.0%
Korea	Dhatt, Kim & Lim; Ihm; Choi & Heo; Mosharian & Ng; Cho; Joh; Dealogic; Lee	1,758	1980-2014	58.8%
Malaysia	Isa; Isa & Yong; Yong; Ma; Dealogic	474	1980-2013	56.2%

Figure 1: continued...

Country	Source	Sample Size	Time Period	Avg. Initial Return
Mauritius	Bundoo	40	1989-2005	15.2%
Mexico	Aggarwal, Leal & Hernandez; Eijgenhuijsen & van der Valk; Villarreal	123	1987-2012	11.6%
Morocco	Alami Talbi; Hearn	33	2000-2011	33.3%
Netherlands	Wessels; Eijgenhuijsen & Buijs; Jenkinson, Ljungqvist, & Wilhelm; Ritter	181	1982-2006	10.2%
New Zealand	Vos & Cheung; Camp & Munro; Alqahtani; Dealogic	242	1979-2013	18.6%
Nigeria	Ikoku; Achua; Dealogic	122	1989-2013	13.1%
Norway	Emilsen, Pedersen & Sættem; Liden; Dealogic	209	1984-2013	8.1%
Pakistan	Mumtaz	80	2000-2013	22.1%
Philippines	Sullivan & Unite; Dealogic	155	1987-2013	18.1%
Poland	Jelic & Briston; Woloszyn	309	1991-2014	12.7%
Portugal	Almeida & Duque; Dealogic	32	1992-2013	11.9%
Russia	Dealogic	64	1999-2013	3.3%
Saudi Arabia	Al-Anazi, Forster, & Liu; Alqahtani	80	2003-2011	239.8%
Singapore	Lee, Taylor & Walter; Dawson; Dealogic	609	1973-2013	25.8%
South Africa	Page & Reyneke; Ali, Subrahmanyam & Gleason; Dealogic	316	1980-2013	17.4%
Spain	Ansotegui & Fabregat; Alvarez Otera; Dealogic	143	1986-2013	10.3%
Sri Lanka	Samarakoon	105	1987-2008	33.5%
Sweden	Rydqvist; Schuster; de Ridder	374	1980-2011	27.2%
Switzerland	Kunz, Drobetz, Kammermann & Walchli; Dealogic	164	1983-2013	27.3%
Taiwan	Chen; Chiang	1,620	1980-2013	38.1%
Thailand	Wethyavivorn & Koo-smith; Lonkani & Tirapat; Ekkayokkaya and Pengniti; Vithessonthi	500	1987-2012	35.1%
Tunisia	Hearn	32	2001-2013	24.3%
Turkey	Kiyamaz; Durukan; Ince; Kucukkocaoglu; Elma	399	1990-2013	9.7%
United Kingdom	Dimson; Vismara; Levis	4,932	1959-2012	16.0%
United States	Ibbotson, Sindelar & Ritter; Ritter	12,702	1960-2014	16.9%

Figure 2: Long-run average three-year return of IPOs in the U.S. IPO market, as well as, International and emerging markets separated into three different tables. (Source: Zielinski, 2013)

Author(s)	Sample period/size	Approach	Benchmark	3-year excess return (%)
Ritter (1991)	N = 1526 1974–1984	CAR	Size matching firm portfolio	–29,1
Loughran/Ritter (1995)	N = 4753 1970–1990	BHAR	AMEX-NYSE	–26,9
Ritter/Welch (2002)	N = 6249 1980–2001	BHAR	CRSP index (value weighted) Size matching firm portfolio	–23,4 –5,1
Brau et al. (2012)	N = 4753 1935–1972	BHAR	CRSP index (value weighted)	–19,9

Author(s)	Market	Sample period/size	Ap- proach	Benchmark	3-year excess return (%)
1	2	3	4	5	6
Aussenegg (1997)	Austria	N = 51 1984–1991	BHAR	Size matching firm portfolio	–56.91
Lee et al. (1996)	Australia	N = 266 1976–1989	CAR	Australian All Industrials Accumulation Index	–46.5
Kooli/Suret (2004)	Canada	N = 445 1991–1998	BHAR	Non issuing matching firms	–19.96
Leleux (1993)	France	N = 69 1985–1991	CAR	SBF 250 Index	–11.21
Bossin/Sentis (2012)	France	N = 207 1991–2005	BHAR	Size matching firm portfolio Book-to-market matching firm portfolio	–28.85 –68.10
Ljungqvist (1997)	Germany	N = 154 1970–1990	CAR	Size matching firm portfolio	–19.95
Stehle/Ehrhardt (1999)	Germany	N = 187 1960–1992	BHAR	Regulated Market (val-weight) Regulated Market (eq-weight)	1.54 –5.04
Thies (2000)	Germany	N = 218 1977–1995	BHAR	DAX DAFOX (val-weighted) DAFOX (eq-weighted)	–12.7 –9.8 –7.8
Arosio et al. (2000)	Italy	N = 97 1985 – 1996	BHAR	MIB Index	–11.53
Kirkulak (2008)	Japan	N = 433 1998–2001	CAR	Tokyo Stock Exchange 300	–18.3

Figure 2: continued...

1	2	3	4	5	6
Alva- rez/Gonzalez (2001)	Spain	N = 56 1987–1997	BHAR	IGBM index (val-weighted) IGBM index (eq-weighted)	–29.55 –14.16
Loughran et al. (1994)	Sweden	N = 162 1980–1990	CAR	Size matching firm portfolio	1.2
Drobetz et al. (2005)	Switzer- land	N = 1983–2000	BHAR	SPI VSCI	–1.69 5.12
Levis (1993)	UK	N = 720 1980–1988	CAR	FTA Index (val-weighted) FTA Index (eq-weighted) HGSC Index	–4.20 –21.3 –8.10
Brown (1999)	UK	N = 232 1990–1995	BHAR	FTA Index	–0.91
Gregory et al. (1999)	UK	N = 2499 1974–2004	BHAR	Size matching firm portfolio (val-weighted) Size matching firm portfolio (eq-weighted)	–12.6 –16.4

Figure 2: continued...

Author(s)	Country	Sample period/size	Approach	Benchmark	3-year excess return (%)
1	2	3	4	5	6
Aggarwal et al. (1993)	Brasilien Mexiko Chile	N = 62 N = 44 N = 28 1979–1990	CAR	The respective national market index (BOVESPA, IPC, IPSA)	–47.0 –19.6 –23.7
Celis/Maturana (1998)	Chile	N = 18 1991–1995	CAR	Global Index of Chilean Electronic Stock Exchange	9.8
Govindasamy (2010)	South Africa	N = 229 1995–2006	BHAR CAR	Johannesburg Stock Exchange All Share Index	–50.0 –47.0
Rekik/ Bouyel-bene (2013)	Tunesia	N = 40 1992–2008	CAR	Tunisian Stock Exchange Index	–3.02
Lyn/Zychowicz (2003)	Poland Hungary	N = 66 N = 25 1991–1998	BHAR	WIG (Polish Stock Exchange) BUX (Hungarian Stock Index)	–24.4 –4.92
Darmetko (2009)	Poland	N = 101 1998–2005	BHAR	WIG (Polish Stock Index) Size und Book to Market matching firm portfolio	–31.07 –42.59
Zielinski (2013)	Poland	N = 263 1994–2005	BHAR	WIG (Polish Stock Index) Market portfolio (eq-weighted)	–14.0 –28.6
Seitibraimov (2012)	Russia Ukraine Kazakhstan	N = 66 N = 11 N = 16 1999–2008	BHAR	The respective national market index (RTS, PFTS, KAZE)	–47.3 –100.0 –94.5
Ozden (2005)	Turkey	N = 134 1990–1997	BHAR	Istanbul Stock Exchange Composite	–63.0
Xia/Wang (2003)	China A-Shares	N = 146 1997–1998	CAR	Shanghai A-Share Index Shenzhen A-Share Index	25.9

Figure 2: continued...

1	2	3	4	5	6
Chi/Padgett (2002)	China A-Shares	N = 409 1996–1997	BHAR loga- rithm.	Shanghai A-Share Index Shenzhen A-Share Index	10.7
Chi et al. (2010)	China A-Shares	N = 897 1996–2002	BHAR	Shanghai A-Share Index Shenzhen A-Share Index	16.6
Su et al. (2011)	China A-Shares	N = 936 1996–2005	BHAR	Shanghai A-Share Index Shenzhen A-Share Index	8.6
Emasari/Tamara (2010)	Indonesia	N = 112 1996–2001	BHAR	Jakarta Composite Index	–68.02
Kumar (2007)	India	N = 21 1999–2006	BHAR	S&P CNX Nifty Stock Exchange of India	–14.7 p.a.
Sahoo/Raib (2010)	India	N = 92 2004–2006	BHAR	National Stock Exchange and Bombay Stock Ex- change	0.4
Nurwati et al. (2007)	Malaysia	N = 435 1990–2000	BHAR	Kuala Lumpur Composite Index	17.9
Vithesonthi (2008)	Thailand	N = 123 2000–2005	BHAR	SET Index – Stock Ex- change of Thailand	–38.7
Komenkul et al. (2012)	Thailand	N = 136 2001–2012	BHAR CAR	SET Index – Stock Ex- change of Thailand	–16.6 –19.6
Kim/Lee (1990)	South Korea	N = 99 1985–1988	CAR	KSE Index (Korea Stock Exchange)	2.0

Figure 3: This graph shows the trend of the U.S. indexes such as Dow Jones, S&P 500 and the NASDAQ at the bottom of the recession. It describes the date in which President Obama signed the stimulus package that started the gradual increase of the market, hence the recovery period. (Source: Etrade website at www.etrade.com)



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