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Determinants of IPO Underpricing

An empirical study based on companies in the
Gulf Cooperation Council countries

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Declaration

I declare that this work is the result of my own investigation and that it has not been already accepted in substance of any degree, nor is it being currently submitted for any degree.

Signature:

A handwritten signature in black ink, appearing to read 'Aalaa Jaafar Haji', written over a dotted line.

Date: January 2015

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Abstract

This paper documents the phenomenon of underpricing initial public offerings (IPOs) for 194 firms that went public between 2000 and 2013 in the markets of the six Gulf Cooperation Council (GCC) countries. The purpose of this study is to investigate factors that potentially influence abnormal returns on the first day trading; the study focuses on assessing the most prominent determinants of the underpricing of IPOs in the GCC region. In addition to previously tested variables such as firm age and offer size, additional untested variables in the GCC market are included, and external factors such as Seasonal Affective Disorder (SAD) have been analyzed, cultural aspects such as the month of Ramadan have been embedded to measure Islamic seasonality, and the financial crisis period has been taken into consideration as well. Once multiple regression was carried out, the empirical findings of this paper show that firm age and offer size variables are clearly significant, both positively and negatively in relation to underpricing, a result which was predicted and similar to past research. Large offer-sized firms appeared to have a positive relationship with underpricing, contrary to what was predicted. Results show that a relationship does exist between financial and non-financial firms, and there are significant differences between banking versus insurance firms. Differentiating fall/winter months from spring/summer months to measure Seasonal Affective Disorder did not appear to be significant, as there was no significant difference between issuing IPOs in fall/winter months from spring/summer months. The same thing was applied to Ramadan months, and produced similar results/ Differentiating IPOs issued in Ramadan from non-Ramadan months and summer vs. non-summer months did not seem to have a significant effect; however, the overall models were significant. The models carried out involving the financial crisis period all appeared to be significant, with the exception of the model which differentiated pre-crisis and post-crisis years. This research provides additional information that sheds more light on some of the main reasons behind IPO underpricing in the GCC region.

Abbreviations and Symbols

IPO	:	Initial Public Offering
GCC	:	Gulf Cooperation Council
UAE	:	United Arab Emirates
SAD	:	Seasonal Affective Disorder
OLS	:	Ordinary Least Square
R	:	Initial Return
$Adj R^2$	:	Adjusted R square
α	:	Intercept
β	:	Slope Coefficient
ε	:	Random Error
R_{j1}	:	Return of stock j at the end of first trading period
P_{j1}	:	Price of stock j at the end of first trading period
P_{j0}	:	Offer price of stock j
SE	:	Standard Error
D.F.	:	Degree of Freedom
D	:	Dummy Variable

1. Introduction

An Initial Public Offering (IPO) is defined as the initial sale of stock by a private company to the general public. Once such sale occurs, the private company transforms into a public company. IPOs are generally used by companies to raise capital, and are often issued by small firms that are seeking capital in order to expand their business. However, IPOs can also be carried out by large, privately-owned companies that are looking to enter the market so their shares can be traded publicly. A company that is willing to engage in an IPO must seek the assistance of an underwriting firm, which is thereafter responsible for determining the best offering price for the company's stock at the initial trading period, and also when to introduce the stock to the public market.

IPOs are usually, maybe mistakenly, interpreted by seemingly uninformed investors as successful investment opportunities given the abnormal returns they generate. However, IPOs can be quite risky; since the stock is being traded for the first time, there is often little or no historical data with which to analyze the company's past performance.

An ongoing puzzle regarding IPOs is the fact that after the stock is introduced to the public, the closing price on the first day is usually higher than the initial offered price (Florin and Simsek, 2006), meaning that the stock was initially 'underpriced' by the underwriting firm. Underpricing refers to the closing price of the share on the first day of trading being higher than the issue price paid by subscribers. Underpricing is also commonly referred to as the initial return.

If investors were to get allocations in IPOs, and were to flip these shares on the day the firm is listed, then on an average their returns would be higher than the market price. There is, however,

an element of risk here. Rock (1986) demonstrated that uninformed retail investors might suffer from a winner's curse problem; that is, they might get all the IPO allocations they have asked for, but generate very low returns on the day of listing, while other IPOs will produce very high returns on the day of listing because of the high demand that such offerings tend to generate, which the uninformed investor did not participate in. Thus, uninformed investors might not be able to utilize the underpricing factor in IPOs to their advantage. Most IPOs are traded at a higher price on the listing day, which means that the firm could have raised more money if they had set a higher offer price than they did. Such discrepancy shows that investors have different beliefs when it comes to the future of the company, such as the belief that the firm has been incorrectly valued and deserves a higher price. This leads to increase in both demand and price of the stocks in the secondary market. The higher the amount of underpricing, the more money the firm could have generated through a higher offer price. On the other hand, the higher the underpricing, the more profit can be made by investors, who got allocations in the IPO and are thus able to sell these shares on the day of listing. This phenomenon is referred to as 'money left on the table' (Pande and Vaidyanathan, 2009).

There is a great deal of literature covering the phenomenon of underpricing and the reasons behind it. According to Ritter (1984), the occurrence of IPO underpricing depends on the period a firm chooses to go public. Rock's model of "underpricing" as an expected equilibrium result is supported by Beaty and Ritter (1986), who in turn propose that underpricing is related to *ex ante* uncertainty. Following up on these studies of IPOs underpricing, McDonald and Fisher (1972), Reilly (1978), and Dawson (1987) maintained that there are significant returns to the investors in the short run.

Many studies examining the determinants of underpricing, such as Ferretti and Meles (2011), Florin and Simsek (2007), (Ljungqvist and Wilhelm, 2002), rely on either information asymmetry or signaling theory to identify potential factors that influence investor behavior.

While the majority of the information used to signal investors is based on firm-level characteristics, research shows that external factors can subconsciously impact investor behavior as well. A prominent external factor which has proven to affect investors' behavior is Seasonal Affective Disorder (SAD), which is a documented psychological condition that produces increased pessimism and risk aversion during the fall and winter months. SAD is a condition that afflicts a large segment of the world's population. Scientists have found that SAD's depressive symptoms are linked to the diminished hours of daylight in the fall and winter months. In relating this medical condition to the financial market, early studies led by Kamstra et al. (2003) have found that SAD generally results in lower market returns during the fall and winter months. There has also been research that confirms the influence of SAD on IPO underpricing, in that underpricing is, on average, more severe for those firms that undergo an IPO during seasons in which there is less daylight (Dolvin and Pyles 2007). Given that SAD is a type of depression, people impacted by SAD are generally more risk averse, and their willingness to take risks decreases (Zuckerman 1994).

In contrast to the widespread findings of initial short run positive returns for IPOs, mixed results have been found regarding their long-term performance, where insignificant or negative abnormal results for IPOs have been found in most studies, including but not limited to studies by Loughran and Ritter (1995) and Purnandam and Swaminathan (2004). IPOs yield economically and statistically significant initial abnormal returns, which is in line with the underpricing

phenomenon of IPOs. However, overall performances tend to yield negative returns once initial returns are excluded. The initial abnormal returns overcompensate for the negative returns over the one-year period, resulting in overall positive abnormal returns. In general, Gulf Cooperation Council (GCC) equity markets underperformed compared to other equity markets, until 2003. From 2003 onwards, performance in this market improved due to increasing oil prices, record corporate profits, and sustained structural reforms, which led to the rapid increase of stock prices in most GCC markets. This increase was mainly driven by the bullish Saudi market. The substantial increase in the number of IPOs in 2005 in some GCC equity markets was one of the warning signals that confirmed the development of a speculative bubble.

According to Deloitte's GCC Equity Capital Markets Confidence Survey (2013), 42% of the challenges experienced during IPO processes are due to the mismatch of valuation expectations. The underpricing phenomenon is explained by various theories such as investment banking conflicts, managerial conflicts, litigiousness and regulations. But the most prominent explanation, and the one with the most empirical support, is that IPO underpricing occurs because of informational asymmetry.

2. Purpose of the Study

The goal of this study is to investigate factors that may potentially influence abnormal returns on the first day trading in order to provide deeper insight about how the market works to issuers, underwriters and investors. The study will focus specifically on assessing the most prevalent determinants of the underpricing of IPOs in the GCC region. Some of the determinants such as *offer size, reputation of underwriters, firm age and ownership structure* have previously been

tested by researchers such as Sharma and Seraphim (2010), and have proven to be either positively related or negatively related to underpricing. This study will test similar, previously-tested variables in addition to a new, as-yet untested variable on the GCC market: *external factors (SAD)*. What differentiates this research from other studies related to the GCC is the breadth of scope it achieves with the inclusion of *external factors (SAD)* in its analysis, rather than focusing on firm specific characteristics, which has been the standard approach. The additional information this research provides will help shed more light on some of the main reasons behind IPO underpricing in the GCC region. It will test how significant certain independent variables are in relation to the dependent variable known as 'underpricing'. It will also test how significant independent variables relate to one other, and whether or not one variable impacts another.

I did not find a vast range of papers related to IPOs in the GCC. I expect this paper will enhance the information availability of IPO research carried out in the GCC region, and will add to the literature related to IPOs by introducing a discussion of the underpricing phenomenon in the GCC region.

Testing the significance of variables in the underpricing of IPOs will be useful in mitigating, lessening or controlling the potential negative effects that these variables might have, such as the effect of SAD, which is an external variable and refers to the effect of seasonal depression on investor behavior and the financial world. This paper applies the concept of SAD in a unique way by separating the winter and fall months from summer and winter months and examining the performance of IPOs during those periods, respectively.

As previously stated, most papers focus on firm specific variables when testing how potentially significant factors affect underpricing. This paper introduces an external variable which was

initially applied to the medical field exclusively, and tests it in the financial world, specifically in the GCC market, for the first time, to the best of my knowledge. In this research, the method of subsampling is introduced and used to select companies from six GCC countries that underwent the process of an IPO. The use of the subsampling method to include countries such as Bahrain and the introduction of a new, previously untested external variable are both factors which will help fill the gap between this research and previously conducted research.

3. Literature Review

There has been ample research conducted to investigate the phenomenon of underpricing. Loughran et al. (1994) were among the first to summarize such research by gathering data from various countries around the world. Although results varied from one country to the next, on average, every country ultimately recorded large first day returns.

According to Ljungqvist (2004), theories of underpricing can be grouped under four broad headings: asymmetric information, institutional reasons, control considerations and behavioral approaches. Of these categories, the most widely-recognized would be the asymmetric information based models.

3.1 Asymmetric Information

Rock's (1986) "winner's curse" hypothesis addresses information asymmetry between different classes of investors. The "winner's curse" hypothesis suggests that some investors are more informed about the true value of an IPO than other investors. While uninformed investors subscribe to every IPO, informed investors only buy new shares if the issue price is less than the

fair value. This causes a “winner's curse” that negatively affects the uninformed investors¹. Rock (1986) also suggests that informed investors are interested in and bid only for IPOs which are attractively priced, whereas the uninformed investors bid somewhat randomly. Although the uninformed investor receives all that was bid for, it comes at a lower, often underpriced offering with less profit, thus creating a “winner’s curse” problem. The informed investor, on the other hand, bids only for the favorable (profitable) offerings, crowding out the uninformed investors’ bids.

If companies have more information about the present value or risk of their future cash flow than investors, then underpricing may be used as a signal that reveals the company’s true value. This is a costly move, but if successful, signaling may allow the issuer to return to the market at a later date to sell equity on better terms. Ibbotson (1975) was the first to investigate the use of signaling in the primary market, and suggests that issuers underprice in order to leave “a good taste in the investors’ mouths” so that future equities can be priced higher. Welch (1989) further formalized this in a two period model where high quality firms can underprice but low quality firms are not be able to do so because of high imitation costs. Grinblatt and Hwang (1989) added to this body of literature by saying that the issuers signal higher quality in IPOs by underpricing as well as by retaining some of the firms’ shares in their personal portfolio. Allen and Faulhaber (1989) found that in some circumstances, good firms want to “signal” to their investors that they have good future prospects, and therefore underprice their IPOs. Grinblatt and Hwang (1989), Welch (1989) and Allen and Faulhaber (1989) have all contributed research that supports the views of Ibbotson (1975). Welch (1989) expanded this study, exploring the nature of timing between IPOs and

¹http://www.ipo-underpricing.com/UP/Underpricing/Modelle/GG/e_Winners%20Curse.html

further equity issues. His work suggests that the longer a firm waits, the more likely that its true value will be revealed to the market.

Information asymmetries between issuers and underwriters create the potential for agency problems; this phenomenon is explored by Loughran and Ritter (2004) in their “corruption” hypothesis. Initial returns represent a wealth transfer from the issuer to investors. Loughran and Ritter (2004) suggest that this can lead to discouraged behavior, such as side payments to underwriters from subscribing investors, or underwriters “spinning” shares, which refers to the practice of underwriters allocating underpriced shares to executives of companies in order to secure their future investment banking business (Loughran and Ritter, 2004). Loughran and Ritter proposed a theory for underpricing in which they state that issuers of IPOs leave a lot of money on the table because they see a prospect of higher trading price in the first few days of listing, consequently offsetting their loss of wealth in underpricing the IPOs and even resulting in personal net gains. More importantly, they found that most IPOs leave little money on the table, and the minority of IPOs that do leave significant sums of money on the table result in personal net increases for issuers due to higher underpricing. In either case, the underwriter gains from deliberately underpricing the IPO.

Leland and Pyle’s model (1976) says that the information asymmetry between issuers of IPOs and investors can be reduced by observing the signal of the equity retained by the issuers. Moreover, they were the first ones to suggest that financial intermediaries are required to resolve information asymmetry. Baron’s (1982) model examines how the contracting mechanism works when the investment banker has better information about the IPO market than the issuer. Since the issuer cannot monitor the investment banker without accruing significant cost, which the

issuer would want to do in order to incentivize the investment banker, the issuer lets the investment banker underprice the issue (optimal delegation). Baron uses the term “delegation contracting” to model the situation in which an issuer not only needs the services of the investment banker for distribution of the IPO, but also needs his advice for setting the offer price.

3.2 Institutional Reasons

Institutional theories focus on two features of the market: litigation and the price stabilizing activities undertaken by underwriters once trading commences. Litigation seems to be heavily focused on the US market, as the majority of countries around the world are not faced with the same stringent disclosure rules. In the USA, all parties who sign the prospectus are exposed to considerable risk of litigation from investors on the grounds that material facts were misstated or omitted. Lowry and Shu (2002) estimate that roughly 6% of IPOs that occurred between 1988 and 1995 fell victim to litigation for violations relating to the IPO. The damages awarded to investors averaged at 13.3% of IPO proceeds. The direct costs of litigation are high and the indirect costs, such as damage to the reputation capital, must also be considered.

In response to this, it is argued that intentional underpricing may take the form of insurance against such litigation (Hensler, 1995; Hughes and Thakor, 1992; Tinic, 1988). The level of underpricing is suggested to be a trade-off between minimizing the probability of litigation and maximizing the gross proceeds of the issue. Tinic postulated that firms underprice their IPOs as a form of insurance against legal liability. If litigation arises after the IPO has been issued, then it harms the reputation of both the issuers and the investment bankers, so in order to guard against this possibility, firms underprice their offerings. This postulate was also tested by comparing 134 IPOs in the post-1933 SEC regulations period and 70 IPOs in the pre-regulation period, and it was

found that in the post-regulation period, underpricing had significantly increased. Hughes and Thakor (1992) provide a theoretical link between litigation risk and IPO underpricing, but they do not attribute this to be the sole cause of underpricing as underpricing is observed even in countries where the legal systems are not strong. They also contend that in all places, the risk of loss of reputation for the underwriter and institutional arrangements drive the underwriters to underprice the IPOs.

3.3 Control Considerations

Control theories argue that underpricing helps shape the shareholder base, with the objective being to reduce intervention by outside investors once the company is public.

Underpricing has been proven to create excess demand for IPOs. Booth and Chua (1996) argue that this ensures that the shares are dispersed among many shareholders, and therefore reduces the possibility of large investors capturing a majority, or large proportion, of the shares. In essence, it acts as a defense against external bodies acquiring control over the company. Brennan and Franks (1997) support this theory, as they found that issuers underpriced their issues in an effort to enable rationing, in which small applications were generally favored over large ones.

3.4 Behavioral Approaches

Behavioral theories assume either the presence of “irrational” investors who bid up the price of IPO shares beyond their true value, or that issuers suffer from behavioral biases that cause them to put insufficient pressure on the underwriting banks to reduce underpricing.

Welch (1992) shows that some types of IPOs are susceptible to “informational cascades,” which can only develop when investors are able to make their investment decisions sequentially, allowing later investors to condition their bids according to the bids of earlier investors. Welch

(1992) suggests that this causes investors to rationally disregard their own information. As a consequence, demand is seen to either snowball or remain low over time. The possibility of cascades creates market power for early investors.

Loughran and Ritter (2002) propose an explanation for IPO underpricing that explores behavioral biases among the decision-makers of IPO firms. They suggest, according to prospect theory, that perceived gains and perceived losses are measured differently, with perceived gains being valued as more important than perceived losses. Because of this, issuers seem not to care about leaving large amounts of money on the table. They instead focus on the wealth gain from retained shares, which is often quite large, as prices jump in the aftermarket.

In addition to Ljungqvist's (2004) four broad headings about underpricing theories, there are several important issues that need to be addressed.

3.5 Additional Important Issues Regarding Underpricing Theories

3.5.1 Reason and Timing of Going Public

Going public marks a turning point in the life cycle of a company. While increased equity can support the firm's future plans for growth, the tradeoff for the firm is increased public scrutiny. In their study of Italian firms, Pagano et al. (1998) found that generally, firms that are going public are not seeking money for growth, but are rebalancing their accounts after a period of high investment and growth. The post-IPO period sees a reduction in leverage as well as investment. They state that going public is a conscious choice that **only** some firms make while others prefer to remain private. Thus, going public is not a natural element in the life cycle of a firm. Lerner (1994) found that there are times (windows of opportunity) when the markets could be

extremely optimistic about a particular industry, and it may be a good time for the firms in that industry to go public.

3.5.2 Valuation of IPOs

Benveniste and Spindt (1989) found that underwriters try to resolve the information asymmetry problem between firms and investors by providing investors with an incentive to reveal private information about the firm. In their study of 190 firms, Kim and Ritter (1999) found that underwriters forecast the next year's earnings numbers and multiply them with PE ratios of comparable firms in the industry to get approximate prices of IPOs. They argue that since most of the firms going public are young firms, it is difficult to adopt the Discounted Cash Flow techniques for valuing these firms, as future cash flows as well as potential discount rates are uncertain. However, they also found that PE ratios using historical earnings numbers do not give accurate results whereas forecasted earnings numbers provide much more accurate valuation. Purnanandam and Swaminathan (2002) say that IPOs are priced 50% higher than their industry peers. They also found that the more the IPO is overpriced with respect to its peers, the worse is its long-term performance.

3.5.3 Allocation Mechanism

The allocation mechanisms are specified by the regulators in different countries. Loughran et al. (1994) discovered 3 main categories across countries: auctions, fixed price offers and book building. Sherman (2005) found that book building is a superior mechanism for selling IPOs as opposed to auctions. Benveniste and Spindt's (1989) model predicts that if the underwriters are allowed to differentiate between investors by offering larger numbers of shares to those

investors who have information that the firm does not have (for example the relative skills of its management), the degree of underpricing can subsequently be reduced.

3.5.4 External Non-Firm-Specific Factors

Seasonal Affective Disorder (SAD) is an extensively-documented medical condition “characterized by recurrent depressions that occur annually at the same time of the year” (Rosenthal et al. 2006), generally the fall and winter months. During SAD periods, it is possible that IPOs need to be priced differently than they are priced at other times during the year. In particular, the theories of Rock (1986) and Benveniste and Spindt (1989) suggest that underwriters purposefully select the offer price in order to create sufficient underpricing to reward investors. In the face of increased investor uncertainty (such as in the presence of SAD or when dealing with a younger firm or both), underwriters, in order to avoid under-subscription, must facilitate higher underpricing. To accomplish this, the underwriters must reduce the offer price relative to their perceived estimate of market value. Thus, for two otherwise identical firms, the firm going public during a SAD period would likely need to price its shares lower to induce investment from investors who are less likely to provide funding due to the influence of SAD. Dolvin and Pyles (2007) examined the influence of SAD on IPOs between 1986 and 2000 and found support for this notion, as issues going public during fall and winter are associated with higher levels of underpricing.

This draws into question whether or not certain firm-level or industry-level characteristics alleviate or further exaggerate the influence of SAD. In particular, it suggests that if a reluctance to accept risk is the key driver in the relationship between SAD and IPO underpricing, IPO firms

that are in the highest risk categories may experience even higher levels of underpricing during periods when sad is SAD prevalent.

3.5.5 Firm Characteristics

Offer size (Megginson and Weiss, 1991) and the age of a firm (Megginson and Weiss, 1991; Logue, 1973; McDonald and Fisher, 1972; Singh et al., 2003) have been associated with IPO underpricing. The level of IPO underpricing is also influenced by a firm's background and past performance. Reside et al. (1994) found the evidence for negative correlation between a firm's age and level of underpricing, which is attributed to greater availability of information when dealing with older firms. In the study of the Indian market by Shelly and Singh (2008), it was found that increased firm age is positively correlated to over-subscription, which implies that higher confidence in firm prospects results in higher underpricing. With respect to firm age, studies such as Islam (2010) and Shelly and Singh (2008) state that there is a positive relationship between the age of a firm and the degree of underpricing. The justification behind this is that the younger a firm, the less transparent it will be in terms of reporting and less information will be available to investors, resulting in a lack of confidence on the part of investors in the firms' future performance; whereas when a firm is well-established and has maintained a stable, positive reputation over a period of time, the investor's confidence will tend to be higher. When the firm engages in an initial public offering, investors will be able to access a greater store of information about the firm, and will thus be keener to purchase the stock, leading to oversubscription, and a higher degree of underpricing.

3.5.6 Industry Classification

The phenomenon of IPO underpricing has been and continues to be studied across the industries by many researchers to examine the implications of industry classification. The most important difference, one which is carried out in this study as well, is the difference between the financial and non-financial industries (Alli et al., 1994; Cagle and Porter, 1996; Tinic, 1988). Since financial institutions are controlled by regulatory bodies, there is less initial uncertainty about the firm value compared to non-regulated industrial firms trying to launch IPOs. Due to greater restrictions, there is less information asymmetry in the market. Alli et al. (1994) examined the difference using two samples from 185 financial and 1361 non-financial institutions that went public within the period of January 1983 to December 1987. Their study found that IPOs of financial institutions were underpriced less frequently than the IPOs of non-financial institutions because of the greater regulatory disclosure requirements imposed on financial institutions result in less uncertainty about the value of issuing firm. Cagle and Porter (1996) also supported that financial institutions exhibit a lower rate of underpricing (4.8% less) compared to other, non-financial industrial institutions, but no significant differences were found between the underpricing of commercial banks and other financial institutions. Contrary to this, Tinic (1988) found that underpricing occurs more frequently among regulated financial than among non-regulated firms because underwriters and issuers tend to underprice IPOs to avoid future legal liabilities for misrepresenting a firm's true value.

3.5.7 Financial Crisis Period (2007 – 2008)

Several studies have examined the relationship between underpricing and the financial crisis of 2007 – 2008. One study done by Zhu (2012) examining US stocks in the financial sector during

the financial crisis period concluded that because the American government made efforts to reduce the effects of the financial crisis by setting comprehensive and mature regulations, accelerated decline of the whole market was averted. Due to this large-scale prevention, the effect of the financial crisis in 2008 was not significant; the fiscal measures the US government took offset any serious negative effects of the crisis. However, results also indicate that IPOs that were announced during the financial crisis period appeared to have lower rates of underpricing, illuminating a negative relationship between underpricing and IPOs carried out during the financial crisis period. According to Zhu (2012) the reason behind that is the low confidence of the public in the market, which caused investors to invest less or to cease investing altogether. A study by Gunturkun et al. (2012) on IPOs observed during the period of 2006-2011 in the Istanbul Stock Exchange concluded that the global financial crisis had an obvious impact on the initial returns. When considered as a whole, this five-year period displayed a positive but weak correlation between the consumer price index and initial returns. When the years were divided and assessed separately, as pre and post crisis, it was found that the consumer price index had a greater effect on initial returns. World oil price was not a determinant in the pre-crisis period, but it was a determinant in the post-crisis period, implying that it was a hugely significant factor in determining the investment criteria after the crisis.

As the literature review demonstrates, many variables have been tested prior to this study to determine their relationship to underpricing. Such variables include firm age, offer size, reputation of underwriters, and the timing of going public, among others. The variables tested in this research include initial return, which is the degree of underpricing, as the dependent variable, and offer size and firm age as the main independent variables. Uncharted territory, such

as industry type and the time of year during which an IPO was offered, will also be incorporated into the study. In order to bolster the existing literature regarding IPOs in GCC countries, data will be collected for IPOs carried out during the period of 2000 to 2013, and will be limited to GCC countries only. Details of how these variables were tested and what they were tested on are presented in the methodology section.

4. Methodology

This section is broken down into five categories starting with the hypotheses, followed by the model created for this study, then details about the variables used, data collection methods, and lastly the techniques applied.

4.1 Hypotheses

Since the purpose of this study is to analyze the relationship between different variables and underpricing, several tests will be carried out to observe the results:

- 1- Testing the relationship between the age of the firm and underpricing, where the age of the firm is the difference between the year the IPO was announced and the year the firm was incorporated
- 2- Testing the relationship between the size of the offer and underpricing
 - i. Large offer size vs. small offer size
- 3- Testing the relationship between industry type and underpricing
 - i. Financial vs. non-financial
 - ii. Differences within the financial industry: banking vs. insurance

4- Testing the relationship between seasonal differences at the time the IPO was announced and underpricing

- i. Fall/winter vs. spring/summer months to measure for SAD
- ii. Ramadan/Eid month vs. non-Ramadan months
- iii. Summer months (July and August) vs. non-summer months
- iv. Financial crisis years vs. non-financial crisis years
 1. Financial crisis (2007 and 2008)
 2. Pre-financial crisis period
 3. Post-financial crisis period

In all cases, the null hypothesis (H_0) assumes that no relationship exists between the dependent and the independent variables. Based on the variables that will be tested, the following eighteen hypotheses have been developed:

H_0 : *There is no relationship between the age of firms and the degree of underpricing.*

H_1 : *There is a relationship between the age of firms and the degree of underpricing.*

This hypothesis is derived from research by Islam (2010) and Shelly and Singh (2008), who state that there is a positive relationship between the age of the firm and the degree of underpricing due to higher levels of investor confidence in firm prospects when a firm has existed for many years. In addition, some studies such as Reside et al. (1994) found evidence for negative correlation between a firm's age and the level of underpricing, which is attributed to the increased availability of information about older firms. Ghosh (2005) found no relationship between firm age and level of underpricing.

H₀: There is no relationship between the offer size and the degree of underpricing.

H₂: There is a relationship between the offer size and the degree of underpricing.

This hypothesis states the higher the offer size, which is the total number of shares offered multiplied by the offer price, the lower the degree of underpricing. This assumption makes sense because when the offer size is proportionately large, it is considered to be an indicator to investors that the company has confidence in its stock and its future prosperity. This in turn would motivate investors to buy the stock, causing underpricing to be somewhat low. Earlier studies such as Islam (2010) found a negative relationship between offer size and degree of underpricing.

H₀: There is no significant difference in the level of underpricing between large offer sizes and small offer sizes.

H₃: There is a significant difference in the level of underpricing between large offer sizes and small offer sizes.

This hypothesis states that the size of an offer, whether a firm is promoting IPOs with small or large offer sizes, has a profound effect on the degree of underpricing. The method of differentiating between the two categories will be explained in more detail in the variables section. There has been no previous research done differentiating between offer sizes and underpricing to the best of my knowledge.

H₀: There is no relationship between the level of underpricing and large offer sizes.

H₄: There is a relationship between the level of underpricing and large offer sizes.

This hypothesis states that when firms have IPOs with large offer sizes, it has a significant impact on the level of underpricing. There has been no previous research done differentiating between offer sizes and underpricing to the best of my knowledge.

H₀: There is no relationship between the level of underpricing and small offer sizes.

H₅: There is a relationship between the level of underpricing and small offer sizes.

This hypothesis basically states that there is a significant relationship between the level of underpricing and a small offer size. There has been no previous research done differentiating between offer sizes and underpricing to the best of my knowledge.

H₀: There is no significant difference in the level of underpricing between IPOs in financial and non-financial industries.

H₆: There is a significant difference in the level of underpricing between IPOs in financial and non-financial industries.

The alternative hypothesis is testing whether the IPOs of financial institutions are tend to be underpriced less frequently than the IPOs of non-financial institutions as a result of less uncertainty about the value of the issuing firm due to greater regulatory disclosure requirements, as per research done by Alli et al. (1994).

H₀: There is no significant difference in the level of underpricing between IPOs within the financial industry with regards to banking vs. insurance.

H₇: There is a significant difference in the level of underpricing between IPOs within the financial industry with regards to banking vs. insurance.

The alternative hypothesis is testing whether or not there is a difference in the level of underpricing between the banking and insurance fields within the financial sector. To the best of my knowledge, there has been no previous research done differentiating the variations in underpricing among the industries within a specific sector.

H_0 : There is no significant difference in the level of underpricing between IPOs announced within summer months (July and August) and non-summer months.

H_8 : There is a significant difference in the level of underpricing between IPOs announced within summer months (July and August) and non-summer months.

The alternative hypothesis is testing changes in the level of underpricing in IPOs announced during the peak summer months in the GCC region (July and August), as compared to every other month of the year. There has been no previous research into the effects of IPO underpricing that differentiates between summer and non-summer months, to the best of my knowledge.

H_0 : There is no significant difference in the level of underpricing between IPOs announced within Ramadan months and non-Ramadan months.

H_9 : There is a significant difference in the level of underpricing between IPOs announced within Ramadan months and non-Ramadan months.

The alternative hypothesis seeks to whether a notable difference in the level of IPO underpricing exists between the month of Ramadan and the non-Ramadan months. Ramadan is the ninth month of the Muslim year, during which strict fasting is observed from dawn to sunset.² Working hours are usually shortened during this time in most Muslim Arab countries. The Islamic calendar

² <http://islam.about.com/od/ramadan/f/ramadanintro.htm>

is not a constant one; it changes from one year to the next, so the month of Ramadan changes accordingly. There has been no previous research done to the best of my knowledge that compares the levels of IPO underpricing during Ramadan to the levels existing during non-Ramadan months.

H_0 : There is no relationship between the level of underpricing and IPOs during Ramadan months.

H_{10} : There is a relationship between the level of underpricing and IPOs during Ramadan months.

The alternative hypothesis examines the effect of national Ramadan observance on the level of underpricing and the announcement of IPOs during the months of Ramadan.

H_0 : There is no relationship between the level of underpricing and IPOs during non-Ramadan months.

H_{11} : There is a relationship between the level of underpricing and IPOs during non-Ramadan months.

The alternative hypothesis seeks to discover the nature of the relationship between underpricing levels and IPOs announced during non-Ramadan months.

H_0 : There is no relationship between IPOs announced during fall/winter months and degree of underpricing.

H_{12} : There is a relationship between IPOs announced during fall/winter months and degree of underpricing.

According to research by Zuckerman (1994), individuals influenced with Seasonal Affective Disorder (SAD) tend to be more risk averse, meaning their willingness to accept risk decreases. Since SAD tends to arise in response to less exposure to sunlight, underpricing tends to be more severe for firms that undergo an IPO during seasons in which there is less daylight (Dolvin and Pyles 2007), hence the positive relationship between IPOs announced during fall/winter months and underpricing. In addition, research by Dolvin and Fernhaber (2013) confirms the influence of SAD on IPO underpricing, and demonstrates that younger firms experience even higher underpricing during periods most heavily associated with SAD.

H_0 : There is no significant difference in the level of underpricing between IPOs announced during the global financial crisis period (2007 and 2008) and non-crisis years.

H_{13} : There is a significant difference in the level of underpricing between IPOs announced during the global financial crisis period (2007 and 2008) and non-crisis years.

The alternative hypothesis is testing whether or not, and to what degree, the global financial crisis affected IPO underpricing by way of comparing the levels of underpricing that occurred during the crisis to those that occurred during non-crisis years. According to Zhu (2012), the financial crisis has resulted in a negative relationship between underpricing and IPOs that were carried out during that period.

H_0 : There is no relationship between IPOs announced during the global financial crisis period (2007 and 2008) and the degree of underpricing.

H_{14} : There is a relationship between IPOs announced during the global financial crisis period (2007 and 2008) and the degree of underpricing.

The alternative hypothesis seeks to define the relationship between IPOs announced during the 2007 and 2008 global financial crisis and subsequent levels of underpricing. According to Zhu (2012), the relationship between underpricing and IPOs carried out during the financial crisis period is negative.

H₀ : There is no significant difference in the level of underpricing between IPOs announced in the years prior to the global financial crisis period (2007 and 2008) and those announced during the crisis period.

H₁₅ : There is a significant difference in the level of underpricing between IPOs announced in the years prior to the global financial crisis period (2007 and 2008) and those announced during the crisis period.

The alternative hypothesis compares the level of underpricing between IPOs announced in the years preceding the crisis and those announced during the fiscal crisis (2007 and 2008). Gunturkun et al. (2012) stated that there is a difference in the level of underpricing between IPOs announced in the pre-crisis period and during the crisis period. The main independent variable that exhibited a strong positive relationship with underpricing was the consumer confidence index.

H₀ : There is no significant difference in the level of underpricing between IPOs announced in the years following the global financial crisis period (2007 and 2008) and those announced during the crisis period.

H₁₆ : There is a significant difference in the level of underpricing between IPOs announced in the years following the global financial crisis period (2007 and 2008) and those announced during the crisis period.

The alternative hypothesis is testing whether or not a difference in the level of underpricing exists between IPOs announced in the years after the financial crisis and those announced during the crisis (2007 and 2008). According to Gunturkun et al. (2012), the post-crisis period stands out from the other periods in that world oil price negatively affected Initial Returns.

H_0 : There is no significant difference in the level of underpricing between IPOs announced in the pre-crisis period and those announced in the post-crisis period.

H_{17} : There is a significant difference in the level of underpricing between IPOs announced in the pre-crisis period and those announced in the post-crisis period.

The alternative hypothesis is testing the difference in the degree of underpricing between IPOs announced in the years before the financial crisis and the years after the financial crisis. To the best of my knowledge, there has been no previous research done differentiating the levels of underpricing in the pre- and post-financial crisis years.

H_0 : Variables are not significant when combined together in one model.

H_{18} : Variables are significant when combined together in one model.

The alternative hypothesis is testing the significance of the following variables when combined together into one model: independent variables such as firm age, offer size, and month IPO was carried out, as well as dummy variables such as large vs. small offer size, financial vs. non-financial industry type, summer vs. non-summer months, Ramadan vs. non-Ramadan months, SAD months, and financial crisis period differentiation.

4.2 The Model

The model used for this study is primarily based on the model constructed by Islam (2010) in his research investigating Underpricing of Initial Public Offerings in the Chittagong Stock Exchange.

Islam (2010) used the following model:

$$UND = \alpha_0 + \alpha_1 AOF + \alpha_2 SOF + \alpha_3 SOFF + \alpha_4 TIME + \alpha_5 TYPE + \varepsilon$$

Where *UND* = Underpricing/Overpricing, *AOF* = Age of the firm, *SOF* = Size of the firm, *SOFF* = Size of the offer, *TIME* = Timing of the offer, *TYPE* = Type of industry

The above model suggests that initial return (underpricing/overpricing) is mainly determined by the age of the firm, size of the firm, size of the offer, timing of the offer and the type of industry.

These were the independent variables which Islam (2010) tested in order to observe their relationship with initial return once IPO was carried out.

Based on the hypotheses developed for this research, the model used in this study will be quite similar to the one mentioned above, with slight changes as follows:

$$R_i = \alpha_0 + \beta_1 AGE_i + \beta_2 SIZE_i + \beta_3 MONTH_j + D_i + \varepsilon_i$$

Where *R_i* = Initial Return; Underpricing/Overpricing for firm *i*, *AGE_i* = Age of firm *i*, *SIZE_i* = Size of the offer for firm *i*, *MONTH* = Timing of the offer (Ranges from Jan to Dec), *D_i* = Dummy variable

4.3 Variables

In order to examine the determinants of underpricing in the GCC region over the fourteen years spanning from 2000 to 2013, the independent variables mentioned in the model must be tested.

Table 1 shows a summary of the literature research for each variable and the expected results in this study:

Table 1 – Summary of the Literature Review Results

Variables	Variable Details	Literature Review	Literature Result (relationship)	My Predicted Result
Age of Firm	Firm Age	Islam (2010) / Shelly and Singh (2008)	Positive relationship	Negative relationship; the older the firm, the smaller the degree of underpricing
		Reside et al (1994)	Negative relationship	
		Ghosh (2005)	No relationship	
Size of Offer	Offer Size	Islam (2010)	Negative relationship	Negative relationship; the bigger the offer size, the smaller the degree of underpricing
	Large offer vs small offer	-	-	large offer sizes have smaller degree of underpricing than small offer size
Industry	Financial vs Non-Financial	Alli et al (1994)	Relationship exists	Significant difference exists between IPOs issued in financial vs. non-financial industries
	Banking vs Insurance	-	-	Significant difference exists between IPOs issued in banking vs. insurance
Timing of Offer	Month Offer was issued	-	-	Underpricing is higher for IPOs announced in months at the end of the year (4 th Quarter)
	Fall/Winter months	Dolvin and Pyles (2007) Dolvin and Fernhaber (2013)	Positive relationship	Positive relationship; IPOs announced during Fall/Winter months have a higher degree of underpricing
	Islamic Seasonality - Ramadan and Eid months	-	-	Positive relationship; IPOs announced during Ramadan months have a higher degree of underpricing
	Summer vs non summer months	-	-	Positive relationship; IPOs announced during summer months have a higher degree of underpricing
	crisis period (2007 and 2008)	Zhu (2012)	Negative relationship	Positive relationship; IPOs announced during the crisis period have a higher degree of underpricing
	Prior crisis period vs during crisis period	Gunturkun (2012)	Relationship exists	degree of underpricing before crisis period is higher than during crisis
	During crisis period vs post crisis period	Gunturkun (2012)	Relationship exists	degree of underpricing post crisis period is lower than during crisis
	Before vs after crisis period	-	-	degree of underpricing prior to crisis period is higher than post crisis

After reviewing the variables presented in the literature, certain variables were selected to be tested in this study. Table 2 lists the variables and explains how each variable has been calculated and determined.

Table 2 – Variables Determination

Type	Variable	Explanation
Dependent variable	Initial Return (R)	It is measured by the initial day returns which is calculated by taking the difference of the closing price of the first day with the offering price and dividing it by the offer price (Islam et al., 2010): $R_{j1} = [P_{j1} - P_{j0}] / P_{j0}$. Where R_{j1} is the return of stock j at end of first trading period (list price), P_{j1} is the price of stock j at the end of first trading period, and P_{j0} is the offer price of stock j.
Independent variables	Age of Firm (AGE)	Firm age is measured in years as the difference between the offer year (year the security was priced), and the year of incorporation of the firm (David, 2002)
	Size of Offer (SIZE)	Offer size is the total amount to be raised through the IPO. It is measured as the total number of shares offered multiplied by the offer price.
	Timing of Offer (MONTH)	Months are given numerical values starting with 1 for January, 2 for February and so on up to 12 for December.
Dummy variables	Size of Offer (D_{size})	In order to measure whether or not the size makes a difference, the median of Offer Size will be calculated; the dummy variable takes a value of 1 if the offer size is equal to or higher than the median and takes a value of 0 if it is lower.
	Financial vs Non-Financial Industry (D_{Ind})	The dummy variable takes a value of 1 if it is a Financial industry and a value of 0 otherwise.
	Banking vs Insurance Industry ($D_{bank/Ins}$)	The dummy variable takes a value of 1 if it is a Banking industry and a value of 0 if it is an Insurance Industry.
	Timing of Offer (D_{summer})	The dummy variable assigned takes a value of 1 if the timing of offer was during July and August, and takes a value of 0 otherwise.

Table 2 continued

Dummy variables	Timing of Offer (Dramadan)	The dummy variable assigned takes a value of 1 if the timing of offer was during the months that Ramadan/Eid took place for each year ³ , and takes a value of 0 otherwise.
	Timing of Offer (DSAD)	The month in which the offer was carried out (to measure the effect of SAD). The dummy variable assigned takes a value of 1 if the timing of offer was between (and including) the months of October to February, and takes a value of 0 otherwise.
	Timing of Offer (Dcrisis)	The dummy variable assigned takes a value of 1 if the timing of offer was during 2007 and 2008, and takes a value of 0 if timing of offer was either before or after crisis period.
	Timing of Offer (Dprecrisis)	The dummy variable assigned takes a value of 1 if the timing of offer was during 2007 and 2008, and takes a value of 0 if the timing of the offer was before crisis years. IPOs after crisis years are excluded.
	Timing of Offer (Dpostcrisis)	The dummy variable assigned takes a value of 1 if the timing of offer was during 2007 and 2008, and takes a value of 0 if the timing of the offer was after crisis years. IPOs before crisis years are excluded.
	Timing of Offer (Dprevspost)	The dummy variable assigned takes a value of 1 if the timing of offer was after crisis period, and takes a value of 0 if the timing of the offer was before crisis years. IPOs during the crisis years 2007 and 2008 are excluded.
Log of variables	Log Size of Offer (LOGsize)	The natural logarithm of offer size will be used in order to get rid of any size bias and to remove heteroscedasticity

4.4 Data and Sample

The data used in this study was secondary data gathered from FactSet, a provider of computer-based financial data and analysis for financial professionals. FactSet consolidates data on global markets, public and private companies, and equity and fixed-income portfolios⁴. Some difficulty

³<http://www.timeanddate.com/holidays/us/ramadan-begins>

⁴<http://www.investopedia.com/terms/f/factset.asp>

was faced when it came to data collection as most providers of this kind of service require subscription or do not permit a trial period. Thanks to FactSet, a trial period was provided with ample time to gather the required data for this study. The program was user friendly, tailored to the user's needs, and contained comprehensive and informative data.

This research introduced and used the method of subsampling to select companies that underwent the process of an IPO in one of the six GCC countries throughout the period of 2000 to 2013. The combination of the subsampling method, which allows for the inclusion of previously overlooked countries such as Bahrain, and the introduction of new, previously untested external variables such as SAD and differentiation of industry type, contribute to bridging the gap between this and previously conducted research.

Data cleaning, which is the process of detecting and correcting corrupt or inaccurate records from a database⁵, was performed on the population in order to exclude companies with insufficient data that were lacking information about offer price, first day listing price, offer date, date of incorporation, and total shares offered. The data selection includes IPO issuers in all sectors; no industry was excluded. The corrected population data was then filtered: The offer type selected was Initial Public Offering only, meaning all follow-on equity issues were excluded. In addition, the only offer status selected was the *Priced* status, which includes the offerings that have been closed and purchased by investors. The remaining offer statuses such as *In registration*, *Postponed* and *Withdrawn* were all excluded. Once the filtrations took place, the sample was produced, comprising 194 companies in total. Table 3 shows a summary of population and sample data segregated by country.

⁵ http://en.wikipedia.org/wiki/Data_cleaning

Table 3 – Population and Sample Data by Country

Country	Population <i>(Offerings in GCC Countries from 2000 to 2013)</i>	Sample <i>(only Priced IPOs)</i>	%
Bahrain	14	12	85.7%
Kuwait	82	8	9.7%
Oman	19	19	100%
Qatar	27	18	66.6%
Saudi Arabia	98	95	96.9%
United Arab Emirates	87	42	48.2%
Total GCC	327	194	59.3%

When data for Offerings during the period of 2000 to 2013 was searched, the results included 41,889 companies. The data was then filtered further to isolate IPOs (as opposed to the combination of IPOs and follow-ons), and then further distilled to include only priced IPOs. This narrowed down the results to 19,496 companies. One further step was taken to filter the location, so only companies situated in GCC countries were considered. Once the search was limited to Bahrain, Saudi Arabia, United Arab Emirates, Qatar, Kuwait and Oman, the final sample size that came up was 194 companies (Appendix 1). Kuwait's sample size was significantly smaller than its population is because 74 out of its 82 companies' offer prices were not available.

4.5 Techniques

Ordinary Least Squares (OLS) method and multiple regression have been applied to determine what factors significantly explain underpricing in the GCC Market. This technique was carried out by Islam et al. (2010). Multiple regression is the most suitable technique to ascertain the relationship between dependent and independent variables. The t-test will be used to test the significance of the individual variables first. Additionally, descriptive statistics will be used to

describe each variable and to highlight any unusual observations. This is used as a statistical element to test for the assumptions of the regression. Furthermore, the correlation matrix will be developed to observe any relationship among the variables which will help in developing the regression model and to detect if any multi-co-linearity exists.

4.5.1 Multiple Regression

Multiple regression is a statistical technique that uses several explanatory variables to predict the outcome of a response variable. The goal of multiple regression is to model the relationship between the explanatory and response variables⁶; it was used in this study to discern and study the relationship between the dependent variable defined earlier as underpricing, and various independent variables such as age of firm, size of offer, and timing of offer.

Multiple regression has several main assumptions which have been presumed throughout the regression analysis:

- A. **Normality of the variables:** This assumption states that variables should be normally distributed. Variables that are not normally distributed such as highly-skewed (positively or negatively) or kurtotic variables can distort relationships and impair the accuracy of significance tests. In order to test this assumption, visual inspection of data plots, skewness, and kurtosis will give information about normality. Observation points that are distant from other observations (outliers) can be identified through visual inspection of histograms or frequency distributions.
- B. **Linear relationship between the dependent and independent variables:** Multiple regression can only accurately estimate the relationship between dependent and

⁶<http://www.investopedia.com/terms/m/mlr.asp>

independent variables if the relationship is linear in nature. If the relationship between the independent variables and the dependent variable is not linear, the results of the regression analysis will under-estimate the true relationship, which means it increases the chances of Type I and Type II errors. Authors such as Pedhazur (1997), Cohen and Cohen (1983), and Berry and Feldman (1985) suggest examining the residual plots through scatter diagrams, which are used during regression analysis to detect non-linearity.

- C. **Measurement of variables:** In simple correlation and regression, unreliable measurement causes relationships to be under-estimated, increasing the risk of Type II error which is accepting the null hypothesis when it is false. In the case of multiple regression or partial correlation, the effect of other variables can be over-estimated if the covariate is not reliably measured, as the full effect of the covariate(s) would not be removed. This is a significant concern if the goal of research is to accurately model the real relationships evident in the population. Correction for low reliability is simple, and widely disseminated in most texts on regression, but rarely seen in the literature.
- D. **Assumptions of homoscedasticity:** Homoscedasticity refers to stability in the variance of errors across all levels of the independent variables. When the variance of errors differs at different values of the independent variables, heteroscedasticity is indicated. According to Berry and Feldman (1985) and Tabachnick and Fidell (1996), slight heteroscedasticity has little effect on significance tests; however, when heteroscedasticity is marked, it can lead to serious distortion of findings and can seriously weaken the analysis as a whole, thus increasing the possibility of a Type I error. This assumption can be checked by visually examining a plot of the standardized residuals (the

errors) according to the regression standardized predicted value, and by examining the results of the F-test.

- E. **Multicollinearity should not be present:** Multicollinearity occurs when more than two independent variables are interrelated. Multicollinearity occurs when the model includes multiple factors that are correlated not just with the dependent variable, but also with each other. In other words, it results when there are factors that are a bit redundant. Multicollinearity increases the standard errors of the coefficients, which results in the coefficients for some independent variables being dismissed as not significantly different from zero. Thus, by overinflating the standard errors, multicollinearity makes some variables statistically insignificant when they should be significant, whereas without multicollinearity, those coefficients might be significant. Severe multicollinearity is a major problem because it increases the variance of the regression coefficients, making them unstable. The more variance they have, the more difficult it is to interpret the coefficients.

These widely-recognized assumptions of multiple regression have been tested in this study. Hence, before starting with the techniques, the descriptive statistics will be examined in order to roughly observe how the variables look, to check the data and to ensure there aren't any discernable errors through a visual inspection of the descriptive statistics.

4.5.2 Descriptive Statistics

Descriptive statistics is a type of data analysis, and the term refers to describing, showing or summarizing data in a meaningful way so that patterns might emerge; put simply, it is a thorough way to assess and describe collected data. Descriptive statistics do not make conclusions that

reach beyond the data that was analyzed, nor do they reach conclusions regarding any hypotheses that were made.

Descriptive statistics are important because if raw data is simply presented, it would be difficult to visualize what the data reveals, especially if it is a large sample. Descriptive statistics therefore enable us to present data in a more meaningful way, which allows simpler and often more precise interpretation of the data. Four basic types of descriptive statistics were used to analyze the data collected in this study.

- A. Measures of central tendency:** This practice determines the central position in a frequency distribution table. This central position is described using a number of statistics, including the mean and median.
- B. Measures of spread:** This method of summarizing data relies on measuring the distance, or spread, of the numbers. The statistics used to describe measures of spread include range, quartiles, absolute deviation, variance and standard deviation.
- C. Skewness:** This is a measure of symmetry, or more precisely, a lack of symmetry. A distribution, or data set, is symmetric if it looks the same to the left and right of the center point. If this balance exists, skewness is said to be close to zero, and the data is deemed normally distributed. Otherwise, it is skewed to the right or to the left.
- D. Kurtosis:** This approach measures how peaked or flat data is on the chart relative to a normal distribution. That is, data sets with high kurtosis tend to have a distinct peak near the mean, decline rather rapidly, and have heavy tails. Data sets with low kurtosis tend to have a flat top near the mean rather than a sharp peak. Both kurtosis and skewness coefficients are used to test the normality of variables.

5. Findings and Discussion

The following section provides results and analysis of the tests carried out. It begins with descriptive statistics, followed by histograms, correlation matrix, sector analysis, country analysis and finally regression analysis.

5.1 Descriptive Statistics

The descriptive statistics for the data is presented in order to make sure error is minimal. It found that six companies had negative ages, where the offer dates of those companies appeared to be a year earlier than the date of incorporation. Instead of excluding them from the data set, the date of incorporation was checked for all six firms, and they all appeared to be the same as their offer date, therefore the amendment was made. The revised descriptive statistics is presented in table 4:

Table 4 – Descriptive Statistics

Measures	<i>UNDERPRICING</i>	<i>OFFER SIZE</i>	<i>FIRM AGE</i>
Mean	1.530	330.376	12.335
Standard Error	0.232	46.620	1.154
Median	0.470	112.863	4
Standard Deviation	3.232	649.348	16.073
Skewness	4.329	4.148	1.717
Kurtosis	27.455	20.257	4.298
Minimum	-0.953	3.977	0
Maximum	27.997	4810	101
Number of Observations	194	194	194

With regards to the measures of central tendency, the underpricing variable shows a mean of 1.53, which can be translated to 153%. This means that based on the data gathered, the mean of the initial day returns is 153% more than the offer price; it can thus be inferred that the majority of the companies in the sample size were initially underpriced. The average offer size was 330.376, which falls somewhere in the middle as shown in the histogram concerning offer size. The mean age of firms undergoing IPOs is approximately 12 years.

When a sample mean deviates from the actual mean of a population, the deviation is the standard error. The smaller the standard error, the more representative the sample will be of the overall population⁷. The underpricing variable has a small standard error of 0.232, meaning that the sample size is, indeed, representative of the population. The standard error of the offer size is 46.62 and firm age is 1.154. The standard error is also inversely proportional to the sample size; the larger the sample size, the smaller the standard error.

The median of the underpricing variable is 0.47, which is less than the mean of 1.53, and indicates that there is a large difference between the returns of the companies when they are listed in order from smallest to largest. The medians of offer size and firm age are 112.863 and 4 respectively, which might be low for the aforementioned reason regarding underpricing.

Standard deviation is a measure of the dispersion of a set of data from its mean. It provides an indication of how far the data vary or "deviate" from the mean⁸, and determines if the data are more concentrated around the mean, or scattered far and wide. The more spread apart the data, the higher the deviation. The standard deviation of the underpricing variable is 3.232, offer size

⁷<http://www.investopedia.com/terms/s/standard-error.asp>

⁸<http://www.surveystar.com/startips/jan2013.pdf>

is 649.248, and age is 16.037. Both the underpricing and offer size standard deviations are relatively higher than their means, indicating that the data for these variables are quite spread apart. The standard deviations of the remaining variables are not as deviated as underpricing and offer size, which means that the data for these variables are not as spread apart.

Standard deviation is calculated as the square root of variance. The reason that variance is squared is to ensure that the differences between the data and the mean are positive. A large variance indicates that numbers in the data set are far from the mean and each other, while a small variance indicates the opposite. The interpretation of variance is similar to that of standard deviation, as stated above.

Although the distribution is not symmetrical, the skewness of all the variables is positive, which means that the tails of their distributions are located to the right of their mean. When a distribution is positively skewed, the mean is greater than the median, reflecting the fact that the mean is sensitive to each piece of data in the distribution, and is therefore subject to large shifts when the sample is small and contains extreme data.⁹

The kurtosis of all the variables is positive, and the variables consistently exhibit a sharp peak, especially underpricing and offer size, which are considerably high at 27.45 and 20.25, respectively.

The minimum and maximum are additional indicators used to verify that no errors exist in the data set. These indicators reveal that for a variable such as underpricing, the minimum was -95%, which means that a number of companies in the data set were overpriced at the offer date,

⁹<http://bobhall.tamu.edu/FiniteMath/Module8/Introduction.html>

after which the price declined and was significantly lower at the end of the first trading day. The maximum shows 2800%, which is the highest degree of underpricing in this data set.

All the variables have a count of 194, indicating that the data set for each variable is complete with no errors.

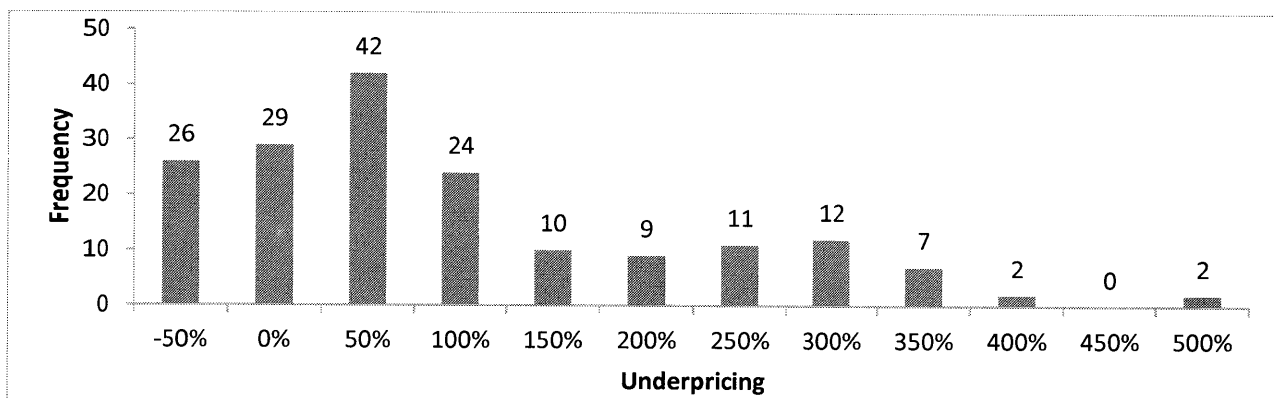
5.2 Histograms

Histograms allow a visual interpretation of numerical data by indicating the number of data points that lie within a range of values, which is called a class. The frequency of the data that falls in each class is depicted by the use of a bar.¹⁰ A histogram is also an effective graphical technique for showing both the skewness and kurtosis of a data set.

Histograms in general are only applicable to numerical data; therefore, histograms were used only to represent underpricing, firm age, offer size, and month IPO was carried out.

The following figures are histogram depictions of the above-mentioned variables:

Figure 1 – Level of Underpricing



¹⁰<http://statistics.about.com/od/HelpandTutorials/a/What-Is-A-Histogram.htm>

Figure 2 – Offer Size of IPOs

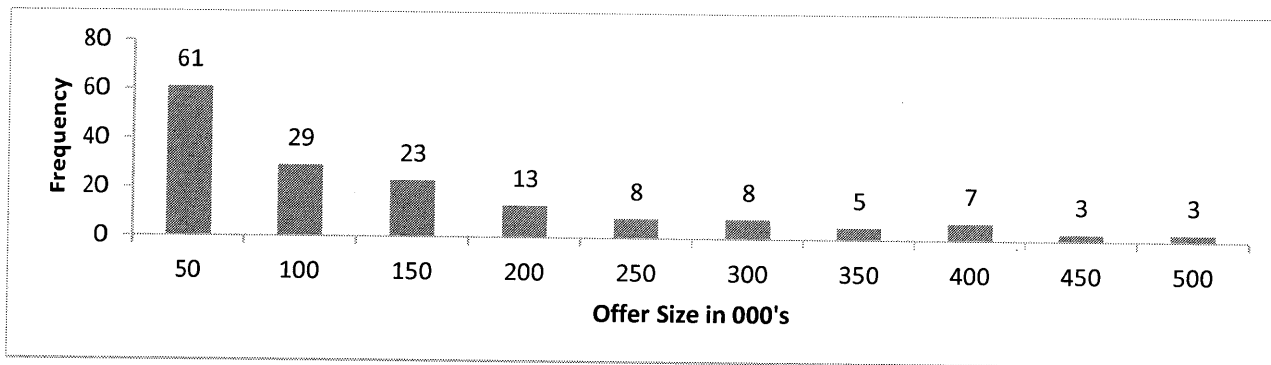


Figure 3 – Firm Age and Time of IPO

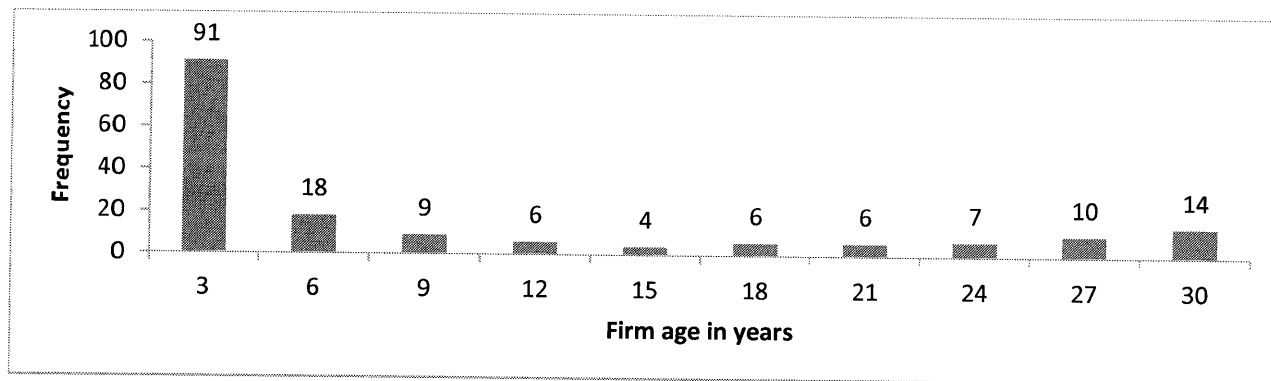
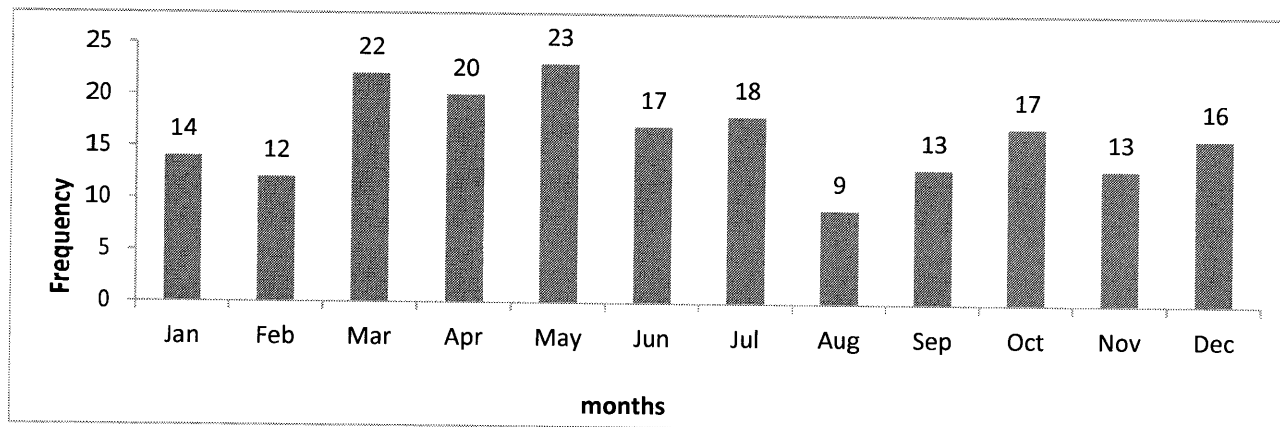


Figure 4 – Month IPO was carried out



As shown in the histograms, the data for these variables is not normally distributed; skewness is present. Underpricing, offer size and firm age are all positively skewed, showing tails to the right. In this case, the mean and the median are both greater than the mode. As a general rule, the

mean will be greater than the median when data is skewed to the right¹¹. Points that are far from the regression line (outliers) have been removed before producing the histograms. Outliers for level of underpricing were companies whose level of underpricing was above 500%; it included 20 companies. The offer size outliers were companies that had offer sizes above \$500,000; this included 34 companies. As for the firm age, the outliers included 23 companies more than 30 years old. More explanation concerning outliers can be found in section 5.3.1.

5.3 Correlation Matrix

A correlation matrix like the one presented below is a matrix that gives the correlation (r) between all pairs of variables in a data set:

Table 5 – Correlation Matrix

Variables	<i>UNDERPRICING</i>	<i>OFFER SIZE</i>	<i>FIRM AGE</i>	<i>MONTH</i>
UNDERPRICING	1			
OFFER SIZE	-0.006	1		
FIRM AGE	-0.160	-0.019	1	
MONTH	0.018	-0.007	0.027	1

The correlation matrix shows that there is a negative relationship between underpricing and offer size ($r = -0.006$), between underpricing and firm age ($r = -0.160$), between offer size and firm age ($r = -0.019$) and between offer size and month ($r = -0.007$). The positive relationships are between underpricing and month ($r = 0.0175$) and between firm age and month ($r = 0.027$). However, all correlations are relatively weak, with the highest correlation being a negative one between underpricing and firm age.

¹¹<http://statistics.about.com/od/Descriptive-Statistics/a/What-Is-Skewness.htm>

5.3.1 Outliers and extreme values

An outlier is a point which lies far from the regression line that has been computed for a collection of data. It generally has a large residual value. Such points may represent erroneous data, or may indicate a poorly fitting regression line. Table 5 shows the correlation between variables, including all outliers.

Another correlation matrix was produced by excluding outliers, which comprised the top 10% of underpricing variables. In addition, in order to eliminate any size bias and avoid heteroscedasticity, the log of offer size was taken into account. The results of this adjusted correlation matrix is presented in table 6.

Table 6 – Correlation Matrix Excluding Outliers

Variables	<i>UNDERPRICING</i>	<i>FIRM AGE</i>	<i>LOG OFFER SIZE</i>	<i>MONTH</i>
UNDERPRICING	1			
FIRM AGE	-0.272	1		
LOG OFFER SIZE	-0.188	0.131	1	
MONTH	0.043	0.005	-0.072	1

After adjusting the data by removing outliers, the correlation matrix between the variables seems to present more accurate results. The highest correlation appears to be -0.272, and is a negative correlation between underpricing and firm age. This indicates that the older the firm's age, the lower the level of underpricing. The correlation between underpricing and offer size is also negative, indicating that the higher the offer size, the lower the level of underpricing. These results are in line with several prior studies, such as Islam (2010).

5.4 Sector Analysis

Sector analysis was also carried out on the data set based on the sectorial allocation provided by FactSet. Table 7 provides an overview of the IPO underpricing on according to sector:

Table 7 – Sector Analysis

Sector	Number of Companies	Mean level of Underpricing	Standard Deviation	Maximum	Minimum
Transportation	8	322%	6.413	1885%	-38%
Finance	89	230%	4.014	2800%	-95%
Health Services	4	160%	1.738	352%	-35%
Process Industries	16	118%	1.531	511%	-53%
Producer Manufacturing	5	105%	1.015	259%	10%
Non-Energy Minerals	12	102%	1.776	598%	-100%
Distribution Services	7	59%	1.670	331%	-87%
Communications	10	59%	1.042	296%	-82%
Utilities	10	55%	1.615	307%	-90%
Consumer Services	8	48%	1.051	241%	-47%
Industrial Services	12	46%	1.539	478%	-80%
Health Technology	2	41%	0.409	70%	12%
Miscellaneous	6	31%	0.653	155%	-19%
Retail Trade	2	-29%	0.608	14%	-72%
Consumer Non-Durables	3	-34%	0.778	54%	-95%
Grand Total	194	154%	3.247	2800%	-100%

The highest average level of underpricing recorded for the GCC companies that had IPOs during the years 2000 and 2013 came from the Transportation sector, with the mean level of underpricing as high as 322%, and a standard deviation of 6.413. Seven companies from the transportation sector exhibited underpricing. The next highest level of underpricing was found in the Finance sector, with the level of underpricing reaching 230%, and a standard deviation of 4.014. There were 65 underpriced companies from this sector. The Health Services sector

recorded the third highest level of underpricing (160% with a standard deviation of 1.738). Three out of the four companies listed under the Health Services sector were underpriced.

The lowest level of underpricing recorded was for the Miscellaneous sector, which included six companies and had an average level of underpricing of 31% and a standard deviation of 0.652.

On the other hand, two sectors tended toward overpricing instead of underpricing when carrying out IPOs. The highest level of overpricing was in the Consumers Non-Durables sector, which exhibited an overpricing rate of 34% and a standard deviation of 0.778. Two out of the three companies listed under this sector were overpriced. The second sector which was overpriced was the Retail Trade sector, overpricing at an average of 29% with a standard deviation of 0.608. This sector consisted of only two companies, one of which appeared to be highly overpriced (72%).

The highest level of underpricing overall came from a company listed in the Finance sector, which was underpriced at 2800%, and the highest overpricing came from a company in the Non-Energy minerals sector, and was overpriced at 100%.

5.5 Country Analysis

In addition to sector analysis, country analysis was carried out on the data set. Table 8 provides an overview of the IPO underpricing on a country-by-country basis:

Table 8 – Country Analysis

Country	Number of Companies	Mean level of Underpricing	Standard Deviation	Maximum	Minimum
Bahrain	12	-26%	0.488	51%	-92%
Kuwait	8	132%	1.386	331%	-19%
Oman	37	-13%	0.843	214%	-95%
Qatar	36	196%	2.982	1127%	-88%
Saudi Arabia	95	162%	2.545	1357%	-100%
United Arab Emirates	42	235%	5.200	2800%	-86%
Grand Total	194	152%	3.236	2800%	0%

The highest average level of underpricing recorded was from the United Arab Emirates, with the mean level of underpricing as high as 235%, and a standard deviation of 5.200. Thirty-five out of 42 companies were underpriced from the UAE. The next highest level of underpricing was found in Qatar, with a level of underpricing reaching an average of 196% and a standard deviation of 2.982. Thirteen out of 18 companies from Qatar were underpriced. Saudi Arabia recorded the third highest average in level of underpricing (162% with a standard deviation of 2.545). Seventy-three out of the 95 companies listed under Saudi Arabia were underpriced.

On the other hand, the IPOs carried out in two countries were overall overpriced instead of underpriced: Bahrain and Oman. The highest level of overpricing was in Bahrain, which showed an average of 26% in overpricing, with a standard deviation of 0.488. Seven out of the 12 companies listed under Bahrain were overpriced. Oman's average overpricing was at 13% with a standard deviation of 0.843. Nine out of 19 companies which were listed in Oman were overpriced.

The highest level of underpricing recorded came from a company listed in the United Arab Emirates, which was underpriced at 2800%, and the highest overpricing came from a company listed in Saudi Arabia, and was overpriced at 100%.

5.6 Models Developed

Multiple regression analysis was used to pinpoint factors that significantly affect underpricing in IPOs carried out in the GCC region by way of the variables being tested. Upon running the regression analysis, the following model was developed:

Model 1: Original model

$$R = 1.806 - 0.032AGE - 0.00004SIZE + 0.021MONTH + \varepsilon$$

(3.379) (-2.242)** (-0.129) (0.303)

** = Significant at 5%

Adjusted $R^2 = 0.012$ SE = 3.218 df = 193

Adjusted R square is 0.012, meaning that only 1.2% of the variation in the initial return is explained by the variation in the independent variables. The only significant variable in this model is found to be age, which is significant at the 5% level.

The intercept is the expected mean value of the dependent variable when all independent variables are equal to zero. Therefore, for this specific data set, the initial return (R) is 1.806, or 180%, when all independent variables including age, offer size and month are equal to zero. If the age of a firm increases by one unit, the level of underpricing will decrease by 0.032 units, holding all other variables constant. Although small, the decrease in the level of underpricing due to an increase in age is in line with the predicted outcome of this study as well as with similar studies in the past (Reside et al, 1994). The offer size also appears to have a negative relationship with the level of underpricing, meaning that the higher the offer size, the lower the underpricing level, holding other variables constant; however, in this case, the coefficient seems to be very small and relatively insignificant. The month variable has a positive relationship with the level of underpricing, indicating that the closer the month the IPO was carried out is to the end of the year, the higher the level of underpricing, holding other variables constant.

In order to get rid of any size bias and heteroscedasticity, the natural logarithm of offer size was taken instead of the original offer size. The following model was then constructed:

Model 2: Log of offer size

$$R = 3.763 - 0.027AGE - 1.019LogSIZE + 0.027MONTH + \varepsilon$$

(4.503) (-1.927)** (-2.975)*** (0.396)

** = Significant at 5% *** = Significant at 1%
Adjusted $R^2 = 0.055$ SE = 3.146 df = 193

Adjusted R square is 0.055, meaning that only 5.5% of the variation in the initial return is explained by the variation in the independent variables. The significant variables in this model are found to be age and log size, which are significant at the 5% and 1% levels, respectively.

The initial return (R) is 3.763 when all independent variables are equal to zero. If the age of a firm increases by one unit, the level of underpricing will decrease by 0.027 units, holding all other variables constant. The log offer size also appears to have a negative relationship with the level of underpricing, meaning that the higher the offer size, the lower the underpricing level. If the log offer size increases by one unit, the level of underpricing will decrease by 1.019 units, holding all other variables constant. The month variable has a positive yet insignificant relationship with the level of underpricing.

Another model was developed concerning size, however in this model the log of offer size was removed, and only the dummy variable of size was taken into consideration. All the companies' offer sizes were labeled as either small or large, divided by the median (112.863) of all the companies:

Model 3: Large vs. Small offer size

$$R = 2.362 - 0.029AGE + 0.024MONTH - 0.481D_{Size} + \varepsilon$$

(4.298) (-2.036)** (0.350) (-2.780)***

** = Significant at 5% *** = Significant at 1%
Adjusted $R^2 = 0.049$ SE = 3.155 df = 193

Adjusted R square is 0.049, meaning that only 4.9% of the variation in the initial return is explained by the variation in the independent variables. The significant variables in this model are found to be age and the dummy variable of size, which are significant at the 5% and 1% levels, respectively.

The initial return (R) is 2.362 when all independent variables are equal to zero. If the age of a firm increases by one unit, the level of underpricing will decrease by 0.029 units, holding all other variables constant. Although the month variable exhibits a positive relationship with the level of underpricing, the relationship is insignificant. On the other hand, the dummy variable of size appears to have a significant negative relationship with level of underpricing, meaning that whether the company belongs to the large offer size group or the small offer size group has a considerable effect on the level of underpricing.

In order to determine whether or not there is a notable difference between large-sized companies and small-sized companies, a model was developed for each of the size classes. The following model only includes data for companies which have been classified as large size entities, i.e. companies with offer sizes greater than 112.863:

Model 4: Large offer size only

$$R = -2.066 - 0.035AGE + 1.221LogSIZE_{Large} + 0.04MONTH + \varepsilon$$

(-1.269) (-2.659)*** (2.092)** (0.589)

** = Significant at 5% *** = Significant at 1%
Adjusted R² = 0.092 SE = 2.238 df = 96

Adjusted R square is 0.092, meaning that only 9.2% of the variation in the initial return is accounted for by the variation in the independent variables. Age and log of offer size appear to be the most significant variables in this model, at the 1% and 5% levels, respectively.

When all independent variables are equal to zero, the initial return (R) is -2.066. If the age of a firm increases by one unit, the level of underpricing will decrease by 0.035 units, holding all other variables constant. In addition, the log offer size appears to have a significant positive relationship with the level of underpricing, meaning that if the log offer size increases then the level of underpricing will increase accordingly. Therefore, if the log offer size increases by one unit, the level of underpricing will increase by 1.221 units, holding all other variables constant. The month variable has shown to have a positive but relatively insignificant relationship with the level of underpricing.

The following model only includes data for companies which belong to the small size category, i.e. companies with offer sizes less than 112.863:

Model 5: Small offer size only

$$R = 6.884 + 0.010AGE - 3.497LogSIZE_{small} + 0.063MONTH + \varepsilon$$

(4.151) (0.379) (-3.221)*** (0.562)

*** = Significant at 1%

Adjusted $R^2 = 0.075$ $SE = 3.678$ $df = 96$

Adjusted R square is 0.075, meaning that only 7.5% of the variation in the initial return is explained by the variation in the independent variables. The significant variable in this model has proven to be the log offer size, which is significant at the 1% level.

The initial return (R) is 6.884 when all independent variables are equal to zero. If the age of a firm increases by one unit, the level of underpricing will increase by 0.035 units, holding all other variables constant. However, age is not a significant variable in this model. The log offer size and the level of underpricing exhibit a negative correlation here, meaning that an increase in the log offer size will incite a corresponding decrease in the underpricing level. Thus, if the log offer size

increases by a single unit, the level of underpricing will decrease by 3.497 units, holding all other variables constant. A positive but insignificant relationship exists between the month variable and the level of underpricing.

In order to assess the significant of industry on underpricing, specifically whether an industry is financial or non-financial, the following model was developed:

Model 6: Financial vs. Non-Financial industry

$$R = 3.487 - 0.025AGE + 0.032MONTH - 0.982LogSIZE + 0.426D_{IND} + \varepsilon$$

(3.888) (-1.743)* (0.477) (-2.842)*** (0.854)

* = Significant at 10% *** = Significant at 1%
Adjusted R² = 0.053 SE = 3.148 df = 193

Adjusted R square is 0.053, meaning that only 5.3% of the variation in initial return is explained by the variation in the independent variables. The significant variables in this model are age and log size, which are significant at 10% and 1% levels, respectively.

The initial return (R) is 3.487 when all independent variables rest at zero. The level of underpricing will decrease by 0.025 units when the age of a firm increases by one unit,, holding all other variables constant. The log offer size appears to be negatively correlated to the level of underpricing, meaning that the higher the log offer size the lower the underpricing level. If the log offer size increases by one unit, the level of underpricing will decrease by 0.982 units, holding all other variables constant. Whereas the month variable has a positive relationship with the level of underpricing, it is insignificant nonetheless. The industry dummy variable has shown to bear no significance on this data, which indicates that whether a firm belongs to the financial or non-financial sector is irrelevant in terms of underpricing.

In order to further investigate the significance of industry, only companies which belong to the financial sector were chosen and subsequently divided into two groups, banking and insurance.

The following model was then developed:

Model 7: Banking vs. Insurance

$$R = 4.199 - 0.025AGE - 1.068LogSIZE - 0.107MONTH + 2.053D_{Bank/Ins} + \varepsilon$$

(2.584) (-0.837) (-1.733)* (-0.930) (2.146)**

* = Significant at 10% ** = Significant at 5%

Adjusted R^2 = 0.255 SE = 2.734 df = 62

Adjusted R square is 0.255, meaning that in this case, 25.5% of the variation in the initial return is explained by the variation in the independent variables. This model has the highest adjusted R square of all models in this study, with log size and the dummy variable of banking vs. insurance being the significant variables, at the 10% and 5% levels, respectively.

The initial return (R) is 4.199 when all independent variables equal zero. If a firm's age increases by one unit, the level of underpricing will decrease by 0.025 units, holding all other variables constant. However, in this model the age variable proves to be insignificant. Furthermore, a negative relationship exists between the log offer size and the level of underpricing, in which a single unit increase in the log offer size results in a 1.068 unit decrease in the level of underpricing, holding other variables constant. While the month variable also exhibits a negative relationship with the level of underpricing, it is not a noteworthy correlation. On the other hand, the dummy variable representing banking vs. insurance exhibits a significant positive relationship with the level of underpricing, meaning that within the financial industry, it is, indeed, relevant whether a company belongs to the banking or insurance industry when carrying out IPOs.

In order to examine whether or not it is significant if an IPO is carried out in a summer or non-summer month, the following model was developed:

Model 8: Summer vs. Non-Summer months

$$R = 3.724 - 0.026AGE - 0.997LogSIZE + 0.032MONTH - 0.441D_{Summer} + \varepsilon$$

(4.438) (-1.778)* (-2.888)*** (0.471) (-0.654)

* = Significant at 10% *** = Significant at 1%
Adjusted R² = 0.052 SE = 3.151 df = 193

Adjusted R square is 0.052, meaning that the independent variables only explain 5.2% of the variation in the initial return. The significant variables in this model are age and log size, which are significant at the 10% and 1% levels, respectively.

The initial return (R) is 3.724 when all independent variables are equal to zero. If the age of a firm increases by one unit, the level of underpricing will decrease by 0.026 units, holding all other variables constant. The log offer size exhibits a significant negative relationship with the level of underpricing whereas if the log offer size increases by one unit, the level of underpricing will decrease by 0.997 units, holding all other variables constant. The month variable has a positive yet insignificant relationship with the level of underpricing. As the dummy variable that signifies the difference between summer and non-summer months has no significance, it can be inferred that, based on this data, it is irrelevant whether an IPO occurs within a summer or a non-summer month.

The data was further analyzed to take into consideration the effect of Ramadan on IPOs, for which the following model was developed:

Model 9: Ramadan vs. Non-Ramadan months

$$R = 3.769 - 0.0273AGE - 1.014LogSIZE + 0.021MONTH + 0.114D_{Ramadan} + \varepsilon$$

(4.494) (-1.917)** (-2.942)*** (0.284) (0.161)

** = Significant at 5% *** = Significant at 1%
Adjusted R² = 0.050 SE = 3.154 df = 193

Adjusted R square is 0.05, meaning that the variation in the independent variables explains just 5% of the variation in the initial return. This model shows that age and log size are the variables with the greatest significance, at the 5% and 1% levels, respectively.

When all independent variables are equal to zero, the initial return (R) is 3.769. If the age of a firm increases by one unit, the level of underpricing will decrease by 0.0273 units, holding all other variables constant. The log offer size has also proven to have a significant negative relationship to the level of underpricing in which a log-offer size increase of one unit corresponds to an underpricing decrease of 1.014 units, holding other variables constant. The month variable has a positive albeit insignificant relationship with the level of underpricing. The dummy variable signifying the difference between a Ramadan or non-Ramadan month has proven to bear significance on the level of underpricing, which indicates that, according to this data, Ramadan has no effect on the IPO process.

In order to assess whether or not a marked difference exists between IPOs carried out during Ramadan and those carried out outside of Ramadan, two models were developed. The following model includes data exclusively for companies which had IPOs during the month of Ramadan:

Model 10: Ramadan months only

$$R = -5.593 + 0.121AGE - 2.997LogSIZE + 1.210MONTH + \varepsilon$$

(-0.616) (1.408) (-1.752)* (1.455)

* = Significant at 10%

Adjusted R² = 0.103 SE = 5.209 df = 28

Adjusted R square is 0.103, meaning that only 10.3% of the variation in the initial return is explained by the variation in the independent variables in this model, where log offer size has been deemed the significant variable, at the 10% level.

The initial return (R) is -5.593 when all independent variables rest at zero. If the age of a firm increases by one unit, the level of underpricing will increase by 0.121 units, holding all other variables constant; however, the age variable is not significant in this model. Neither is the month variable, which exhibits a positive but ineffectual relationship to the level of underpricing. It is the log offer size that appears to have a significant relationship with level of underpricing, and this relationship is negative, in that the higher the log offer size, the lower the underpricing level. For instance, if the log offer size increases by one unit, the level of underpricing will decrease by 2.997 units, holding all other variables constant. The following model only includes data for companies which had IPOs that took place during non-Ramadan months:

Model 11: Non-Ramadan months only

$$R = 3.491 - 0.038AGE - 0.750LogSIZE - 0.001MONTH + \varepsilon$$

(4.944)
(-3.163)***
(-2.536)***
(-0.021)

*** = Significant at 1%

Adjusted R² = 0.088
SE = 2.552
df = 164

Adjusted R square is 0.088, meaning that the variation in the independent variables accounts for only 8.8% of the variation in the initial return. The significant variables in this model are age and log of offer size, which are both equally significant at the 1% level.

The initial return (R) is 3.491 when all independent variables are equal to zero. If the age of a firm increases by one unit, the level of underpricing will decrease by 0.038 units, signifying a negative relationship, and holding all other variables constant. The log offer size also has a significant negative relationship with the level of underpricing, in which a high log offer size results in a low level of underpricing. In this case, if the log offer size increases by one unit, the level of underpricing will decrease by 0.750 units, holding all other variables constant. While the month

variable also has a negative relationship with the level of underpricing, it is of no significance here.

In order to measure the significance of Seasonal Effective Disorder on the IPO process, the following model was developed:

Model 12: Seasonal Affective Disorder

$$R = 3.758 - 0.0267AGE - 1.039LogSIZE + 0.013MONTH + 0.343D_{SAD} + \varepsilon$$

(4.490) (-1.874)* (-3.019)*** (0.178) (0.699)

* = Significant at 10% *** = Significant at 1%
Adjusted R² = 0.052 SE = 3.150 df = 193

Adjusted R square is 0.052, meaning that a mere 5% of the variation in the initial return is explained by the variation in the independent variables. The significant variables in this model are age and log size, which are significant at the 10% and 1% levels, respectively.

When all independent variables are equal to zero, the initial return (R) is 3.758. If the age of a firm increases by one unit, the level of underpricing will decrease by 0.0267 units, holding all other variables constant. The log offer size mirrors this negative relationship to the level of underpricing, whereby a log offer size increase of one unit will result in a decrease in the level of underpricing of 1.039 units, holding all other variables constant. The month variable's positive relationship with the level of underpricing proves insignificant, as does the dummy variable that represents the month (SAD or otherwise) during which the IPO was carried out, which together indicate that the role of season is irrelevant in the IPO process.

The significance of the financial crisis was also measured several times, starting with the model developed below, which shows whether or not IPOs carried out during the years of the financial

crisis (2007 and 2008) show any significant difference from those carried out in the years preceding and following this period:

Model 13: Crisis vs. Non-Crisis period

$$R = 3.186 - 0.035AGE - 0.985LogSIZE + 0.056MONTH + 1.221D_{Crisis} + \varepsilon$$

(3.721) (-2.443)*** (-2.912)*** (0.833) (2.501)***

*** = Significant at 1%

Adjusted $R^2 = 0.080$ $SE = 3.104$ $df = 193$

Here, the adjusted R square is 0.08, which indicates that 8% of the variation in the initial return can be explained by the variation in the independent variables. This model has three noteworthy variables: age, log offer size and the dummy variable crisis period, which are all equally significant at the 1% level.

The initial return (R) is 3.186 when all independent variables are equal to zero. Both the age of a firm and the log offer size appear to have significant negative relationships to the level of underpricing. If the age of a firm and the log offer size increase by one unit, the level of underpricing will decrease by 0.035 units and 0.985 units, respectively, holding all other variables constant. The month variable has a positive yet insubstantially relevant relationship with level of underpricing. In contrast, the dummy variable of crisis period appears to have a notably significant positive relationship with the level of underpricing, from which it can be inferred that the IPO process was significantly affected by the financial crisis.

In order to measure the significance of the financial crisis period, only IPOs carried out during 2007 and 2008 were selected, which resulted in the following model:

Model 14: Crisis period only

$$R = 4.279 - 0.050AGE - 1.051LogSIZE + 0.150MONTH + \varepsilon$$

(3.106) (-2.441)*** (-2.030)** (0.293)

** = Significant at 5% *** = Significant at 1%

Adjusted $R^2 = 0.128$ $SE = 3.165$ $df = 65$

Adjusted R square is 0.128 in this model because the variation in the independent variables accounts for 12.8% of the variation in the initial return. The significant variables in this model are age and log offer size, which are significant at the 1% and 5% levels, respectively.

When all independent variables are equal to zero, the initial return (R) is 4.279. If the age of a firm increases by one unit, the level of underpricing will decrease by 0.05 units, holding all other variables constant. The log offer size appears to have a similarly significant negative relationship with the level of underpricing, in which a high log offer size corresponds to a low level of underpricing; therefore, if the log offer size increases by one unit, the level of underpricing will subsequently decrease by 1.051 units, holding all other variables constant. Although the month variable has a positive relationship with level of underpricing, it proves to be insignificant.

A second model concerning the financial crisis was developed, which took into consideration data concerning IPOs carried out during the pre-crisis period, and compared it against data regarding IPOs carried out during the crisis period, as follows:

Model 15: Pre-Crisis period only

$$R = 3.058 - 0.039AGE - 0.931LogSIZE + 0.0956MONTH + 1.093D_{PreCrisis} + \varepsilon$$

(2.481) (-2.093)** (-2.148)** (1.032) (1.726)*

* = Significant at 10% ** = Significant at 5%

Adjusted $R^2 = 0.060$ $SE = 3.514$ $df = 138$

Adjusted R square is 0.06, meaning that 6% of the variation in the initial return is explained by the variation in the independent variables. The significant variables in this model are age, log

offer size and the dummy variable pre-crisis period, which are significant at the 5%, 5%, and 10% levels, respectively.

The initial return (R) is 3.058 when all independent variables are equal to zero. If the age of a firm increases by one unit, the level of underpricing will decrease by 0.039 units, holding all other variables constant. The log offer size also appears to have a negative relationship with the level of underpricing; as such, if the log offer size increases by one unit, the level of underpricing will then decrease by 0.931 units, holding all other variables constant. The month variable has a positive yet relatively insignificant relationship with the level of underpricing. The dummy variable of pre-crisis period also appears to have a significant positive relationship with the level of underpricing, and this relationship does prove significant, implying that whether an IPO was carried out during the financial crisis years or prior to the crisis period is, indeed, pertinent.

The third model concerning the financial crisis assessed data apropos to IPOs carried out in the post-crisis against data collected in regards to IPOs carried out during the financial crisis. The model is as follows:

Model 16: Post-Crisis period only

$$R = 3.387 - 0.039AGE - 1.177LogSIZE + 0.042MONTH + 1.560D_{PostCrisis} + \varepsilon$$

(3.907) (-2.840)*** (-3.306)*** (0.553) (3.193)***

*** = Significant at 1%

$$Adjusted R^2 = 0.169 \qquad SE = 2.596 \qquad df = 120$$

With an adjusted R square of 0.169, it is understood that 16.9% of the variation in the initial return is explained by the variation in the independent variables. In this model, age, log offer size and the dummy variable post-crisis period stand as the significant variables, at a shared significance level of 1%.

The initial return (R) in this model is 3.387 when all independent variables are equal to zero. Results show a significant negative relationship between the firm's age and the level of underpricing, in which an age increase of one unit will result in an underpricing decrease of 0.039 units, holding all other variables constant. Similarly, if the log offer size increases by one unit, the level of underpricing will decrease by 1.177 units, holding all other variables constant. Once again, the month variable exhibits a positive but insignificant relationship to the level of underpricing. Yet the dummy variable of post-crisis period appears to have a significant positive relationship with the level of underpricing, which suggests that highly relevant differences exist between IPOs carried out during the financial crisis years versus those carried out in the post-crisis period.

The last model concerning the financial crisis excluded all data collected from the financial crisis period, and took into consideration only data from the pre-crisis and post-crisis periods before the crisis and after the crisis. The model can be seen as follows:

Model 17: Pre-Crisis vs Post-Crisis period

$$R = 3.557 - 0.019AGE - 1.008LogSIZE + 0.020MONTH - 0.558D_{PrePostCrisis} + \varepsilon$$

(3.039) (-0.943) (-2.169)** (0.259) (-0.981)

** = Significant at 5%

Adjusted R² = 0.019 SE = 3.089 df = 127

Adjusted R square is 0.019, which means only 1.9% of the variation in initial return is explained by the variation in the independent variables. The only significant variable in this model is the log offer size, at the 5% level.

The initial return (R) is 3.557 when all independent variables are at zero. The age variable has a negative, but largely insignificant relationship to the degree of underpricing, in which a one unit

increase in a firm's age is followed by a 0.019 unit decrease in the level of underpricing, holding all other variables constant. On the other hand, the log offer size has a significant negative relationship with the level of underpricing. If the log offer size increases by one unit, a 1.008 unit decrease in the level of underpricing will ensue, holding all other variables constant. Both the month variable and the dummy variable representing whether an IPO was carried out pre- or post-crisis exhibit a positive relationship with the level of underpricing, yet both of these positive relationships are insignificant. . The insignificance of these numbers indicates that it is irrelevant whether a firm carried out an IPO during the pre-crisis or the post-crisis period.

A final model was developed to include all independent variables in addition to the dummy variables of offer size—large vs. small (D1), industry type—financial vs. non-financial (D2), summer vs. non summer months (D3), Ramadan vs. non Ramadan months (D4), SAD months (D5), and financial crisis period differentiation (D6). These variables were included in order to test whether or not they are significant if combined.

Model 18: All inclusive

$$R = 2.871 - 0.031AGE - 0.950LogSIZE + 0.042MONTH + 0.066D_1 + 0.326D_2 - 0.357D_3 + 0.224D_4 + 0.375D_5 + 1.302D_6 + \varepsilon$$

(2.269) (-2.095)** (-2.712)*** (0.535) (0.069) (0.644) (-0.490) (0.227) (0.699) (1.411)

$$\begin{array}{lll} ** = \text{Significant at 5\%} & & *** = \text{Significant at 1\%} \\ \text{Adjusted } R^2 = 0.063 & SE = 3.132 & df = 194 \end{array}$$

Adjusted R square is 0.063 in this model, meaning that the variation in the independent variables explains only 6.3% of the variation in the initial return. The significant variables in this model are age and log offer size, which are significant at the 5% and 1% levels, respectively.

Here, the initial return (R) is 2.871 when all independent variables are equal to zero. Once again, the results show a significant negative relationship between the level of underpricing and both the firm's age and the log offer size. If the age of a firm increases by one unit, the level of underpricing will decrease by

0.031 units, and if the log offer size increases by one unit, the level of underpricing will decrease by 0.950 units, holding all other variables constant in both instances. The month variable has a positive yet insignificant relationship with the level of underpricing. Similarly, all the dummy variables, including offer size, industry type, Ramadan months, SAD months and financial crisis period differentiation all appear to have positive yet insignificant relationships with underpricing levels. The outlier is the summer vs. non summer months variable, which has a negative relationship to the level of underpricing, but again, the relationship is insignificant. It appears that when combined, the dummy variables lose their significance. However, as presented earlier, when each dummy variable was tested separately with the independent variables, the majority of the output provided significant results.

The following and final table shows a summary of the multiple regression models developed, indicating the significance level of each variable.

Table 9 – Summary of the Multiple Regression Models

Models	V1			V2			V3			V4			Dummy Variable			Dummy Value		Adj R Square	D.F.
	AGE			SIZE			LOGSIZE			MONTH									
	Coef	t-value		Coef	t-value		Coef	t-value		Coef	t-value		Coef	t-value		Coef	t-value		
1	-0.032	-2.243 **		-4E-05	-0.129					0.021	0.303						0.012	193	
2	-0.027	-1.927 **					-1.019	-2.975 ***		0.027	0.396						0.055	193	
3	-0.029	-2.036 **								0.024	0.350		Large vs. Small Size	-0.481	-2.780 ***	0.049	193		
4	-0.035	-2.659 ***					1.221	2.092 **		0.040	0.589		Large Size			0.092	96		
5	0.01	0.379					-3.497	-3.221 ***		0.063	0.562		Small Size			0.075	96		
6	-0.025	-1.743 *					-0.982	-2.842 ***		0.032	0.477		Fin vs. Non Fin Industry	0.426	0.854	0.053	193		
7	-0.025	-0.837					-1.068	-1.733 *		-0.101	-0.930		Banking vs. Insurance	2.053	2.146 **	0.255	62		
8	-0.026	-1.778 *					-0.997	-2.888 ***		0.032	0.471		Summer vs. Non Summer	-0.441	-0.654	0.052	193		
9	-0.027	-1.917 **					-1.014	-2.942 ***		0.021	0.284		Ramadan vs. Non Ramadan	0.114	0.161	0.050	193		
10	0.121	1.408					-2.997	-1.752 *		1.210	1.455		Ramadan Only			0.103	28		
11	-0.038	-3.163 ***					-0.750	-2.536 ***		-0.001	-0.021		Non Ramadan Only			0.088	164		
12	-0.027	-1.874 *					-1.039	-3.019 ***		0.013	0.178		S.A.D.	0.343	0.699	0.052	193		
13	-0.035	-2.443 ***					-0.985	-2.912 ***		0.056	0.833		Crisis vs. non crisis period	1.221	2.501 ***	0.080	193		
14	-0.05	-2.441 ***					-1.051	-2.03 **		0.150	0.293		Crisis period only			0.128	65		
15	-0.039	-2.093 **					-0.931	-2.148 **		0.096	1.032		Pre Crisis period	1.093	1.726 *	0.060	138		
16	-0.039	-2.840 ***					-1.117	-3.306 ***		0.042	0.553		Post Crisis period	1.560	3.193 ***	0.169	120		
17	-0.019	-0.943					-1.008	-2.169 **		0.020	0.259		Pre vs Post crisis period	-0.558	-0.981	0.019	127		
18	-0.031	-2.095 **					-0.95	-2.712 ***		0.042	0.535		ALL INCLUSIVE			0.063	193		

According to the regression results summary presented in table 9, the firm age variable was significant in all models with the exception of four: small offer size, banking vs. insurance, Ramadan months and pre- vs. post-crisis years. In all the models where the age variable appears as significant, it has a negative relationship with the level of underpricing, meaning that the older the firm, the lower the level of underpricing. This result corresponds to previous literature results such as Reside (1994), as well as to my predicted outcome stated earlier in Table 1.

The offer size was consistently significant in all models once the natural logarithm was employed, albeit at different levels of significance, but the majority of levels were at 1%. In every model, log offer size had a negative relationship to the level of underpricing, indicating that the larger the offer size, the lower the level of underpricing, which is in line with previous literature such as Islam (2010), as well as my predicted outcome. The only exception was the model which included firms that were classified as “large-size” entities. This could be an indication that the firms with large offer sizes tend to be underpriced, but more research is needed to verify this assumption.

The month variable appeared to be insignificant in all models, exhibiting no significant relationship with the level of underpricing and can therefore be deemed an irrelevant variable.

The highest adjusted R square was found in model 7, which consisted of data exclusively for companies that belong to the financial sector that fall into either the banking or insurance category. The adjusted R square of this model was 0.255, indicating that 25.5% of the variation in the initial return can be explained by the variation in the independent variables of age, log offer size, month and the dummy variable, which in this case was banking vs. insurance.

The models developed in relation to the financial crisis were the most useful models as they exhibited the greatest number of significant variables, specifically model 13, which included the

dummy variable of crisis period vs. non-crisis period, and model 16, which included the dummy variable crisis period vs. post-crisis period. In both these models, the dummy variables were significant at the 1% level, along with the independent variables firm age and log offer size. This highlights the difference in the level of underpricing between IPOs carried out in the financial crisis years versus those carried out in the pre- and post-crisis periods, proving that the financial crisis had a significant impact on the level of underpricing.

All models were significant overall, with the exception of models 1, 10 and 17. Model 1 was the original model which included the original offer size; once the original offer size was replaced with the log offer size, as shown in model 2, the model became significant overall. Model 10 examined the effect of Ramadan, and the dummy variable represented only IPOs that were carried out during Ramadan months. Both the dummy variable and the overall model were insignificant, meaning no significant relationship was found between Ramadan and the level of underpricing. The dummy variable in Model 17 signified data culled exclusively from pre-crisis and post-crisis years, excluding all IPOs carried out during 2007 and 2008, the actual financial crisis period. Both the dummy variable and the overall model proved insignificant.

6. Conclusion

This paper examined the determinants of IPO underpricing of 194 companies listed in the GCC market from 2000 to 2013. The results show that the firm age and offer size variables were statistically significant in most models tested, which is a conclusion similar to those that have been widely-documented in the existing literature. Predicted negative relationships between independent variables (age and offer size) and the dependent variable of underpricing were

correct. Large offer-sized firms, however, turned out to have a positive relationship with underpricing, contrary to what was predicted. Results show that significant differences in the level of underpricing do exist between financial and non-financial firms, as well as between banking and insurance firms. Differentiating fall/winter months from spring/summer months to measure SAD did not appear to be significant, nor issuing IPOs during Ramadan months versus non-Ramadan months and summer vs. non-summer months. However, in all the aforementioned cases, the overall models did prove significant. As previously mentioned, the models assessing the levels of underpricing during the financial crisis period all appeared to be highly relevant, with the exception of the model which differentiated pre-crisis and post-crisis years.

This study provided a comprehensive analysis of determinants of underpricing, and took into consideration important factors such as the timing of the financial crisis and its influence on IPO issuance, and external factors such as SAD. In addition, the month of Ramadan was incorporated into this study to test whether or not Islamic seasonality has any significance on the underpricing of IPOs. Such studies have not been carried out in the GCC region before to the best of my knowledge, and this study can therefore be considered a significant contribution to the literature.

7. Limitations and Recommendations

This paper studied IPOs of 194 companies in GCC countries during the fourteen- year period of 2000 to 2013. The sample size used in this study could be considered too small; which means that it would be difficult to find significant relationships from the data, as statistical tests normally

require a larger sample size to ensure that the sample is a fair representation of the population. This limitation is relevant in this study given that it is a quantitative research.

Obtaining the necessary data was somewhat of a challenge as the information required was not publicly available on the stock exchange websites of the six selected countries. Therefore, data was collected from FactSet, which is a provider of computer-based financial data and analysis. The trial period to collect all necessary data was limited to one month, and this study is completely dependent on the accuracy and validity of the data collected from FactSet, as there was no other source of data accessible. If any of the actual data is different than what was provided here, the results provided here may require amendment. Hence, it is suggested that for greater accuracy, the same study be carried out using data collected from a source other than FactSet.

In addition, the method of calculating age of firm only took into consideration the year the IPO was announced and the year the firm was established. Therefore, if both the IPO announcement and date of establishment coincided in the same year, the firm age would be zero, regardless of how many months it was operating before the IPO was announced. That would put firms with different actual ages in the same category, which also might have altered results.

The independent variable “month” referred to the month that the IPO was announced. Results show that this variable is insignificant in all of the models developed, therefore suggesting that a different way of measuring time should be implemented in order to observe and assess its actual significance. Earlier studies such as Singh et al. (2003) and Taufil (2007) measured the timing of an offer by way measuring the time between the date of the listing and the offer date. Using this measurement of time might lead to more accurate results.

Standard multiple regression was used to develop the models in this study, which assessed the relationship between dependent and independent variables, and provided results as to how much each independent variable contributed to the existing relationship. However, the study proved inconclusive in terms of what combination of independent variables would best predict the dependent variable. Therefore, it is recommended that stepwise multiple regression be implemented to identify which variables contribute significantly and which fail to add anything statistically meaningful to the regression equation.

The results of this study included all six GCC countries in tandem; no country was subject to an independent analysis. Investigating each country independently could lead to different conclusions, as each country has its own unique characteristics which might be reflected in its firms. The same is applicable to sectors, as all sectors were combined in this study. The results provided for country analysis and sector analysis include only an overview of how mean, standard deviation, and minimum and maximum results manifest in IPOs. Developing models by performing regression analysis on countries and sectors separately could lead to more comprehensive results.

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Appendices

Appendix 1 - List of companies

1. Abu Dhabi Commercial Bank
2. Saudi Telecom Co.
3. Arab Banking Corp. BSC
4. Alinma Bank
5. DP World Ltd.
6. Emaar The Economic City
7. Saudi Arabian Mining Co.
8. Mobile Telecommunications Co. Saudi Arabia
9. Industries of Qatar Co.
10. Ezdan Holding Group
11. Rabigh Refining & Petrochemical Co.
12. Masraf Al-Rayan QSC
13. Global Investment House KSCC
14. Vodafone Qatar QSC
15. Mesaieed Petrochemical Holding Co.
16. Dar Al Arkan Real Estate Development Co.
17. Deyaar Development PJSC
18. Kingdom Holding Co.
19. Qatar Gas Transport Co.
20. Investcom LLC
21. Air Arabia PJSC
22. Commercial Bank of Qatar
23. Saudi International Petrochemical Co.
24. Emirates Integrated Telecommunications Co. PSJC
25. National Petrochemical Co. (Saudi Arabia)
26. Almarai Co. Ltd.
27. Saudi Industrial Investment Group
28. Al Baraka Banking Group BSC
29. Dana Gas PJSC
30. Mohammad Al-Mojil Group
31. Bank Aljazira
32. Jabal Omar Development Co.
33. Yanbu National Petrochemical Co.
34. Oman Telecommunications Co.
35. Gulf International Services QSC

36. Omani Qatari Telecommunication Co. SAOG
37. Qatar National Bank SAQ
38. Dubai Financial Market PJSC
39. Investcorp Bank BSC
40. Depa Ltd.
41. Bank Albilad
42. Damac Real Estate Development Ltd.
43. Sorouh Real Estate
44. Al Tayyar Travel Group
45. Saudi Airlines Catering Co.
46. Qurain Petrochemical Industries Co. KSC
47. Fawaz Abdulaziz AlHokair Co.
48. Ithmaar Bank BSC
49. Drake & Scull International LLC
50. Aseer Trading Tourism & Manufacturing Co.
51. RAK Properties PJSC
52. Barwa Real Estate Co.
53. Saudi Research & Marketing Group
54. Dubai Islamic Bank PJSC
55. Knowledge Economic City
56. Damas International Ltd.
57. Etihad Etisalat Co.
58. Boubayan Bank KSC
59. Gulf Navigation Holding PJSC
60. City Cement Co.
61. Gulf Finance House BSC
62. Astra Industrial Group
63. Northern Region Cement Co.
64. Arkan Building Materials Co. PJSC
65. Eshraq Properties Co.
66. Aldar Properties PJSC
67. Najran Cement Co.
68. Al Abdullatif Industrial Investment Co.
69. Methanol Chemicals Co.
70. Qatari Investors Group
71. Advanced Petrochemical Co.
72. Aluminium Bahrain BSC
73. Al Jouf Cement Co.
74. Abu Dhabi National Energy Co. PJSC
75. Abdullah A.M. Al-Khodari Sons Co.
76. Bank Nizwa SAOG

77. Galfar Engineering & Contracting SAOG
78. Ajman Bank PJSC
79. Aramex PJCS
80. Tamweel PJSC
81. Abu Dhabi Islamic Bank
82. BankMuscat SAOG
83. Mazaya Qatar Real Estate Development
84. Bawan Co.
85. Dallah Healthcare Holding Co.
86. Kuwait China Investment Co.
87. Red Sea Housing Services Co.
88. Sembcorp Salalah Power & Water Co. SAOC
89. Aabar Investments PJSC
90. Al Hassan Ghazi Ibrahim Shaker Co.
91. Hail Cement Co.
92. Kuwait National Airways Co. KSC
93. Saudia Dairy & Foodstuff Co.
94. Saudi Paper Manufacturing Co.
95. Middle East Specialized Cables Co.
96. Al Salam Bank
97. National International Co. (Holding) KSCC
98. Amlak Finance PJSC
99. Abu Dhabi Aviation Co.
100. Saudi Re for Cooperative Reinsurance Co.
101. Saudi Steel Pipe Co.
102. alizz islamic bank SAOG
103. United Electronics Co.
104. Saudi Printing & Packaging Co.
105. National Medical Care Co.
106. Saudi Integrated Telecom Co.
107. United Wire Factories Co.
108. Mouwasat Medical Services Co.
109. Al-Babtain Power & Telecommunication Co.
110. Agthia Group PJSC
111. Gulf Warehousing Co.
112. Soor Fuel Marketing Co. KSC
113. Abu Dhabi National Co. for Building Materials
114. Nass Corporation BSC
115. Sahara Petrochemical Co.
116. Etihad Atheeb Telecommunication Co.
117. United International Transportation Co. Ltd.

118. Abdullah Al Othaim Markets Co.
119. Bahrain Commercial Facilities Co. BSC
120. Al-Sorayai Trading & Industrial Group Co.
121. SMN Power Holding SAOG
122. Takween Advanced Industries Co.
123. Arabtec Holding Co. PJSC
124. Solidarity Saudi Takaful Co.
125. Aldrees Petroleum & Transport Services Co.
126. Islamic Arab Insurance Co.
127. Bank Sohar
128. Saudi Vittrified Clay Pipes Co.
129. Mediterranean & Gulf Insurance & Reinsurance Co.
130. Saudi Industrial Services Co.
131. Basic Chemical Industries Co.
132. Seef Properties BSC
133. Qatar Oman Investment Co.
134. Halwani Bros Co. Ltd.
135. Bupa Arabia for Cooperative Insurance Co.
136. Saudi Enaya Cooperative Insurance Co.
137. Al Khaleej Training & Education Co.
138. Dlala Brokerage & Investment Co.
139. Malath Cooperative Insurance & Reinsurance Co.
140. Green Crescent Insurance Co. PJSC
141. Voltamp Energy SAOG
142. Sohar Power Co.
143. Amana Cooperative Insurance Co.
144. Esterad Investment Co. BSC
145. Herfy Food Services Co.
146. ACWA Power Barka
147. AES Barka SAOG
148. Trade Union Cooperative Insurance Co.
149. Aljazira Takaful Taawuni Co.
150. Gulf Livestock Co.
151. Dhofar Power Co. SOAG
152. Jazeera Airways Co. K.S.C.
153. National Takaful Co.
154. Al Maha Petroleum Products Marketing Co. Saog
155. Gulf Union Cooperative Insurance Co.
156. Methaq Takaful Insurance Co.
157. Takaful Emarat PSC
158. Al Sagr Co. for Cooperative Insurance

159. Arabia Insurance Cooperative Co.
160. United Cooperative Assurance Co.
161. Arabian Shield Cooperative Insurance Co.
162. Saudi United Cooperative Insurance Co.
163. AXA Cooperative Insurance Co.
164. Gulf General Cooperative Insurance Co.
165. Weqaya Takaful Insurance & Reinsurance Co.
166. Sanad Insurance & Reinsurance Cooperative Co.
167. Al Dhafra Insurance Co. PSC
168. Insurance House PSC
169. Al Rajhi Co. for Cooperative Insurance
170. Alinma Tokio Marine Co.
171. Al Alamiya for Cooperative Insurance Co.
172. Banader Hotels Co. BSC
173. Takaful House PJSC
174. Al Kamil Power Co. SAOG
175. American Intl Group & Arab National Bank Coop Insurance Co.
176. Buruj Cooperative Insurance Co.
177. International Fish Farming Holding Co.
178. Islamic Holding Group
179. Abu Dhabi Ship Building Co.
180. Taageer Finance Co. SAOC
181. ACE Arabia Cooperative Insurance Co.
182. Allied Cooperative Insurance Group
183. SALAMA Cooperative Insurance Co.
184. Saudi Arabian Cooperative Insurance Co.
185. Saudi Indian Co. for Co-operative Insurance
186. Takaful Oman Insurance SAOG
187. SABB Takaful Co.
188. Allianz Saudi Fransi Cooperative Insurance Co.
189. Qatar German For Medical Devices
190. Wataniya Insurance Co.
191. Alahli Takaful Co.
192. Sharqiyah Desalination Co. SAOC
193. Widam Food Co. QSC
194. Maritime Industrial Services Co. Ltd., Inc.

Appendix 2 - Regression Results

Model 1 - Original Model

<i>Regression Statistics</i>	
Multiple R	0.162
R Square	0.026
Adjusted R Square	0.011
Standard Error	3.218
Observations	194.000

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	3.000	52.803	17.601	1.699
Residual	190.000	1968.143	10.359	
Total	193.000	2020.946		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	1.806	0.534	3.379	0.001
AGE	-0.032	0.014	-2.243	0.026
SIZE	0.000	0.000	-0.129	0.897
MONTH	0.021	0.069	0.303	0.762

Model 2 - Log Size

<i>Regression Statistics</i>	
Multiple R	0.263
R Square	0.069
Adjusted R Square	0.055
Standard Error	3.146
Observations	194.000

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	3.000	140.220	46.740	4.722
Residual	190.000	1880.726	9.899	
Total	193.000	2020.946		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	3.763	0.836	4.503	0.000
AGE	-0.027	0.014	-1.927	0.055
LOG OF OFFER SIZE	-1.019	0.343	-2.975	0.003
MONTH	0.027	0.068	0.396	0.693

Model 3 - Large vs Small Offer Size

<i>Regression Statistics</i>	
Multiple R	0.253
R Square	0.064
Adjusted R Square	0.049
Standard Error	3.155
Observations	194.000

ANOVA				
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	3.000	129.550	43.183	4.338
Residual	190.000	1891.396	9.955	
Total	193.000	2020.946		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	2.362	0.550	4.298	0.000
AGE	-0.029	0.014	-2.036	0.043
DUMMY SIZE LARGE vs small	-1.264	0.455	-2.780	0.006
MONTH	0.024	0.068	0.351	0.726

Model 4 - Large offer size only

<i>Regression Statistics</i>	
Multiple R	0.347
R Square	0.120
Adjusted R Square	0.092
Standard Error	2.238
Observations	97.000

ANOVA				
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	3.000	63.729	21.243	4.243
Residual	93.000	465.622	5.007	
Total	96.000	529.351		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	-2.066	1.629	-1.269	0.208
AGE	-0.035	0.013	-2.659	0.009
LOG OF OFFER SIZE	1.221	0.584	2.092	0.039
MONTH	0.040	0.068	0.589	0.557

Model 5 - Small Offer size only

<i>Regression Statistics</i>	
Multiple R	0.323
R Square	0.104
Adjusted R Square	0.075
Standard Error	3.678
Observations	97.000

ANOVA				
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	3.000	146.240	48.747	3.604
Residual	93.000	1257.966	13.527	
Total	96.000	1404.206		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	6.884	1.659	4.151	0.000
AGE	0.010	0.027	0.380	0.705
LOG OF OFFER SIZE	-3.497	1.086	-3.221	0.002
MONTH	0.064	0.113	0.562	0.575

Model 6 - Financial vs. Non-Financial Industries

<i>Regression Statistics</i>	
Multiple R	0.270
R Square	0.073
Adjusted R Square	0.053
Standard Error	3.148
Observations	194.000

ANOVA				
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	4.000	147.445	36.861	3.719
Residual	189.000	1873.501	9.913	
Total	193.000	2020.946		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	3.487	0.897	3.888	0.000
AGE	-0.025	0.014	-1.743	0.083
MONTH	0.032	0.068	0.477	0.634
LOG OF OFFER SIZE	-0.982	0.346	-2.842	0.005
DUMMY INDUSTRY (FIN VS NON FIN)	0.426	0.498	0.854	0.394

Model 7 - Banking vs Insurance

<i>Regression Statistics</i>			
Multiple R	0.5502		
R Square	0.3027		
Adjusted R Square	0.2547		
Standard Error	2.7344		
Observations	63.0000		

ANOVA			
	<i>df</i>	<i>MS</i>	<i>F</i>
Regression	4.0000	47.0733	6.2959
Residual	58.0000	7.4769	
Total	62.0000		

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	4.1992	2.5838	0.0123
AGE	-0.0254	-0.8367	0.4062
LOG OF OFFER SIZE	-1.0678	-1.7333	0.0883
MONTH	-0.1069	-0.9297	0.3564
DUMMY INDUSTRY BANKING VS INSURANCE	2.0525	2.1458	0.0361

Model 8 - Summer vs Non Summer months

<i>Regression Statistics</i>	
Multiple R	0.267
R Square	0.071
Adjusted R Square	0.052
Standard Error	3.151
Observations	194.000

ANOVA			
	<i>df</i>	<i>MS</i>	<i>F</i>
Regression	4.000	36.115	3.638
Residual	189.000	9.928	
Total	193.000		

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	3.724	4.438	0.000
AGE	-0.026	-1.778	0.077
LOG OF OFFER SIZE	-0.996	-2.888	0.004
MONTH	0.032	0.471	0.638
DUMMY SUMMER MONTHS	-0.441	-0.654	0.514

Model 9 - Ramadan vs Non Ramadan months

<i>Regression Statistics</i>	
Multiple R	0.264
R Square	0.070
Adjusted R Square	0.050
Standard Error	3.154
Observations	194.000

ANOVA

	<i>df</i>	<i>MS</i>	<i>F</i>
Regression	4.000	35.119	3.530
Residual	189.000	9.950	
Total	193.000		

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	3.769	4.494	0.000
AGE	-0.027	-1.917	0.057
LOG OF OFFER SIZE	-1.014	-2.942	0.004
MONTH	0.021	0.284	0.776
DUMMY RAMADAN/ EID MONTHS	0.114	0.161	0.872

Model 10 - Ramadan Only

<i>Regression Statistics</i>	
Multiple R	0.446
R Square	0.199
Adjusted R Square	0.103
Standard Error	5.209
Observations	29.000

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	3.000	168.594	56.198	2.071
Residual	25.000	678.334	27.133	
Total	28.000	846.927		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	-5.593	9.074	-0.616	0.543
AGE	0.121	0.086	1.408	0.171
LOG OF OFFER SIZE	-2.997	1.710	-1.752	0.092
MONTH	1.210	0.831	1.455	0.158

Model 11 - Non Ramadan Only

<i>Regression Statistics</i>	
Multiple R	0.323
R Square	0.104
Adjusted R Square	0.088
Standard Error	2.552
Observations	165.000

ANOVA				
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	3.000	122.015	40.672	6.243
Residual	161.000	1048.899	6.515	
Total	164.000	1170.914		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	3.491	0.706	4.944	0.000
AGE	-0.038	0.012	-3.163	0.002
LOG OF OFFER SIZE	-0.750	0.296	-2.536	0.012
MONTH	-0.001	0.062	-0.021	0.984

Model 12 - S.A.D.

<i>Regression Statistics</i>	
Multiple R	0.268
R Square	0.072
Adjusted R Square	0.052
Standard Error	3.150
Observations	194.000

ANOVA			
	<i>df</i>	<i>MS</i>	<i>F</i>
Regression	4.000	36.267	3.654
Residual	189.000	9.925	
Total	193.000		

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	3.758	4.490	0.000
AGE	-0.027	-1.874	0.062
LOG OF OFFER SIZE	-1.039	-3.019	0.003
MONTH	0.013	0.178	0.859
DUMMY fall + winter MONTHs (SAD)	0.343	0.699	0.485

Model 13 - Crisis vs Non Crisis period

<i>Regression Statistics</i>	
Multiple R	0.315
R Square	0.099
Adjusted R Square	0.080
Standard Error	3.104
Observations	194.000

ANOVA

	<i>df</i>	<i>MS</i>	<i>F</i>
Regression	4.000	50.120	5.203
Residual	189.000	9.632	
Total	193.000		

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	3.186	3.721	0.000
AGE	-0.035	-2.443	0.015
LOG OF OFFER SIZE	-0.985	-2.912	0.004
MONTH	0.056	0.833	0.406
DUMMY CRISIS PERIOD	1.221	2.501	0.013

Model 14 - Crisis period only

<i>Regression Statistics</i>	
Multiple R	0.410
R Square	0.168
Adjusted R Square	0.128
Standard Error	3.165
Observations	66.000

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	3.000	125.634	41.878	4.181
Residual	62.000	621.076	10.017	
Total	65.000	746.710		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	4.279	1.378	3.106	0.003
AGE	-0.050	0.021	-2.441	0.018
LOG OF OFFER SIZE	-1.051	0.518	-2.030	0.047
MONTH	0.150	0.142	1.061	0.293

Model 15 - Pre crisis vs during crisis period

<i>Regression Statistics</i>			
Multiple R	0.295		
R Square	0.087		
Adjusted R Square	0.060		
Standard Error	3.514		
Observations	139.000		

ANOVA			
	<i>df</i>	<i>MS</i>	<i>F</i>
Regression	4.000	39.552	3.203
Residual	134.000	12.347	
Total	138.000		

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	3.058	2.481	0.014
AGE	-0.039	-2.093	0.038
LOG OF OFFER SIZE	-0.932	-2.148	0.033
MONTH	0.096	1.032	0.304
DUMMY BEFORE VS DURING CRISIS	1.093	1.726	0.087

Model 16 - During crisis vs post crisis period

<i>Regression Statistics</i>	
Multiple R	0.444
R Square	0.197
Adjusted R Square	0.169
Standard Error	2.596
Observations	121.000

ANOVA				
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	4.000	191.601	47.900	7.107
Residual	116.000	781.872	6.740	
Total	120.000	973.473		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	3.387	0.867	3.907	0.000
AGE	-0.039	0.014	-2.840	0.005
LOG OF OFFER SIZE	-1.177	0.356	-3.306	0.001
MONTH	0.042	0.076	0.553	0.581
DUMMY DURING VS AFTER CRISIS	1.560	0.488	3.193	0.002

Model 17 - Pre vs post crisis periods

<i>Regression Statistics</i>	
Multiple R	0.224
R Square	0.050
Adjusted R Square	0.019
Standard Error	3.089
Observations	128.000

ANOVA			
	<i>df</i>	<i>MS</i>	<i>F</i>
Regression	4.000	15.485	1.623
Residual	123.000	9.542	
Total	127.000		

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	3.557	3.039	0.003
AGE	-0.019	-0.943	0.348
LOG OF OFFER SIZE	-1.008	-2.169	0.032
MONTH	0.020	0.259	0.796
DUMMY BEFORE VS AFTER CRISIS	-0.558	-0.981	0.328

Model 18 - All inclusive



<i>Regression Statistics</i>	
Multiple R	0.327
R Square	0.107
Adjusted R Square	0.063
Standard Error	3.132
Observations	194.000

ANOVA				
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>
Regression	9.000	216.524	24.058	2.453
Residual	184.000	1804.421	9.807	
Total	193.000	2020.946		

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	2.871	1.265	2.269	0.024
AGE	-0.031	0.015	-2.095	0.038
LOG OF OFFER SIZE	-0.950	0.350	-2.712	0.007
MONTH	0.042	0.079	0.535	0.594
DUMMY SIZE LARGE	0.066	0.949	0.069	0.945
DUMMY INDUSTRY (FIN VS NON FIN)	0.326	0.507	0.644	0.521
DUMMY SUMMER MONTHS	-0.357	0.728	-0.490	0.625
DUMMY CRISIS PERIOD	1.302	0.922	1.411	0.160
DUMMY RAMADAN/ EID MONTHS	0.224	0.987	0.227	0.821
DUMMY fall + winter MONTHs (SAD)	0.375	0.537	0.699	0.486