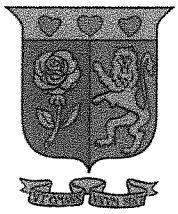

Strathmore
UNIVERSITY

Underpricing of Initial Public Offerings at the Nairobi Securities Exchange between 1994 and 2014

Mumbo, Jane Valary
072470

Submitted in partial fulfillment of the requirements for the Degree of Bachelor of Business Science in Financial Economics at Strathmore University

School of Finance and Applied Economics
Financial Economics
Strathmore University
Nairobi, Kenya

[November, 2015]

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

Jane Valary Mumbo

..... *Signature*

02/12/2015 ..... *Date*

This Research Project has been submitted for examination with my approval as the Supervisor.

Ferdinand Okoth Othieno

..... *Signature*

2 DECEMBER 2015 ..... *Date*

School of Finance and Applied Economics

Strathmore University

ABSTRACT

Underpricing of Initial Public Offerings is characterized by the closing price being higher than the offer price on the first day of trading. Research carried out in different financial markets has generated varied results with regard to the degree of underpricing present in the markets and its determinants. This study examines the extent of underpricing for listings on the Nairobi Securities Exchange between 1994 and 2014.The study establishes that IPOs on the Nairobi Securities Exchange are significantly underpriced by approximately 46.28%.Firm specific and offer specific factors such the size of the offer, size of the firm, age of firm and the subscription rate of the offer are significant explanatory factors for the observed underpricing, with subscription rate being the most significant. The results are robust for varied binary regression model specifications.

Key words: *IPO Underpricing, Nairobi Securities Exchange, binary regression*

Table of Contents

List of Tables

List of Figures

Definition of Key Terms

Term	Definition
Abnormal returns	A term used to describe the returns generated by a given security or portfolio over a period of time that is different from the expected rate of return.
Underpricing	When the offer price of an IPO is lower than the price of the first trade.
Overpricing	When the offer price of an IPO is higher than the price of the first day of trade.
Issuer	A legal entity that develops, registers and sells securities for the purpose of financing its operations.
Underwriter	A company or other entity that administers the public issuance and distribution of securities from a corporation or other issuing body. An underwriter works closely with the issuing body to determine the offering price of the securities, buys them from the issuer and sells them to investors via the underwriter's distribution network.
Investor	Any person who commits capital with the expectation of financial returns.

Abbreviations and Acronyms

Acronym	Term
IPO	Initial Public Offering
NSE	Nairobi Securities Exchange
MAARO	Market Adjusted Return on Securities

1 Introduction

1.1 Background to the study

The financing decision is key in corporate finance and companies are advised to choose a financing mix that maximizes the value of the firm. When using equity, companies issue shares through an initial public offering, after which these shares are traded in the secondary market. Initial Public Offerings (IPOs) are one of the most intriguing and studied events in the world of finance, and the pricing behavior of IPOs has been one of the great mysteries of modern corporate finance (Rajagopalan, 2013).

The primary reason firms go public is the desire to raise equity capital for the firm and to create a public market in which the founders and other shareholders can convert some of their wealth into cash at a future date (Ritter & Welch, 2002). In the case of younger firms, IPOs also serve as a nearly-stage financing option (Riding, 1998). By their nature, IPOs create information asymmetry between issuers and buyers of the the stock. As such firms often find that they must compensate outsiders for investing with this inferior information by "leaving some money on the table", by setting an offer price that is lower than what the stock is intrinsically worth.

In IPO literature, underpricing is considered to occur when the offer price of a new issue is lower than the price of the first trade. This phenomenon is documented by scholars such as Ibbotson (1975), Ritter (1984), Chalk and Peavy (1987), Allen and Faulhaber (1989), Cook and Officer (1996) and, Loughran and Ritter (2002) in the United States. Authors such as Aggarwal, Leal and Hernandez (1993), Islam, Ali, and Ahmad (2010), Bansal and Khanna (2012), Islam (2014) among others document evidence of underpricing in Latin American and Asian emerging markets. Similar studies have however been fewer on the African continent with scholars such as Osei, Adjasi and Fiawoyife (2012), van Heerden and Alagidede (2013), and Cheluget (2008) and Swanya (2014) documenting evidence of underpricing in

Nigeria, South Africa and Kenya respectively.

The plethora of research in IPO underpricing has yielded several hypotheses to explain its existence; these include the "hot issue" market (Ibbotson & Jaffe, 1975) and (Ritter, 1984), information asymmetry as explained by (Baron, 1982), (Ritter & Beatty, 1986) and (Rock, 1986), and signaling as posited by (Allen & Faulhaber, 1989) and (Jegadeesh, Weinstein, & Welch, 1993). Obviously IPO underpricing is inconsistent with the efficient market hypothesis, since the correction of the price on the first day of trading would suggest that the offer price does not contain all available information. Additionally, it differs from the issuer's goals of raising capital that reflects the true value of the company.

Scholars have sought to explain IPO underpricing by empirically analyzing the factors that significantly affect underpricing including the size of the offer, size of the firm, subscription rate and age of the firm. However, results regarding the significance of some of the determinants of underpricing vary across different financial markets. Previous studies in the Kenyan market have focused on determining the effect of the subscription rate, leaving out a number of other factors that have been shown to explain underpricing. This research empirically investigates the significance of four factors (size of firm, size of offer, age of firm and subscription rate) to IPO underpricing with a focus on those issued at the Nairobi Securities Exchange between 1994 and 2014.

1.2 Price behavior of IPOs on the Nairobi Securities Exchange

1.2.1 Background to the Nairobi Securities Exchange

The Nairobi Securities Exchange (NSE), the sole exchange market in Kenya and formally known as the Nairobi Stock Exchange, has a history that can be traced back to the 1920s. Trading took place on a gentleman's agreement until 1954 when the stock exchange was registered as a voluntary organization of stockbrokers, charged with the responsibility of developing the securities market and regulating trading activities. Between 1963 and

1970, before the collapse of the East African Community, the NSE operated as a regional market serving both Uganda and Tanzania.

In 1991, NSE was registered as a private company limited by shares with the floor-based open outcry system in place, which was replaced by the central depository system that was commissioned in 2004; automating the process of clearing and settlement of shares traded in Kenya's capital markets.

The market at the NSE is split into the Main Investment Market Segment (MIMS), Alternate Investment Market Segment (AIMS) and the Fixed Income Securities Market Segment (FISMS). The exchange was expanded to include the Growth Enterprise Market Segment (GEMS), in 2013, with the aim of attracting small and medium enterprises interested in raising initial and ongoing capital.

There are two indices that are used to measure performance in the Nairobi Securities Exchange: the NSE 20 share index and the NSE All Share Index. The NSE 20 share index measures the performance of 20 blue-chip companies with strong fundamentals and which have consistently returned positive financial results. This focuses on the price changes for the twenty companies. The Nairobi Securities Exchange All Share Index (NASI) uses the overall market performance. Its attention is therefore on the overall market capitalization.

The NSE remains one of the most vibrant markets in Africa and the leading in East Africa. However, with only 64 enterprises listed, a comparatively small number compared to exchanges in developed markets such as the United States and the United Kingdom with listed companies in excess of 5,000 and 2,000 respectively, there is potential for growth of the securities exchange through new issues.

1.2.2 Price behavior of IPOs on the NSE - 1994 - 2014

In the period between 1994 and 2014, there have been a total of 16 IPOs with an almost equal number witnessed in each half of the period under study. While other companies listed on the NSE during the same period, they opted

for alternative means such as introduction and private placement. All IPOs[1] except that of Britam and Sameer Africa recorded a positive initial return, indicating underpricing.

1.3 Problem Statement

An ideal market is a market in which prices provide accurate signals for resource allocation, that is, a market in which firms can make production-investment decisions and investors can choose among securities that represent ownership of firms' activities under the assumption that prices fully reflect all available information (Fama, 1970).

For majority of IPOs issued on the Nairobi Securities Exchange the initial return at the end of the first day of trading tends to be abnormal indicating underpricing. This anomaly in the market is a loss to the issuing firm because it is a loss of money that could be utilized for profitable investment opportunities. In prior research this has been attributed to information asymmetry, among other hypotheses.

Different issue-specific, firm-specific and market-specific characteristics have also been found to contribute to determining the initial return of the IPOs, which brings about the underpricing phenomenon. These include: the size of the offer, size of firm, age of the firm and the subscription rate of the IPO. However, given the differences in capital markets across countries, there is a need to determine the significance of the above variables to IPO underpricing at the Nairobi Securities Exchange.

1.4 Research objectives

The objectives of this research are:

i. To determine the level of underpricing of IPOs that took place at the NSE between 1994 and 2014.

---

[1] See Appendix 1, Table 4

ii. To establish the significance of the size of the offer, size of the firm, the age of the firm and the subscription rate, to IPO underpricing at the Nairobi Securities Exchange.

1.5 Research Questions

The research questions directing this study are:

i. What was the level of underpricing of IPOs issued at the NSE between 1994 and 2014?

ii. Are the variables: size of the offer, size of the firm, age of the firm and the subscription rate, significant in determining IPO underpricing at the NSE?

1.6 Justification of the study

According to research done in 2015 by global law firm Baker & McKenzie, African companies are going public at what could be their fastest rate ever. Thirty initial public offerings by African-domiciled companies are already in the pipeline for 2015, which will see volumes spike by a quarter from 2014.

The Kenyan domestic exchange is expected to be one of the most active, and the leading in East Africa, accounting for 8% of the total IPOs in Africa. Additionally, IPOs are increasingly being seen as desirable investments to the extent that banks have come up with IPO loans for investors. This research aims to provide insight on the Kenyan IPOs, which will help inform investors on the types of IPOs that are best to invest in. For example, an investor looking to make large gains on initial return might use information regarding how the size of the offer will affect their returns given that it has been found that on average underpricing occurs more often in small offerings than in large offerings (van Heerden & Alagidede, 2013).

The manner in which each independent variable under study affects underpricing will provide additional information useful in making decisions with regard to capital accumulation, in the case of investors and corporate financing, in the case of issuers and underwriters.

2 Literature Review

2.1 Introduction

This chapter provides the literature review of the theoretical framework under which IPO underpricing has been investigated. The several theories that have been brought forward to explain it are discussed and justified. The chapter also consists of empirical studies on the effect of size of the firm, size of the offer, age of the firm and subscription rate on an IPO's performance at the NSE.

2.2 Theoretical Hypothesis on the Underpricing Phenomenon

2.2.1 The Efficient Market Hypothesis

An efficient market as described by Fama (1970) is one in which investors can choose among securities that represent ownership of firms' activities under the assumption that security prices at any time fully reflect all available information. Given the abnormal initial returns, the prices of IPOs prove inconsistent with the above theory.

2.2.2 IPO Underpricing

The new issue market has been thought to somehow resemble an auction. However, price is not determined by the bidding of investors; the investor with the highest valuation does not obtain the shares, even if their valuation exceeds the issuer's offer price. Additionally, the issuing firm is both a bidder, who submits a price in consultation with the underwriting investment bank, and a seller, who exchanges an asset for cash.

There has been a general consensus by scholars that IPOs are underpriced. In IPO literature when the offer price of a new issue is lower than the price of the first trade, the stock is considered underpriced. In developed and developing markets alike scholars have proven its presence in their stock markets. IPO underpricing is a widely documented phenomenon, with early research on the subject dating back to that of Ibbotson & Jaffe (1975). There is

no consensus as to the cause of underpricing in the primary market; however, several hypotheses have been advanced to explain this occurrence.

2.2.2.1 The "Hot Issue" Market Hypothesis

Hot issues usually refer to particular stock issues that have risen from their offering prices to higher than average premia in the aftermarket. Consequently, "hot issue" markets are defined as periods in which the average aftermarket performance of new issues is abnormally high as noted by Ibbotson and Jaffe (1975). For example, Ritter (1984), established that during the 15-month period commencing January 1980; the mean return on IPOs of common stock purchased at the offering price and sold at the closing bid price on the first day of public trading was 48.4%, in contrast to 16.3% mean return during the remainder of the period between 1977-82. These results suggest that issuers may obtain a higher offering price relative to the efficient price when they issue in cold issue markets.

2.2.2.2 Information Asymmetry and the Winners Curse Problem

Information asymmetry arises as a result of one party having more information in any given transaction. This gives the uninformed party the difficulty of distinguishing good quality from bad and is inherent in the business world (Akerlof, 1970). Major participants in the initial public offers include the investment bank or the underwriter, the initial buyers, the issuing firm and the secondary market. The participants have different levels of knowledge related to the issuer.

A model of underpricing where issuers delegate the pricing decision to the underwriters is put forward by Baron (1982). This represents a case where the underwriters possess more information than the issuer and the investors. Underwriters find it less costly to market an IPO that is underpriced, and will therefore underprice the issue.

Another scenario is presented by Rock (1986) where information asymmetries occur between outside investors - the informed versus uninformed theory. Investors that have information about a firm's prospects

only participate in IPOs that are underpriced. This leads to a situation where the uninformed investors receive a disproportionate allocation of overpriced issues. Therefore, issues that are underpriced therefore ensure that uninformed investors participate in the new issues market and earn a normal return.

Ex ante uncertainty about IPOs and their initial return is seen as the cause of underpricing by Ritter and Beatty (1986). They argue that the higher the *ex ante* uncertainty, the higher the underpricing. *Ex ante* uncertainty comes about because even though IPOs on average are underpriced an investor submitting a purchase order cannot be certain about an offering's value once it starts trading publicly.

The winner's curse problem occurs as a result of the rationing that takes place when there is any excess demand for shares, following the setting of the offer price by the issuing firm and their underwriters. It creates a situation whereby the average initial return conditional upon receiving sharers is lower than the average initial return conditional upon submitting a purchase order. If one is allocated the requested number of shares, one can expect that the initial return will be less than average. Faced with this winner's curse problem, a representative investor will only submit purchase orders if, on average, initial public offerings are underpriced.

2.2.2.3 Signaling Hypothesis

An argument by Allen and Faulhaber (1989) postulates that underpricing is a signal that the firm is good to its investors, as only good firms are able to recoup this loss after their performance, and investors are aware of this. Good firms like to signal investors their superior prospects and low IPO prices are used as such a signal. This will put the firm in favourable light should they choose to issue a subsequent seasoned offering. A similar conclusion was made by Jegadeesh, Weinstein and Welch (1993)who found a positive relation between IPO underpricing and the probability and size of subsequent seasoned offerings, however, the economic significance of the relationship was weak.

These models of signaling through IPOs place superior information with the issuer rather than the underwriters and outside investors, as is the case in earlier models. Cook and Officer (1996), who studied reverse - leveraged buyouts, echo the thoughts of Allen and Faulhaber (1989), adding that the cost of underpricing is recouped in a seasoned offering where additional shares reflect the value of a high quality firm. Firm quality, according to Cook and Officer (1996), can be described as the likelihood of generation of positive information. This is especially evident in the cases where reissuance takes place within the same year.

2.2.2.4 Insurance Hypothesis

The insurance premium hypothesis was used to explain underpricing of IPOs by Tinic (1988). Tinic indicates that gross underpricing serves as an efficient form of protection against legal liabilities and the associated damages to the reputations of both the investment bankers and the issuers. It is a form of implicit insurance against liabilities that may arise for misrepresenting the value of an issue. This view is supported by the work of Hughes and Thakkor (1992).

2.2.2.5 Impresario or Fads Theory

Under pricing also helps in creating an assured return for the initial day investors. By doing this, they succeed in creating an impression that the brokers and underwriters are giving good investment advice (Shiller, 1990). A similar study by Aggarwal and Rivoli (1990) backs this opinion.

2.2.2.6 Ownership Retention

Other authors, for example: Brennan and Franks (1995), Zingales (1995), and Booth and Chua (1996) hypothesize that the underpricing of new issues is a means for the owners to retain control of the firm. Issuing firms may intentionally underprice their shares in order to generate over subscription, and so be able to have a large number of small shareholders. This disperse ownership will both increase the liquidity of the market for the stock, and make it unlikely for outsiders to threaten the original owners.

2.3 Empirical Explanations to Underpricing

The following section provides a review of some of the empirical literature that has been done in the area of underpricing with regard to size of offer, size of firm, age of firm and subscription rate.

2.3.1 Underpricing

Presence of underpricing is tested by a standard model that looks at the percentage return on the issue following the first day of trade. Positive returns on the issue indicate the presence of underpricing while, in cases in which it occurs, overpricing is indicated by presence of negative returns; correctly priced IPOs are expected to have an initial return of zero. This model has been used by scholars such as Islam, Ali and Ahmad (2010) in Bangladesh, Osei, Adjasi and Fiawoyife (2012) in Ghana and Nigeria, and van Heerden and Alagidede (2013) in South Africa, which emerging and frontier markets.

However, van Heerden and Alagidede used a market-adjusted model that measures the initial trading returns in excess market return form. This is used for markets that are highly volatile, such that there is a major change in most stocks during the IPO period. Economists such as Aggarwal, Leal and Hernandez (1993) also used this measurement in earlier studies on the short-run performance of Latin American IPOs. Though used in majority of the studies, it has been argued that adjustments for market movement result in only slight changes in initial return (Cook & Officer, 1996).

In the Kenyan market, a study done by Cheluget (2008) found the first day gains to be 40.28%. The study looked at IPOs that took place between 1984 and 2008. Later, Swanya (2014) analyzed IPOs that took place between 2006 and September 2014 and found that the average first day gains of the IPOs was 67.67%. The difference in their findings can be attributed to the use of samples of different sizes and with different variable characteristics resultant from the study of IPOs issued during different periods.

2.3.2 Size of the Offer

Size of the offer is measured in terms of the offering price multiplied by the number of shares offered. It has been found that on average underpricing occurs more often in small offerings than in larger offerings. In the United States, Chalk and Peavy (1987) conducted an examination of daily returns for 649 firms that went public between 1975 and 1982. Average initial returns on IPOs with an offering price of $1 or more was lower than for whose offering price was less than $1, the lowest priced IPOs accounted for most of the sample's abnormal returns over the aftermarket trading period, indicating that underpricing is larger in smaller offerings.

Similar results were obtained by M'Kombe and Ward (2002) in research on South African IPOs. Low priced shares are viewed as high risk, so one would expect high returns to be associated with them to compensate for the risk. This study indicated that offer size has significant negative effect on the degree of underpricing.

2.3.3 Size of the Firm

A study carried out by Yong (2011)on Malaysian IPO's established that initial return was driven by the size of the firm. In order to test the existence of size effect in Malaysian IPOs, the independent t-test was employed on the equality of means (average initial returns), between the two boards of listing. Yong analyzed a sample of 277 Malaysian IPOs from January 2004 to December 2010 and found that size of the firm was a determinant of IPO performance. The result indicated that the average initial return of IPOs listed on the ACE market (the Malaysian alternative market used as a proxy for small-sized firms) is significantly higher than the average of those IPOs listed on the Main Market (proxy for big-sized firms), an indication that "size effect" plays an important role in explaining the underpricing phenomenon in Malaysian IPOs.

Similarly, a study conducted by Osei, Adjasi and Fiawoyife (2012) examined size of the firm as one of the variables that affected IPO Underpricing in

Ghana and Nigeria over the period between 1990 and 2006.Following the standard empirics in explaining initial abnormal returns in IPOs they estimated a multiple regression model and found that underpricing is positively correlated to firm size.

2.3.4 Age of the Firm

In a study of the levels of underpricing of IPOs and its determinants, Islam and Ali (2010) analyzed those issued on the Dhaka Stock Exchange (DSE). A regression analysis showed that the age of the firm had no significant impact on the degree of underpricing of the IPOs. These results contradicted Carter, Dark and Singh (1998) who found that age of the firm was significant in explaining underpricing after studying 2,292 IPOs issued in the US between 1979 and 1991. Carter, Dark and Singh concluded that older firms have longer operating histories and face less uncertainty. This conclusion implied that older firms have a lower degree of information asymmetry than do younger firms, leading to less underpricing of their IPOs.

The inconsistency in the scholars' results may be attributed to the differing nature of the US and Bangladesh capital markets.

2.3.5 Subscription Rate

Theoretically, the level of underpricing depends on the demand for the IPO. The demand for the IPO is measured by the subscription rate. Rock (1986) argued that the level of underpricing depends on information heterogeneity among investors which increases with the demand for the firm's shares. This was supported by Booth and Chua (1996) as they found a positive relation between underpricing and oversubscription.

In Kenya, Cheluget (2008) found that there is a positive relationship between investor demand and first day performance. Bansal and Khanna (2012) did a study to measure the relationship between subscription and underpricing and studied IPO's listed in the Bombay exchange between April 1999 and December 2012, similar to previous studies, they established a positive link.

3 Methodology

3.1 Introduction

This chapter presents the methodology for this study. The purpose of this study was to find out: (1) the degree of underpricing at the NSE between 1994 and 2014 (2) the significance of the size of the offer, size of the firm, the age of the firm and subscription rate to IPO underpricing at the Nairobi Securities Exchange. This methodology borrows from the structure of the study by Islam, Ali and Ahmad (2010), and Perera (2014).

3.2 Research Design

3.2.1 Approach

This research employed a quantitative approach to test the research hypotheses. This is because the study was concerned with calculating the level of underpricing, which is obtained as the percentage initial return. Additionally, the determinants of underpricing were established by their significance using regression analysis models that are run using numerical data.

3.2.2 Data and Data Sources

The study used survey data covering the period between 1994 and 2014 for the following variables: size of the offer, size of the firm, age of the firm and subscription rate. Data for the study consisted mainly of secondary data on16 IPOs conducted at the Nairobi Securities Exchange between 1994 and 2014. The data on IPOs and firm specific characteristics, as well as share prices of the firms in the sample, were obtained from the Nairobi Securities Exchange, the Capital Markets Authority and the prospectuses of the companies under study. No company which issued an IPO in the period under study was excluded as complete information with regard to the variables being tested was accessible. To calculate the return on the market index the Nairobi 20-share index was used as data dating back to 1994 was available. Binary

regression models were used to test the relationship between the variables under study and underpricing.

3.3 Data Analysis

Underpricing was measured by calculating the percentage market adjusted return on securities (MAARO). A positive return indicated underpricing, negative returns were interpreted as overpricing, while a return of zero indicated that the IPO was correctly priced.

Previously, the determinants of short-run market performance have been identified using multiple regression analysis, however, according to Perera (2014), a binary regression model is more realistic and important for IPO investors than the multiple regression models for a number of reasons. First, it does not assume normal distribution and linearity. Additionally, it estimates the associated probabilities (risks) of determinants, which is more important due to the change in economic and financial factors in the market. Finally, the associated probability (risk) of a determinant is known as marginal probability, which is important to identify the directional change in the IPO market performance.

Unlike the Ordinary Least Squares (OLS) regression model that contains the dependent variable as a continuous variable, the binary regression models have it as a binary outcome. The probit and logit models are estimated using the maximum likelihood method. The sign of the co-efficient and not its magnitude was interpreted, such that an increase in one of the independent variables would increase or decrease the likelihood that, in this case, underpricing would take place.

3.3.1 Measuring Underpricing

The research adopted the standard model for calculating IPO underpricing. The initial return on stock i wascalculated as:

$$R_i = \frac{P_1}{P_0} - 1 \tag{1}$$

Where, R_i is total return at the close of the first trading day, P_1 is the price of the stock at the close of the first trading day and P_0 is the offer price of the IPO.

The return on the market index during the same time was calculated in order to obtain the market adjusted returns on securities (MAARO). This rests upon the assumption that the systematic risk of the IPOs under consideration was the same as that of the index. The return on the market index was calculated as:

$$M_i = \frac{I_1}{I_0} - 1 \tag{2}$$

Where M_i is the market return on the first day of trading, I_i is the closing index at listing day and I_0 is the closing index at offer day.

The market adjusted return on securities combined both equation 1 and 2, as follows:

$$MAARO = \left[\frac{(1 + R_i)}{(1 + M_i)} - 1\right] * 100 \tag{3}$$

The market adjusted model measures the initial trading returns in excess market return form. This measurement was used in earlier studies on the short run performance of IPOs by economists such as Aggarwal (1993) on Latin American IPOs and van Heerden and Alagidede (2013) on South African IPOs.

3.3.2 Choice of Variables

Binary regression models (logit and probit) were used to test the factors that affect underpricing. These models measured the probability of underpricing occurring in the short-run market performance of IPOs. The dependent variable in the models were denoted as '1' and '0'. Underpricing was considered 1 and overpricing 0. Another test was carried out with underpricing greater than 20% considered 1, and that less than or equal to

20%, 0. This research expected that the size of the offer, the size of the firm, age of the firm and the subscription rate would significantly affect the underpricing of an IPO.

3.3.2.1 Measurement of Variables

Variable	Measurement
MAARO	Proxy for underpricing. Measured as the market adjusted initial return on securities.
Size of the offer	The number of shares issued under the offer for sales multiplied by par value per share. Transformed by obtaining the log.
Size of firm	The net assets of the company in the year of the IPO. Transformed by obtaining the log.
Age of firm	The number of years between incorporation of the company and the IPO.
Subscription rate	Number of shares applied for divided by the number of shares offered.

Table 1: Measurement of variables under study

All independent variables were transformed by obtaining the natural logs of the values, in order to normalize the data.

The binary regression models were applied to the following regression to establish factors that significantly affect underpricing at the NSE capital market:

$$MAARO = a_0 + a_1 lnSOFF + a_2 lnSOF + a_3 lnAGE + a_4 lnSRATE + \varepsilon \quad (4)$$

Where:

UND = Underpricing/Overpricing

$SOFF$ = Size of the offer

SOF = Sizeof the firm

AGE = Age of the firm

$SRATE$ = Subscription rate

$MAARO$ = Market adjusted return on securities

The logistic function F, which is a function of any random variable, z, would be

$$F(z_i) = \frac{e^{z_i}}{1 + e^{z_i}} = \frac{1}{1 + e^{-z_i}} \quad (5)$$

where e is the exponential under the logit approach. The model is so called because the function F is in fact the cumulative logistic distribution. So the logistic model estimated would be

$$P_i = \frac{1}{1 + e^{-(\beta_1 + \beta_2 x_{2i} + \cdots + \beta_k x_{ki} + u_i)}} \quad (6)$$

where again $P_i$is the probability that $MAARO = 1$.

Instead of using the cumulative logistic function to transform the model, the cumulative normal distribution is sometimes used instead. This gives rise to the probit model. The function F in equation (5) is replaced by:

$$F(z_i) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{z_i^2}{\sigma}\right)} \quad (7)$$

This function is the cumulative distribution function for a standard normally distributed random variable. As for the logistic approach, this function provides a transformation to ensure that the fitted probabilities will lie between zero and one (Brooks, 2008).

3.4 Limitations of the Study

The key limitation of the study was the sample size which took into account the 16 IPOs that took place over 20 years. Similar studies in Bangladesh have

included 191 IPOs (Islam, Ali, & Ahmad, 2010), while those in South Africa have included 138 IPOs (van Heerden & Alagidede, 2013). Additionally, in the study, it is assumed that the IPOs took place under similar economic and political conditions which was not the case. Economic factors could have given the model additional explanatory ability. The researcher also acknowledges that, although useful, the inclusion of the offer price might introduce some bias in the regression as there is already information on the offer price in the dependent variable (MAARO).

4 Data Analysis, Results and Discussion

4.1 Introduction

On analysis of the IPOs that took place during the period under this study, the research finds that there has not been a wide disparity in the number of IPOs issued in any given year[2]. However, most IPOs took place on or around an election year; less than two years before or after an election.

The financial services sector, segmented on the NSE into banks, insurance and investment companies, issued the highest percentage of IPOs during the 1994-2014 period, 31%. The technology, commercial and services, and manufacturing sectors each issued 13% of the IPOs. The remainder of the sectors, including the construction and allied, and agriculture sectors, were classified as others, having issued an IPO each, and had a 31% share of the total IPOs[3].

This chapter discusses and evaluates the summary statistics of the initial return used to measure the underpricing of the IPOs, examines the underpricing determinants, and relays these key findings.

4.2 Underpricing

This research calculates summary statistics based on raw and market-adjusted return measures for the first listing day. Further, the study uses market-adjusted return as the dependent variable of the regression models employed to identify the significant determinants of the short-run market performance.

Based on raw initial return, two of the sixteen IPOs issued between 1994 and 2014 were overpriced, one was correctly priced while the remaining were underpriced. The market adjusted returns produces similar results with two overpriced and fourteen underpriced IPOs. The highest underpricing witnessed was the KenGen Company Ltd IPO at 200.5% while the British

[2] See appendix 1, Table 5
[3] See appendix 2, Figure 1

American Investment Group Ltd. IPO was overpriced by 1.4%[4].Sample companies were underpriced on the first listing day by 46.28% based on the raw return and 46.22% based on the MAARO. The slight difference appears because most market returns on the index were lower than the IPO returns. These returns are statistically significant at the 1% level.

The results for IPOs on the Nairobi Securities Exchange largely follow that of other studies on emerging markets as well as industrial markets. This finding support the studies of Islam, Ali and Ahmad (2010). The study's findings are also comparable with other Kenyan studies on the subject by Cheluget (2008) and Swanya (2014), as well as that of Osei, Adjasi and Fiawoyife (2012) in the West African markets of Ghana and Nigeria.

4.3 Determinants of Underpricing

The study employs logit and probit multivariate statistical models to measure the probability of underpricing occurring in the short-run market performance of IPOs. The dependent variable in the model is denoted as '1' and '0'. In the first set of regressions, the research considers underpricing as 1 and overpricing 0. In the second set of regressions, it takes underpricing greater than 20% as 1 and that less than or equal to 20%, 0.

All determinants of the short-run market performance discussed in the methodology chapter were treated as independent or explanatory variables. In contrast to the multiple regression model, the logit and probit models measure the probability associated with the explanatory variables in the short-run market performance.

Initial tests with the strict underpricing and overpricing condition, indicated perfect prediction and inexistence of MLE with both the probit and logit tests. In light of the perfect prediction, a second set of tests with 20% as the threshold was conducted. Initially, the variables are found to be insignificant in determining underpricing. However, incremental modelling, by excluding the age of firm variable, which had the largest disparity, finds that the

[4] See appendix 2, Figure 2

subscription rate is significant at a 5% level of significance, as seen in table 2 and 3 below, consistent with literature on the subject. A higher subscription rate makes underpricing, by greater than 20%, more likely to occur. The study deems size of offer though negatively related to underpricing, insignificant as was the size of the firm, which is positively related to underpricing.

Table 2: The logit model for underpricing

	Coefficient	Std. Error	z	p-value
Constant	-12.8710	10.8320	-1.1880	0.2347
lnSRATE	2.3458	1.1278	2.0800	0.0375 **[5]
lnSOFF	-0.8401	0.8675	-0.9684	0.3328
lnSOF	1.3113	0.9582	1.3680	0.1712

Table 3: The probit model for underpricing

	Coefficient	Std. Error	z	p-value
Constant	-8.1292	6.2593	-1.2990	0.1940
lnSRATE	1.4440	0.6374	2.2660	0.0235 **
lnSOFF	-0.5234	0.4943	-1.0590	0.2897
lnSOF	0.8231	0.5465	1.5060	0.1320

Additionally, the research finds that the size of the firm and age of the firm tend to move together and that one could most often be predicted by another, depending on the timing of the IPO. This finding is informed by the fact that majority of firms that raised more funds than their value, taken as the difference between the size of the offer and the size of the firm, tended to raise IPOs after election[6]. This can be attributed to the increase in interest rates following an election year that attracts investors. One of the exceptions to this was National Bank of Kenya in 1994 that was affected by image issues, due to its high indebtedness, in the period leading to the IPO. Conversely, as a result of capital flight, majority of the IPOs issued in the years preceding an

[5] 5% level of significance
[6] See appendix 1, Table 6

election or on the election year were found to have under-raised capital. Capital flight can be attributed to the fear that elections could interfere with the economic stability of the country and, consequently, the investments made.

4.4 Summary

This chapter has presented the analysis of the short-run market performance and identified its significant determinants based on the offer, firm and market characteristics of Kenyan IPOs listed between January 1994 to December 2014. The short-run market performance was analyzed using the first listing day returns and determinants of the short-run market performance were identified using logit and probit regression models. The short run underpricing was found to be 46.28% using the market adjusted return, with the subscription rate being the most significant determinant of underpricing.

5 Conclusions and Recommendations

5.1 Conclusion

The market for newly issued shares is subject to a variety of well-known eccentric patterns, one of which is IPO underpricing in the short-run. This study discussed theoretical matters on IPO underpricing in both industrial and emerging markets and, subsequently, tested the empirics of underpricing in a Kenyan stock market. The results, consistent with other studies, show that there is presence of underpricing on the initial day after the IPO issued. Results for IPOs on the Nairobi Securities Exchange largely follow that of other studies on developing as well as advanced markets.

5.2 Policy Recommendations

With this knowledge investors, asset managers, and analysts in Africa can take steps to properly value issuing firms. However, with the relationship between oversubscription and underpricing, companies should strive to ensure their IPOs are oversubscribed. Given that oversubscribed issues are underpriced, with a positive initial return, the rise in the share price of the company boosts investor confidence and can lead to a further increase.

5.3 Suggestions for Further Studies

Given the discovery that with the exception of one or two, IPOs that took place before an election year tended to issue IPOs larger than the size of their firm, it would be of interest to find out whether, given a larger sample size and comparing IPOs across different countries, this factor significantly affects the pricing and size of offer, in relation to the size of the firm, of IPOs in various African countries.

References

Abu Bakar, N. B., & Uzaki, K. (2013). An Empirical Study of Initial Public Offerings Underpricing for Shariah-Compliant Companies: The Case of Malaysian Market. *International Journal of Economics, Business and Finance , 1* (9), 262-274.

Aggarwal, R., & Rivoli, P. (1990). Fads in the Initial Public Offering Market? *Financial Management , 19* (4), 45-57.

Aggarwal, R., Leal, R., & Hernandez, L. (1993). The Aftermarket Performance of Initial Public Offerings in Latin America. *Financial Management , 22* (1), 42-53.

Akerlof, G. A. (1970). The Market for Lemons: Quality, Uncertainty and the Market Mechanism. *The Quarterly Journal of Economics , 84* (3), 488-500.

Allen, F., & Faulhaber, G. R. (1989). Signalling by Underpricing in the IPO market. *Journal of Financial Economics , 23*, 303-323.

Bansal, R., & Khanna, A. (2012). Determinants of IPO Underpricing: An Empirical Evidence from Bombay Stock Exchange after Stock Market Crisis. *Journal of Financial Risk Management , 1* (4), 68-74.

Baron, D. P. (1982). A Model for the Demand of Investment Bank Advising and Distribution Sevices for New Issues. *The Journal of Finance , 37* (4), 955-976.

Booth, J. R., & Chua, L. (1996). Ownership Dispersion, Costly Dispersion and IPO Underpricing. *Journal of Financial Economics , 41*, 291-310.

Brennan, M. J., & Franks, J. R. (1995). Underpricing, Ownership and Control in Initial Public Offerings of Equity Securities in the UK. *Journal of Financial Economics , 45*, 391-413.

Brooks, C. (2008). *Introductory Econometrics for Finance.* New York: Cambridge University Press.

Carter, R. B., Dark, F. H., & Singh, A. K. (1998). Underwriter Reputation, Initial Returns and the Long-Run Performance of IPO Stocks. *The Journal of Finance , 53* (1), 285-311.

Chalk, A. J., & Peavy, J. W. (1987). Initial Public Offerings: Daily Returns, Offering Types and the Price Effect. *The Financial Analysts Journal , 43* (5), 65-69.

Cheluget, J. K. (2008, October). Investor's Demand for IPOs and First Day Performance: Evidence From Nairobi Stock Exchange.

Cook, J. P., & Officer, D. T. (1996). Is Underpricing a Signal of Quality in 'Second' Initial Public Offerings? *Quarterly Journal of Business and Economics , 35* (1), 67-78.

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance , 25* (2), 383-417.

Henrick, B. (2012, Spring). The Role of Industry Affiliation in the Underpricing of U.S. IPOs.

Hughes, P. J., & Thakor, A. V. (1992). Litigation Risk, Intermediation and the Underpricing of Initial Public Offerings. *The Review of Financial Studies , 5* (4), 709-742.

Ibbotson, R. G. (1975). Price Performance of Common Stock New Issues. *Journal of Financial Economics , 2*, 235-272.

Ibbotson, R. G., & Jaffe, J. F. (1975). "Hot Issue" Markets. *The Journal of Finance , 30* (4), 1027-1042.

Islam, A., Ali, R., & Ahmad, Z. (2010). An Empirical Investigation of the Underpricing of Initial Public Offerings in the Chittagong Stock Exchange. *International Journal of Economics and Finance , 2* (4), 36-46.

Islam, A., Ali, R., & Ahmad, Z. (2010). Underpricing of IPOs: The Case of Bangladesh. *Global Economy and Finance Journal , 3* (1), 44-61.

Islam, R. (2014). An Empirical Investigation of Short Runs IPO Underpricing: Evidence from Dhaka Stock Exchange. *IOSR Journal of Economics and Finance , 4* (4), 1-11.

Jegadeesh, N., Weinstein, M., & Welch, I. (1993). An Emprical Investigation of IPO Returns and Subsequent Equity Offerings. *Journal of Financial Economics , 34*, 153-175.

Loughran, T., & Ritter, J. R. (2002, March). Why Has IPO Underpricing Increased Over Time?

M'kombe, C., & Ward, M. (2002). Aftermarket Price Performance of Initial Public Offerings on the JSE. *Investment Analysts Journal , 31* (55), 7-20.

Osei, K. A., Adjasi, C. K., & Fiawoyife, E. U. (2012). *Underpricing of Initial Public Offerings on African Stock Markets: Ghana and Nigeria.* The Africa Economic Research Consortium. Nairobi: The African Economic Research Consortium.

Perera, K. (2014, March). Evaluation of Market Performance of Initial Public Offerings and Its Determinants: Evidence from Australia IPOs.

Rajagopalan, A. (2013). Speculative Initial Public Offerings: A Disagreement Approach to the IPO Puzzle. *Yale Journal of Economics , 2* (1).

Riding, A. L. (1998). *Financing Entrepreneurial Firms: Legal and Regulatory Issues.*

Ritter, J. R. (1998). Initial Public Offerings. *Contemporary Finance Digest , 2* (1), 5-30.

Ritter, J. R. (1984). The "Hot Issue" Market of 1980. *The Journal of Business , 57* (2), 215-240.

Ritter, J. R. (1991). The Long Run Performance of Initial Public Offerings. *Journal of Finance , 46* (1), 3-27.

Ritter, J. R., & Beatty, R. P. (1986). Investment Banking, Reputation, and the Underpricing of Initial Public Offerings. *Journal of Financial Economics , 15*, 213-232.

Ritter, J. R., & Welch, I. (2002). A Review of IPO Activity, Pricing and Allocations. *Journal of Finance , 57* (4), 1795-1828.

Rock, K. (1986). Why New Issues Are Underpriced. *Journal of Financial Economics , 15*, 187-212.

Shiller, R. J. (1990). Speculative Prices and Popular Models. *The Journal of Economic Perspectives , 4* (2), 55-65.

Swanya, J. (2014, November). Effect of Subscription Rate on Initial Public Offerings Performance on the Nairobi Securities Exchange.

Tinic, S. M. (1988). Anatomy of Initial Public Offering of Common Stock. *The Journal of Finance , 14* (4), 789-882.

van Heerden, G., & Alagidede, P. (2013, April). Short-run Underpricing of Initial Public Offerings in the Johannesburg Stock Exchange.

Yong, O. (2011). Investor Demand, Size Effect and the Immediate Post-Listing Behaviour of Malaysian IPOs. *Universiti Tun Abdul Razak E-Journal*, *7* (2), 23-32.

Zingales, L. (1995). Insider Ownership and the Decision to Go Public. *Review of Economic Studies*, *62*, 425-448.

Appendices

Appendix 1: IPOs and IPO Characteristics

Table 4: Initial Public Offerings in Kenya between 1994 and 2014 (Survey data, 2015)

Company	Year Listed	Issued Shares	Offer Price (KES)	Closing Price(KES)
NSE Ltd	2014	194,625,000	9.50	17.00
BRITAM (Kenya) Ltd	2011	1,891,451,850	9.00	8.10
Co-opBank	2008	700,000,000	9.50	10.45
Safaricom Ltd	2008	40,000,000,000	5.00	7.35
Kenya-Re	2007	240,000,000	9.50	15.75
AccessKenya Group Ltd	2007	218,467,081	10.00	14.00
Eveready East Africa Ltd	2006	210,000,000	9.50	11.00
KenGen Company Ltd	2006	2,198,361,456	11.90	40.00
Scangroup Ltd	2006	284,789,128	10.45	15.00
Mumias Sugar Co. Ltd	2001	1,530,000,000	6.25	6.25
ARM Cement Ltd	1997	495,275,000	12.25	12.60
TPS Serena	1997	12,893,000	13.00	16.37
Kenya Airways Ltd	1996	1,496,469,035	11.25	12.55
Rea Vipingo Plantations Ltd	1996	60,000,000	10.50	12.00
Sameer Africa Ltd	1994	278,342,393	35.50	35.00
National Bank of Kenya Ltd	1994	280,000,000	10.00	26.00

Table 5: Table of the number of IPOs per year

Year	No. of IPOs
1994	2
1996	2
1997	2
2001	1
2006	3
2007	2
2008	2
2011	1
2014	1
Total	16

Table 6: Table illustrating the relationship between distance of listing year from election years, and capital raised

Name of Firm	Year of Listing	Nearest Election	Distance from Nearest Election	lnSOF - lnSOFF
ScanGroup Ltd.	2007	2006	-1	-1.0975
Safaricom Ltd.	2007	2008	1	-0.4219
Sameer Africa Ltd.	1992	1994	2	-0.3776
Eveready East Africa Ltd.	2007	2006	-1	-0.2719
Nairobi Securities Exchange Ltd.	2012	2014	2	-0.1808
Co-operative Bank Ltd.	2007	2008	1	0.1238
Kenya Airways Ltd.	1997	1996	-1	0.2241
Athi River Mining	1997	1997	0	0.4750
British American Investment Group Ltd.	2012	2011	-1	0.5915
Mumias Sugar Company Ltd.	2002	2001	-1	1.0492
Kenya Reinsurance Ltd.	2007	2007	0	1.1059
AccessKenya Group Ltd.	2007	2007	0	1.1203
TP Serena Ltd.	1997	1997	0	1.1459
Rea Vipingo Plantations Ltd.	1996	1997	-1	1.3228
KenGen Company Ltd.	2007	2006	-1	1.5448
National Bank of Kenya Ltd.	1992	1994	2	1.6961

Appendix 2: Graphs Showing the IPOs and Underpricing in Kenya

Figure 1: Chart showing IPOs per sector

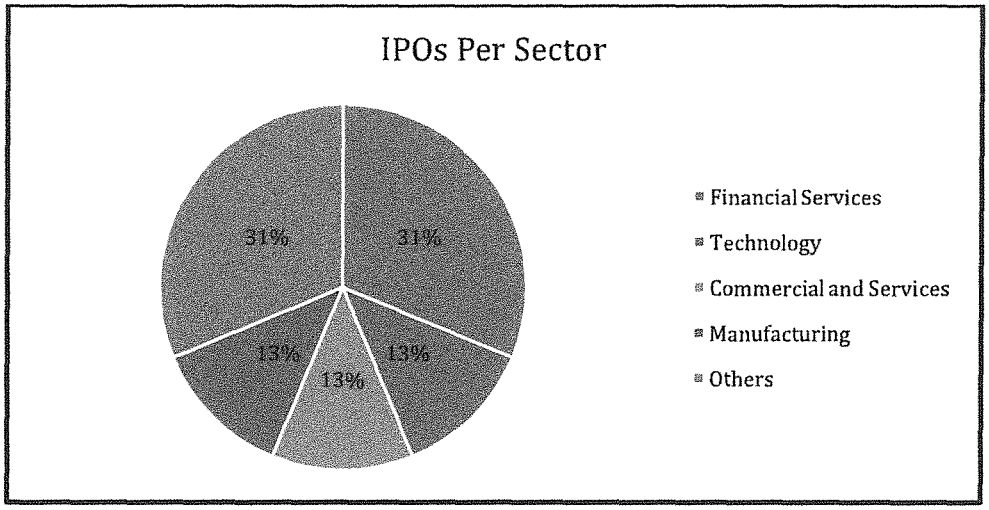

Figure 2: Graph of the market adjusted return on securities per company