Underpricing Process of IPOs in Tunis Stock Exchange:

An Agent-Based Modelling Approach

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Abstract

The fundamental problematic treated in our study was an attempt to explain an anomaly in the issuance of new stocks in IPOs process. The objective of this research is to analyze the effect of certain variables on the level of undervaluation by presenting certain econometric models issued from Agent-based modelling approach. Certain variables can be predictive of the phenomenon of undervaluation such as: the Stock equity distributed to institutional investors, liquidity in the secondary market measured by the price range and the type of investor who can be insiders or outsiders, in addition to these variables we have introduced some control variables which in turn help explain the level of underpricing and which are the age of the company, its size and dimension, the volume of trade and the volatility. Empirically and based on a sample of 16 companies, we were able to respond to our problematic. In fact, according to the hypotheses tests, the prices of the newly introduced stocks on the stock exchange are mostly undervalued which were aligned with our study. Thereby, the methodology adopted based to Dynamic linear models (DLM) that allows offering a very generic framework to analyse time series data. The results of this research were, in part, consistent with work done in developed countries (especially in USA and Europe). Indeed, the undervaluation is in a positive relationship with certain explanatory variables such as the Institutional ownership (INST), Insiders ownership (INSID), Price range (FOUR), etc. On the other hand, we were able to identify significant negative relationships between the initial undervaluation and the basic variable Outsiders ownership (OUTSID), the size of companies listed on the Tunis Stock exchange (BVMT) and the volume of issued stocks.

Keywords: underpricing, IPOs, agent-based modelling, insiders ownership, outsiders ownership, dynamic linear models

1. Introduction

According to agency theory, an improvement in the performance of the firm is expected following changes in two factors in the structure of ownership, namely the concentration of capital and the nature of the shareholders. However, change in these two factors for a company only happens when there is a fundamental change in its strategy or even its structure. Indeed, the company can be innovative, with high growth potential, the capital requirements may not be satisfied by the sole self-financing or the increase in capital by the original partners (founders), Mitnick, Barry M., (1975); Ross, Stephen A. (1973). Therefore, increasing their capital through a public offer is a better solution to attract the necessary funds to finance the growth of the company. IPO offers to these companies an improvement of visibility, a reinforcement of notoriety recognitions to the publicity made around the operation of introduction, Gupta, V., Singh, S. and Yadav, S.S. (2019). In addition, it strengthens the weight of the company in the business world, reassures the current partners of the listed company and gives it access to privileged partnerships with high-level companies that would not agree to join to an unlisted company. The literature investigation confirms that the majority of IPOs are almost automatically associated with undervaluation in all countries and all sectors, Yaakub, N. and Sherif, M. (2019). While the percentage of undervaluation may vary depending on the company and the stock market, it is always present. Many empirical studies have been carrying out on this phenomenon in several countries. For proposed models, the phenomenon of undervaluation during the introduction of companies on the

stock market has been explained by quantitative and qualitative variables, internal and external to the company and before and after the launch introduction. Our empirical study is developed to detect the undervaluation of the shares newly introduced on the Tunisian financial market and this through models which respectively link the discount to the asymmetry of information, liquidity, allocation and governance of the company, Zhang, F., and al., (2020); Xu, Z.-J., and al., (2017); Arora, N. and Singh, B. (2020); Ammer, M.A. and Ahmad-Zaluki, N.A. (2016). To this end, we introduce a set of basic variables and control variables in order to analyze the level of initial profitability. In the course of this article and first, we will present a literature review of our phenomenon and a theoretical development of the hypotheses relating to those. Then, we define the variables used and we present the models. Finally, we try to analyze the relationship between the level of undervaluation and the variables they explain.

2. Literature Review and Hypothesis Development

The short-term undervaluation is a general phenomenon that has existed and highlighted
by a very large number of academic articles, although some reservations can be made to this consensus. A certain number of articles have indeed looked at the level of undervaluation affecting issuing companies backed by private equity, compared to "traditional" companies. Several studies carried out in various countries reach similar conclusions. They show that the newly floated shares trigger abnormally positive performances over the first days of trading, Ong, C.Z., and al., (2021). The methodologies generally adopted consist in analyzing the evolution and the sign of the returns on shares over a horizon of a few days, or even weeks or months following their initial public offering, either in the short term, under the assumption that the attitude market price may not be fully reflected in the first few days of trading. It is possible to examine quite simply the initial rate of return which is powerful enough to reflect the attitude of the market on the first day of introduction, or the informative content of this ratio which is important. Most of these papers Saengchote, K. and Charoenpanich, C. (2021); Levis, (2008) show that the level of initial haircuts is on average lower for private equity backed companies than for other companies. The skills, particularly financial, of capital investors are very often mentioned in an attempt to explain this specificity. That being said, it is striking to note that, in the general case, this "anomaly" is observed at the same time on a very large number of stock markets, but also during various periods. The studies that look at initial profitability are mainly American. Ibbotson (1975) conducted studies on the US market and concluded that for 5,000 newly listed companies during the period 1960-1982, the average of initial profitability was 18.8%. Following the methodology of Ibbotson and Jaffe (1975), Ritter J. (1984) demonstrated during the period 1977-1982, that the initial issues on the American market had recorded an average initial profitability equal to 16.3% during the first day of trading. Ritter J. explained this strong profitability by the presence of a market highly receptive to the first issues of securities on the secondary market, Yaakub, N. and Sherif, M. (2019). On the American equity markets, Ljungqvist (2004) observes that the level of short-term undervaluation is between 10 and 20% on average during the period 1960-2003, with however quite significant variations during the period time: the difference between the return observed on the first day of trading and the initial offer price thus amounted to 71% in 1999, in full stock market euphoria, and to 57% in 2000, at the start of the price movement correction of the stock price, Arora, N. and Singh, B. (2020). Recently, Ritter J. and Welch I. (2002) worked on a sample of 6,249 companies newly listed on the US market during the period 1980-2001 and recorded an average initial profitability of 18.8%. The studies by Ljungqvist, A.P., Wilhelm, W.J., (2004) during the period 1993-2000 showed that the average initial profitability of new issues is equal to 28.1% for a sample made up of 3435 American companies. When it comes to European stock markets, Ljungqvist (2004) shows that the level of underpricing varies quite significantly across countries. Thus France, Italy, Spain and Luxembourg are characterized by a degree of discount among the lowest on average over the period 1990-2003 (less than 15%), while the United Kingdom, Germany and Ireland have an undervaluation level of 30% or more. Gresse and Gajewski (2006) obtain similar results over the period 1995-2004. Finally, Ljungqvist (2004) shows that the levels of undervaluation observed appear to be higher overall in Asia (around 20%) than in Latin America (less than 10%), calculated on average over the period 1990-2001. If the undervaluation of the initial offer price is verified empirically almost everywhere, on the other hand the explanations provided by the literature to justify this phenomenon are multiple and protean. To make the understanding of the various theses presented clearer, we can classify them into two broad categories, similar to Arora, N. and Singh, B. (2020); Welch and Ritter (2002), depending on whether or not they fall under the hypothesis of information asymmetries. . The oldest and most developed theories are those which assume the existence of information asymmetries. Some studies have measured undervaluation; others have offered explanations for undervaluation behavior, Ammer, M.A. and Ahmad-Zaluki, N.A. (2016).

2.1. Information Asymmetry Hypothesis

The quality of the investors who hold shares in the listed company often determines the level of undervaluation. The issued shares must be held either by better informed investors such as insiders (interns) who retain their stake in the company, or by outsiders (external) who are assumed to be less informed about the qualities of the company. Rock (1986) assumes that the primary market depends on the continued participation of uninformed investors, in the sense that informed that there is insufficient demand to take all available stocks even in attractive offers. Several authors link the ex-ante uncertainty and the expected underestimation, Felix, T.H. and von Eije, H. (2019). This uncertainty can be assessed through various variables such as the characteristics of companies or offers, the publication of the introductory prospectus, or market variables subsequent to the introduction. Among the characteristic variables of companies, we find age (Ritter, 1984; (Megginson and Weiss, 1991); Ljungqvist and Wilhelm, 2004), accounting measures such as turnover (Ritter, 1984), industrial (Benveniste, 2003). With regard to the offer, the characteristics relate in particular to the amounts issued (Habib and Ljungqvist, 2001), the destination of the funds raised (Beatty and Ritter, 1986) or the number of risk factors presented in the prospectus (Mehmood, W., and al., (2020)). Market variables such as volumes traded (Miller and Reilly, 1987) or Volatility (Ritter, 1984 and 1987) rely on information not available at the time of introduction but which may be particularly affected by the success of the introduction. The quality of the prospectus can be assumed as a proxy for the quality of the company and its management, denoting a greater propensity for openness to the market and transparency which indicates a more developed " financial culture " As previously illustrated, in the literature (Rock 1986) the undervaluation was held to represent a kind of compensation demanded by uninformed investors for adhering to the offer; such compensation would be for risk in securities trading with operators in possession of additional or better information. The informative prospectus which must accompany the offer of the company's securities represents one of the chains (channels) for which the company could reduce the uncertainty of the correct valuation of its own securities and extend information on its structure, its financial situation, its commercial position and its prospects for growth. The previous uncertainty of the value of the company, its age, its size agree with the model of Rock (1986) cited by Lorenz, F. (2019), the risk for uninformed investors who subscribe to the offer is reduced as the company offer must be made to attract uninformed investors as well.

►*Hypothesis* 1: The level of undervaluation depends on the uncertainty about certain qualities of the company introduced (age, size, etc.).

2.2. Allocation Hypothesis

The majority of empirical studies that focus on the topic of IPOs support a distinction between presumably less informed individual investors and presumably more and better informed institutional investors. The two researchers Hanley and Wilhelm (1995) demonstrate a strong difference in the size of the allocations received by investors depending on whether or not the introductions are undervalued. For Aggarwal and Rivoli (1990), institutional investors perform better on introductions than individuals due in particular to a greater amount invested in the securities that performed the best, and therefore institutional investors guarantee greater returns on their investments allocation. If institutions have private information, the aggregate demand flow from institutions is greater in more undervalued publications, and intermediaries may allocate them a greater number of shares in those publications, Kumar Singla, H. (2019). Most theories explain undervaluation as the reward to institutional investors for the particularly positive information they truthfully reveal during the IPO process or for the control they achieve after the IPO is consistent with IPO undervaluing behavior, Xu, Z.-J., Wang, L. and Long, J. (2017). In short, with their financial expertise and easy access to sources of funds and their contributions in terms of price stability, institutions transmit information on the potential undervaluation that is not necessarily fully detected by other variables or factors known at the time of introduction.

►*Hypothesis 2:* The initial profitability is influenced by the level of allocation to institutional investors.

2.3. Governance Hypothesis

The corporate control model plays an important role in determining the level of undervaluation of newly listed shares since the original owners who want to go public with their company are concerned to retain control of the company because control brings private benefits. The possibility of retaining power would therefore reassure the large shareholders, who would be in favor of mechanisms allowing a controlling bloc to retain power. For companies that place specific values on allocations in order to have large shareholders including institutional investors, a specified level of undervaluation is required to achieve full allocation, because these investors are generally more informed, it is possible that a few companies could benefit from the increased control by institutional investors, Arora, N. and Singh, B. (2020). This does not imply that large shareholders are glued to less attractive IPOs because the lower the

undervaluation is compensated by receiving a higher proportion of disclosure. Moreover, since large shareholders may derive the additional private allowances of control (Bolton and VonThadden 1998) or believe that their superior control practices can produce long-term returns, they are more likely to participate in IPOs less undervalued or even excessively expensive. So companies that place a lower value on liquidity allocations than those in a concentrated ownership structure would tend to be less undervalued. In addition, it is also an important event in the transformation of the governance structure. Some work in the literature looks at institutional investors who play an important role of control; there may be a relationship between institutional shareholders and their trading practices on the price of the share. Institutional investors, as they typically hold larger stocks than typical shareholders, are said to control the operations of the firm (Ahmad-Zaluki, N.A. and Badru, B.O. (2020); Morck, Sheifer, and Vishny (1998). This reduces agency costs and increases the value of the firm. In the summary, our arguments can be formally stated in the following hypothesis:

►*Hypothesis 3:* The concentration of the ownership structure affects the level of undervaluation.

2.4. Liquidity Hypothesis

The Investors participating in IPOs want to be compensated not only for the fundamental risk of the company and unfavorable selection costs in the IPO process, but also for the expected liquidity of the stocks they buy and worry about. an illiquid secondary market, they don't know exactly how trading in the secondary market works. The interest of our hypothesis will relate to the relationship: initial undervaluation and liquidity of newly issued securities, at this stage, we will be interested in the research which has shown that the initial undervaluation increases the number of interested investors; this will improve the liquidity of newly issued securities since they will be more traded in the short term. Ruud (1993) shows that introducers evaluate the introductions at the value expected by the market and support offers whose prices fall below the initial price on the secondary market. For Hanley (1993) and Charreaux G., (1991), price support constitutes insurance for market makers. He confirms that it reduces the liquidity risk of market makers and leads them to lower their price ranges. Thus, this decrease helps to make the introducer more competitive with respect to its competitors. For other researchers, undervaluation strengthens the secondary market, Dumrongwong, K. (2020). Because undervalued trades are often oversubscribed, investors served at IPO have the option of selling their shares back to rationed investors at a price higher than the IPO price, Chhabra, S., Kiran, R. and Sah, A.N. (2017). More recently, Ellul and Pagano (2006) have developed models that show that there is a causality that can work between undervaluation and secondary market liquidity; indeed investors do not know precisely how secondary market liquidity varied. In this extended version, undervaluation increases with liquidity risk: investors demand compensation not only for the expected level of trading costs in the aftermarket, but also for their variability. This hypothesis suggests that the undervaluation stems from the owner's desire to dispose of the capital offered during the initial public offering in order to ensure greater liquidity in the market. In addition, the additional liquidity promised should contribute as the stock price increases. Therefore liquidity is a fundamental determinant of undervaluation, Wales, W. and Mousa, F.-T. (2016).

►*Hypothesis 4:* The undervaluation is dependent on the liquidity variability on the secondary market.

3. Research Methodology

3.1 Variables Definition

a – The explained variable

The measure used in the main works measuring the performance of the IPO on the markets is the undervaluation, (Leleux 1993; Ginglinger, 2002; Broye and Schatt, 2003). Undervaluation, which reflects the level of uncertainty and asymmetry of information regarding the valuation of securities, is defined as the difference between the first quoted price and the offer price, relative to the offer price. The first quoted price results from the exchange of securities and corresponds to the firm's market clearing price. The offer price is available in the IPO prospectuses.

b – The explanatory variables

To assess the level of initial profitability which is the dependent variable certain variables are highlighted and which can be classified into two categories; basic and control.

- **Basic variables:**

- Institutional ownership (INST)

This variable is measured by the percentage of shares held by institutional investors, which is equal to the number of shares held by these shareholders deflated by the total number of shares in the company. In fact, we have considered, according to several studies as institutional investors, financial institutions, investment companies, insurance

companies and social security funds. This measure has been used by Sarin (2000), Dennis and Weston (2001) and Randi Naes (2004).

- Price range (FOUR)

This variable is defined as the percentage of the daily price range calculated on a daily basis and then averaged over a year. The price range is the difference between ask and bid divided by their average. Askt: is the price at which a purchase is made at t, Bidt: is the price at which a sale is made at t. This variable was measured in the same way by Sarin (2000), (Heflin and Shaw (2000)) and Attig (2006).

- Concentration of ownership structure (CONC)

The variable CONC leads us to capture the fraction of shares held by large shareholders, which are mainly founders, members of the same family or institutional investors. In fact, the risk of losing control of the company is reduced for majority shareholders holding almost all of the capital, compared to a shareholder holding a smaller fraction of the shares of his company. It is measured by the percentage of shares held by institutional investors.

- Insiders ownership (INSID)

Insiders or insiders; those with private information and the power to change the business. Insider ownership is measured by the percentage of shares held by interns. These shareholders are those who hold shares in the capital of the firm while participating in a sustainable way in decision-making and / or in management.

- Outsiders ownership (OUTSID)

These are the external shareholders. Ownership of outsiders is measured by the percentage of shares held by outsiders. These shareholders are those who hold shares in the capital of the firm while participating in a conditional manner (depending on the strategies of the firm) in decision-making and / or in management.

- **Control variables:**

- Company dimension (DIM)

This variable is generally used as a proxy for the previous level of uncertainty about the value of the company; in fact, all other things being equal, larger companies are better known, even more so in the case of financial institutions and privatized companies. One might, therefore, expect a correlation between undervaluation and the societal dimension. For the measurement of this variable, we use the turnover achieved by the company during one year.

- Company Age (AGE)

The studies have documented the existence of a negative correlation between the level of undervaluation and the age of society. It seems reasonable enough to assume, in fact, that as the age increases (calculated as the years since the IPO) it will be easier for the market to have a better knowledge of the company and will therefore be in a better position to assess it.

- Company size (Size)

This variable is measured by market capitalization. A large firm has an ease of dissemination of information and a balance of power vis-à-vis stakeholders during the issuance which will allow it to set a high introductory price which will reduce undervaluation. So we can expect a negative relationship between the size of the firm and the variable undervaluation.

- Price volatility (volatility)

It is the natural logarithm of the ratio of the highest price to the lowest price of the share during each year; this variable is a very important index for risk averse investors, in addition this variable helps to anticipate little precisely the variation in share prices and their limits. According to Kevin Daly (1997), volatility can be defined as the variability of the variable under consideration. The more the variable fluctuates during a period, the more it is supposed to be volatile.

- Number of stocks traded (T-Volume)

It is the logarithm of the number of shares placed on the market at the time of the introduction, the greater the number of shares placed on the market, the greater the liquidity should be. The undervaluation of equities would therefore be smaller since a balance between supply and demand would have to be achieved more quickly. The expected relationship should be negative.

3.2 Presentation of the Sample and Sources of Information

The final sample consists of 16 companies listed on the Tunis Stock Exchange (BVMT) during the period January 2010 until December 2018. Study data was collected manually from the following sources of information:

- Bond issue prospectuses, Stock issue prospectuses and company activity reports available from the Financial Market Council;

- Financial statements published in official BVMT bulletins;

- The BVMT (Tunis stock exchange) website.

3.3 Descriptive Statistics

Our study will be carried out on 16 companies listed on the BVMT and which issue new shares each year during the period 2010-2018. It is necessary to resort to certain descriptive statistics to obtain a more detailed portrait of the sample to be tested. Table (1) shows the distribution of the level of undervaluation of the shares retained by Tunisian companies making up the sample during their stock market issues during the period 2010-2018. This table highlights how the level of undervaluation varies from company to company and even at the level of a single company for a few years.

Table 1. Sample characteristics

	MEAN	MEDIAN	MAXIMUM	MINIMUM	STD
AIR-LIQUIDE	0,17	0,18	0,19	0,15	0,015
ALKIMIA	0,054	0,060	0,060	0,040	0,0078
ELECTROSTAR	0,042	0,040	0,060	0,040	0,0075
ESSOUKNA	0,41	0,41	0,43	0,40	0,015
MAGASIN GENERALE	0,42	0,43	0,44	0,41	0,013
SFBT	0,11	0,12	0,13	0,11	0,008
SIPHAT	0,07	0,07	0,07	0,07	0,000
SIMPAR	0,15	0,16	0,18	0,12	0,023
SOMOCER	0,10	0,11	0,13	0,06	0,029
SOTUMAG	0,19	0,20	0,22	0,18	0,012
SOTUVER	0,48	0,49	0 ,50	0,45	0,02
STIP	0 ,18	0,18	0,18	0,18	0,000
SITS	0,10	0,12	0,13	0,08	0,021
TUNISIE-LAIT	0,26	0,26	0,30	0,23	0,026
TUNISAIR	0,41	0,41	0,43	0,40	0,012

Remark: In our sample, the level of undervaluation is on average 18%

and varies between 45% (SOTUVER) and 6% (SOMOCER).

4. Presentation of Econometric Models and Estimation Results

The methodology adopted based to Dynamic linear models (DLM) that allows offering a very generic framework to analyse time series data. It is a form of multiple regressions which allows analyzing the dependent variable according to several explanatory variables. Thereby, the methodology adopted based to Dynamic linear models (DLM) that allows offering a very generic framework to analyse time series data. The indices i, t represent the company and the period considered respectively. The econometrics of the panel data allows us to highlight the heterogeneity of the observations data. Indeed, in this article, we will restrict ourselves to the study of simple linear models on panel data, the latter being defined in opposition to dynamic models involving lagged endogenous variables.

4.1 Preparatory Phase Models

These are the two preparatory phase models which are the information asymmetry model and the allocation model.

a- Econometric model 1: the asymmetry model

- Principal model 1: (before introduction of the control variables):

$$NSE_{i,t} = \alpha_0 + \beta\ INSID_{i,t} + \varepsilon_{i,t} \qquad\qquad (1)$$

With:

$NSE_{i,t}$: the level of undervaluation of firm i in year t.

$INSID_{i,t}$: Insiders Ownership of the company i in year t (Share of stocks held by interns);

$\varepsilon_{i,t}$: the residual model term.

Where α_0, β are the unknown model parameters.

- Principal model 2: (before introduction of the control variables)

$$NSE_{i,t} = \alpha_0 + \beta\ OUTSID_{i,t} + \varepsilon_{i,t} \qquad\qquad (2)$$

With:

$NSE_{i,t}$: the level of undervaluation of firm i in year t.

$OUTSID_{i,t}$: Outsiders ownership of the company i in year t (Share of stocks held by externs);

$\varepsilon_{i,t}$: the residual model term.

Where α_0, β are the unknown model parameters.

- Secondary model (after introduction of the control variables):

$$NSE_{i,t} = \alpha_0 + \beta_1\ INSID_{i,t} + \beta_2\ OUTSID_{i,t} + \beta_3\ DIM_{i,t} + \beta_4\ AGE_{i,t} + \varepsilon_{i,t} \qquad (3)$$

With:

$NSE_{i,t}$: the level of undervaluation of firm i in year t.

$INSID_{i,t}$: Insiders Ownership of the company i in year t (Share of stocks held by interns);

$OUTSID_{i,t}$: Outsiders ownership of the company i in year t (Share of stocks held by externs);

$DIM_{i,t}$: the dimension of the company i in year t.

$AGE_{i,t}$: the age of firm i in year t.

$\varepsilon_{i,t}$: the residual model term.

Where α_0, β_1, β_2, β_3, β_4 are the unknown model parameters.

In addition, in a market governed by the assumption of asymmetry of information, we could predict a short-term undervaluation, ie a positive abnormal initial return.

The results of our study are illustrated in the table below:

Table 2. Ordinary least squares estimation of the relationship between the level of undervaluation and information asymmetry

	1st regression (without control variables)		2nd regression (without control variables)		1st regression (with control variables)	
	coef	Prob	coef	Prob	coef	Prob
C	0,436	0,0000	0,546	0,0000	-0,431	0,0200
INSID	0,983	0,0002	-	-	0,981	0,0400
OUTSID	-	-	-0,983	0,0001	-0,002	0,0939
DIM	-	-	-	-	-2,93E	0,0051
AGE	-	-	-	-	2,58E	0,0390
R^2	0,998		0,998		0,958	

By observing the results of the regressions done with the previous model on the entire sample, we notice that the explanatory power of the model is relatively strong ($R^2 = 0.998$). Our estimate of the variables is classified into three regressions. At the level of the first regression, we noticed the significance of the INSID variable which has a positive and significant effect on the level of under-evaluation (coef = 0.983) and (P = 0.0002 <0.05) therefore the

more the number of actions issued is held by insiders is high the level of undervaluation is high. This result confirms the idea that insiders are more susceptible to undervaluation when they own a high fraction of shares in the preparatory phase of an IPO, which means greater private benefits. These results are verified by Grinblatt and Hwang (1989) who showed that there should be a positive relationship between IPO undervaluation and IPO insider retention, since insiders seem maximize their wealth. Alternatively at the second regression level, the OUTSID variable is significant but it has a negative effect on the level of undervaluation (coef = -0983) and (P <0.05) and consequently the more the outsiders hold newly introduced shares the more the level of initial profitability is low. Thus, these results lead us to validate the asymmetry hypothesis; the adverse selections of investors seem to influence the undervaluation significantly. The market takes into account the fact that company managers have superior or privileged information on growth opportunities and potential difficulties. This information asymmetry has important implications for the valuation and volume of IPOs. For the last regression where we integrate the control variables, some of the latter play a role in the explanation of the underestimation. The AGE variable positively and significantly influences the underestimation. In accordance with our expectations, the initial return increases with the age of the introduced company. Likewise, we find a significant and negative association (coefficient = -2.93E) between the size of the company and the level of discount.

b- Econometric model 2: Allocation model

- Principal model (before introduction of control variables):

$$NSE_{i,t} = \alpha_0 + \beta\ INST_{i,t} + \varepsilon_{i,t} \qquad (4)$$

With:

$NSE_{i,t}$: the level of undervaluation of firm i in year t.

$INST_{i,t}$: the pat of stocks allocated to institutional investors by company i in year t.

$\varepsilon_{i,t}$: the residual model term.

Where α_0, β are the unknown model parameters.

- Secondary model (after introduction of control variable):

$$NSE_{i,t} = \alpha_0 + \beta_1\ INST_{i,t} + \beta_2\ DIM_{i,t} + \beta_3\ AGE + \varepsilon_{i,t} \qquad (5)$$

With:

$NSE_{i,t}$: the level of undervaluation of firm i in year t.

$INST_{i,t}$: the pat of stocks allocated to institutional investors by company i in year t.

$DIM_{i,t}$: the dimension of the company i in year t.

$AGE_{i,t}$: the age of firm i in year t.

$\varepsilon_{i,t}$: the residual model term.

Where $\alpha_0, \beta_1, \beta_2, \beta_3$ are the unknown model parameters.

The results of our study are illustrated in the table below:

Table 3. Estimation by the ordinary least squares method of the relationship between the level of undervaluation and the level of allocation to institutional investors

	1st regression (without control variables)		1st regression (with control variables)	
	coef	Prob	coef	Prob
C	0,006	0,0001	0,011	0,0020
INST	0,574	0,0001	0,571	0,0001
DIM	-	-	1,60E	0,0001
AGE	-	-	-0,001	0,0009
R^2 adjusted	0,996		0,996	

Observing the results of the regressions performed on the previous model on the entire sample, we notice that the explanatory power of the model is relatively strong (R^2 = 0.996). We notice from table (3), that in the first regression, the coefficient of the shares of shares allocated to institutional investors during the IPO is positive and significant at the 5% threshold (coef = 0.574 and p = 0.0001). Consequently, it can be said that there is a positive

relationship between the initial undervaluation and the institutional allocation when Tunisian companies are listed on the stock market; the more these investors hold shares, the greater the undervaluation. Which leads us to confirm our second hypothesis; The institutional assignment may contain private information about Day 1 returns not reflected in the price update and other explanatory variables related to Day 1 listing returns. (e.g. Beatty and Ritter, 1986; Carter and Manaster, 1990; Michaely and Shaw, 1994; Jegadeesh, Weinstein, and Welch. 1993) suggest that if institutions have private information, the aggregate demand flow from institutions is larger (super) in more undervalued (sold cheaper) issues (posts) and intermediaries can allocate (spread) them a larger number of shares (shares) in these issues (posts). In table (3) and at regression level 2, we can also note the existence of a positive and significant relationship at the 5% threshold between the initial undervaluation and the percentage of shares held by institutional investors. (coef = 0.571 and p = 0.0001), but this significance is lower than the first regression, this is due to the existence of other variables determining the level of endogenous variable. Regarding the size of the company which is approximated by the level of asymmetry of information, the results of the study affirm that this variable has a positive and significant impact on the initial undervaluation, since the dimension is a criterion of the reputation of the company introduced, the greater its dimension, the more it is known by investors. On the other hand, the age of the company is negatively linked to the level of undervaluation; the newer the company is to the market, the higher the discount level.

4.2 Post-Introduction Phase Models

These are mainly the two phase IPO models, which are the corporate governance model and the liquidity model.

a- Econometric model 1: Governance model

- Principal model (before introduction of control variables):

$$NSE_{i,t} = \alpha_0 + \beta\, CONC_{i,t} + \varepsilon_{i,t} \qquad (6)$$

With:

$NSE_{i,t}$: the level of undervaluation of firm i in year t.

$CONC_{i,t}$: the percentage of stocks held by institutional investors by company i in year t.

$\varepsilon_{i,t}$: the residual model term.

Where α_0, β are the unknown model parameters.

- Secondary model (after introduction of control variables):

$$NSE_{i,t} = \alpha_0 + \beta_1\, CONC_{i,t} + \beta_2\, \text{T-Volume}_{i,t} + \beta_3\, \text{Volatility}_{i,t} + \beta_4\, Size_{i,t} + \beta_5\, DIM_{i,t} +$$
$$B_6\, AGE_{i,t} + \varepsilon_{i,t} \qquad (7)$$

With:

$NSE_{i,t}$: the level of undervaluation of firm i in year t.

$CONC_{i,t}$: the percentage of stocks held by institutional investors by company i in year t.

$\text{T-volume}_{i,t}$: the natural logarithm of the number of stocks issued by company i in year t.

$\text{Volatiltity}_{i,t}$: It is the natural logarithm of the ratio between the highest price and the lowest price of the stock of firm i in year t.

$Size_{i,t}$: The size of firm i in year t.

$DIM_{i,t}$: the dimension of the company i in year t.

$AGE_{i,t}$: Age of firm i in year t.

$\varepsilon_{i,t}$: the residual model term.

Where $\alpha_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the unknown model parameters.

In what follows, we will present the results of econometric analyzes aimed at examining the impact of corporate governance and more specifically the impact of ownership structure on the level of initial profitability. It should be noted, however, that the estimates for all models are made on panel data, which allows us to verify the effect of concentration of capital on undervaluation.

Table 4. Ordinary least squares estimation of the relationship between the level of undervaluation and the level of concentration of ownership structure

	1st regression (without control variables)		1st regression (with control variables)	
	coef	Prob	coef	Prob
C	0,006	0,0001	-0,002	0,9805
CONC	0,574	0,0001	0,572	0,0001
T-Volume	-	-	0,002	0,2952
Volatility	-	-	-0,068	0,1118
Size	-	-	2,15E	0,8669
DIM	-	-	1,35E	0,0199
AGE	-	-	-0,021	0,0165
R^2 adjusted	0,996		0,996	

Estimates are made using two panel data regressions. The first regression without control variables. The results of the estimates, according to this model show that the model is significant because $R^2 = 0.996$, indeed, the regression coefficient of the basic variable CONC is positive (coef = 0.574) and significant at the 5% level (prob = 0 , 0001 <0.05) so our third hypothesis is verified because it is a positive relationship between the concentration of ownership structure and the level of undervaluation, the result emphasizes that the percentage of shares held by institutions positively affects the level of initial profitability. This result is consistent with Zingales (1995), indicating that the issuers of these IPOs may be more interested in retaining control and building liquidity to facilitate further sales this is achieved by the concentration of ownership in the hands. Institutional investors who bring more profits through their management and control strategies. The second regression with control variables shows the following results; the basic variable coefficient remains positive but its significance has decreased and this is explained by the intervention of certain control variables which explain the level of variable to be explained. Among these variables we can cite the variable DIM which has a positive and significant regression coefficient at a risk level of 5% (P = 0.019 <0.05). We also notice from the estimation table that the age variable is significantly negatively related to the level of undervaluation (p = 0.0165 <0.05).

b. Econometric model 2: Liquidity model

- Principal model: (before introduction of control variables):

$$NSE_{i,t} = \alpha_0 + \beta \, FOUR_{i,t} + \varepsilon_{i,t} \tag{8}$$

With:

$NSE_{i,t}$: the level of undervaluation of firm i in year t.

$FOUR_{i,t}$ **:** The price range of firm i in year t.

$\varepsilon_{i,t}$: the residual model term.

Where α_0, β are the unknown model parameters.

- Secondary model (after introduction of control variables):

$$NSE_{i,t} = \alpha_0 + \beta_1 \, FOUR_{i,t} + \beta_2 T\text{-volume}_{i,t} + \beta_3 Volatility_{i,t} + \beta_4 \, Size_{i,t} + \beta_5 \, DIM_{i,t} +$$
$$B_6 \, AGE_{i,t} + \varepsilon_{i,t} \tag{9}$$

With:

$NSE_{i,t}$: the level of undervaluation of firm i in year t.

$FOUR_{i,t}$: the price range of firm i in year t.

$T\text{-volume}_{i,t}$: the natural logarithm of the number of stocks issued by company i in year t.

$Volatility_{i,t}$: It is the natural logarithm of the ratio between the highest price and the lowest price of the share of firm i in year t.

$Size_{i,t}$: The size of firm i in year t.

$DIM_{i,t}$: the dimension of the company i in year t.

$AGE_{i,t}$: Age of firm i in year t.

$\varepsilon_{i,t}$: the residual model term.

Where α_0, β_1, β_2, β_3, β_4, β_5, β_6 are the unknown model parameters.

The results of our study are illustrated in the following table:

Table 5. Estimation by the method of ordinary least squares of the relationship between liquidity and initial undervaluation

	1st regression (without control variables)		1st regression (with control variables)	
	coef	Prob	Coef	Prob
C	0,230	0,0001	0,019	0,9373
FOUR	0,032	0,0023	0,031	0,0082
T-Volume	-	-	0,018	0,6338
Volatility	-	-	-0,093	0,8436
Size	-	-	-0,006	0,0013
DIM	-	-	2,57E	0,0061
AGE	-	-	0,003	0,0145
R^2 adjusted	0,216		0,240	

Firstly, we highlight that liquidity risk should affect undervaluation, because performing investors do not know precisely the liquidity of their units. It is interesting to note that the quality of the models is relatively poor (the R2 are very low), which explains only a small part of the underestimation at the introduction. The results obtained in this table lead us to conclude that the level of the initial undervaluation increases with the degree of liquidity on the Tunisian stock market. Nevertheless, these results are confirmed by the regression coefficient of the variable FOUR which is positive (coefficient = 0.0322) and significant (P = 0.0415 <0.05) at the 5% threshold at the level of regression 1 and 2. So our fourth hypothesis is verified which states that the abnormal initial return depends on the degree of liquidity in the secondary market. These results agree with those of Ellul and Pagano (2006) who validate this hypothesis by performing an empirical test conducted on a sample on the London Stock Exchange. They find a significant cross-association between secondary market liquidity (as measured by the spread of price brackets) and the level of undervaluation. By using the variable estimation tables, we can see the insignificance of transaction volume and volatility (we have respectively p = 0.63 <0.05 and p = 0.84 <0.05). Analysis of size shows that it is significantly and negatively related to underestimation, in accordance with the results of Anderson, Mansi, and Reeb (2003). In this sense, large firms tend to seek a certain determined level of undervaluation, and subsequently the managers of these firms always tend to limit the level of initial profitability. Regarding the regression coefficient of the variable DIM is significant positive at the 5% threshold. These results are due to the fact that regarding the age variable, we notice that the coefficient sign is positive (coef = 0.03). However, this variable is significant (p = 0.0145 <0.05). This association between the AGE variable and the level of discount can be explained via the professionalism of the listed company in its field and therefore not endangering the risk of undervaluing.

4.3 Two-Phase Model: Preparatory and Introduction (The Global Model)

$$NSE_{i,t} = \alpha_0 + \beta_1 \, INST_{i,t} + \beta_2 \, INSID_{i,t} + \beta_3 \, OUTSID_{i,t} + \beta_4 \, CONC_{i,t} + \beta_5 \, FOUR_{i,t} + B_6 \, DIM_{i,t} + \beta_7 \, AGE_{i,t} + \beta_8 \, T\text{-volume}_{i,t} + \beta_9 \, Volatility_{i,t} + \beta_{10} \, Size_{i,t} + \varepsilon_{i,t} \qquad (10)$$

With:

$NSE_{i,t}$: the level of undervaluation of firm i in year t.

$INST_{i,t}$: the pat of stocks allocated to institutional investors by company i in year t.

$INSID_{i,t}$: Insiders Ownership of the company i in year t (Share of stocks held by interns);

$OUTSID_{i,t}$: Outsiders ownership of the company i in year t (Share of stocks held by externs);

$CONC_{i,t}$: the percentage of shares held by institutional investors by company i in year t.

$FOUR_{i,t}$: the price range of firm i in year t.

$T\text{-volume}_{i,t}$: the natural logarithm of the number of stocks issued by company i in year t.

$Volatility_{i,t}$: It is the natural logarithm of the ratio between the highest price and the lowest price of the share of firm i in year t.

$Size_{i,t}$: The size of firm i in year t.

$DIM_{i,t}$: the dimension of the company i in year t.

$AGE_{i,t}$: Age of firm i in year t.

$\varepsilon_{i,t}$: the residual model term.

Where $\alpha_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}$ are the unknown model parameters.

This is just one regression:

Table 6. Ordinary least squares estimate of the level of initial undervaluation

	coef	prob
C	0,019	0,9373
INST	0,011	0,0001
INSID	0,112	0,0000
OUTSID	-0,342	0,0954
CONC	0,034	0,0001
FOUR	0,124	0,0012
DIM	0,018	0,0038
AGE	0,093	0,0130
T-Volume	0,006	0,8436
Volatility	-2,23E	0,0861
Size	0,002	0,0045
R^2 adjusted	0,903	

5. Discussion

The coefficient of determination adjusted by the degree of freedom R^2 is equal to 0.903, which makes it possible to conclude that our model has good explanatory power. The results obtained with the linear regressions confirm the impact of the explanatory variable majorities on the underestimation in accordance with the results obtained by the various "reduced" models that we have previously tested. We find that the Stock equity held by institutional investors exerts a positive influence on the undervaluation (coef = 0.011), which tends to verify the allocation hypothesis; Hanley (1993) has tried to test the hypothesis that institutional investors who hold favorable information are rewarded through the pricing rule that seeks to favor them. However, this variable is only significant at the 5% level ($P < 0.05$). Concerning the second and the third variable which explains the abnormal initial return according to the theory of information asymmetry, we find that the higher percentage of insiders positively affects the level of undervaluation (coefficient = 0.112) on the contrary of the percentage of outsiders (coefficient = -0.342) Rock (1986) was the first to model these information asymmetries to explain the phenomenon of the predominantly undervalued securities in the financial markets. Recognitions to the private information at their disposal, insiders participate massively in the IPOs of companies whose securities are undervalued. Conversely, "uninformed" investors will receive only a tiny fraction of the securities. The results provided in table (6) make it possible to deepen the role played by the concentration of capital ownership in the hands of institutional investors on the undervaluation since there is a positive and significant causality (coef = 0.034 and p = 0, 0001). In particular, it leads us to confirm the governance hypothesis, we can also add that a majority shareholder can control more effectively than minority shareholders, because he holds enough voting rights to influence the managers or possibly convince other shareholders to support it in the event of opposition with the management of the company (Mtanios and Paquerot, 1999). Numerous studies have demonstrated the positive effect of the presence of majority shareholders on the performance of companies (Shivdasani, 1993; Agrawal and Knoeber, 1996; Bethel, 1998). In addition, by observing this table, this study attempts to statistically prove a significantly positive association between liquidity on the secondary market (measured by the bid-ask) and the level of discount because (coefficient = 0.124) and (P = 0, 0012 <0.05). Ellul and Pagano (2006) confirm this idea by asserting that investors should be compensated with the higher

undervaluation not only for the illiquid secondary market they expect, but also for being risky in their investments liquidity assessments. For the control variables, some play a role in the explanation of underestimation. The dimension variable is statically significant and positively influences the underestimation. In accordance with our expectations, the latter grows with the size (measured by turnover) of the company introduced. This result confirms the idea that companies are less susceptible to undervaluation when they have low incomes. In addition, the age variable is significant at the 5% level ($p = 0.013 < 0.05$). The positive sign obtained by this variable (coef = 0.093) reflects the fact that the seniority of the listed company has a positive effect on the level of the discount. In addition, the company size variable is statistically significant at the 5% level ($p = 0.0045$). However, this variable has a positive coefficient equal to 0.002. This result therefore allows us to conclude that the variable SIZE measured by market capitalization explains the variation in undervaluation. Finally, we can state that the results of the parameter estimation and therefore the conclusions drawn are identical to those of a study made by the separate models.

6. Conclusion

Nowadays, the IPO is a decisive act that is part of the development strategy of a company that operates in an uncertain environment where competition is increasingly increasing. During an IPO, the original shareholders or managers of the company being introduced must carry out various arbitrations, knowing that they want both to attract investors to ensure the success of the IPO, and to preserve their wealth by limiting the level of undervaluation (in the short run), while retaining the private gains associated with controlling the company (in the longer run). At the end of this work, we have attempted to identify, within its theoretical and empirical framework, the essential questions raised by the operation of undervaluing newly listed shares. The results obtained led us to conclude that the initial undervaluation improves the degree of liquidity of the newly issued shares on the BVMT. It was also possible to conclude that other factors have a positive relationship with the initial under valuations such as the allocations made by institutional investors on the Tunisian stock market, the percentage of shares held by insiders and the age of the companies introduced in stock exchange. On the other hand, there are factors which have a negative relation with the initial undervaluation such as the percentage of the shares held by the outsiders and the number of shares offered to the public. However, some results are not conclusive enough. This is probably due to the narrowness of the Tunisian stock market as well as the low number of observations (16 companies) that we used in our empirical study. However, this small sample size is explained by the unavailability of the information necessary for these tests. By way of conclusion, this research work has provided us with some interesting results concerning the explanatory factors of the initial undervaluation on the Tunisian stock market. It also enabled us to develop a few lines of research such as taking into account the consequences of the decision to go public in the identification of the initial undervaluation. Indeed, with the development that the Tunisian financial market is progressively experiencing, this study will thus open up new horizons on potential fields of investigation which may be the subject of subsequent research.

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