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ARE TUNISIAN AND EGYPTIAN SHARE IPO MARKETS HOT OR COLD?

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ABSTRACT

This paper seeks to detect hot and cold IPO cycles in the Tunisian and Egyptian share market using a Markov regime switching model. Using a set of IPO activity measures (number of IPOs, level of underpricing, market conditions and duration), we established a model which estimates these activity measures in hot and cold periods respectively. We depicted the turning points for each activity measure. It is found that these markets are cold in the major period. As in regards to cycles, the segmentation method gives almost the same periods, except for the market condition measures (Trading volume for Tunisian stock market and Stock Market Returns (SMR) for Egyptian stock market) which give a different segmentation.

Keywords: Egyptian IPO market, Tunisian IPO market, Hot/cold periods, Markov regime switching model.
JEL Classification: C58, E37, G17.

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Contribution/ Originality

This study has two contributions. First, it is one of few studies detecting IPO cycles and turning points of hot/cold periods for Tunisian and Egyptian share markets. Second, it provides some policy suggestions for the improvement and the optimization of Tunisian and Egyptian share IPO markets.

1. INTRODUCTION

The initial public offering (IPO) market follows a cycle with intense oscillations, called hot and cold markets. An information set is used in forming predictions about the future condition of the IPO market (hot or cold IPO market), which includes the current level of underpricing, the number of IPOs currently on issue and the current economic and market conditions when the firm goes public. Several studies highlighted, for emerging markets, that issuance volume reflects the state of the market: hot or cold Agrawal (2006); Loughran and Ritter (1995); Guo *et al.* (2010). Hot IPO markets have also been defined based on underpricing. Lowry and Schwert (2002) studied the relationship between volume and underpricing over hot and cold markets and reported that periods of high underpricing are usually followed by high IPO volume. Ameer (2012) seeked to explore whether

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local macroeconomic variables influence the number of IPOs in an emerging market. He found that "hot IPO market regime evolves when the investors begin experiencing extremely high initial returns and their anticipation about the future interest rate provides an indication about entrepreneur's/manager's willingness to move to the IPO market. On the other hand, when a government pursues monetary tightening, investors believe that future earnings are expected to shrink due to higher interest rate in future, and valuation of shares would be affected due to lower dividend yield, it keeps investors away from the IPO markets causing cold IPO market". Guo *et al.* (2010) found that, in the Chinese A-share market, a hot period is related with an abundant supply of IPOs, high levels of underpricing, positive market conditions and short waiting time to listing after prospectus issue.

This paper enriches the international literature relating to hot and cold cycles by studying Tunisian and Egyptian share IPO markets which constitutes a too little explored context. We seek to detect turning points (between hot and cold IPOs market) using four activity measures: the number of IPOs per month, underpricing, market conditions and waiting time to listing after prospectus issue. Given the similarities in economic and financial conjuncture between the two countries, this study is concerned with detecting hot and cold IPO cycles for Tunisian and Egyptian share market using a univariate Markov regime switching model. In fact, a limited number of studies have examined hot and cold cycles in the context of frontier markets.

Egypt and Tunisia are interesting for comparison since they seem to have experienced comparable development paths in the years since independence. In the mid-1990s the issue of privatization was also on the policy program of the two countries. The sale of state enterprises to the public can itself have different objectives, such as obtaining the maximum price, revitalizing the stock market, ensuring the continuity of the company, or creating social responsibility. It could be argued, however, that obtaining the highest price is essential for a successful privatization, as governments seriously need funds. But this goal cannot be achieved while forgetting other important considerations. In fact, when the state sells a company through a public offering, the success of the issue becomes the most important consideration. That is why, the government will sell shares when the market is optimistic and investors are confident about the future. The issue is more likely to succeed under such conditions. Many authors (Yung *et al.*, 2008; Tran and Jeon, 2011) argue that in an active (hot) IPO market, investor confidence and interest in IPOs are greater, prevailing stock market conditions are more promising. An IPO during a hot market can so more easily interest investors and generate a large amount of financial resources that will support growth prospects of the company. The condition of the IPO market (hot or cold IPO market) is thus an essential element in deciding when to offer the company's stock on the market.

This paper will be structured as follows: Section 2 will present the institutional characteristics of the Tunisian and the Egyptian financial markets after explaining data sources. Thereafter, it will describe the used methodology. Section 3 will present the IPO activity measures as well as descriptive statistics. Section 4 will be devoted to results and the last section concludes.

2. DATA AND METHODOLOGY

2.1. Data

For the Tunisian stock market, the sample consists of the entire ordinary Tunisian share IPOs issued from January 1998 to December 2010. There are in total 31 ordinary share IPOs issued in 156 months included in our paper. Closing prices and the market Index are collected from the Tunisian Stock Exchange (TSE) online database (www.bvmt.com.tn). We obtained information on IPO firm

characteristics around the listing period and on the operation of introduction itself from hard copies of prospectus published by the issuers (available at the Financial Market Council (FMC) documentary service and from the Bulletin Official of the TSE).

For the Egyptian stock market, the sample consists of the entire ordinary Egyptian share IPOs issued from January 2005 to December 2010. There are in total 11 ordinary share IPOs issued in 72 months included in our paper. Market Index is collected from the website http://www.quotenet.com/indices/Asia_Pacific . We obtained information on IPO firm characteristics around the listing period and on the operation of introduction itself from hard copies of prospectus published by the issuers and from Egyptian Stock Exchange online database (http://www.egx.com.eg).

2.1.1 The Tunisian Stock Market

The Tunisian stock exchange was created in 1969. The Electronic trading began in 1996. Two trading systems exist: fixing and continuous systems. Nearly 60 companies are currently listed on this stock market; most of them belong to financial sector (banks, insurance and leasing companies). Companies operating in telecommunications, tourism, and agricultural sectors are actually underrepresented. The settlement is fully consistent with the recommendations of the group of "Thirty" that encourages standardization and improvement in global securities administration.

Ahmed and Fatma (2004) argued that "the major challenges facing public offerings in Tunisia are the depth and breadth of the market, as well as the savings/investment mentality. The market is relatively small compared to the size of the economy and is not liquid. Investors prefer other, less risky forms of investment".

2.1.2 The Egyptian Stock Market

"The Egyptian Exchange (EGX) dates back to more than 125 years. It was operating through two locations, the Alexandria Stock Exchange was officially established in 1883, followed by Cairo Stock Exchange in 1903" (http://www.ifie.org/index.php/the-egyptian-exchange-profile), and since 1997, both Exchanges were combined. "The trading system at EGX has perceived gradual development from an outcry system (prior to 1992) to an automated order-driven system (between 1992 and 2001). In May 1998, EGX contracted with "efa", a Canadian software company, to provide a new trading, clearing and settlement system. The trading component of this system started operations in May 2001, after applying a locally developed automated trading system for almost 9 years" (http://www.egx.com.eg/english/trading_system.aspx). Nearly 212 companies are listed on this stock market at the end of 2012 year (Source: Monthly Bulletin of Egyptian Exchange (2012)). According to Bruce (2011) "In line with the other Maghreb markets, the financial sector dominates both capitalization and traded value. There is also significant concentration of capitalization in the Basic Materials sector and communications sector in the overall market, revealing that extractive industries engaging in international production raise finance on the domestic exchange in contrast to Tunisia". The settlement is fully consistent with the recommendations of the group of "Thirty".

Ahmed and Fatma (2004) argued that "the major challenges inhibiting public offerings in Egypt are political and social pressures to prevent the sale of SOE to foreign investors".

2.2. METHODOLOGY

Markov state switching models are a type of specification which allows for the transition of states as an

intrinsic property of the econometric model. Such types of statistical representations are well known and utilized in different problems in the field of economics and finance. Also, "Markov regime switching models are a type of specifications of which the selling point is the flexibility in handling processes driven by heterogeneous states of the world. In this section, we give a brief explanation on the subject. Consider the following process given by:

$$y_t = \mu_{S_t} + \varepsilon_t \qquad (1)$$

where $S_t = 1, \ldots, k$ and ε_t follows a Normal distribution with zero mean and variance given by $\sigma^2_{S_t}$. This is the simplest case of a model with a switching dynamic. Note that for the model given in Equation (1), the intercept is switching states with respect to an indicator variable S_t, this means that if there are k states, there will be k values for μ and σ^2. If there is only one state of the world ($S_t = 1$), equation (1) takes the shape of $y_t = \mu_{S_1} + \varepsilon_t$ and it can be treated as a simple linear regression model under general conditions. Assuming now that the model in equation (1) has two states ($k = 2$). An alternative representation is:

$$y_t = \mu_{S_1} + \varepsilon_t \text{ for state 1} \qquad (2)$$

$$y_t = \mu_{S_2} + \varepsilon_t \text{ for state 2}$$

Where: $\varepsilon_t \to N(0, \sigma_1^2)$ for State 1 and $\varepsilon_t \to N(0, \sigma_2^2)$ for State 2. This representation (equation 2) clearly implies two different processes for the dependent variable y_t. When the state of the world for time t is in state 1 (state 2), then the expectation of the dependent variable is μ_1 (μ_2) and the volatility of the innovations is σ_1^2 (σ_2^2).

In this paper, we assume an IPO market (St) may undergo two states S_t=0 or S_t=1 that represent whether the IPO market is in a hot period or in a cold period. y_t represent a vector of IPO activity. We assume also IPO activities are independent and their transitions of states follow a first-order Markov process, which means that the probability of the current state, hot or cold, is only based on the most recent state. The activity yt can be denoted as the following equation:

$$y_t = \mu_1 S_t + \mu_2(1 - S_t) + (\sigma_1 S_t + \sigma_2(1 - S_t))\varepsilon_t \qquad (3)$$

For a Markov regime switching model, the transition of states is stochastic (and not deterministic). This means that one is never sure whether there will be a switch of state or not. But, the dynamics behind the switching process are known and driven by a transition matrix. This matrix will control the probabilities of making a switch from one state to the other. It can be represented as follow:

$$P = \begin{bmatrix} p & 1-q \\ 1-p & q \end{bmatrix} \qquad (4)$$

The transitions of states are governed by first-order Markov process, $P(S_t/y_{t-1}, S_{t-1}) = P(S_t/S_{t-1})$ where:

$P(S_t=1/S_{t-1}=1)=p$

$P(S_t=1/S_{t-1}=1)=1-p$

$P(S_t=1/S_{t-1}=1)=q$

$P(S_t=1/S_{t-1}=1)=1-q$

The objective of Markov switching model is to estimate the unknown parameters: $\mu_1, \mu_2, p, q, \sigma_1$ and σ_2 based on observations of IPO activity in each month.

3. IPO ACTIVITY MEASURES

Consistent with the paper of Guo *et al.* (2010) and in order to detect the IPO issuing cycles across the study periods, four set of variables are used to measure IPO activity:

- The number of IPOs offered in each month (denoted Nt)
- Underpricing measured by initial-day returns of IPOs issued each month. Two calculations are used: the Initial day Return in month t (IRt) and the adjusted Stock Market Initial day Return in month t ($MIRt$)

$$IR_t = \left(\frac{P_{t,i,1st}}{P_{t,i,0}}\right) - 1 \qquad (5)$$

$$MIR_t = \left[\left(\frac{P_{t,i,1st}}{P_{t,i,0}}\right) - 1\right] - \left[\left(\frac{M_{t,i,1st}}{M_{t,i,0}}\right) - 1\right] \qquad (6)$$

Where $P_{t,i,1st}$ is the closing price of stock i issued in the month t on the first trading day and $P_{t,i,0}$ is the offer price of stock i. $M_{t,i,1st}$ is the Tunindex composite index in the month t on the first trading day and $M_{t,i,0}$ is the Tunindex composite index the offering day in the month t. When there is more than one IPO per month, the average return is calculated as follow:

$$IR_t = \frac{\sum\left[\left(\frac{P_{t,i,1st}}{P_{t,i,0}}\right) - 1\right]}{N_t} \qquad (7)$$

$$MIR_t = \frac{\sum\left[\left[\left(\frac{P_{t,i,1st}}{P_{t,i,0}}\right) - 1\right] - \left[\left(\frac{M_{t,i,1st}}{M_{t,i,0}}\right) - 1\right]\right]}{N_t} \qquad (8)$$

Where N_t is the number of IPOs in the month t.

- Market conditions: Some studies separate market conditions in two categories and investigate their influences on IPO issuing separately: market return and investors sentiment (Lowry, 2003). In this paper, four variables are used which reflect market conditions in different aspects:
- The trading volume (denoted $tradingvol_t$) tracks the overall stock market and describes investor sentiment monthly. It is the trading volume of the secondary stock market, measured as follow:

$$tradingvol_t = \left(\sum tradingvol_m\right) / M_t \qquad (9)$$

M_t is the number of working days in the stock market for the month t. $tradingvol_m$ is the ordinary share trading volume in the Tunisian secondary stock market for the day m of the month t (where $m = 1,2,3,...,M_t$).

This variable is introduced into the model to study the Tunisian market. For Egypt, the data is lacking.

- The stock market Index changes between offering and listing day (denoted $SMR_{t,1st}$) explains stock market sentiment after listing

$$SMR_{t,1st} = \left(\frac{M_{t,i,1st}}{M_{t,i,0}} \right) - 1$$

- The stock market Index changes across 30 working days (denoted $SMR_{t,offering\text{-}30}$) is the stock market return on the offering day compared with the 30^{th} working day before the offering

$$SMR_{t,offering-30} = \left(\frac{M_{t,i,0}}{M_{t,i,-30days}} \right) - 1$$

where $M_{t,i,-30days}$ is the Tunindex composite index on the 30 working day before the offering day.

- At the same way, the stock market return on the offering day compared with the 60^{th} working day before the offering (denoted $SMR_{t,offering\text{-}60}$) is :

$$SMR_{t,offering-60} = \left(\frac{M_{t,i,0}}{M_{t,i,-60days}} \right) - 1$$

where $M_{t,i,-60days}$ is the Tunindex composite index on the 60 working day before the offering day. $SMR_{t,offering-30}$ and $SMR_{t,offering\text{-}60}$ measure market changes across 30 and 60 working days before the offering date respectively. They are used in order to detect if stock market change (in one or two months) is correlated with the date of a new offering.

- Duration (D_t): measures the number of days between prospectus and listing of the stock introduced by IPO. When there is more than one IPO per month, the average duration is calculated as follow:

$$D_t = \frac{\sum D_{t,i}}{N_t}$$

Where $D_{t,i}$ is the duration between prospectus and listing of stock *i* which is offered in the month *t* and N_t the number of IPOs in the month *t*.

3.1. Descriptive Statistics for Tunisian Stock Market

Table-1. Descriptive statistics of activity measures for Tunisian stock market (1998-2010)

Variable	N	Mean	Std. deviation	Min	Max	Median
N_t	156	0.199	0.431	0	2	0
IR_t (%)	156	10.637	16.91	-13.74	55.695	2.875
MIR_t (%)	156	-0.84	27.91	-57.51	56.587	-0.79
$Tradingvol_t$	156	466.031	443.95	68.42	3235.76	332.119
$SMR_{t,1st}$ (%)	156	-0.297	1.86	-7.033	3.91	-0.12
$SMR_{t,offering-30}$(%)	156	1.589	3.4275	-4.503	8.594	1.542
$SMR_{t,offering-60}$(%)	156	2.426	5.68	-7.017	17.403	1.408
D_t (*days*)	156	20.63	11.686	4	56	17

Source: Authors calculations

Table-2. Descriptive statistics of activity measures for Tunisian stock market (1998-2012)

Variable	N	Mean	Std. deviation	Min	Max	Median
N_t	180	0.19	0.4022	0	2	0
$IR_t(\%)$	180	10.115	16.379	−13.741	55.695	3.063
$MIR_t(\%)$	180	−4.107	29.376	−60.430	56.587	−3.403
$Tradingvol_t$	180	480.57	435.53	68.42	3235.76	366.45
$SMR_{t,1st}$ (%)	180	−0.302	1.779	−7.033	3.908	−0.118
$SMR_{t,offering-30}(\%)$	180	1.302	3.464	−4.503	8.594	1.07
$SMR_{t,offering-60}(\%)$	180	2.025	5.710	−7.435	17.403	1.258
$D_t(days)$	180	22	11.36	4	56	21

Source: Authors calculations

Table 1 presents descriptive statistics for each variable for the studied period (1998-2010). In order to compare between financial market activity before and after the revolution, we present in table 2 descriptive statistics for a longer period including two years after the revolution (January 14, 2011) which induced a political change, that is for the period 1998-2012.

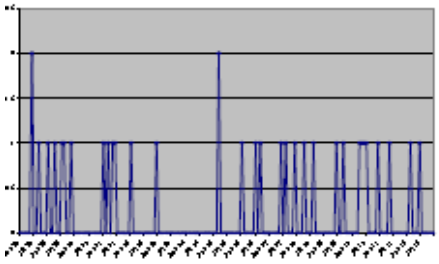

Figure-1.1. N_t

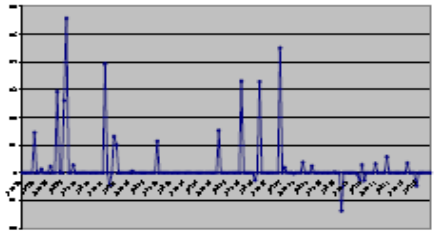

Figure-1.2. IR_t

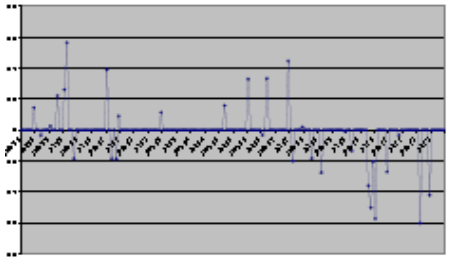

Figure-1.3. MIR_t

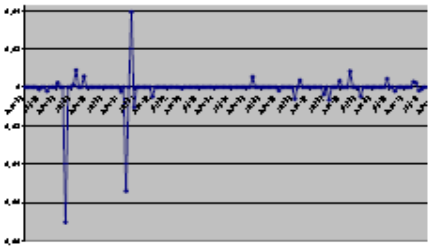

Figure-1.4. $SMR_{t,1st}$

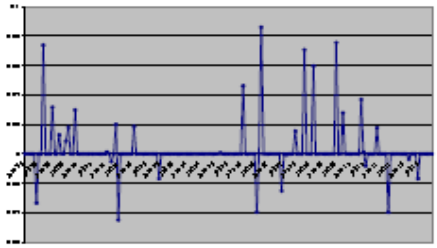

Figure-1.5. $SMR_{t,trading-30}$

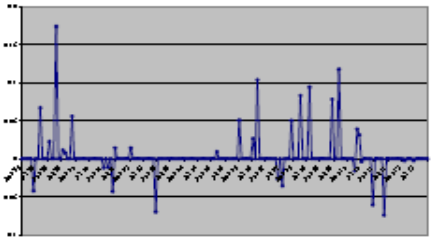

Figure-1.6. $SMR_{t,trading-60}$

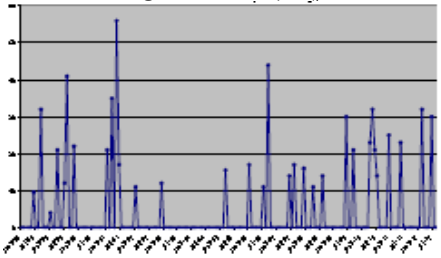

Figure-1.7. D_t

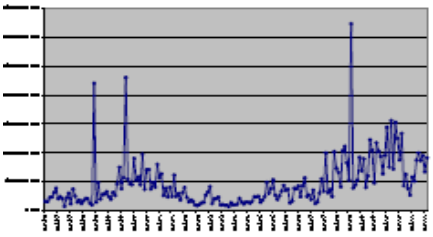

Figure-1.8. $tradingvol_t$

Figure-1. The distribution of each activity measure from 1998 to 2012 for Tunisian stock market

Source: Authors calculations

Figure 1 depicts trends of each issuing month for each activity measure. We can deduce:

- The number of IPOs varies from 0 to 2 IPOs going public in a month with an average number of (0.19) which corresponds to an annual average of 2.26 IPO per year. In figure 1.1, it appears that the issuing of IPOs fluctuate greatly during these 15 years.
- For underpricing, initial return on average (IR_t) is of 10.115%. It ranges from −13.74% to 55.7%, while the market adjusted Initial return (MIR_t) is on average of (−4.107%) and it ranges between (-60.43%) and 56.59%. The phenomenon of IPOs underpricing has been well documented by anterior researchers. Miller and Reilly (1987) and Levis (1990) reported an average IPO underpricing of 20.6% in the US market and 9.56% in the UK market. Guo *et al.* (2010) reported an average IPO underpricing of 9.56% in the Chinese share market.
- The average IPO underpricing is of 10.115%, but 50% of the observations have an underpricing little than 3.063% (median), which allows us to expect a "cold" market for most of the studied period. In fact, Lowry and Schwert (2002) investigate the statistical relationship between volume and underpricing over hot and cold markets and find that periods of high underpricing are followed by high IPO volume.
- For Stock market returns, the average $SMR_{t,1st}$ is around (-0.302%), $SMR_{t,offering\text{-}30}$ is 1.302% and $SMR_{t,offering\text{-}60}$ is 2.025%. We can notice that the means increase in an ascending order as do the ranges of these three variables, which reflect that the stock returns as well as the uncertainty and the risk may increase when the time horizon becomes longer, this is confirmed by observing the standard deviations moving from 0,01777828 to 0,03463516 then 0,05710012.
- Finally for the duration, Guo and Brooks (2009) found that IPOs can list faster during positive market sentiment especially in hot periods. Guo *et al.* (2010) assume that the waiting time from prospectus to listing will be shorter if issuers and investors detect a hot market. For the Tunisian market, duration ranges from 4 to 56 days. The average duration is 22 days between the prospectus and the listing, and 50% of IPOs have a duration less than or equal to 21.

According to table 3, there are two periods that IPOs have to wait for a longer time to see their offering listing: January 1998 - May 2001 and June 2009 - December 2012. In these two periods, the monthly average duration may exceed 25 days. For the period June 2001 - May 2009, the average duration is of 16.625. We notice that the majority of IPOs have duration between 10 and 30 days. Only 7 IPOs have duration of more than 30 days and 2 IPOs have duration less than 10 days.

Table-3. Duration and number of IPOs per period

Period	Average Duration	Average N_t
January 1998 - May 2001	25.35	0.2683
June 2001 - May 2009	16.625	0.13542
June 2009- December 2012	25.1	0.23256

Source: Authors calculations

We note that when the number of IPOs increases, the duration increases. By cons, when the number of IPOs decreases, the duration decreases. It appears that institutional and regulatory features induce lags between the closing subscription date and the listing date.

3.2. Descriptive Statistics for Egyptian Stock Market

Table-4. Descriptive statistics of activity measures for Egyptian stock market

Variable	N	Mean	Std. deviation	Min	Max	Median
N_t	72	0.15	0.3602	0	1	0
IR_t (%)	72	23.59	29.435	-6.87	91.511	15.103
MIR_t (%)	72	23.48	29.372	-5.435	91.495	14.535
$SMR_{t,1st}$ (%)	72	0.34	2.04	-7.966	9.356	0.47
$SMR_{t,offering-30}$ (%)	72	1.597	11.502	-32.66	40.303	1.587
$SMR_{t,offering-60}$ (%)	72	6.113	22.418	-48.957	67.84	6.264
D_t (*days*)	72	11.3	10.36	5	40	8.5

Source: Authors calculations

- The number of IPOs varies from 0 to 1 IPO going public in a month with an average number of (0.15) which corresponds to an annual average of (1.8) IPO per year.
- For underpricing, Initial return (IR_t) on average is of (23.59%). It ranges from (-6.87%) and (91.51%), while the market adjusted initial return (MIR_t) is on average of (23.48%) and it ranges from (-5.435%) and (91.495%). These values are high if compared with the Tunisian stock market as well as with other share markets. In fact, Miller and Reilly (1987) and Levis (1990) reported an average IPO underpricing of 20.6% in the US market and 9.56% in the UK market. Guo *et al.* (2010) reported an average IPO underpricing of 9.56% in the Chinese share market. Despite high initial returns, we notice a low IPO volume (according to the number of IPOs N_t), which is not in accordance with the results of Lowry and Schwert (2002) who find that periods of high underpricing are typically followed by high IPO volume.
- The average $SMR_{t,1st}$ is around (0.34%), $SMR_{t,offering\text{-}30}$ is 1.597% and $SMR_{t,offering\text{-}60}$ is 6.113%. We can remark that the means increase in an ascending order as do the ranges of these three variables, which reflect that the stock market returns as well as the uncertainty and the risk may increase when the time horizon becomes longer, this is confirmed by observing the standard deviations moving from 0.0204 to 0.11502 then 0.22418.
- Finally, for the duration, it ranges from 5 to 40 days. The average duration is 11.3 days between the prospectus and the listing, and 50% of IPOs have a duration less than or equal to 8.5. We notice that the waiting time from prospectus to listing is shorter than the Tunisian stock market. This may be due to differences in institutional and regulatory features which induce lags between the closing subscription date and the listing date.

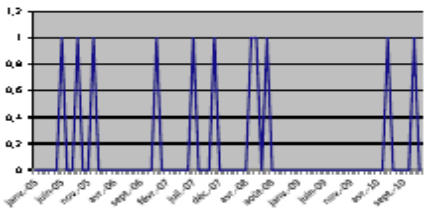

Figure-2.1. N_t

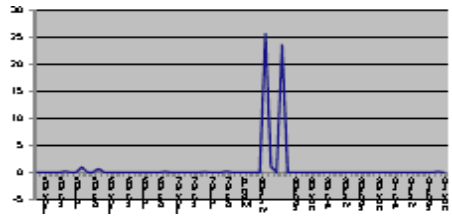

Figure-2.2. IR_t

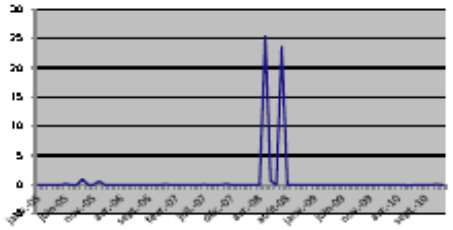

Figure-2.3. MIR_t

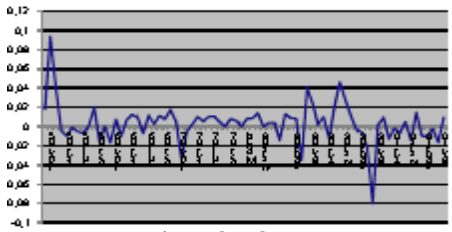

Figure-2.4. $SMR_{t,1st}$

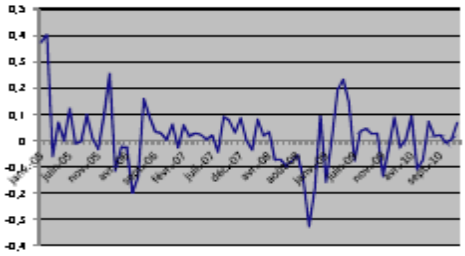

Figure-2.5. $SMR_{t,trading-30}$

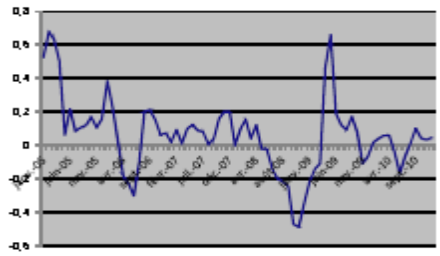

Figure-2.6. $SMR_{t,trading-60}$

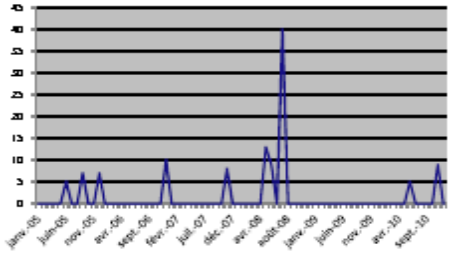

Figure-2.7. D_t

Figure-2. The distribution of each activity measure (2005-2010) for Egyptian stock market

Source: Authors calculations

4. RESULTS

Hot and cold issuing cycles using Markov regime switching models

4.1. The Tunisian Stock Market

Table 5 presents the optimal estimates and their standard errors for each IPO activity measure. In general, the means (μ) and the standard errors (σ^2) in cold periods are lower than those in hot periods.

The average number of IPOs issued per month is found to be of great difference between cold and hot periods. During cold period, there is almost no IPO. During hot periods, the average is 1.0624 IPO per month, with a standard error of 0.043. T he estimated probability of staying in a hot market is 0.5 while the estimated probability of staying in a cold market is 0.91. So, the expected duration of a hot regime is only 2 months but the expected duration of a cold regime is approximately around 11 months.

"The expected duration for a cold period is determined by the rule $(1/1-p)$. In the same way, the expected duration for a hot period is determined by the rule $(1/1-q)$. Brailsford *et al.* (2000) take 6 months as the minimum phase for a real hot or cold period. However, Guo *et al.* (2010) argue that some important phases and fluctuations may be ignored when taking 6 months as the minimum criterion. They extract periods which are less than 6 months but longer than 3 months and name them as 'quasi hot' or 'quasi cold' periods.

Table-5. The regime switch estimates for each IPO activity measure (Tunisian stock market)

IPO activity measure	parameter	μ1 (cold)	μ2 (hot)	σ2 (cold)	σ2 (hot)	p (cold)	q (hot)	Expected duration of regime cold	Expected duration of regime hot
N_t Likelihood: 11.4482	Estimate	3.86 *10^{-6}	1.0624	0.03568	0.05868	0.91	0.5	11.11	2
	Standard error (%)	0.000	4.290	0.000	1.480				
IR_t (%) Likelihood: 774.9056	Estimate	-3.2276 *10^{-5}	0.1108	0.000001	0.02732	0.83	0.00	5.88	1
	Standard error (%)	0.010	3.060	0.000	0.710				
MIR_t (%) Likelihood: 873,5777	Estimate	7.98675* 10^{-6}	-0.0424	3.50256* 10^{-7}	0.08604	0.82	0.16	5.55	1.19
	Standard error (%)	0.000	5.280	0.000	2.180				
$tradingvol_t$ Likelihood: -479,0542	Estimate	3.7744	3.7744	6.06292	118.920	0.90	0.12	10	1.14
	Standard error (%)	18.980	18.980	47.520	3974.99				
$SMR_{t,1st}$ (%) Likelihood: 1214,9865	Estimate	-2.6178 *10^{-7}	-0.0030	1.05896 * 10^{-8}	0.000305	0.82	0.16	5.43	1.19
	Standard error (%)	0.000	0.310	0.000	0.001				
$SMR_{t,offering-30}$ (%) Likelihood: 879,3079	Estimate	1.1171 *10^{-5}	0.0151	0.000001	0.00132	0.99	0.01	5.94	1.01
	Standard error (%)	0.010	0.700	0.000	0.040				
$SMR_{t,offering-60}$ (%) Likelihood: 673.7732	Estimate	2.346 *10^{-5}	0.0233	0.00001	0.00357	0.84	0.09	6.19	1.10
	Standard error (%)	0.020	1.15	0.000	0.100				
$Duration_t$ (Days) Likelihood: -226.1879	Estimate	-0.0708	2.3576	0.60507	2.36216	0.94	0.92	16.66	12.5
	Standard error (%)	6.260	17.790	0.000	61.770				

Source: Authors calculations

The Tunisian stock market is cold in the major period, taking a cycle of six months will lead to ignoring many fluctuations, since the expected duration of hot periods is in majority between one and two months. In this paper, we will consider the market in 'quasi hot' or 'quasi cold' period if the expected duration is between 2 and 3 months. If the duration is more than 3 months, the market is 'cold' or 'hot'. We notice that, as regards to cycles, the segmentation method using the number of IPOs or underpricing variables gives almost the same periods (hot/cold)" (Hedhili and Kammoun, 2014)

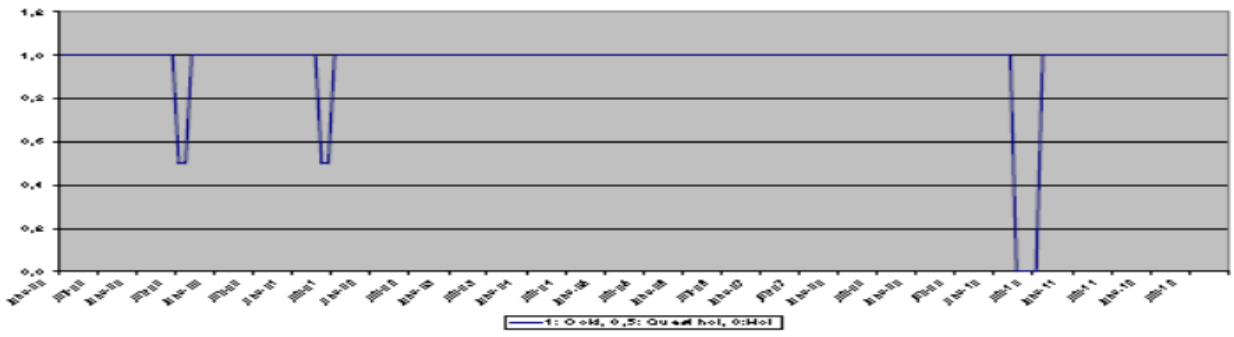

Figure-3. The switching regimes and hot and cold periods using N_t

Source: Authors calculations

Table-6. Hot/cold periods using N_t

Period	Jan 98 - june 99	July - Aug. 99	Sep. 99 - Apr. 2001	May - June 2001	July 2001- Mar 2010	Apr - July 2010	Aug 2010 - Dec. 2010
hot/cold (Nt)	cold	Quasi hot	cold	Quasi hot	cold	hot	cold

Source: Authors calculations

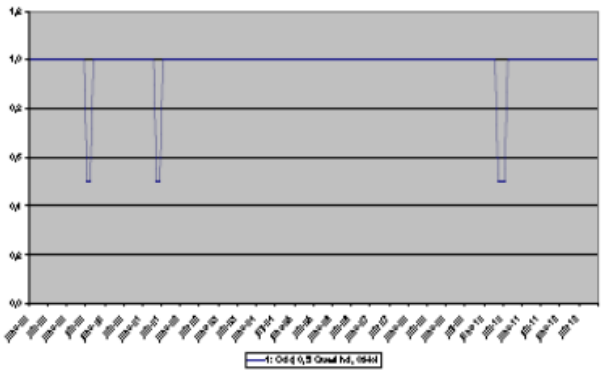

Figure-4.1. IR_t

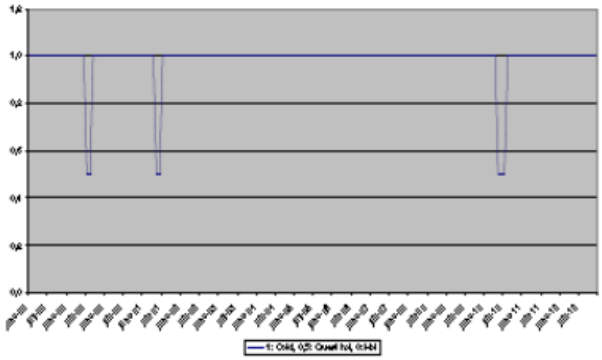

Figure-4.2. MIR_t

Figure-4. The switching regimes and hot and cold periods using underpricing variables

Source: Authors calculations

Table-7. Hot/cold periods using MIR_t

Period	Jan 98 - june 99	July - Aug. 99	Sep. 99 - Apr. 2001	May - June 2001	July 2001- April 2010	May - July 2010	Aug 2010 - Dec. 2010
hot/cold (MIR_t)	cold	Quasi-hot	cold	Quasi hot	cold	Quasi-hot	cold

Source: Authors calculations

For the stock market conditions, the average trading volume in hot periods is about 758 millions of dinars, but in cold periods, about 388 million dinars are exchanged on average in a single month. The market is found to be more active when traders detect a hot stock market. During the hot period October 1999-June 2001, the trading volume is almost twice the trading volume in cold periods. The probability for staying in cold period (0.90) is much bigger than the probability for staying in a hot period (0.12), which is alike with the results using the number of IPOs or underpricing variables.

$SMR_{t,1st}$, $SMR_{t,offering-30}$ and $SMR_{t,offering-60}$ indicate significant differences of the stock market returns between hot and cold periods. These three measures show the average means of (-0.3%), 1.51% and 2.33% in hot periods, and much lower means of ($-2.6178 * 10^{-5}$%), 0.000117% and 0.000234% in cold periods. When the stock market indices increase, this may reflect an optimistic market sentiment in hot periods. As regards to cycles, the segmentation method using all activity measures give almost the same period (hot/cold), except for the trading volume which give a different segmentation (see figure 5.1). The trading volume gives the best segmentation for the IPO market (ie the segmentation that replicates at best reality). Based on this variable, financial market authorities and investors can anticipate hot and cold periods of the market.

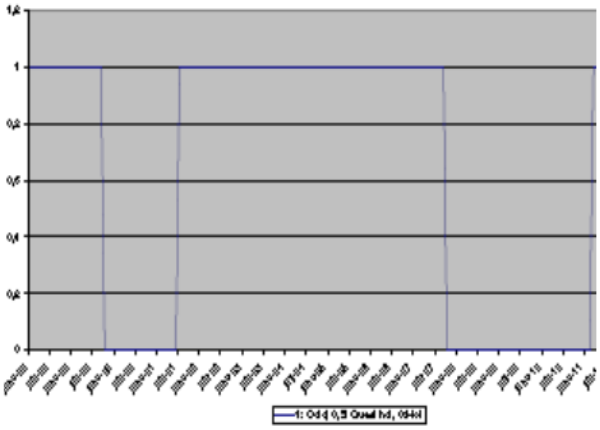

Figure-5.1. $tradingvol_t$

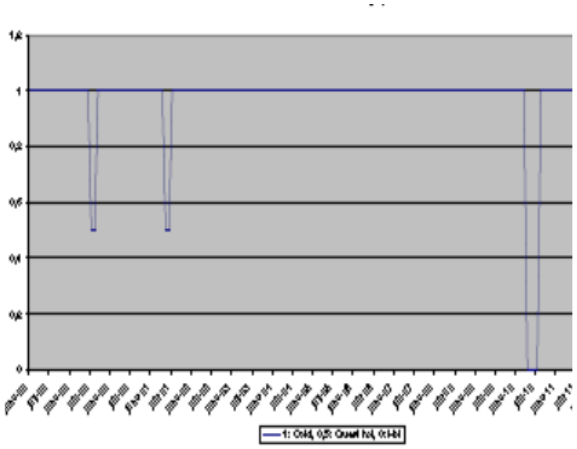

Figure-5.2. $SMR_{t,1st}$

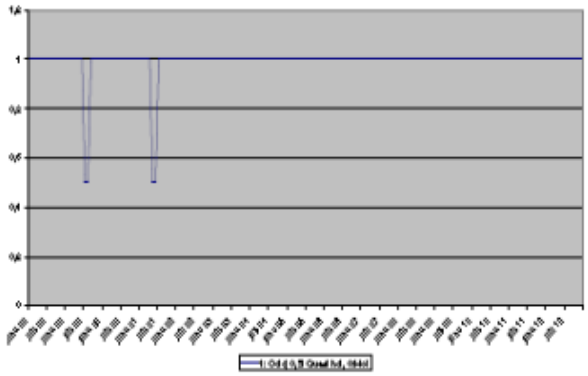

Figure-5.3. $SMR_{t,offering-30}$

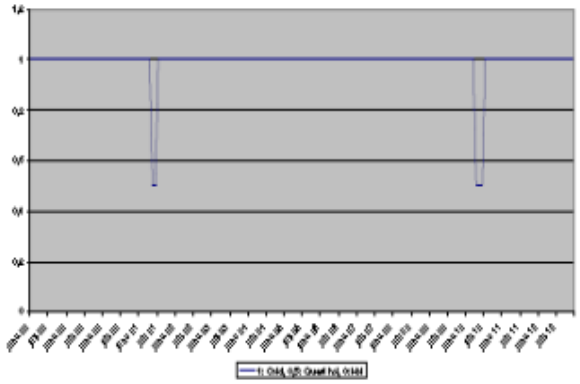

Figure-5.4. $SMR_{t,offering-60}$

Figure-5. The switching regimes and hot and cold periods according to market conditions variables

Source: Authors calculations

Table-8.1. Hot/cold periods using the trading volume

Period	Jan 98 - Sept. 99	Oct. 99 - June 2001	July 2001 - Sept. 2007	Oct. 2007 - Dec. 2010
Hot / Cold	cold	hot	cold	hot
Average trading volume	293	660	238	857

Source: Authors calculations

Table-8.2. Hot/cold periods using SMR_t

Period	Jan 98 - June 99	July - Aug. 99	Sept. 99 - April 2001	May - June 2001	July 2001 - March 2010	April - July 2010	Aug. 2010 - Dec. 2010
Hot / cold ($SMR_{t,1st}$)	cold	Quasi-hot	cold	Quasi-hot	cold	hot	cold

Period	Jan 98 - June 99	July - Aug. 99	Sept. 99 - April 2001	May - June 2001	July 2001 - Dec. 2010
Hot / cold ($SMR_{t,30}$)	cold	Quasi-hot	cold	Quasi-hot	cold

Period	Jan 98 - April 2001	May - June 2001	July 2001 - March 2010	April - June 2010	July 2001 - Dec. 2010
Hot / cold ($SMR_{t,60}$)	cold	Quasi-hot	cold	Quasi-hot	cold

Source: Authors calculations

For the Duration, we find that in cold periods, the estimated duration is near to zero, but in hot periods, the estimated duration is 23, 5 days. The duration to listing is thought to be informative in addressing IPO hot issues. This relation is not verified in the Tunisian market. Since the Tunisian market is in majority "cold", and since the monthly average number of IPOs is very little, it appears that institutional and regulatory features may induce lags between the closing subscription date and the listing date.

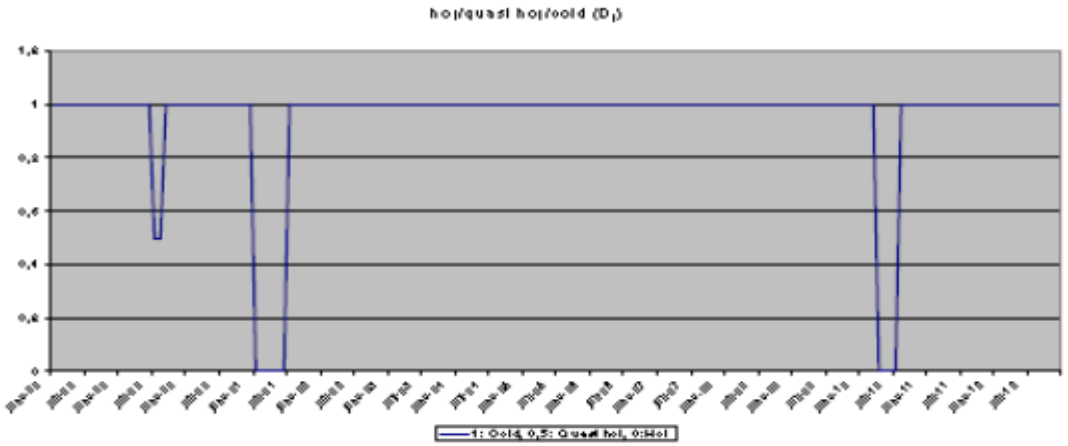

Figure-6. The switching regimes and hot and cold periods using Duration
Source: Authors calculations

Table-9. Hot/cold periods using *Duration*

Period	Jan.98-June 99	Jul-aug.99	Sep. 99-Dec. 2000	Jan-june.2001	July 2001-Mars 2010	Apr - July 2010	Aug.2010-Dec. 2010
hot/cold (Dt)	cold	Quasi hot	cold	Quasi hot	cold	hot	cold

Source: Authors calculations

4.2. The Egyptian Stock Market

Table 10 presents the optimal estimates and their standard errors for each IPO activity measure. In general, the means (μ) and the standard errors (σ^2) in cold periods are lower than those in hot periods.

The average number of IPOs issued per month is found to be of great difference between cold and hot periods. During cold period, there is almost no IPO. During hot periods, the average is 1 IPO per month with a standard error of 0.0433. Furthermore, the estimated probability of staying in a hot market is 0.1 while the estimated probability of staying in a cold market is 0.85. So, the expected duration of a hot regime is only 1.11 months but the expected duration of a cold regime is approximately around 7 months. Similarly, the levels of underpricing during hot periods (29.09%) are much higher than those in cold periods (- 0.08%).

The expected duration for a cold period is determined by the rule ($1/1 - p$). In the same way, the expected duration for a hot period is determined by the rule ($1/1 - q$). Like the Tunisian stock market, the Egyptian stock market is cold in the major period, and since the expected duration of hot periods is in majority between one and two months. In this paper, we will consider the market in 'quasi hot' or 'quasi cold' period if the expected duration is between 2 and 3 months. If the duration is more than 3 months, the market is 'cold' or 'hot'. We notice that, as regards to cycles, the segmentation method using the number of IPOs or underpricing variables give almost the same periods hot/cold (see figure7).

Table-10. The regime switch estimates for each IPO activity measure (Egyptian Stock market)

IPO activity measure	parameter	μ1 (cold)	μ2 (hot)	σ2 (cold)	σ2 (hot)	p (cold)	q (hot)	Expected duration of	Expected duration of hot
N_t Likelihood: 48.0307	Estimate	0.0000	1.0000	0. 018765	0.018765	0.85	0.1	6.89	1.11
	Standard error (%)	0.01	4.33	0. 000	0.000				
IR_t (%) Likelihood: 164.7679	Estimate	-0.0003	0.2909	0. 000424	0.08358	0.88	0.00	8.12	1.00
	Standard error (%)	0.27	10.85	0.000	4.22				
MIR_t (%) Likelihood: 988.5674	Estimate	-2.6922 *10^{-9}	0 .1 1 5 4	7.3395 *10^{-16}	0.309711	0.84	0.03	6.37	1.03
	Standard error (%)	0.000	16.01	0.000	0.000				
$SMR_{t,1st}$ (%) Likelihood: 198.4716	Estimate	0.0018	0.0088	0.00009	0.001696	0.91	0.6	10.83	2.52
	Standard error (%)	0.14	0.97	0.000	0.001				
$SMR_{t,offering-30}$ (%) Likelihood: 70 5042	Estimate	0.0281	-0.0077	0.001803	0.021246	0.88	0.85	8.56	6.7
	Standard error (%)	0.79	2.49	0.0004	0.0043				
$SMR_{t,offering-60}$ (%) Likelihood: 18.6546	Estimate	0.1209	-0.2478	0.029782	0.015261	0.96	0.84	28.2	6.19
	Standard error (%)	2.53	4.69	0.58	0.69				
$Duration_t$ (Days) Likelihood: 192.4013	Estimate	-1.1842	18.0036	2.396134	43.12774	0.79	0.00	4.84	1.00
	Standard error (%)	46.68	2.7916	90.05	999.81				

Source: Authors calculations

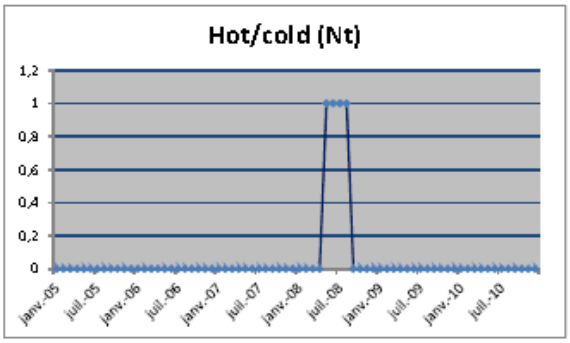

Figure-7.1. Nt

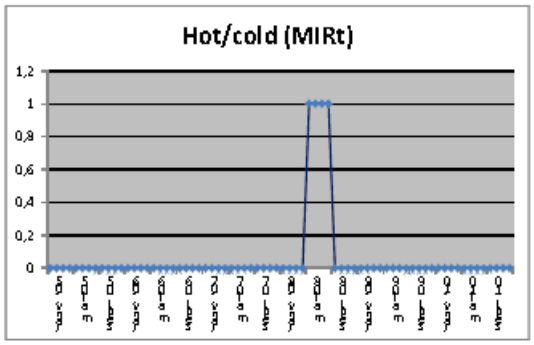

Figure-7.2. MIRt

Figure-7. The switching regimes and hot and cold periods using N_t and underpricing variables

Source: Authors calculations

Table-11. Hot/cold periods using N_t

Period	Jan. 2005 - April 2008	May - Aug. 2008	Sept. 2008 - Dec. 2010
Hot / cold (N_t)	cold	hot	cold

Source: Authors calculations

Table-12. Hot/cold periods using IR_t

Period	Jan. 2005 - Dec. 2010
Hot / cold (IR_t)	cold

Source: Authors calculations

Table-13. Hot/cold periods using MIR_t

Period	Jan. 2005 - April 2008	May - Aug. 2008	Sept. 2008 - Dec. 2010
Hot / cold (MIR_t)	cold	hot	cold

Source: Authors calculations

$SMR_{t,1st}$, $SMR_{t,offering-30}$ and $SMR_{t,offering-60}$ indicate significant differences of the stock market returns between hot and cold periods. These three measures show the average means of -0.3%, 1.51% and 2.33% in hot periods, and much lower means of ($-2.6178 * 10^{-5}$%), 0.000117% and 0.000234% in cold periods. When the stock market indices increase, this may reflect an optimistic market sentiment in hot periods.

As regards to cycles, the segmentation method using all activity measures does not give the same period (hot/cold), especially for Stock Market Returns (SMR) which give a different segmentation from other activity measures (see figure 8).

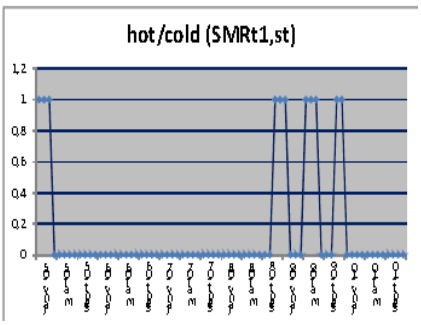

Figure-8.1. $SMR_{t,1st}$

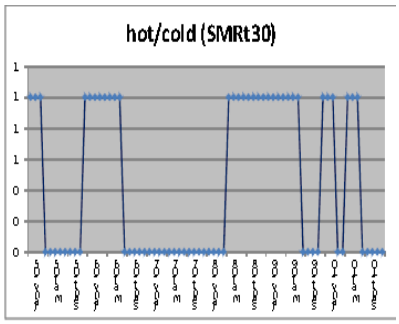

Figure-8.1. $SMR_{t,30}$

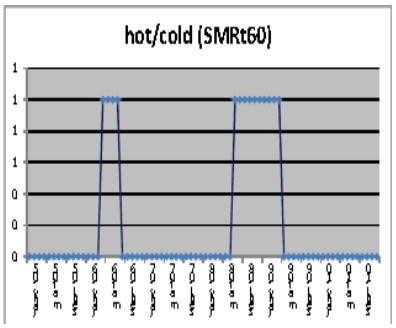

Figure-8.1. $SMR_{t,60}$

Figure-8. The switching regimes and hot and cold periods according to market conditions variables

Source: Authors calculations

Table-14. Hot/cold periods using SMR_t

Period	Jan. - Mar. 05	Apr. 05 - Oct. 08	Nov. 08 - Jan. 09	Feb. 09 - Apr. 09	May 09- July 09	Aug. - Oct. 09	Nov. 09 - Dec. 09	Jan. - Dec. 2010
Hot/cold ($SMR_{t,1st}$)	hot	cold	hot	cold	hot	cold	Quasi-hot	cold

Period	Jan. - Mar. 05	Apr. - Nov. 05	Dec. 05 - July 06	Aug. 06 - Apr.08	May 08 - July09	Aug. - Nov. 09	Dec. 09 -Feb. 10	Mar. -Apr. 10	May - July10	Aug. - Dec. 10
Hot/cold ($SMR_{t,30}$)	hot	cold	hot	cold	hot	cold	hot	Quasi-cold	hot	cold

Period	Jan. 05 - Mar. 06	April - July 06	Aug. 06 - June 08	July 08 - April 09	May 09 - Dec. 10
Hot/cold ($SMR_{t,60}$)	cold	hot	cold	hot	cold

Source: Authors calculations

For the Duration, we find that in cold periods, the estimated duration is near to zero, but in hot periods, the estimated duration is 18 days. The duration to listing is thought to be informative in addressing IPO hot issues.

This relation is not verified neither for the Tunisian nor for the Egyptian markets. Since these markets are in majority "cold", and since the monthly average number of IPOs is very little, it appears

that institutional and regulatory features may induce lags between the closing subscription date and the listing date.

Table-15. Hot/cold periods using *Duration*

Period	**Jan. 2005 - Dec. 2010**
Hot / cold (D_t)	cold

Source: Authors calculations

It is found that Egyptian and Tunisian IPO markets are cold in the major period. This can be attributed to:

- On one hand, stock market investors may consider the investment in shares as too risky (their fear of instability is greater than hope of gain), they orient themselves to more secure investments even if the expected return is lower. These investors are risk averse; they do not seek to support an additional risk to achieve higher profitability. As a result, firm valuations are low, which does not encourage firms to go public.
- Besides, another explanation may be advanced, it concerns the confidence of the market (that is of the investors) to the IPO, and this dimension may be reflected by weak demand during the subscription period or longer subscription duration.
- Finally, note that the majority of firms (for Tunisia an Egypt) tend to choose the fixed-price introduction mechanism. It might be time to change this procedure and let play the law of supply and demand, which implies the use of other introduction methods such as the offer at minimum price, public sales.

5. CONCLUSION

Consulting specific literature on IPOs shows that studies focus on many puzzling stylized facts related particularly to:

- The undervaluation of the shares at the introduction
- The long-term underperformance
- And the existence of an IPO clustering phenomenon which means the existence of periods with high number of IPOs followed by periods of inactivity.

These facts are related. In fact a hot market may encourage the company to go public at an early age (Chemmanur and Fulghieri, 1999). Furthermore, the undervaluation of the shares in the IPO stimulates Hot market. Besides, behavioral model developed by Ljungqvist *et al.* (2002) argues that the presence of irrational investors leads to hot markets with long-term underperformance. Understanding these facts and their interactions can participate in solving the IPO puzzle. Generally, the ultimate objective of a company is to have a successful IPO, which depends on several factors, including:

- The investor who should be interested in this new introduction, but he is interested only if he expects a higher return on securities to which he subscribes, which is guaranteed if the share is undervalued. Many studies show that hot markets and underpricing are positively correlated.

- Market conditions that affect transactions and liquidity on the market since these conditions are likely to encourage or discourage both investors to place their money on the stock market and firms to go public.

According to literature, hot markets are characterized by high volume of offering, greater amount of underpricing and oversubscription. On the other hand, cold markets are characterized by less volume of offering and amount of underpricing and smaller subscription.

The detection of Hot and Cold cycles on the IPO market is therefore useful for both the newly introduced firm as

for the investor since it gives an idea about underpricing and market conditions that prevail at the moment of the IPO since it provides an idea about the conditions prevailing on the market which are decisive firstly for the investor to assist him in making its decision to subscribe or not to IPO and second for the firm deciding to go public or not. It is a common concern for the firm and the investor.

Within the framework of this paper, we focused on clustering IPO phenomenon. Four set of variables measuring IPO activity are employed to detect and predict hot and cold cycles and their turning points for the Tunisian and Egyptian share IPO markets using Markov regime switching models. These variables are the number of IPOs issued the levels of underpricing measured by the Initial Return and the Adjusted Stock Market Initial return, market conditions measured by the trading volume and three stock market returns across different periods and finally the listing speed. For both studied countries, results show that markets are in the majority of cases in cold state and the hot periods do not last for many months, this reinforces our need for a model that predicts the state of the market.

As regards to cycles, the segmentation method using all activity measures give almost the same period (hot/cold), except the trading volume for the Tunisian stock market and Stock market returns for the Egyptian stock market which give a different segmentation. In fact, the trading volume gives the best segmentation for the Tunisian IPO market (ie the segmentation that replicates at best reality). Based on trading volume, Tunisian financial market authorities and investors can anticipate hot and cold periods of IPO markets. For Egyptian IPO market, since stock market returns give the best segmentation, Egyptian financial market authorities can use these measures to anticipate hot and cold periods of IPO markets.

Moreover, results show that the levels of underpricing during hot periods are much higher than those in cold periods. For market conditions, our findings demonstrate that the market is more active when traders detect a hot stock market. Furthermore, when the stock market indices increase, this may reflect an optimistic market sentiment in hot periods. Finally the duration to listing is found to be non-informative in addressing IPO hot issues especially for Egypt.

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Contributors/Acknowledgement: All authors contributed equally to the conception and design of the study.

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