

# **Effect of Macro-economic Factors on Aggregate Stock Returns in the Tunisian Financial Market**

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## **Abstract**

The stock market returns are known to be significantly correlated with both inflation and money growth. Nevertheless, the impact of real macroeconomic variables on aggregate equity returns has been difficult to establish, perhaps, because their effects are neither linear nor time-invariant. Therefore, we estimate a GARCH model of daily equity returns in which the realized returns and their conditional volatility depend on twelve macro-series announcements. Hence, we perceive the absence of a significant relation between the macroeconomic announcement and the stock market returns. Moreover, the effect of the announcement of these variables has been tested on the returns. The obtained results show that the macroeconomic variables disclosed in the Tunisian financial market do not have any impact on the volatility of the returns of the shares quoted in the B.V.M.T.

**JEL classification numbers:** E2, E44.

**Keywords:** macroeconomic variables, equity returns, macro-series announcement, return volatility.

## **1 Introduction**

«*Macroeconomic development exerts important effects on equity returns*». In fact, this quote has frequently been cited in various literatures, but it has a weak empirical support. In fact, the equities are affected by the factors related to the systematic risk. Therefore, in an economy governed by averse-investors, there will be an allowance for this risk in order to compensate for this “undiversifiable risk”. However, according to Flannery and Protopapadakis (2002), the macroeconomic variables are originally of this kind of risk because the change of the macroeconomic aggregates simultaneously affects the cash-flows of the firms and influences the risk-adjusted discount rate. Again, the economic conditions influence the number and the type of investment opportunities. For instance, the fluctuation of the unemployment rate offers new information about the returns of the

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human capitals, while inflation can change the differential of the returns expected from the various types of equities. Accordingly, the movement of the trade balance implies that a variation of the foreign exchange rate of the currency is expected.

Since the works of Chen, Roll and Ross (1986), several studies have attempted to show a genuine relation between the macroeconomic variables and the equity returns. Till nowadays, the literature has stressed that the market returns are deemed to be considerably negatively correlated with the inflation and the money growth. Flannery and Protopapadakis (2002) assert that the monetary aggregates simultaneously affect the level and the volatility of the returns. Whereas, the consumption price index (CPI) and the production price index (PPI) affect only the level of the return.

Indeed, Shiller (1981) explained this relation by showing that the volatility of the macroeconomic variables is strongly related to the variation of the interest rates, and, consequently, highlighted the relation between the volatility of equity returns and the interest rates. In order to explain the rise of the market volatility during a period of time, Schwert (1989) studied the impact of the economic factors. These factors involve inflation, the appreciation of the money, the production, the interest rate, the risk-adjusted discount rate, the volatility of the bond returns.... In his work, Schwert (1989) confirmed that if the inflation of the prices of the goods is dubious in time, the nominal volatility of the equity returns must reflect the volatility of inflation. The results affirmed the effect of the variability of the interest rate, in long and short term, in explaining the volatility of the financial assets. This assertion is especially aimed at the volatility of the returns of the treasury bills. In this respect, Kramer (1994) shows that the seasonal variation detected in the American financial market is strongly related to the seasonal variation of the macroeconomic variables. Beltratti and Morana (2005) affirm that the causal link between these two volatilities is more marked if the direction of the relation is from the macroeconomic volatility towards the volatility of the equities rather than the opposite direction. Indeed, they explain why the volatility of the macroeconomic factors contributes to the persistent and non-persistent component of the fluctuation of the volatility of the equities, while the volatility of the equities exerts only one influence limited to the macroeconomic volatility. Additionally, they find that an increase in the volatility of 1% is determined by 0.85% of the non-persistent component and 0.15% of the persistent component.

In contrast, Hooker (2004) studies the relation between the macroeconomic factors and the volatility of the equities in several emerging markets. He affirms that the whole of the macroeconomic factors in the emerging markets does not have any explanatory power over the volatility of the returns of the equities except the variable exchange rate. Furthermore, the research at hand re-fortifies the importance of the financial variables in the explanation of volatility.

## **2 Research Motivation**

Most of the studies have shown that the impact of the macro - innovations on the returns is invariant in time. However, if the impact of the macroeconomic developments varies according to the economic conditions, then the effect of the macroeconomic factors on the returns is no more significant. Thus, there appears the importance of the role of the announcement of the macroeconomic information in explaining the noticeable variation (in absolute value) of the returns. This is due to the fact that the effect of the information

of macroeconomic orders is variable in time.

In this perspective, according to Christie-David and al. (2002), Ederington and Lee (1993,1996), Fleming and Remolona (1999), Harvey and Huang (1991), as well as Nikkinen and Sahlstöm (2001), the employment reports, the production price index (PPI) and the consumption price index (CPI) provide a significant impact on the evaluation process of the financial assets.

In their research, Geij and Marquering (2004, 2006) studied the impact of the disclosure of the macroeconomic information on volatility. They showed that macroeconomic information is announced periodically and according to pre-planned programs. Thus, this type of information represents the most significant part of the public information which is the major determinant of the volatility of the flow of equities in the financial market.

This research highlights the importance of the announcement of the macroeconomic information in explaining the asymmetry of volatility. It also attaches the most important role of the specific information to the cited companies in order to determine the volatility of the shares. For this reason, the asymmetry of volatility persists even after the incorporation of other macro-information. In contrast, the volatility of the treasury bills, the announcement of information related to the interest rate, inflation, the monetary and the fiscal policy remain the most determinant factors of this volatility. The GARCH models show that volatility is not persistent enough, but the financial assets answer these announcements asymmetrically. Indeed, most of the previous works stressed that the GARCH models are more likely to model volatility than the CCOR models (constant correlation model).

Flannery and Protopapadakis (2002), in their research, went beyond that and noted that the announcement of macroeconomic information is associated with a very large amount of transactions. They came up with the conclusion that the macro announcements may be viewed as an information source for the financial market.

Most of the researches study the effect of the event of the announcement of new macroeconomic information on the volatility of the financial assets without attaching a great importance to the type of the current information revealed in the market by this announcement. However, since the macroeconomic information is announced periodically and according to pre-established programs, the participants in the financial market anticipate such information which will be revealed by these announcements. In accordance with their anticipations, these participants take the positions that maximize their profits. Thus, the anticipations of information have an important ability in determining the movements of the market. Intuitively, the announcement of information is no longer an important factor in explaining the volatility of equities but rather it is the difference between the participants' anticipations about this information and its realization which affects the volatility of the equities. Accordingly, Singh (1993, 1995), Kim (1998, 1999), Li and Hu (1998) and Balduzzi and al. (1997) were interested in the study of the impact of the non-anticipated component of the information revealed about the movements of the market. Aggarwal and Schirm (1998) showed that the non-anticipated component of the balance of exchange has an asymmetrical impact on the average of the returns of the bonds, the shares as well as the exchange rates. Kim, McKenzie and Faff (2004) fortify this way of research by assessing the impact of the most important six macroeconomic factors on the average and the volatility of the returns of the bonds, the shares and the foreign exchange market. Not only will the impact of the announcement be taken into account, but the study is also interested in the role of the anticipations of the participants of the market in the volatility of the returns. Actually, this

analysis is aimed at three main goals: to highlight the answer of the financial markets to the announcement of the macroeconomic information, to show the predominance of the USA<sup>1</sup> in the determination of the economic conditions of other countries and, lastly, to identify the role of the anticipations of the market regarding the macroeconomic information in the explanation of the movements of the market. When analyzing, Kim, McKenzie and Faff (2004) show that the financial markets do not homogeneously answer each realization of information by the government. What is more, they affirm that the cause of the reaction of the market is no longer the announcement of information but rather the nature of information. According to the results, the non-anticipated component of information relating to the balance of exchange presents the most important variable for the explanation of the average volatility of the exchange market. Whereas, the information related with the internal economy represents the primary source of volatility for the bonds, i.e. the information concerning the consumption price index (CPI) and the production price index (PPI)<sup>2</sup> are able enough to explain the volatility of the returns. Lastly, they emphasize that, unlike the former studies, the volatility of the financial market increases as a result of a certain category of information and drops due to other types of announcements. This result is explained by the fact that the adopted policy varies according to the various macroeconomic indicators.

### **3 Objectives**

Recently, the emerging markets are increasingly interesting for the foreign institutional investors as they are enticed by the encouraging opportunities to diversify their portfolios in order to have higher proceeds. For that reason, the analysis of the impact of the announcement of the macroeconomic variables on the volatility of the stock exchanges proves to be important.

Indeed, this analysis focuses on three main goals:

- To highlight the answer of the Tunisian financial market to the announcement of the macroeconomic information,
- To show the importance of the phenomenon of surprise, measured by the difference between the anticipations of the investors and the realization of the macroeconomic variables, in determining the variability of the returns of the equities. In other words, to identify the role of the market anticipations about the macroeconomic information in the explanation of the movements of the market,
- Finally, to highlight the existence of a trilateral relation between the macroeconomic variables, the volumes of transactions and the volatility of equity returns.

### **4 Sample and Period of Research**

Throughout this research, we primarily intend to make an application to the Tunisian financial market as it is a new field of investigation. In fact, it is considered as an emerging market, and there are not so many works attempting to show the impact of the announcement of the macroeconomic variables on such kind of market. Thus, a similar analysis proves to be very important. Hence, our sample gathers twenty four companies involved in the Tunisian financial market, namely:

AIR LIQUIDE – AMEN LEASE – ALKIMIA – ALMAZRAA – AMS – ASTREE – ATB – ATL – BIAT – BNA – BS – BT – MAGASIN GENERAL – MONOMPRIX – SFBT – SIMPAR – SITEX – SOTUMAG – STB – STS – TUNISIE LEASING – TUNISAIR – UBCI – UIB

The period of study lasted six years, from January 3rd, 2000 to December 30th, 2005. That is to say, 1496 business days. The data are of daily frequencies, i.e., 35904 observations. The obtained data are:

- Daily closing price,
- Size of the daily exchange per equity,
- Frequency of the daily transactions per equity,
- Macroeconomic variables quoted below,
- Dates of the announcements of the macroeconomic variables,
- Financial variables

## 5 Description of the Macroeconomic Variables

- The number of the days of transactions: 1496 days per equity.
- The number of the announcements of the macroeconomic variables: 474 announcements distributed as follows:
  - ✓ 360 announcements of monthly frequency,
  - ✓ 96 announcements of quarterly frequency,
  - ✓ 18 announcements of annual frequency.
- The number of days with announcements of macroeconomic orders: 102 days distributed as follows:
  - ✓ 72 days with 12 announcements,
  - ✓ 24 days with 4 announcements,
  - ✓ 6 days with 3 announcements.
  - ✓ The days without announcements are 1394.

<b>The macroeconomic variables</b>	<b>The announcement frequency</b>	<b>The number of announcement</b>
The trade balance	Annual	6
The gross domestic product	quarterly	24
The interest rate of the financial market	monthly	72
The consumption price index	Monthly	72
The saving remuneration rate	Monthly	72
The wage rising rate	Quarterly	24
The economy liquidity rate	annual	6
Inflation rate	Annual	6
Industrial production index	Monthly	72
Scriptural money	quarterly	24
Quasi-money	Quarterly	24
The industrial selling price index	Monthly	72

## 6 Methodology

The GARCH models show that volatility is not persistent enough, but the financial assets respond to these announcements asymmetrically. Indeed, most of the previous works stressed that the GARCH models are more likely to model volatility than the CCOR models (constant model correlation).

Moreover, as it is difficult to establish the impact of the real macroeconomic variables on the equities, since their effects are neither linear nor invariant in time, Flannery and Protopapadakis (2002) use a GARCH model for the daily returns. For such a model, the conditional volatility of the returns depends on seventeen macroeconomic variables.

Thus, following the example of Flannery and Protopapadakis (2002), the same method will be chosen to measure volatility and to test the effect of the macroeconomic variables on this volatility. Consequently, the appropriate measure of volatility is the conditional variance of the GARCH model.

## 6.1 Impact of the Announcement of the Macroeconomic Variables on the returns and the Volatility of Equity Returns

Following the example of Flannery and Protopapadakis, in order to show the impact of the announcement of the macroeconomic variables on the volatility of the returns, we have to choose the regression of the following model:

$$r_t = E_{t-1}r_t + \sum_{n=1}^{12} \beta_n [F_{nt} - E_{t-1}(F_{nt})] + \mu_t \quad (1)$$

$$E_{t-1}(r_t) = r_0 + \psi TB3_{t-1} + \sum_{n=1}^4 \omega_w DW_{wt} + \sum_{k=1}^6 \lambda DJ_{kt} \quad (2)$$

$$\mu_t \equiv h_t, \text{ where } \varepsilon_t \sim N(0,1) \text{ and } i i d \quad (3)$$

$$h_t^2 = \left\{ h_0^2 + \rho_1 \frac{h_{t-1}^2}{\Gamma_{t-1}} + \theta_1 \mu_{t-1}^2 + \gamma_p JPRE_{t-1}^2 + \gamma_t TB3M_{t-1}^2 \right\} * \Gamma_t \quad (4)$$

$$\Gamma_t = EXP \left\{ \sum_{w=1}^4 \phi_w DW_{wt} + \phi_r PRE_t + \phi_s POST_t + \sum_{n=1}^{12} f_n DF_{nt} \right\} \quad (5)$$

Where:

- $r_t$  = the realized market returns on the day  $t$ ,
- $E_{t-1}(r_t)$  = The expected market returns for the day  $t$ ,
- $F_{nt}$  = the real value of the  $n^{\text{th}}$  risk factor,  $n = 1, \dots, N$ ,
- $\beta_n$  = the measurement of the market returns sensitivity to the non-anticipated change at the level of  $n^{\text{th}}$  risk factor,
- $r_0$  = a constant return,
- $TB3$  = the 3 months Treasury bill rate,
- $h_t$  = the conditional standard deviation of the error  $\mu_t$ .
- ✓ The parameters  $\beta_n, \omega_w, \lambda_k, f_n, \phi_w, \phi_s$  and  $\phi_r$  have unrestricted signs; whereas  $h_0, \rho_1, \theta_1, \gamma_p$  and  $\gamma_t$  must be positive.
- ✓  $F_{nt}$  : are the announcements of information about twelve macroeconomic factors including : the trade balance ( $TB$ ), the gross domestic product ( $GDP$ ), financial market interest rate ( $FMIR$ ), the consumption price index ( $CPI$ ), saving remuneration rate ( $SRR$ ), wage rising rate ( $WRR$ ), the economy liquidity rate<sup>2</sup> ( $ELR$ ), inflation rate ( $IR$ ), industrial production index ( $INDP$ ), the scriptural money<sup>3</sup> ( $MNS$ ), the quasi<sup>4</sup> - money (MNQ), the industrial selling price index (ISPI).
- ✓  $TB3_{t-1}$ : the three months Treasury bill rate on the date  $t-1$ .
- ✓ The dummy variables (DW) are four business days (out of five business days, one day

<sup>2</sup>The economy liquidity rate =  $M_3/GDP$  according to the data from the BCT.

<sup>3</sup>Its main components are: sight deposits are the banks and the sight deposits at the CPC.

<sup>4</sup>Its main components are: financial term deposits and other products, certificates of deposits and saving deposits.

is eliminated to avoid the problem of auto-correlation). They allow indicating the behavior of the weekly returns and the equities volatility. Several studies allocate this weekly behavior to the incidence of the announcements of macroeconomic information.

- ✓ The January effect is detected by six dummy variables ( $DJ_t$ ) which are: The last three days of December (from December 28th to 30th), the last day of transactions for December noted ( $DECLD$ ) and the first two days of January.
- ✓  $PRE_t$  and  $POST_t$  are equal to one if the day of transactions precedes ( $PRE_t$ ) or follows ( $POST_t$ ) the holidays.
- ✓  $DF_n$ : is a dummy variable which is equal to one if the day corresponds to the date of the announcement of information of macroeconomic nature, otherwise it is equal to zero.
- ✓ We suppose that the program of macro-announcement has a multiplex effect on the conditional variance.
- ✓ The exponential form of the equation (5) ensures the fact that the conditional variance of volatility is positive; therefore, there are no constraints regarding the sign of the dummy variables.
- ✓ The component  $\ll \frac{h_{t-1}^2}{\Gamma_{t-1}} \gg$  prevents the anticipated events from affecting the future volatility.

## 6.2 The Announcement of Macroeconomic Information and the Volume of Transactions

A large literature is interested in the relation between the volume of transactions and the equities returns. Most of the studies in finance, theoretical and empirical, such as those carried out by Chan and Fong (2000), Manganelli (2002) and Goetzman and Massi (2003) highlighted a positive relation between the returns of the equities and the volume of transactions. Several explanations to this relation volume - volatility were advanced. Thus, Kim and Verrecchia (1991), Blume, Easley and O' Hara (1994) and Easley, Hvidkajer and O' Hara (2000) affirm that public information affects the transactions through the exchanges. So, intuition suggests that the macroeconomic information (Classified as public information) must affect the volumes of transactions and, consequently, the returns of the equities. This intuition pushed Flannery and Protopapadakis (2002) to test the relation between the macroeconomic factors and the volumes of transactions. In fact, Flannery and Protopapadakis (2002) proposed an explanation which was not the focal point of former researches. In fact, they showed that the macroeconomic factors affect the level of the volume of transactions (since the macroeconomic variables have an effect on the type and the number of opportunities of investment) and, consequently, they have an impact on the returns. Accordingly, they affirmed that the volume of transactions plays a blatant role in the explanation of the volatility of the equity returns. Indeed, the macroeconomic variables increase the volumes of transactions significantly. It is worth mentioning that only the economic variables affecting the returns have an impact on the volumes of transactions. This result corroborates the work of Beaver (1968) who shows that the volume of transaction of the equities increases by 34% during the weeks of the announcement of macroeconomic information.



In order to highlight the relation between the factors of macroeconomic orders and the volume of transaction, we will try to study the following model:

$$\begin{aligned}
 \text{Log}(Volume_t) = & \alpha_0 + \sum_{k=1}^{10} \theta_k \log(Volume_{t-k}) + \sum_{t=1}^{12} \beta_t [F_{nt} - E(F_{nt})]^2 \\
 & + \sum_{n=1}^3 \delta_n DF_{nt} + \gamma TB_{3t-1} + \sum_{w=1}^4 \psi_w DW_{wt} \\
 & + \sum_{k=1}^6 \phi_k DJ_{kt} + \phi_r PRE_t + \phi_s POST_t + \varepsilon_t,
 \end{aligned} \tag{6}$$

with:

Volume = the total volume of transactions measured by the number of the exchanged shares or by the frequency of transactions.

Officer (1973), Shiller (1981), Schwert (1989) and Flannery and Protopapadakis (2002) studied the relation between the macroeconomic factors and the market volatility. In fact, they assume that the economic factors measure the risk factors and, consequently, they must affect the returns of the equities. They supposed that the macroeconomic variables affect the market returns negatively, and, as a result, the absolute volatility since they represent the greatest part of the private information. Throughout their studies about the seventeen macroeconomic factors in the equities returns, Flannery and Protopapadakis (2002) assert the existence of a significantly negative relation between the returns of the equities and the three nominal variables: inflation (measured by the two indexes: CPI and PPI) and the growth of money. This relation is also existent between the returns and the three real variables: the balance of exchange, the employment report and house-constructions. Moreover, the results show that there is a significantly positive relation between the volumes of transactions and the macroeconomic variables.

## 7 Results and Interpretations

The results show that the statistics of Durbin and Watson are close to each other. This, in fact, allows us affirming the absence of an auto-correlation of errors. Hence, the MCO estimators converge asymptotically towards the real values of the parameters with a minimal variance.

Additionally, the results of the test of Augmented Dickey and Fuller "ADF" applied to all the variables and the equities of our sample show that all the variables are stationary. Therefore, there comes the possibility of establishing an equilibrium relation between these variables and the estimates by ordinary least squares.

## 7.1 The Impact of the Announcement of the Macroeconomic Variables on Returns

All the way through this study, we tried to determine the impact of the announcement of twelve macroeconomic variables on the Tunisian financial market. Particularly, we studied the effect of the “phenomenon of surprise” of the investors after the announcement of macroeconomic information on the returns of the exchanged shares in the B.V.M.T. As it is intuitively suggested, it is the difference between the announced real value of the macroeconomic variable and the value estimated by the investors regarding this variable which is originally the variation of the equities returns. The results of this analysis are presented in the following table:

	$r_t = E_{t-1}(r_t) + \sum_{n=1}^{12} \beta_n [F_n - E_{t-1}(F_n)] + \mu_t$												
	<i>TMM</i>	<i>TREINDP</i>	<i>IPVIPC</i>	<i>BOT</i>	<i>PIB</i>	<i>TES</i>	<i>MNS</i>	<i>MNQTXL</i>	<i>TXI</i>	<i>TXI</i>	<i>TXI</i>	<i>TXI</i>	<i>TB3</i>
<i>Air liquide</i>	-1,54* (-3,09)	2,72 (0,86)	0,0004* (2,86)	-0,0005 (-0,19)	0,03* (14,2)	-0,002 (-0,09)	-0,002 (-0,58)	-0,65 (-0,63)	-1,83 (-0,63)	-0,007 (-0,34)	-0,097 (-0,01)	-0,09 (-0,01)	-0,009 (-0,69)
<i>AL</i>	-1,51 (-0,07)	-7,52 (-0,07)	0,0055 (0,004)	0,1199 (0,006)	0,102 (0,05)	-0,0002 (-0,05)	-0,0002 (-0,01)	-3,53 (-0,01)	0,0001 (0,01)	0,0001 (0,002)	2,8343 (0,001)	1,9889 (0,001)	-1,722 (-0,02)
<i>Alkimia</i>	-3,77 (-0,002)	60,78 (0,002)	-0,001 (-0,009)	0,1296 (0,004)	0,302 (0,05)	0,002 (0,012)	-0,0009 (-0,03)	-1,857 (-0,03)	0,0005 (0,003)	0,0006 (0,004)	4,1121 (0,005)	-1,5544 (-0,002)	-2,186 (-0,013)
<i>Almazraa</i>	0,186 (0,025)	0,902 (0,095)	0,00034 (0,7533)	0,0022 (0,264)	-0,001 (-0,11)	0,0002 (0,034)	0,0004 (1,199)	-0,354 (-0,406)	0,00002 (0,074)	-0,04* (-4,59)	-0,117 (-0,04)	-0,525 (-0,249)	-0,0075 (-0,564)
<i>AMS</i>	-0,8453 (-0,032)	0,1646 (0,009)	-0,0006 (-0,351)	-0,003 (-0,12)	0,016 (0,42)	-0,0003* (-4,25)	-0,0003 (-0,16)	0,3988 (0,092)	-0,0004 (-0,294)	0,0002 (0,026)	0,0466 (0,018)	-0,2433 (-0,084)	0,033 (0,973)
<i>Astree</i>	0,6949 (0,097)	0,7522 (0,054)	-0,0001 (-0,05)	0,0016 (0,04)	-0,0016 (-0,01)	-0,00001 (-0,003)	0,0001 (0,003)	-1,262 (-0,38)	-0,0003 (-0,01)	-0,006 (-0,62)	-0,1 (-0,008)	-0,078 (-0,005)	0,008 (0,16)
<i>ATB</i>	-0,2815 (-0,075)	-0,918 (-0,373)	0,000004 (0,111)	-0,0008 (-0,128)	0,0007 (0,088)	0,000003 (0,398)	0,0002 (0,538)	-0,09 (-0,118)	0,00001 (0,79)	-0,03* (-2,49)	-0,155 (-0,04)	0,277 (0,069)	-0,017* (-2,18)
<i>ATL</i>	-1,179* (-1,998)	4,12* (3,52)	-0,0003* (-2,35)	0,0001 (0,07)	-0,0004 (-0,11)	-0,00002 (-0,197)	0,0001 (0,18)	0,155 (0,36)	-0,0005 (-0,24)	-0,005 (-0,11)	0,353 (0,31)	0,73 (0,26)	-0,0008 (-0,07)
<i>BIAT</i>	-2,3787* (-13,152)	3,851* (8,88)	-0,00004 (-0,03)	0,0016 (0,69)	0,0008 (0,2)	0,000002 (0,913)	-0,0002 (-0,82)	0,121 (0,38)	0,00001 (0,803)	0,0007 (0,67)	-0,104 (-0,073)	0,052 (0,056)	-0,004 (-0,59)
<i>BNA</i>	-1,23* (-1,989)	1,546 (1,01)	-0,0001 (-0,473)	-0,009* (-2,78)	0,014* (4,25)	-0,004* (-2,93)	0,0007 (1,53)	18,126* (3,77)	-0,004* (-3,94)	0,003* (4,33)	0,874 (1,475)	0,65 (0,78)	-0,029* (-2,79)
<i>BS</i>	-0,992* (-1,992)	1,84 (0,37)	0,0006* (3,66)	0,016* (5,45)	0,013* (3,16)	-0,00002 (-0,175)	-0,0002 (-0,65)	-1,429* (-3,05)	0,00009 (0,43)	-0,002 (-0,89)	0,36 (0,28)	0,51 (0,103)	0,015 (1,159)
<i>BT</i>	0,96 (1,52)	-2,65 (-1,36)	0,0001 (0,74)	0,004 (1,568)	-0,02* (-9,98)	0,00001 (0,03)	-0,0001 (-0,63)	0,13 (0,32)	-0,0002 (-0,22)	0,002* (3,26)	0,45 (0,47)	0,98 (0,92)	-0,005 (-0,37)
<i>MG</i>	1,33 (0,002)	1,071 (0,001)	0,0002 (0,002)	0,004 (0,002)	-0,004 (-0,01)	-0,0009 (-0,0009)	0,0003 (0,002)	-0,103 (-0,005)	-0,0002 (-0,004)	-0,002 (-0,06)	0,166 (0,006)	0,88 (0,002)	-0,016 (-0,002)
<i>Monoprix</i>	-0,07 (-0,16)	0,73 (0,29)	-0,0002 (-0,01)	0,001 (0,43)	0,009* (2,32)	-0,0002 (-0,93)	0,0002 (0,09)	-1,88* (-4,82)	-0,0003 (-1,77)	0,0003 (0,28)	0,01 (0,07)	-0,36 (-0,34)	-0,003 (-0,4)
<i>SFBT</i>	-1,76 (-0,96)	1,92 (0,64)	-0,0003 (-0,12)	0,004 (1,90)	-0,004 (-0,67)	-0,00007 (-0,2)	0,0002 (0,51)	0,82 (1,58)	0,00002 (1,10)	0,0002 (0,15)	0,124 (0,06)	0,52 (0,38)	0,02* (2,79)
<i>SIMPAR</i>	2,31 (0,003)	1,27 (0,001)	-0,0002 (-0,001)	0,004 (0,002)	-0,003 (-0,08)	-0,00007 (-0,01)	-0,0005 (-0,04)	0,438 (0,002)	-0,0009 (-0,001)	-0,002 (-0,05)	0,153 (0,007)	0,116 (0,003)	0,366 (0,107)
<i>SITEX</i>	1,97 (0,0051)	-2,45 (-0,002)	-0,0006 (-0,007)	-0,005 (-0,003)	-0,011 (-0,05)	0,00004 (0,0006)	-0,0009 (-0,07)	0,154 (0,005)	0,0002 (0,002)	0,0007 (0,02)	0,078 (0,001)	-0,0553 (-0,008)	0,55 (0,232)

<b>SOTUMAG</b>	-0,99 (-0,66)	1,044 (0,37)	-0,0007* (-3,21)	0,009* (2,09)	0,001 (0,169)	-0,00001 (-0,34)	-0,0002 (-0,6)	0,43 (0,29)	-0,0006 (-0,22)	-0,002 (-0,16)	-0,41 (-0,53)	0,12 (0,06)	-0,038* (-2,71)
<b>STB</b>	-0,039 (-0,015)	-0,71 (-0,17)	-0,00006 (-0,55)	0,0015 (0,82)	-0,001 (-0,31)	-0,0001 (-0,14)	0,0003 (1,025)	0,65 (0,91)	0,0002 (0,13)	-0,001 (-1,51)	0,29 (0,75)	-0,19 (-0,05)	0,0064 (0,603)
<b>STS</b>	-0,26 (-0,136)	-4,49 (-1,22)	0,0001 (0,18)	-0,001 (-0,08)	-0,0008 (-0,03)	-0,00003 (-0,15)	-0,0004 (-0,58)	-0,54 (-0,28)	0,0004 (0,09)	0,0002 (1,91)	1,34 (1,008)	2,13 (0,39)	0,004 (0,17)
<b>TL</b>	6,609 (0,07)	53,0004 (0,82)	0,0022 (0,38)	0,307* (2,51)	0,337* (2,36)	-0,0006 (-0,536)	-0,0005 (-0,23)	-10,73 (-0,316)	-0,0001 (-0,16)	-0,002 (-0,25)	-3,077 (-0,07)	-3,14 (-0,05)	-0,11 (-0,04)
<b>TUNISAIR</b>	-0,83 (-0,14)	-1,24 (-0,248)	0,0001 (0,33)	0,002 (0,51)	-0,01 (-1,24)	-0,0002 (-0,25)	0,001* (3,02)	0,83 (0,89)	-0,007* (-2,8)	-0,05* (-5,68)	0,29 (0,14)	-1,93 (-0,47)	-0,009 (0,062)
<b>UBCI</b>	4,98 (0,0022)	-2,71 (-0,007)	-0,0007 (-0,0025)	-0,0024 (-0,003)	-0,004 (-0,05)	0,00002 (0,0002)	-0,0001 (-0,01)	1,95 (0,002)	0,0001 (0,009)	-0,009 (-0,07)	0,22 (0,001)	-0,55 (-0,002)	0,803 (0,09)
<b>UIB</b>	-0,34 (-0,13)	-0,92 (-0,49)	-0,0001 (-1,38)	0,003 (1,21)	0,096* (2,76)	-0,0002 (-0,63)	0,0001 (0,62)	-0,474 (-1,03)	-0,0008 (-0,12)	-0,03* (-2,29)	0,22 (0,11)	-0,63 (-0,47)	-0,003 (-0,3)

The analysis of the table presented above shows that “the surprise effect” due to the announcement of the macroeconomic variables on the Tunisian financial market is not important. Indeed, the relation between the announcement of the macroeconomic variables and the returns of the flows are not significant only for some equities.

The results show that the liquidity rate (LR) as well as the inflation rate (IR) is not significant for the individuals of such a sample. This enables us to acknowledge that these two variables do not explain the returns of the equities. In addition, it is noted that the two variables for measuring inflation are: the consumption price index (CPI) and the selling price index (SPI) which have a significantly positive effect on the returns. Actually, this study shows that the relation between the selling price index and the returns is significantly positive for 30% of the equities of the sample. This disagrees with the results of the study carried out by Nelson (1976) and Fama and Schwert (1977) who announce a significantly negative relation between inflation and the equities returns. However, it may be noted that the coefficients are low, so the multiplex effect of these variables is not marked. Similarly, the consumption price index is significant only for 17% of the equities. This result is explained by the fact that inflation can change the differential of the expected returns between the various types of equities. Thus, it should also be noted that this relation is significant only for a limited number of the equities constituting the sample. In fact, this result agrees with the results found by McQueen and Roley (1993) which acknowledge the existence of a weak evidence to the negative relation between PPI and the flows of the equities; whereas, they show that this relation is not significant for CPI. There is a theoretical explanation of this result given by some researchers. In other words, theoretically, the prices of the equities and inflation are independent. Indeed, for evaluated of the price according to the cash-flows model:

$$(E_{t-1}P_t = E_{t-1} \sum_{k=1}^{\infty} D_{t+k} / (1 + R_{t+k})^k) \text{ brought up to a level of inflation higher than the}$$

anticipated one is translated an increase in the cash-flows (on the level of the numerator) which will be compensated by an adjustment of the denominator related to the increase in the discount rate in order to recoup the losses brought about by the increase in the prices which is supported by the equities purchasers. Consequently, according to this point of view, the price of the equities remains stable and, thus, inflation does not have any effect on the volatility of the returns of the equities. In this, Hardouvelis (1987) enhances this explanation and shows that the two measurements of inflation (CPI and PPI) do not provide any explanation to the movements of equities returns.

In contrast, the variables scriptural money and quasi money exert a negative effect on the returns. Indeed, the results show that the relation between the quasi-currency and the returns is significantly negative for 25% of the individuals involved in our sample. This result indicates that the more the effect “surprise” due to the announcement of the variable quasi currency is important, the lower the return will be. In other words, the higher the non-anticipated component of the variable quasi-currency is, the lower the equities price will be and induce a lower level of return. However, as the quasi-money is primarily made up of: term deposits and other financial products, deposits certificates and savings deposits; this result seems to be logical. Indeed, the investment in the deposits certificates and the other financial products can affect the level of investment in the financial market and, consequently, will negatively act on the equities returns negotiated in such a market. This result agrees with the idea developed by Morana and Beltratti (2002). They put the stress on the importance of the financial policy when explaining the movements of the returns equities. Again, they affirm that any change on the level of this policy affects the level of the economic activity and, consequently, the volatility of the equities in the financial market. They also suppose that a stable monetary policy involves a stable equities price in the market. Likewise, the analysis of the impact of the scriptural money on the returns shows that this relation is significantly negative for 9% of the equities. The relation between the financial market rate and the equities returns is significantly negative for 21% of the equities of our sample. The theoretical explanation of this relation is based on the fact that the current prices of the equities are given by the update of the estimated values of the cash-flows which are represented by the following equation:

$$E_{t-1}P_t = E_{t-1} \sum_{k=1}^{\infty} D_{t+k} / (1 + R_{t+k})^k .$$

With  $D_{t+k}$  represent the capital gain plus the dividends distributed during the period  $t+1$  and  $1/(1+R_{t+k})^k$  is the up-dating rate for the period  $t+k$  on the basis of the information available during the period  $t-1$ . Thus, the variance of the prices,  $\text{var}_{t-1} P_t$ , depends on the conditional variance of the estimated values of the future cash-flows, the future up-dating rate and the conditional covariance between them. However, the up-dating rate is strongly affected by the variation of the financial market rate. Thus, the financial market rate affects the returns of the equities negatively.

According to the industrial production index of the (INDP), the results show that this variable is significant only for 17% of the individuals. Indeed, this relation is significantly negative for the whole of the equities. This result is explained by the fact that the industrial production index measures the price of the raw materials which constitute the consumer goods. Thus, its effect is recognized on the equities returns since it affects the behaviour of the investors and the investment opportunities.

For the other variables such as the saving remuneration rate (SRR), the wage rising rate (WRR), the trade balance (TB) and the gross domestic product (GDP), the results are almost similar and show that these variables do not have a significant effect on the equities returns. They have an impact only on a very small number of the equities in the sample.

Briefly, the results, presented above, allow us affirming that the impact of the non-anticipated component of the macroeconomic variables on the equities returns is not so important. This result can be explained by the fact that the “surprise” effect, due to the announcement of the macroeconomic variables, is measured by the difference between the real value related to this variable and its last value. However, as the variability of

these factors is not very important in the Tunisian economic context, this differential will be weak and, consequently, its impact on the equities returns will be negligible. But it should be noted that this result corroborates the one found by several former studies undertaken on various stock exchanges which failed to detect a significant relation between the macroeconomic variables and the equities returns of Tunisian financial market.

However, this first regression is aimed to determine the values of volatility. Indeed, volatility is measured by the conditional variance resulting from the GARCH model. Hence, the nature of the relation between the volatility and the macroeconomic variables will be analyzed.

### 7.2 The Impact of the Announcement of the Macroeconomic Variables on the Volatility of Equities Returns

In order to highlight the impact of the announcement of the macroeconomic variables on the volatility of the equities returns in the Tunisian financial market, we attempted, through this study, to detect the days of announcements of these variables and to test their effects on the volatility of the equities. The announcements are carried out in the following frequencies: annual measured by  $f_{1t}$ , monthly measured by  $f_{2t}$  and quarterly measured by  $f_{3t}$ .

	<sup>5</sup>									
	$h_t^2 = \left\{ h_0^2 + \rho_1 \frac{h_{t-1}^2}{\Gamma_{t-1}} + \theta_1 \mu_{t-1}^2 + \gamma_\tau TB_{3t-1}^2 \right\} * \Gamma_t$									
	$f_{1t}$	$f_{2t}$	$f_{3t}$	$f_{1t-1}$	$f_{2t-1}$	$f_{3t-1}$	$\gamma_{\tau t-1}$	$\rho_1$	DW	R <sup>2</sup>
<i>Air liquide</i>	0,08 (0,32)	-0,119 (-0,087)	-0,02 (-0,07)	0,11 (0,33)	-0,04 (-0,57)	0,06 (0,22)	-3,79* (-278)	0,285* (22,71)	2,004	0,810
<i>AL</i>	-0,08* (-2,76)	-0,008 (-0,9)	0,027 (1,55)	-0,0007 (-0,014)	0,02 (1,29)	-0,01 (-0,59)	1,14* (4,08)	0,79* (43,51)	1,91	0,999
<i>Alkimia</i>	-0,0012 (-0,06)	-0,017* (-3,45)	0,005 (0,51)	0,0053 (0,17)	0,033* (3,75)	0,009 (0,57)	-0,046 (-0,30)	0,67* (74,26)	1,98	0,999
<i>Almazraa</i>	0,04 (0,58)	0,004 (0,307)	0,001 (0,03)	0,169* (2,44)	0,012 (0,83)	-0,128 (-4,98)	-1,18* (-4,54)	0,883* (29,40)	2,03	0,949
<i>AMS</i>	0,006 (0,73)	0,0012 (0,509)	-0,0019 (-0,406)	-0,055* (-3,65)	0,0005 (0,14)	0,001 (0,23)	-0,009 (-0,15)	0,69* (76,94)	2,06	0,900
<i>Astree</i>	-0,03 (-0,308)	-0,0055 (-0,029)	0,024 (0,536)	0,164 (0,89)	0,033 (0,606)	-0,19* (-2,53)	1,61 (1,67)	0,67* (13,85)	1,91	0,995
<i>ATB</i>	-0,128 (-0,36)	-0,21 (-1,31)	0,362 (1,52)	0,37 (0,53)	1,70 (0,09)	-1,68 (-0,09)	-12,13* (-2379)	0,04* (6,13)	1,91	0,675
<i>ATL</i>	-0,115 (-1,01)	-0,06 (-1,84)	0,109 (1,72)	0,147 (1,122)	-0,022 (-0,58)	-0,05 (-0,93)	0,295 (0,51)	0,74* (16,74)	1,98	0,881
<i>BIAT</i>	-0,101 (-0,51)	0,05 (1,44)	-0,039 (-0,34)	0,21 (0,29)	0,106 (0,59)	0,388 (0,788)	82,09* (3,77)	4,509* (4,15)	1,93	0,863
<i>BNA</i>	-0,285 (-1,803)	0,04 (0,62)	-0,048 (-0,48)	0,117 (0,54)	-0,114 (-1,13)	-0,12 (-0,84)	0,98 (4,47)	0,29* (32,21)	1,89	0,84

<sup>5</sup>Such that:

$$\Gamma_t = \text{Exp} \left\{ \sum_{w=1}^4 \phi_w DW_{wt} + \phi_p PRE_t + \phi_s POST_t + \sum_{n=1}^3 f_n DF_{nt} \right\}$$

<b>BS</b>	-0,116 (-0,403)	0,015 (0,278)	-0,0011 (-0,012)	-0,004 (-0,01)	- 0,253* (-5,22)	0,228* (2,503)	-0,82 (-0,89)	0,804* (8,502)	1,87	0,999
<b>BT</b>	-0,113 (-0,286)	-0,012 (-0,117)	0,046 (0,25)	1,729 (0,38)	-4,62 (-0,82)	2,88 (0,518)	0,096 (0,178)	0,006 (0,176)	1,92	0,968
<b>MG</b>	-0,0009 (-0,63)	-0,0003 (-0,08)	0,0006 (0,77)	0,0008 (0,37)	0,0001 (0,25)	- 0,0006 (-0,49)	-0,016 (-1,49)	0,656* (306,9)	2,01	0,987
<b>Monoprix</b>	-0,24 (-0,102)	-0,207 (-0,68)	0,36 (0,79)	0,012 (0,017)	0,032 (0,223)	-0,004 (-0,02)	-10,79* (-54,5)	0,15* (21,73)	2,07	0,999
<b>SFBT</b>	-0,42 (-0,33)	-0,04 (-0,36)	-0,035 (-0,16)	1,68 (0,19)	0,114* (3,05)	-0,23 (-1,223)	-2,51 (-1,77)	0,464* (5,312)	1,91	0,986
<b>SIMPAR</b>	0,00002 (0,032)	-0,0008 (-0,37)	0,000002 (0,005)	-0,0004 (-0,34)	- 0,0004 (-0,01)	- 0,0007 (-0,96)	-0,001* (-2,69)	0,599* (78228)	1,99	1
<b>SITEX</b>	-0,0003 (-0,41)	-0,0002 (-0,93)	0,0005 (1,21)	0,001 (0,83)	0,0003 (0,85)	- 0,0003 (-0,555)	-0,02* (-3,24)	0,598* (1598)	2,01	1
<b>SOTUMAG</b>	-0,26 (-0,186)	-0,76* (-11,24)	0,822* (2,47)	-0,51 (-0,55)	0,51* (3,64)	-0,31 (-0,38)	-1,105* (-1,98)	0,83* (3,85)	2,04	0,995
<b>STB</b>	-0,048 (-0,409)	-0,03 (-1,02)	0,02 (0,44)	-0,029 (-0,233)	- 0,183* (-6,35)	0,16* (3,14)	-1,366* (-3,53)	0,685* (14,49)	1,99	0,906
<b>STS</b>	-0,0007 (-0,05)	0,003 (0,78)	-0,001 (-0,24)	-0,02 (-0,73)	-0,001 (-0,17)	-0,001 (-0,07)	0,02 (0,17)	0,555* (43,4)	2,02	0,806
<b>TL</b>	0,0001 (0,038)	-0,0009 (-0,07)	-0,00008 (-0,032)	0,00001 (0,002)	- 0,011* (-5,68)	0,007* (2,25)	0,007 (0,25)	0,72* (122,1)	2,09	0,931
<b>TUNISAIR</b>	-0,109 (-1,002)	0,015 (0,79)	0,005 (0,126)	0,009 (0,08)	0,026 (1,22)	-0,05 (-1,41)	0,849 (2,04)	0,858* (23,04)	2,004	0,952
<b>UBCI</b>	0,00004 (0,24)	0,0001* (2,304)	-0,0001 (-1,82)	0,001* (3,79)	0,004* (8,49)	0,001* (-10,05)	-0,007* (-4,75)	0,599* (6433)	2,08	1
<b>UIB</b>	-0,15 (-0,96)	-0,103* (-2,65)	0,133 (1,84)	0,274 (1,113)	-0,078 (-1,71)	0,004 (0,08)	2,077* (2,95)	0,815* (16,23)	1,99	0,894

The analysis of this table shows the lack of a significant relation between the announcements of the macroeconomic variables and the volatility of the flows. In other words, there is no volatility of returns on the days of announcement of the macroeconomic variables.

Indeed, the results show that the announcements of annual frequency are, statistically, significantly positive only for one equity of the sample. In fact, this enables us to affirm that the variables: the economy liquidity rate, the inflation rate and the exchange balance do not present any explanatory power to the volatility. This result can be explained by the fact that the announcement of these variables is distant in time. Moreover, it should be noted that these results are identical to those presented by the previous analysis since these variables do not have any impact on the equities returns.

For the analysis of the impact of the announcements of quarterly frequency, in fact, the results show that variables: quasi-money, scriptural money, the wage rising rate, and the gross domestic product affect the volatility of only one equity in our sample.

On the contrary, the results show that the variables: the industrial production prices, the

financial market rate, the saving remuneration rate, the consumption price index, and the selling price index negatively affect the volatility of the flows in the Tunisian financial market. Indeed, the coefficients  $f_{2t}$ , statistically, are significantly negative for 19% of the equities. This result reconfirms the explanatory capacity offered by these variables to the equities returns found at the level of the first part of our study. Therefore, one can affirm that only the monthly announced variables have an effect on volatility. Thus, the question that offers itself is whether the nature of the announced variable or the frequency of the announcements is the cause of the fall of volatility? However, the negative effect of the announcement of the macroeconomic variables on volatility is explained by the fact that the investors are afraid of the announcement of these variables. Thus, they will be reluctant about the exchange during the periods of the announcements of these variables while trying to stabilize the price of the equities and, consequently, to reduce volatility.

However, it is worth being mentioned that the relation between the returns of the treasury bills during three months and the volatility of the flows is statistically significantly negative for 50% of the equities. This result highlights the importance of the financial variables in the explanation of the volatility of the flows of the equities. Accordingly, one can affirm the superiority of the explanatory power of the financial variables to that provided to volatility by the macroeconomic variables. This result agrees with that found by former researches. Indeed, Hooker (2004) studies the relation between the macroeconomic factors and the volatility of the equities in several emerging markets and affirms that the whole of the macroeconomic factors in the emerging markets does not represent any explanatory power over the volatility of the returns of the equities. In addition, this research proves the importance of the financial variables in the explanation of volatility. Likely, when dealing with the explanatory power in his study, Morelli (2002) shows that only 4,4% of the variation of the volatility of the equities is explained by the macroeconomic volatility. This result is also found by Schwert (1989) who affirms that the volatility of the equities is explained only by 2,2% to 5% by the volatility of the macroeconomic variables.

Furthermore, the results show that the last macroeconomic variables have an explanatory power over volatility superior to the one provided by the current prices of these variables. One may note that the last variables of the monthly announcement have an effect on the volatility of the flows around 30% of the equities of our sample. This indicates that the Tunisian financial market is characterized by a process of slow adjustment. Thus, the response of the equities (or of the market) subsequent to the announcement of the macroeconomic variables is not efficient.

Although the results show the incapacity of the macroeconomic variables in the explanation of the volatility of the equities, our model shows a very high coefficient of adjustment  $R^2$  which tends towards 1. This, actually, reflects the ability of this model in the explanation of volatility since it presents a maximum adjustment degree. This is explained by the integration of the seasonal variables in the model such as: the Monday effect, the January effect and the holiday's effect. In fact, the coefficients related to these variables are strongly significant for the whole sample. Additionally, this model is in the form of an ARMA structure. The results show that the coefficients relating to this structure are strongly significant. In fact, the coefficient  $\rho_1$  which measures the process AR (1) is statistically significantly positive for about 100% of the equities and is lower than one. Likewise, the coefficient related to the structure MA,  $\theta_1$ , is statistically significant for the entire sample and is too weak. The sum of ARMA coefficient,  $\rho_1 + \theta_1 \approx 1$ , this explains the quality of adjustment of our model.

### 7.3 The Volume of Transactions and the Macroeconomic Announcements

It is intuitively suggested that the macroeconomic variables affect the volumes of transactions and, consequently, involve the volatility of equity returns. All the way through this study, in actual fact, we tried to detect the effect of the macroeconomic variables on the volumes of transactions of the equities in the Tunisian financial market. The results are presented by the following table:

$$\log(\text{Volume}_t) = \alpha_0 + \sum_{k=1}^{10} \theta_k \log(\text{Volume}_{t-k}) + \sum_{t=1}^{12} \beta_t [F_{nt} - E(F_{nt})]^2$$

$$+ \sum_{n=1}^3 \delta_n DF_{nt} + \gamma TB_{3t-1} + \sum_{w=1}^4 \psi_w DW_{wt} + \sum_{k=1}^6 \phi_k DJ_{kt} + \phi_r PRE_t + \phi_s POST_t + \varepsilon_t$$

	TMM	TRE	INDP	IPV	IPC	BOT	PIB	TES	MNS	MNQ	TXL	TXI	TB3
<i>Air liquide</i>	-4640 (-0,03)	-6130 (-0,02)	-0,509 (-0,017)	-37,01 (-0,06)	7,19 (0,008)	-0,14 (-0,04)	-0,42 (-0,07)	115,1 (0,001)	-0,07 (-0,02)	-0,13 (-0,05)	10787 (0,12)	6928 (0,06)	-201,71 (-0,129)
<i>AL</i>	24,23 (0,17)	35,36 (0,16)	0,003 (0,14)	-1,108* (-2,07)	0,502 (0,66)	0,001 (0,55)	-0,002 (-0,44)	24,75 (0,32)	0,0029 (1,18)	0,004* (2,26)	0,388 (0,45)	13,1 (0,16)	6,24* (3,83)
<i>Alkimia</i>	-87,62 (-0,63)	-523,9* (-2,506)	-0,002 (-0,104)	0,117 (0,236)	-0,67 (-0,89)	-0,00007 (-0,02)	0,0004 (0,09)	85,84 (1,23)	-0,001 (-0,606)	-0,001 (-0,60)	12,81 (0,161)	-18,75 (-0,193)	4,39* (2,71)
<i>Almazraa</i>	-35,03 (-0,103)	-193,7 (-0,37)	0,02 (0,35)	-0,69 (-0,56)	0,71 (0,38)	0,003 (0,56)	0,008 (0,68)	176,52 (1,04)	-0,0034 (-0,54)	-0,006 (-1,23)	-100,9 (-0,703)	-167,1 (-0,703)	8,29* (2,11)
<i>AMS</i>	-8777 (-0,03)	-18659 (-0,04)	-3,14 (-0,06)	-412,39 (-0,417)	498,39 (0,333)	-2,39 (-0,42)	8,03 (0,78)	-37053 (-0,27)	3,16 (0,622)	2,01 (0,45)	-14885 (-0,93)	-4933* (-2,38)	8202* (2,86)
<i>Astree</i>	-26469 (-0,01)	107860 (0,03)	-7,5 (-0,01)	-72,15 (-0,009)	-95,93 (-0,08)	1,405 (0,03)	-6,18 (-0,08)	-4964 (-0,004)	-1,37 (-0,036)	-0,55 (-0,01)	48984 (0,04)	98525 (0,06)	-23399 (-1,109)
<i>ATB</i>	34649 (0,09)	50376 (0,09)	21,77 (0,309)	-121,25 (-0,09)	466,03 (0,23)	-0,46 (-0,06)	-0,6 (-0,04)	-23669 (-0,12)	0,05 (0,007)	-1,25 (-0,21)	-45767 (-0,2)	32464 (0,11)	5887 (1,51)
<i>ATL</i>	39033 (0,23)	101483 (0,409)	18,57 (0,6)	-63,51 (-0,1)	381,49 (0,42)	2,73 (0,83)	0,89 (0,14)	16067 (0,19)	1,56 (0,51)	0,97 (0,37)	-19933 (-0,21)	27005 (0,23)	6822* (3,46)
<i>BIAT</i>	-81,44 (-0,11)	771,76 (0,72)	0,109 (0,81)	1,23 (0,48)	2,81 (0,73)	-0,0004 (-0,03)	-0,003 (-0,12)	15,67 (0,04)	0,01 (1,65)	0,01 (1,65)	24,12 (0,05)	193,79 (0,39)	50,37* (5,02)
<i>BNA</i>	-47,99 (-0,13)	-160,46 (-0,28)	-0,07 (-1,001)	0,35 (0,27)	-0,55 (-0,28)	-0,022 (-1,29)	-0,006 (-0,60)	-1132 (-0,49)	0,003 (0,59)	-0,001 (-0,34)	-85,08 (-0,43)	26,77 (0,09)	35,73* (7,16)
<i>BS</i>	630,7 (0,95)	825,11 (0,83)	-0,02 (-0,24)	1,69 (0,71)	4,85 (1,36)	-0,0055 (-0,42)	-0,02 (-0,94)	-11,23 (-0,03)	0,015 (1,24)	0,0038 (0,36)	76,73 (0,205)	111,87 (0,24)	47,99* (5,88)
<i>BT</i>	-2058* (-2,21)	-960 (-0,68)	0,106 (0,603)	7,99* (2,39)	-1,23 (-0,24)	0,033 (1,82)	0,077* (2,21)	-416,7 (-0,89)	0,066* (3,86)	0,02 (1,35)	-625,31 (-1,18)	91,62 (0,14)	26,42* (2,55)
<i>MG</i>	522,79 (0,65)	1228 (1,02)	0,23 (1,53)	2,306 (0,804)	-1,35 (-0,31)	-0,008 (-0,51)	-0,07* (-2,70)	186,4 (0,46)	0,021 (1,48)	0,029* (2,29)	260,99 (1,65)	937,5 (1,68)	15,89 (1,77)
<i>Monoprix</i>	660801 (0,67)	930662 (0,63)	-241,97 (-1,31)	5580 (1,59)	22325* (4,209)	-72,38* (-3,72)	-139,7* (-3,76)	-2277* (-4,64)	-101,2* (-5,54)	32,28* (2,05)	922926 (1,65)	400292 (0,58)	6447,5 (0,62)
<i>SFBT</i>	1784 (0,84)	2259 (0,709)	-0,0005 (-0,001)	-2,98 (-0,39)	4,502 (0,39)	-0,01 (-0,33)	-0,02 (-0,37)	-718,02 (-0,68)	0,015 (0,39)	0,008 (0,245)	821,4 (0,68)	-178,56 (-0,12)	245,6* (7,12)
<i>SIMPAR</i>	11922 (0,17)	50152 (0,502)	-0,03 (-0,002)	78,68 (0,33)	-89,96 (-0,25)	-0,09 (-0,06)	-0,48 (-0,19)	-10148 (-0,305)	-0,724 (-0,58)	-0,425 (-0,40)	-1577 (-0,04)	-1418 (-0,28)	964,55 (1,38)
<i>SITEX</i>	99,614 (0,57)	218,08 (0,85)	-0,002 (-0,08)	0,06 (0,102)	-0,715 (-0,78)	-0,0009 (-0,29)	0,0001 (0,01)	16,049 (0,19)	0,011 (0,35)	0,004 (1,79)	37,72 (0,39)	74,306 (0,63)	7,29* (3,59)
<i>SOTUMAG</i>	-151,7 (-0,28)	300,65 (0,37)	-0,01 (-0,15)	-2,004 (-1,06)	2,92 (1,023)	0,009 (0,93)	0,005 (0,29)	-98,23 (-0,37)	0,001 (0,19)	0,003 (0,37)	-37,06 (-0,12)	-2,62 (-0,001)	22,03* (3,34)
<i>STB</i>	-508,8 (-0,65)	725,18 (0,626)	-0,03 (-0,21)	-2,13 (-0,77)	0,67 (0,16)	0,009 (0,63)	0,01 (0,402)	154,96 (0,402)	0,0024 (0,174)	-0,012 (-1,05)	-123,98 (-0,28)	-84,80 (-0,15)	63,27* (5,44)
<i>STS</i>	66,69 (0,48)	120,83 (0,585)	-0,03 (-1,24)	0,28 (0,56)	-0,479 (-0,64)	-0,0001 (-0,06)	-0,004 (-0,85)	-4,64 (-0,06)	0,0004 (0,18)	0,0006 (0,302)	11,73 (0,15)	41,64 (0,43)	4,02* (2,72)
<i>TL</i>	-108,36 (-0,18)	447,36 (0,49)	0,02 (0,18)	-1,21 (-0,56)	3,36 (1,03)	0,002 (0,18)	0,003 (0,14)	47,36 (0,15)	0,001 (0,15)	0,002 (0,23)	38,96 (0,11)	119,05 (0,28)	33,76* (4,53)
<i>TUNISAIR</i>	1889 (0,75)	1817 (0,48)	0,556 (1,17)	0,67 (0,07)	5,64 (0,41)	0,0069 (0,139)	0,08 (0,903)	-59,85 (-0,04)	0,02 (0,52)	-0,02 (-0,55)	-123,73 (-0,08)	-309,29 (-0,17)	114,66* (3,85)
<i>UBCI</i>	-112,02 (-0,29)	100,19 (0,177)	-0,12 (-1,72)	0,08 (0,05)	0,05 (0,02)	-0,0019 (-0,26)	0,0096 (0,69)	153,69 (0,82)	-0,004 (-0,67)	-0,006 (-1,06)	-14,26 (-0,06)	-141,5 (-0,54)	17,2* (3,57)
<i>UIB</i>	495,51 (0,56)	-777,18 (-0,59)	0,193 (1,18)	2,17 (0,69)	-4,998 (-1,06)	-0,002 (-0,16)	0,022 (0,71)	1270,1* (2,92)	0,001 (0,06)	-0,001 (-0,12)	68,17 (0,138)	94,08 (0,155)	21,79* (2,208)



The analysis of this table shows that the macroeconomic variables do not have any impact on the volume of transactions. Indeed, the results show that the “surprise” effect due to the announcement of the macroeconomic variables is significant only for 4% of the equities of our sample. This indicates the absence of a relation between the variations of the volumes of transactions and the variations of the macroeconomic variables. Hence, the volume of transactions affects the volatility, but this effect is not due to the announcement of the macroeconomic variables. Thus, there is independence between the announcement of the macroeconomic variables, the variation of the volumes of transactions and the volatility of equity returns. Moreover, the results failed to check the trilateral relation between the volume, the macroeconomic variables and the volatility of the returns. Nevertheless, the results show that the financial variable, namely the Treasury bill return rate during three months, affects the volumes of transactions positively. Indeed, the analysis of the preceding table underlines the existence of a significantly positive relation between the volume of transaction and the rate of the treasury bills in a three-month term of about 75% of the equities of our sample. This result highlights the importance of the financial variables in the explanation of the variation of the volumes of transactions and, consequently, of the volatility of the returns. Thus, we can affirm the superiority of the financial variables compared to the macroeconomic variables in the explanation of the relation between the volumes of transactions and the volatility of the returns. This confirms the analysis presented above which shows the capacity of the financial variables in the explanation of the volatility of the returns. This result corroborates Hooker (2004) who, throughout his study, reconfirms the importance of the financial variables in the explanation of volatility.

## 8 Conclusion

The analysis of the volatility of the financial market over time builds the relation between such volatility and the variability in the time of the economic variables. In fact, volatility is a measurement of risk. However, it is recognized, according to the modern theory of finance and especially according to the market model, that this risk includes two components: a component specific to the individual equity and a systematic component due to the risk of the market. Thus, we can affirm that the equities are affected by the factors related to the systematic risk (not to diversify) represented by the macroeconomic factors of the market. Actually, the existence of a relation between the macroeconomic variables of the market and the volatility of the equities is intuitively proposed. Moreover, the literature as well as the empirical studies affirm that the macroeconomic variables are originally of this type of risk. Indeed, the study of this relation was the focal point of several empirical investigations which emphasize the existence of a significant relation between the volatility of the equities and the macroeconomic variables in terms of the ability of the macroeconomic volatility to foresee the volatility of the equities. In this respect, Beltratti and Morana (2005) affirm that the causal link between these two volatilities is more marked if the direction of the relation is from the macroeconomic volatility towards the volatility of the equities rather than the opposite direction. Likewise, the study of Liljeblom and Stenius (1997) affirms that between a sixth (1/6) and two thirds (2/3) of the variation of the conditional volatility of the equities is related to the conditional volatility of macroeconomic nature such as inflation, the industrial production and money supply. In addition, the study of Morelli (2002), in terms of explanatory

power, shows that only 4,4% of the variation of the volatility of the equities are explained by the macroeconomic volatility. But Flannery and Protopapadakis (2002) proposed an explanation which had not been the subject matter of former researches. In fact, they showed that the macroeconomic factors affect the level of the volume of transactions (since the macroeconomic variables have an impact on the type and the number of opportunities of investment) and, consequently, they have an influence on the returns. The literature stressed the negative relation between the returns of the equities and inflation on the hand, and the growth of the money on the other hand.

Like Goeij and Marquering (2004), Peter and Wessel (2004) showed that the macroeconomic factors do not have any effect on the volatility of the market since these factors are invariable in time. They affirmed that it is rather the announcement of information concerning the macroeconomic variables which possess an explanatory power over the movement of the returns and the volatility of the flows. In their research, Geij and Marquering (2004, 2006) studied the impact of the disclosure of the information of macroeconomic nature on volatility. They showed that the macroeconomic information is announced periodically and according to prearranged programs. Thus, this type of information represents the most significant part of the public information which is the major determinant of the volatility of the flows of the equities in the financial market.

Eventually, the analysis of this extensive literature enables us to affirm that there is a relation between the various macroeconomic variables and the volatility of the equities of Tunisian financial market, who qualified like emerging market.

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