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The risk premium in times of financial crisis: an assessment from ICAPM on the MENA region

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C H R O N I C L E

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A B S T R A C T

The purpose of our research is to study the impact of financial crisis on Risk premium evolution for a set of emerging countries of MENA (Middle East and North Africa), giving special attention to the appreciation of the local risk premium in addition to the currency risk premium through the study of the dynamics of the financial integration under two assumptions: perfect integration and partial segmentation. At the methodological level, we test a conditional version of the international model of the financial assets ICAPM of De initially proposed by Adler and Dumas 1983 [Adler, M., & Dumas, B. (1983). International portfolio choice and corporation finance: A synthesis. *The Journal of Finance*, *38*(3), 925-984.]. Our analysis is based on the conditional model of regime change of Bekaert and Harvey (1995) [Bekaert, G., & Harvey, C. R. (1995). Time-varying world market integration. *the Journal of Finance*, *50*(2), 403-444.], we follow the econometric modeling using the Kalman filter and the Markov regime-switching model with variable transition probabilities.

1. Introduction

The incidence of financial crises over the last decade has caused a radical change in the global financial system. The latest subprime mortgage crisis in 2007 in the first place emerged as a liquidity crisis. But after the sharp change in the interbank markets have also affected other financial market segments such as stock markets (Caballero & Simsek, 2009). Thus, high volatility and financial instability form the recent behavior of stock markets during this period of crisis. In this financial context, it seems a very reasonable demand from investors concerning the risk premium which must be higher in times of disruption than during the quiet phase of the economic cycle (Arrouri et al., 2011). The financial crisis which was appeared for 20 years has quickly propagated and they affected the financial systems worldwide as well as the economic activity in almost all countries: the Mexican crisis in 1994, the Asian crisis 1997- 1998 (Thailand, Korea, Malaysia, Indonesia and the Philippines). Then, a crisis hit Russia in 1998 and Brazil in late 1998 and 2002. Turkey experienced the crisis at the end of 2000, Argentina in 2001, and finally, the mortgage crisis in the US 2007. Our particular attention in this paper is to study the effect of this new behavior of the financial market caused by these sudden shocks on the risk premium of the stock markets in the MENA region. The risk premium represents the supplement of profitability with regard to that generated by the risk-free asset that the investor requires against part of their detention of assets risked with uncertain income. It is essential to integrate the risk premium in any portfolio management strategy. Previous studies explore this premium through the conception of the Capital Asset Pricing Model of Sharpe (64), Linter (65) and Mossin (66), which was used a long time as the most solicited models by the theoreticians as well as by the investors on the financial markets.

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The international extension of this model rests on fundamental notions which present the base of development of the ICAPM, namely: the phenomenon of the financial market integration, the international diversification and the violation of purchasing power parity. The first international version of CAPM was proposed by Solnik (74), Adler and Dumas (83), the development of this version is based on the assumption of the violation of purchasing power parity. Indeed, the consideration of this deviation in the ICAPM revealed an additional risk further to the detention of a foreign asset is the currency risk. De Santis and Gérard (1998) examined the American, German, Japanese and English financial markets, by using the approach GARCH multivariate, they showed that the currency premium is statistically and economically significant for the financial markets of developed countries. For European countries the same results were found in the studies of Carrieri (2001), Hardouvelis et al. (2002), Cappiello et al. (2003) and De Santis et al. (2003). As well as for the markets of emerging countries presented by the studies of Phylaktis and Ravazzolo (2004) and Tai (2003, 2007). Recently and following the turmoil which struck the world financial system, the researchers incited to lead empirical investigations on the effects of financial crises on the risk premium of the stock markets. However, there are few studies on this subject (Arouri et al., 2011; Chong, 2011; Yamani & Swanson, 2014; Choudhry, 2015). The results show that stock markets become more integrated after the financial crises. It is who explains the important values of the risk premium on financial markets after the crisis. The markets are in a situation of partial segmentation and both extreme cases of the perfect integration and the strict segmentation are theoretical cases and do not reflect the reality of financial markets. Thus, the type of assumption on the degree of financial integration is the point that distinguishes the research from each other. On our part, we will proceed to study the dynamics of the financial integration of stock markets in the MENA region through the ICAPM estimation, taking into account the local risk premium in addition to the currency risk premium to appreciate their contribution to the total risk premium.

So, the aim of this study is to identify the effects of the recent world crisis on the risk premium at the level of stock markets in the MENA region and to compare these effects with those of previous crises, by an empirical measure based on the ICAPM for the world market risk premium, currency premium and local premium to explain the various disturbances that occurred in these financial markets and to emphasize the appreciation of local market risk besides currency risk for a foreign investor. The second section specifies the methodology used to estimate our model, the third section presents the database , the fourth section shows the preliminary analyses as well as the different empirical results and the fifth section forms the conclusion.

2. Methodology

The methodology adopted in this paper consists in estimating a conditional version of the international capital asset pricing model ICAPM which takes into account deviation of the purchasing power parity (setting account of currency risk) and a possible financial segmentation (setting account of local risk). First, our theoretical model is based on the conditional regime-switching model of Bekaert and Harvey (95), this model is advantageous from the point of view of a successful combination of two extreme cases of financial market structure: integration perfect and strict segmentation. Let us consider, first of all a completely integrated system of financial markets in which the currency risk is absent, under these hypotheses the conditional version of the CAPM of Sharp and Linter is written as follows according to Bekaert and Harvey (1995), De Santis and Imrohoroglu (1997),

$$E(R_{it}^{l} / \Psi_{t-1}) - R_{ft} = \delta_{m,t-1} \operatorname{cov}(R_{it}^{l}, R_{mt} / \Psi_{t-1}) \tag{1}$$

with $R_{it}^{l}, R_{ft}, R_{mt}, \delta_{m,t-1}, \Psi_{t-1}$ respectively denote the return of any financial asset l (in country i), the risk-free rate, the return of the market portfolio, the price of the global market risk and the information set available to the investors at the end of period (t-1). In the case of strict market segmentation and under the same assumptions, the Eq. (1) is written as follows

$$E(R_{it}^{l} / \Psi_{t-1}) - R_{ft} = \delta_{i,t-1} \operatorname{cov}(R_{it}^{l}, R_{it} / \Psi_{t-1}) \tag{2}$$

where $R_{it}, \delta_{i,t-1}$ are respectively, the return of the local market portfolio and the local price of risk. At the national level, the expected excess return of the national market is determined by the conditional variance $\operatorname{var}_{t-1}(R_{it})$

$$E(R_{it} / \Psi_{t-1}) - R_{ft} = \delta_{i,t-1} \operatorname{var}(R_{it} / \Psi_{t-1}) \tag{3}$$

However, the extreme situation of the perfect integration as well as the strict segmentation is purely a theoretical case which does not conform with the reality of financial markets; result affirmed by Bekaert and Harvey (1995, 1997), as well as other studies such as: Griffin and Stulz (2001), Gérard et al. (2003), Karolyi and Stulz (2002), Barr and Priestley (2004) and Hardouvelis et al. (2006). Thus, taking into account this point, Bekaert and Harvey (1995) combined the models to form a general model for measuring financial assets which are called regime switching model where i the market return is determined by:

$$E(R_{it}/\Psi_{t-1})-R_{ft}=\phi^{i}_{t-1}\left[\delta_{m,t-1}\operatorname{cov}(R_{it},R_{mt}/\Psi_{t-1})\right]+\left(1-\phi^{i}_{t-1}\right)\delta_{i,t-1}\operatorname{var}(R_{it}/\Psi_{t-1}) \quad (4)$$

The parameter ϕ^{i}_{t-1} is a conditional measure of transition between segmentation and integration states. It can be interpreted as the degree of integration between the local market and the international market. It is between 0 and 1. If ϕ^{i}_{t-1} =1 then the financial integration is completed, on the other hand, if ϕ^{i}_{t-1} = 0 we are in the case of a strict segmentation of the local market and ϕ^{i}_{t-1} between 0 and 1, there is a situation of partial financial integration which combines both national and international factors of evaluation. Now, supposing that the hypothesis of the purchasing parity powers is not verified, and the inflation rates are random and vary from a country to the other one, in this case, the exchange risk premium must be incorporated into the model. Therefore and second, our model is based on the conditional version of international CAPM which integrates the foreign exchange risk with the market risk such as it is presented and analyzed by Santis and Gérard (1998), models initially was developed by Adler and Dumas (1983), this version is obtained under the hypothesis of perfect financial integration is the following one.

$$E(R_{it}/\Psi_{t-1})-R_{ft}=\delta_{m,t-1}\operatorname{cov}(R_{it},R_{mt}/\Psi_{t-1})+\sum_{c=1}^{L}\delta_{c,t-1}\operatorname{cov}(R_{it},R_{ct}/\Psi_{t-1}) \quad (5)$$

With R_{ct} the exchange rate return of country c "the variation of the exchange rate against the currency of reference countries" and $\delta_{c,t-1}$ the price of exchange risk of the currency c. Third, starting from the main idea of our research at this stage; setting price value of local risk on the one hand and the specification of the degree of integration of each national market studied the other hand. So given that the version of ICAPM as presented by Bekaert and Harvey relies on the assumption of the unaudited PPA and the assumption that combines the two extreme cases of financial markets structure: financial integration and the strict segmentation. So the model provides us the measure of following variables: the price of market risk, the amount of local market risk as well as the degree of integration of each national market studied. However, the reality on financial markets is that the hypothesis of the purchasing power ratio is verified; thus the price of exchange risk must be incorporated and it according to Ferson and Harvey (1994), Dumas and Solnik (1995), De Santis and Gérard (1998). Therefore, starting from this result by incorporating the foreign exchange risk in the ICAPM, our model presents a mixed relationship that combines the influence of the international market, "market price risk", the exchange rate, "price of exchange risk", the domestic market, "price of local market risk" and a measure of financial integration is:

$$E(R_{it}/\Psi_{t-1})-R_{ft}=\phi^{i}_{t-1}\left[\delta_{m,t-1}\operatorname{cov}(R_{it},R_{mt}/\Psi_{t-1})+\sum_{c=1}^{L}\delta_{c,t-1}\operatorname{cov}(R_{it},R_{ct}/\Psi_{t-1})\right]+\left(1-\phi^{i}_{t-1}\right)\left[\delta_{i,t-1}\operatorname{var}(R_{it}/\Psi_{t-1})\right] \quad (6)$$

3. Econometric specification

So, to estimate the conditional version of MEDAFI such as our model introduces it in Eq. (6), we follow the econometric modeling of Hardouvelis et al. (2006), by formulating the system of following equations:

$$R_{mt}=\delta_{m,t-1}\operatorname{var}(R_{mt})+\sum_{c=1}^{L}\delta_{c,t-1}\operatorname{cov}(R_{mt},R_{c,t})+\varepsilon_{t}^{m} \quad (7)$$

$$R_{it}=\delta_{i,t-1}\operatorname{var}(R_{mt})+\sum_{c=1}^{L}\delta_{c,t-1}\operatorname{cov}(R_{it},R_{c,t})+\varepsilon_{t}^{L} \quad (8)$$

$$\delta_{c,t}=\delta_{m,t-1}\operatorname{cov}(R_{mt},R_{c,t})+\delta_{c,t-1}\operatorname{var}(R_{c,t})+\varepsilon_{t}^{c} \quad (9)$$

$$R_{it}-R_{f,t}=\phi^{i}_{t-1} \quad (10)$$

$$\left[\delta_{m,t-1}\operatorname{cov}(R_{it},R_{mt})+\sum_{c=1}^{L}\delta_{c,t-1}\operatorname{cov}(R_{it},R_{ct})\right]+\left(1-\phi^{i}_{t-1}\right)\left[\delta_{i,t-1}\operatorname{var}(R_{it})\right]+\varepsilon_{t}^{i}$$

With $\varepsilon_{t}=(\varepsilon_{t}^{m},\varepsilon_{t}^{L},\varepsilon_{t}^{c},\varepsilon_{t}^{i}/X_{t-1})\approx N(0,H_{t})$. It is the vector of conditional error terms and H_{t} is the provisional covariance matrix of asset returns. Relationship (10) incorporates the price of risk related to the international market, the exchange rate and the local market. The studies of Bekaert and Harvey (1995), De Santis and Gérard (1997) and Gérard et al. (2003) have shown that these prices are variable over time and that the price of international market risk price reflects the aggregation of the risk aversion of all investors who are investors who are supposed to be adverse to the risk thus this

price must be positive no matter the time t. Consequently, it is modelized as an exponential function of some information variables related to aggregate macroeconomic and specific condition of the market.

$$\delta_{m,t-1} = \exp(\delta_m^{'} X_{m,t-1}) \quad (11)$$

$X_{t-1} \subset \phi_{t-1}$, denotes all the information on global variables available at *(t-1)* and $\delta_m^{'}$ represents the weights associated with these variables. The price of local market risk is then written as follows Hardouvelis et al. (2006).

$$\delta_{i,t-1} = \exp(\gamma_m^{'} X_{i,t-1}) \quad \text{Eq. (12)}$$

$X_{i,t-1}$ is the vector of local variables of information observable on the market *i* at *(t-1)* and $\gamma_i^{'}$ represents the weights associated with these variables. The price of currency risk can theoretically take positive values or negative ones. It is supposed to vary as a linear function of instrumental variables as follows (Carrieri, 2001; De santis et al., 2003).

$$\delta_{c,t-1} = (\delta_c^{'} X_{m,t-1}) \quad (13)$$

where $\delta_c^{'}$ is the weight of each variable in the vector $X_{m,t-1}$. We also make the same assumption as the earlier studies of Hardouvelis et al. (2006). The degree of integration of region i into the world market is modeled by using an exponential function as follows

$$\phi_{t-1}^{i} = \exp(-|\varphi_i^{'}| X_{i,t-1}) \quad (14)$$

where $X_{i,t-1}$ is the vector of information variables available at time *t-1* that are susceptible to drive the integration degree of region *i*.

Our study focuses on the economies of the MENA region, the data for the following countries: Tunisia, Morocco, Egypt, Turkey, Jordan, Arabia Saudi, the UAE and the world market. Four groups of data are considered: series of stock market returns in each area and for the world market, series of exchange rates expressed vis-à-vis the U.S. dollar, as well as macroeconomic, financial variables used to condition the estimation of the price of risk and the degree of integration, and the instrumentals variables related to financial integration.

1 - Series of stock market returns:

Data are monthly, and the period extends from January 1995 to December 2013 for Morocco, Egypt, Turkey and Jordan, and from May 2005 to December 2013 for Tunisia, Saudi Arabia and the United Arab Emirates. Stock indexes are extracted from the Morgan Stanley Capital International (MSCI) database, and the global incidence MSCI world index approximates the market portfolio, the stock returns are expressed in dollars and adjusted by dividends.

2 -Series of exchange rates

Real exchange rates series of all countries are expressed against the U.S. dollar. These data are from International financial statistic (IFS), the real exchange rates are constructed through deflating the nominal exchange rate by the consumer price index (CPI)

3- Global and local instrumental variables

The instrumental variables are used to condition estimating the prices of market risk, currency risk and risk local, like Hardouvelis et al. (2006) and Carrieri and All (2007) we retain the following factors to condition estimating the prices of market risk and foreign risk :

-the monthly change in dividend yield (dividend to price ratio) of the world market portfolio (MSCI world index) over the 30-day eurodollar interest rate (DRMDV)

-the monthly change in the premium term, it's the difference between a long interest rate (10 years us treasury notes) and short rate (3 months us treasury bills) (DEPTERM)

-the monthly change in the short term interest rate (3 months us treasury bills) (DSHORT).

-the monthly change in the S&P's 500 stock market index (RSP)

-A constant term

all these information variables are extracted from the international datastream database and are used with a lag behind the series of excess returns.

for the risk of the local market of each country, we use the following set of information variables is determined by previous studies like Bekaert and Harvey, 1995; Gerard et al., 2003)

-a constant term

-the monthly change in the excess stock returns of each country (DRD)

-the monthly change in 1-month interest rate (DSHORT)

-the monthly change in the regional inflation rate (VIR)

4- the instrumentals variables of financial integration

the degree of financial integration for each country is affected by some economic financial and sociopolitical factors at the local and international level. It is, therefore, necessary to identify the determinants of the degree of financial integration. To this end, we use the following variables information

– DGDP: each country's Gross domestic product (GDP) in volume, which is considered the most appropriate instrument to identify the level of integration by Carrieri et al. (2007) and Bhattacharya and Daouk (2002).

- INRD: the interest rate differential between the US market and the local market, this variable reflects the convergence of these emerging markets to the global market

- INFD the differential between the rate of inflation in each local market and the US, this variable highlights the volatility of exchange rates of the local currency and provides information on the investment costs and consequently the advantage of diversification.

4. Empirical Study in the MENA region

4.1 Preliminary analyses and statistical properties of data

Statistical properties of the data

Statistical properties of the excesses of profitability (Annex 1)

According to Table 1, we note that the lowest average yield is assigned to the Jordanian market with an average of -1%; whereas the most remarkable is registered for the Turkish market with a rate of 0.43%, followed by the Moroccan market with a yield of 0.4%. In terms of risk, the Tunisian stock exchange has the least risk with a gap of deviation of 5.26% while that higher is marked on the stock exchange of the Turkish with a gap-type of 11.63%. The test Ljung-Box of order 6 shows the absence of serial autocorrelation for the markets: Egypt, Jordan and Morocco. In effect, the probability of the test Ljung-Box of order 6 is lower, all, at the threshold of significance of 1%. That said, it seems unnecessary to introduce a correction AR in the equation of the average for the model's GARCH.

Table 1
Estimate of the price of foreign exchange risk

	Egypt	EMIRATES	Jordan	Morocco	Saudi	Tunisia	Turkey
Panel A : the estimation of the price of the foreign exchange risk							
Cons	12.022***	0.273***	2.114**	0.5066	0.267***	-12.264**	1.599***
DPTERM	-0.038**	-0.011	-0.00069	0.0009	2.61 e-05	-0.257	0.26***
DRMDV	-0.0002	5.8E-05***	1.4 e-05**	3.4 e-05***	1.6 E-05	-0.0034	-0.0009
DSHORT	0.0037**	-0.025**	-5.3 E-05	-0.0015	6.85 e-05	1.614*	0.298**
RSP	0.00024	1.29 e-06	-1.26 E-05	-2.4E-05**	-1.9E-06***	0.0034	0.0012
Panel B: the residue tests							
JB	59.014***	697.178***	450945.1***	223157.2***	85.170***	37.779***	693.718***
BJ	658.371**	697.219**	45.211**	1957.233	25.135**	37. 853**	193.7182**
White	22.5**	10.42**	98366	88.36	30.08**	27.09**	88.12
ARCH	9.014*	27.179*	145.1	257.2	0.4170***	7.728**	93.702
Wald	519.237**	607.179**	595.144**	215.248**	85.170**	2.708**	93.372**

****, **, *: Significant degree at 1%, 5% and 10%.*
JB: test of normality, BJ: test of autocorrelation, Wald: Wald test of non-significance of coefficients.
White: test of the heteroskedasticity of residuals; ARCH tests allow to test for a range of specifications of conditional heteroskedasticity in the residuals of the equation

Statistical properties of exchange rates (Appendix 1)

According to Table 2, Morocco has the average exchange rate the lowest with a value of 12%. While the highest values are recorded at the level of the Egyptian market and Jordan in highlighting significant volatility of exchange rates on these markets. For the test of normality to Jar Béra, the statistics show that the probability of the test of Ljug-Box of order 6 is less than the threshold of significance of 1% for Arabia, Jordan, the Emirates and Egypt. On the other side, the autocorrelation is absent in the series of square exchange rate for most of the series studied, only the autocorrelations of order 1 are significant which could be in favor of a possibility of modeling GARCH of order 1.

4.2 Empirical Results

Evaluation of price of foreign exchange risk, international market and local risk

Price of Foreign Exchange Risk

This price is estimated using the Kalman filter applied to the Eq. (9) and it is conditioned in the function of instrumental variables International (Eq. (13)).

According to Table 1 Panel A, one finds that the variables of information weakly explain the evolution of the price of the foreign exchange risk. For Egypt, the United Arab Emirates, Tunisia and Turkey, in addition to the constant, two other instrumental variables explain their price of foreign exchange risk significantly. It is precisely the monthly variation of the term premium (DPTERM) and the monthly variation of the interest rate to 1 month (DSHORT). The price of foreign exchange risk respectively of the Jordan, Morocco and the Saudi are significantly explained, in addition to the constant, by DRMDV and RSP. This price reflects well the variations supported by the real exchange rate of all countries following the various financial disturbances that occurred on the world market to know the crises of emerging countries; Mexico in 1995 and Asia in 1997, the terrorist attacks of 11 September 2001 against the United States and finally the crisis current mortgage 2007-2008. Subsequently, the fluctuating behavior of the prices of the exchange risk is considered by the application of the Hodrick-Prescott filter which highlights several phases of expansions and recessions, especially during the periods of crises (Appendix 2 Chart 1). Overall, the prices of the foreign exchange risk of countries in our sample have responded significantly to a single major international event, which is the mortgage crisis in the United States in 2007-2008.

Price of risk of the world market

The analysis conducted on the price of the portfolio risk of the market has provided the results of the exponential regression function of instrumental variables International.

Table 2
Estimate of the price of Market Risk

	Egypt	EMIRATES	Jordan	Morocco	Saudi	Tunisia	Turkey	World
The panel has: Results of the estimation of the price of the foreign exchange risk Moreover, the price of the global risk in the function of instrumental variables International								
Cons	12.022**	0.273***	2.11	0.506**	0.267***	-12.26	0.535*	0.18***
DPTERM	-0.038	-0.0012	-6.9E-04***	9.2E-04***	2.6E-05***	-0.257	0.26	-2.4E-04
DRMDV	-0.0002	5.8E-05	1.4E-05**	3.5E-05***	1.6E-06***	-0.003	-0.0009	8.4E-04***
DSHORT	0.0037	-0.0247	-5.3E-05*	-0.0015***	6.9E-05***	1.614	0.298	-0.0044
RSP	2.4E-04	1.2E-06	-1.3E-05***	-2.5E-05***	-1.9E-05***	0.003	0.001	5.5-05
Panel B: the residue tests								
JB	454490.5	27.79946	271595.0	2222.457	24.64575	37.77661	3448.361	49.86960
BJ	44.577	37.719	45.211	27.033	325.735	41.577	33.5182	223.554
White	46.304	33.521	35.8441	47.243	25.5035	40.304	13.1882	24.758
ARCH	0.1371	7.1289	0.1032	0.2894	0.11035	7.727853	0.70177	0.8791
Wald	12.734	38.126	115.5847	10.012	211.861	7.694	4.044	-

*A)***, **, *: significant degree at 1%, 5% and 10%. , (B) JB: test of normality, BJ: test of autocorrelation, Wald: Wald test of non-significance of coefficients, c)White: test of the heteroskedasticity of residuals; ARCH tests allows to test for a range of specifications of conditional heteroskedasticity in the residuals of the equation.*

The results of the estimation (Table 2 Panel A) show that the price of risk of the world market is in positive-sum during the entire period of study. The instrumental variables explain 1% of the variation in the price of the global risk. The tests applied on residues (Table 2 panel B) indicates that the hypothesis that the price of the global risk is constant is rejected; the latter varies in function of instrumental variables. According to the chart (Appendix 3 Chart 2), the price of the market risk is too volatile in particular at the end of the years 1990 and after 2001. The application of the filter of Hodrick-Pescot (Chart 3 Appendix 4) underlines two periods of expansion: The first between 1995 and 1997 and the second between 2001 and 2009. This is explained by the direct impact of the financial crises that have struck Asia and Latin America in 1995 and 1997, even the world market has responded to the terrorist attacks against the United States in 2001 as well as the subprime crisis in 2007-2008.

Price of local risk

Table 3
Estimate of the price of the risk of the local market

	Egypt	EMIRATES	Jordan	Morocco	Saudi	Tunisia	Turkey
The panel has: Results of the estimation of the price of the local risk In the function of the instrumental variables Local Authorities							
Cons	0.005	-9.8E-04	5.7E-05	0.0024	1.7E-04	6.8E-04	0.0072
DRD	0.0015***	0.0017***	0.0049***	0.0028***	0.0015***	9.2E-04***	7.7E-04***
VIR	0.0044	-5.3E-04	-8E-06	0.0014	0.0034	2.6E-04	4.4E-04
DSHORT	0.0214	-0.0117	7.3E-04	0.0034	0.0138	0.0022	-5.4E-04
Panel B: the residue tests							
JB	4490.5	17. 946	1595.8	22.957	14. 575	17. 661	48.961
BJ	40.077	32.219	40.711	22.533	321.235	37.177	28.1182
White	26.304	13.521	15.8441	27.243	5.535	20.304	3.1882
ARCH	0.1371	7.1289	0.1032	0.2894	0.11035	7.727853	0.70177
Wald	9.734	30.126	100.58	7,012	201.86	4.694	3.044

****, **, *: Significant degree at 1%, 5% and 10%.*
JB: test of normality, BJ: test of autocorrelation, Wald: Wald test of non-significance of coefficients.
White: test of the heteroskedasticity of residuals; ARCH tests allows to test for a range of specifications of conditional heteroskedasticity in the residuals of the equation.

According to Table 3, the price of domestic risk of different countries studied in the MENA region are all significant; they are explained, especially by the excess stock market returns of each country. This enables us to identify a slight partial segmentation characterizing these markets. In addition, after the robust test of Wald, the results reject the basic hypothesis according to which the price of the local risk is zero. Then the price of the local risk is a significant factor and internationally paid; it must be taken into consideration during the evaluation of financial assets on these markets in the MENA regm8ion. The graph (4) See (Appendix 5 Chart 4) shows a high volatility at the level of the price of local risk for the various countries studied, the filter of Pescot applied (see Appendix 6 Chart 5) shows that the risk that the price of domestic risk is similar to that of the global market, it also presents a phase of expansion between 2007 and 2009. This phase indicates a significant impact of the global crisis which is more extensive and valuable than that of crises of emerging countries (Asia and Mexico) on the prices of the market risk of Egypt, Jordan and Morocco. For Turkey, their price of local risk has experienced two phases of expansion during the 1990s with the shocks of Mexico and Asia, and during the current crisis 2007-2008.

The financial structure of the markets: Financial integration or the partial segmentation.

Estimation results under the assumption of financial integration perfect

In the case of the perfect integration, the coefficient φ_{t-1}^{i} =1, then the Eq. (6) is written as follows:

$$E(R_{it} / \Psi_{t-1}) - R_{ft} = \delta_{m,t-1} \operatorname{cov}(R_{it}, R_{mt} / \Psi_{t-1}) + \sum_{c=1}^{L} \delta_{c,t-1} \operatorname{cov}(R_{it}, R_{ct} / \Psi_{t-1})$$

In the context of financial integration, some assumptions are assumed, in effect, the price of risk and their variances are variable over time and the account of the international factors as the only source of risk on the market, as well total neglect of domestic factors. Table 7 indicates that for all countries studied, the coefficients assigned to the risk premium of exchange are all significant with positive values thus stressing a growing relationship between the premium of two risk factors. For the coefficients assigned to the risk premium of portfolio of the world market, they are negative for three countries; Egypt, the Emirates, and Tunisia, this scope emphasizes the implementation as well because of the relevance of the assumption of financial integration perfect for these markets since the exchange rates are related to the macroeconomic factors that characterize the economic situation of each country. The hypothesis of the perfect integration is not so appropriate for certain markets in our sample, this observation leads us to re-estimate the MEDAFI under the assumption of the partial segmentation.

Table 4
Estimate of MEDAFI under the assumption of perfect integration

				Wald test		
	Cons	**PRM**	**PRC**	**Lm=1**	**Lk=0**	**Lk=1**
Egypt	0.0475*	-0.003	0.0115**	611.49***	4.983**	36649.1***
Emirates	0.0569*	-0.2525*	2.3678***	75.273***	0.9332	31.311***
Jordan	0.0285	0.1658*	0.4562*	94.57***	3.494***	35.599***
Morocco	-0.1831*	0.0879*	0.1412**	302.173***	0.4023	26.283***
Saudi	3.7368***	0.1628	0.6149*	67.114***	1.86	91.922***
Tunisia	-0.0047	-0.0493**	0.0044*	540.655***	0.0115	580.66***
Turkey	0.223*	0.1113**	0.0013*	3025.16***	0.00075	42769.61***

****, **, *: Indicates that the coefficient in question is significantly different from zero at a threshold of 1%, 5% and 10%.*

Estimation results under the assumption of the partial segmentation

Under the assumption of the partial segmentation, all sources of risk, both international and national, are presented in the training of the premium for the risk premium total. In this framework, the coefficient φ^{i}_{t-1} <1 then the equation six is described as follows

$$E(R_{it}/\Psi_{t-1}) - R_{ft} = \left[\delta_{m,t-1}\,\mathrm{cov}(R_{it}, R_{mt}/\Psi_{t-1}) + \sum_{c=1}^{L}\delta_{c,t-1}\,\mathrm{cov}(R_{it}, R_{ct}/\Psi_{t-1})\right] + \left[\delta_{i,t-1}\,\mathrm{var}(R_{it}/\Psi_{t-1})\right]$$

The following table presents the results of the estimation of Eq. (6);

Table 5
Estimate of MEDAFI under the assumption of partial segmentation

	Egypt	Emirates	Jordan	Morocco	Saudi	Tunisia	Turkey
Cons	0.443*	0.057	0.130*	-0.113*	0.421***	-0.015***	0.224*
PRM	-0.022*	-0.253*	0.1356	0.12**	0.0327	-0.017	0.113*
PRC	0.888**	2.373*	0.381**	0.1819	54.806***	0.218*	0.699*
PRL	1.238*	0.885*	0.56***	0.669***	1.18**	7.801***	1.468***
				Wald test			
Lm=1	207.81***	71.342***	85.133***	228.16***	69.497***	264.369***	2773.08***
		Execution time:					
Lc=0	2.418	0.836	2.1527	0.6999	1.216	0.0965	0.0224
Lc=1	30918.6***	22.961*	28.244***	29.522***	122.26***	275.54***	4601322***
Ll=0	3.755*	8E-05	0.1496	14.049***	4.933**	6.18***	21.855***
Ll=1	661.38***	313.89***	30.091***	6.49***	222.02***	4.6977**	2225.9***

****, **, *: Indicates that the coefficient in question is significantly different from zero at threshold of 1%, 5% and 10%.*

For the premium of the local risk, it is important and significant for all markets studied without exception, Tunisia presents the highest value (7,801) then Turkey and Egypt with a value greater than 1, as well the hypothesis of the partial segmentation indicates a positive relationship between the risk premiums Total and the premium domestic. Thus, the estimate of the MEDAFI under the assumption of partial segmentation has been able to show the existence and the significance of the local risk as a component of the premium of the total risk, in addition to the premium of exchange risk and that of the world market. This hypothesis is the most appropriate for this type of market, on the one hand, it allows us to provide a better measure of the risk premium of exchange, and on the other hand to emphasize the existence of the risk premium local.

2.4. The financial crises and the dynamics of risk premiums

To Our last result to seek in this axis is to determine how the risk premium has reacted during the phase of the financial crises otherwise know what influence to exercise the financial shocks on the dynamics of the risk premium. Of this fact, we are going to conduct a comparison of values of risk premiums and their volatility before, during and after the financial crisis. The extent of the risk premium in total and its three components will be presented under 3 periods: the first period of pre-crisis and the second during the crisis and in the third period of post-crisis

Table 6
The dynamics of the risk premium as a function of financial crises

	Egypt	Jordan	Morocco	Turkey	Egypt	Jordan	Morocco	Turkey	Egypt	Jordan	Morocco	Turkey
	The period 1995 - 2007				**The period 2007 – 2009**				**The period 2009 - 2013**			
PRC	7,515	0,698	0.398	1,916	6,484	0.705	0.380	0,598	5,960	0.705	0.386	0.738
PRL	5.35	0.804	0.28	0.486	3,938	0.842	0.057	0.297	4.313	0.531	0.3	0.124
PRT	15.845	2.006	0.942	2.747	11.792	1,946	0.461	1.0447	11.3792	1.8146	0.761	1.0447
PRC/PRT	0.474	0.348	0.422	0.697	1.569	0.362	0.824	0.572	0.524	0.388	0.507	0.706
PRL/PRT	0.337	0.401	0.298	0.177	0.334	0.433	0.123	0.284	0.330	0.307	0.222	0.131
σ_{PRC}	4.19	4.56	3.32	12.89	20.67	8.67	15.51	20.2	15.52	9.76	12.95	24.61
σ_{PRL}	2.598	13.635	1.216	62.248	2.375	1.246	4.338	11.894	2.733	5.685	3.467	9.126
σ_{PRT}	8.99	23.59	5.31	89.18	29.21	10.56	21.58	33.6	17.63	1,564.69	15.95	30.32
$/\sigma_{PRT}\sigma_{PRC}$	0.466	0.193	0.625	0.144	0.707	0.821	0.718	0.600	0.880	0.496	0.7434	0.811
$/\sigma_{PRT}\sigma_{PRL}$	0.289	0.747	0.229	0.698	0.184	0.118	0.201	0.354	0.314	0.289	0.199	0.301

The estimation results are presented in Table 9, during the period pre-crisis the risk premium of exchange is positive for all the countries of MENA, its value is lowered during the period of crisis (2007-2009), with the exception of the Jordan is increased with a small ap. For the risk premium local, its value is positive for all markets of MENA during all periods, it has recorded a decrease during the crisis phase for all markets with the exception of the Jordan, its value of the risk premium

local level remains stable. In sum, according to these results, the exchange risk premium presents high volatility that occurred at the end of 2007 up to the end of the period of our study. As well, these fluctuations caused by the mortgage crisis are more important in terms of influence on the markets studied than those of previous crises (the crisis in Asia and Mexico). Of this fact, the fall in the value of the exchange risk premium reflects well the magnitude of the crisis as well as the attitude of investors who are willing to pay for exposure to the risk of unexpected fluctuations in exchange rates.

5. Conclusion

The brutal events accelerated and have affected the global financial system, causing the series of financial crises that have affected both the emerging countries and the developed, the more expensive are those of Mexico and Asia and the last current crisis in the United States in 2007. The scientific research in international finance has granted importance to the impact of these crises on the financial markets, a component of the work has examined the risk premium on the stock markets in a period of crisis. The effects of the financial panic on the evolution of the risk premium present the concern which we have sought throughout this study. Then, the work has taken into account the factor of the financial crisis for the appreciation of the risk premium as Arouri et al. (2010), Chong (2011) and Choudhry (2015). However the methodological limitations have been identified for these jobs, in effect that this is the basic assumption in their approach is the perfect integration of markets or the perfect segmentation or partial, a total ignorance of the value of the risk premium local has been registered at this level despite its presence on the stock markets due to the segmentation of national markets with the world market which has been approved by the Studies of Bekaert and Harvey (95,97), Griffin and Stulz (2001), Károlyi and Stulz (2002), Dumas et al. (2003), Barr and Pristley (2004). As well, our contribution in this line of research has been to put in the value of the risk premium local, we have tested the MEDAFI in the case of the perfect integration and that of the partial segmentation, with the taking into account of the effect of different financial crises on a sample of the countries of the MENA region to know (Tunisia, Morocco, Egypt, Jordan, the Arabia, the United Arab Emirates, Turkey and the world market), whose objective to assess the risk of local more of exchange rate risk on the stock markets of these countries and thus steer the decisions of international investors. Our results have shown the importance of the risk premium local and its possible contribution to the training of the risk premium in total, same result for the risk premium of exchange that is significant for all the countries studied with high volatility during the mortgage crisis 2007-2008. Our model which has been estimated under the two assumptions of financial integration to know the perfect integration and the partial segmentation, has been able to show the importance of three risk factors in the evaluation of financial assets on the stock markets in the MENA region; and it has demonstrated that the hypothesis of the partial segmentation is the most appropriate for this emerging area thus giving a significant appreciation of the risk premium local. As well, these results can form a basis of information for international investors in their strategy of portfolio management in the MENA region. This finding is the subject of our fourth and last section.

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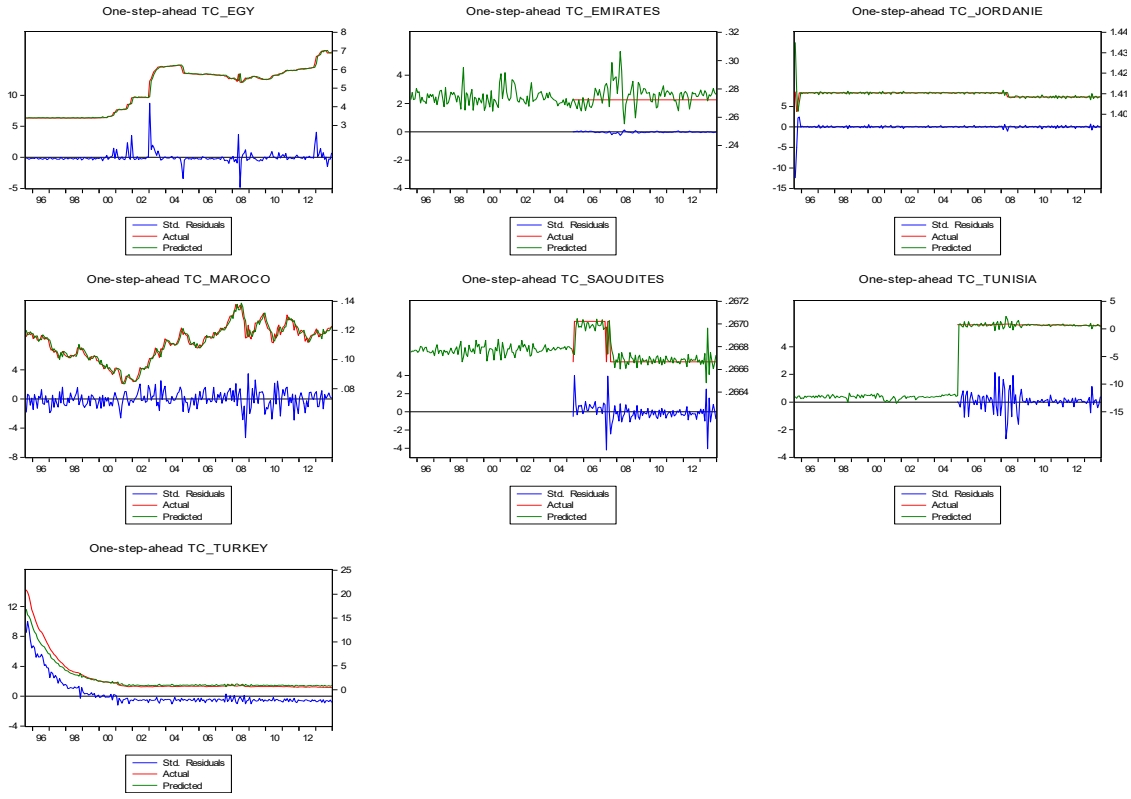
Appendix 1

	R_EGY	R_EMIRATES	R_JORDANIE	R_MAROCO	R_SAOUDITES	R_TUNISIA	R_TURKEY
Mean	0.003243	-0.001837	-0.010173	0.004018	-0.001868	0.003091	0.004389
Median	0.007672	-0.004126	-0.005951	0.005514	0.015175	0.000913	0.019491
Maximum	0.254089	0.309324	0.142862	0.214552	0.179606	0.216483	0.249082
Minimum	-0.394862	-0.405903	-0.263533	-0.168999	-0.293655	-0.192007	-0.420481
Std. Dev.	0.101650	0.114075	0.060101	0.062671	0.088220	0.052653	0.116346
Skewness	-0.616002	-0.235692	-0.928537	0.045562	-0.832487	0.103322	-0.685375
Kurtosis	4.494826	4.741033	6.062441	3.817358	4.207182	6.434261	4.152042
Jarque-Bera	16.26013	14.09806	55.58483	2.930967	18.32752	51.29302	13.89335
Probability	0.000295	0.000868	0.000000	0.230966	0.000105	0.000000	0.000962
ARCH-LM (6)	27.879***	22.354**	33.124***	19.187*	112.87***	20.105**	75.01***

	TC_TURKEY	TC_TUNISIA	TC_SAOUDITES	TC_MAROCO	TC_JORDANIE	TC_EMIRATES	TC_EGY
Mean	0.662135	0.722102	0.266752	0.120316	1.409139	0.272294	5.857052
Median	0.658512	0.732145	0.266667	0.119232	1.408451	0.272294	5.735400
Maximum	0.862664	0.870474	0.267023	0.137775	1.410440	0.272294	7.015000
Minimum	0.468121	0.598659	0.266667	0.107890	1.408451	0.272294	5.296900
Std. Dev.	0.098612	0.066977	0.000153	0.006906	0.000950	0.000000	0.426874
Skewness	0.193453	-0.058714	1.215095	0.498332	0.646764	1.215095	1.539785
Kurtosis	2.262538	2.414375	2.476456	2.816836	1.418307	2.476456	4.596754
Jarque-Bera	3.005368	1.545898	26.77966	4.449841	18.09153	26.77966	52.14461
Probability	0.222532	0.461650	0.000002	0.108076	0.000118	0.000002	0.000000
ARCH-LM (6)	11.024**	12.887**	17.008***	9.784*	11.012**	17.201***	15.442**

Appendix 2



Appendix 3

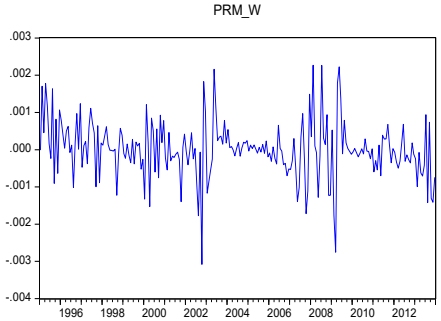


Chart 2

Appendix 4

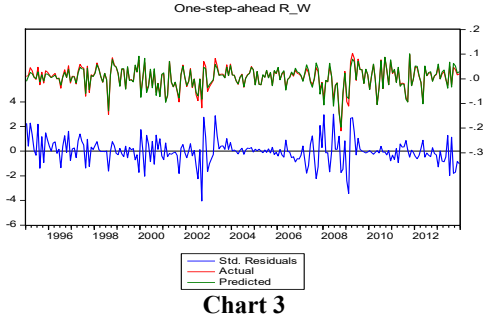
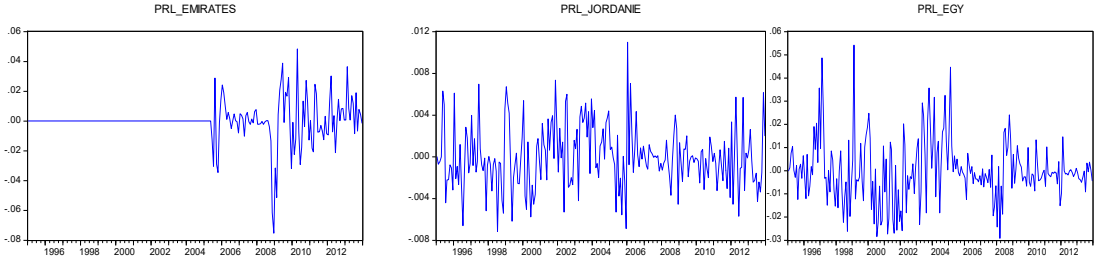


Chart 3

Appendix 5



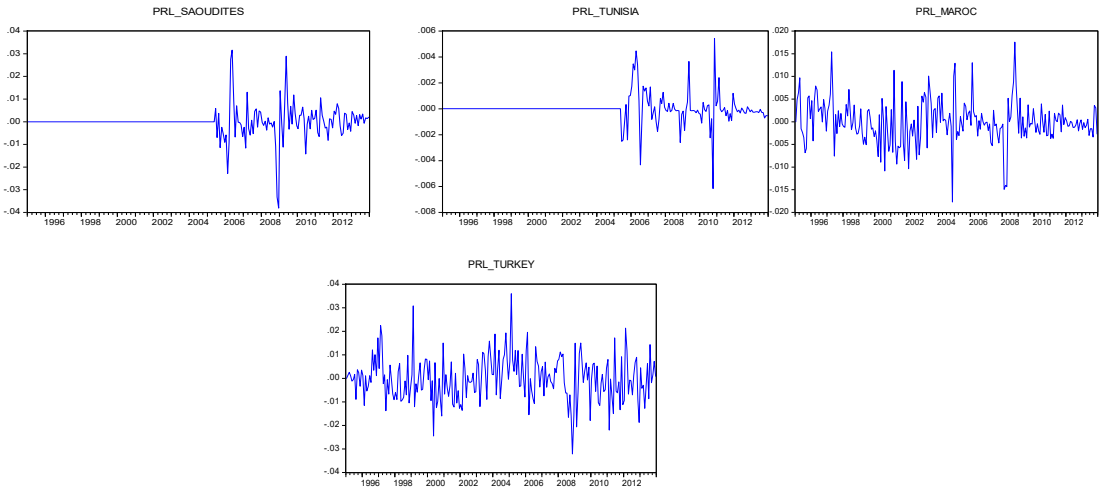


Chart 4

Appendix 6

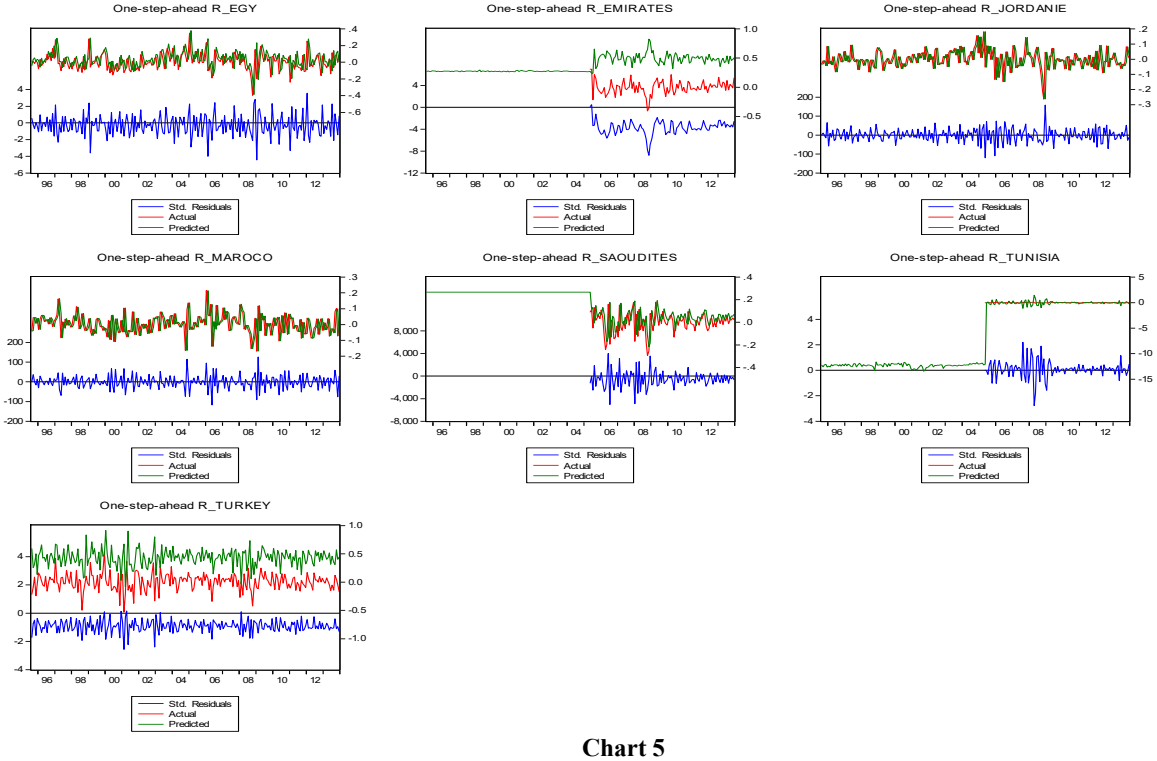


Chart 5