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The Risk Premium on Mediterranean Emerging Stock Markets

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ABSTRACT: In this paper, we test a conditional version of the international asset pricing model, using the multivariate GARCH process of De Santis and Gerard (1998). The model is estimated, over the period January 1997-March 2007, for five markets: the global, USA, Egyptian, Turkish and Israeli markets.

We analyze a version of the ICAPM with a constant market risk price as well as the exchange rate risk price, while the conditional covariances vary over time. The results show that risk premium vary significantly across markets and over time, for all stock markets the contribution of currency premium to the total risk premium is economically significant. This study confirms that currency risk is a significant factor in the international valuation of financial assets.

KEYWORDS: International valuation of financial assets, Currency risk, Risk premium, Multivariate GARCH

1- INTRODUCTION

The foundation of the theory of financial asset pricing lies in the fact that; for a risk averse investor, the systematic integration of the risk premium in their investment decision process in risky assets, is very important.

Indeed, this risk premium plays a crucial role in any portfolio management strategy. It represents the additional profitability, compared to that generated by the risk-free asset, that the investor requires in return for holding risky assets with uncertain income.

The measurement and evaluation of the risk premium requires recourse to one of the fundamental paradigms of finance: the capital asset pricing model (CAPM) of Sharpe (64), Linter (65) and Mossin (66).

Over the years and following the globalization of financial markets, an important debate has emerged concerning the valuation of financial assets in the international context. Thus, the international versions of the CAPM proposed by Solnik (74), Sercu (80), Stulz (81) and Adler and Dumas (83) are based on the hypothesis of the violation of purchasing power parity, which has been proven in the short term by all the studies, such as Cornell (79).

Thus, taking this deviation into account in international models of financial asset valuation introduces an additional risk following the holding of a foreign asset; the exchange rate risk.

In other words, if purchasing power parity is not verified, investors in different countries will measure the return on the same asset differently, since they face different prices for that asset. As a result, investing in foreign markets will result in exposure to currency risk.

However, this additional source of risk raises the following two questions: first, it is important to know whether currency risk is a factor that is really taken into account in financial markets. Second, if currency risk is taken into account, then what compensation can investors expect to receive for supporting such risk? "De Santis and Gérard (1998).

Obviously, the search for the answer opens the door to the various tests applied to the theoretical models of the international valuation of financial assets.

Early attempts to examine the international CAPM were based on the unconditional version (Sthele (1977), Jorion and Schwartz (1986)), providing inconclusive results.

A more complete test of the conditional version of the ICAPM is carried out with the time-varying risk premium & PPP hypothesis untested

The first model presented by Dumas and Solnik (95), contains risk premiums that are based on the covariances of assets with exchange rates, in addition to the traditional risk premium based on the covariance with the market portfolio. This new premium exists because of the deviation from PPP[1].

Using a conditional approach, the goal of this study is to find out whether currency risks are remunerated in international asset markets.

In other words, the two authors distinguished empirically between the classical CAPM and the international CAPM, in order to test the null hypothesis that currency risk is not remunerated.

In sum, the results of this study support the international CAPM. However, the MMG method does not perform the dynamic specification of second moments, so it is unable to give indicators of primary interest to the investor; conditional betas, conditional correlations, etc.

This specification is presented in the article by De Santis and Gérard (98) "how big is the premium for currency risk?

In order to overcome the difficulty of the MMG method as used by Dumas and Solnik (95), De Santis and Gérard (98) have used the multivariate GARCH approach. Thus, in contrast to the MMG method, and in order to examine the conditional version of the international CAPM, this approach makes it possible to specify the dynamics of the conditional second moments and to evaluate the importance of the exchange premium in the total risk premium.

De Santis and Gerard (98) start from the idea that, since correlations between international markets are considerably lower than those between stock portfolios of a single market, investors can gain significant benefits from international portfolio diversification.

If purchasing power parity is violated, investing in foreign markets results in exposure to currency risk. The authors state that: "any investment in foreign assets is a combination of an investment in the performance of the foreign assets and an investment in the performance of the domestic currency relative to the foreign currency.

This study contains some contributions:

*A simultaneous analysis of a number of equity and Eurocurrency deposit markets, in which the conditional measures (prices) of market risk and currency risk are time-varying and explicitly parameterized.

*The econometric methodology used is an innovation in the literature. Indeed, the assumption that the second order moments follow a GARCH process and that market and exchange rate risk are time-varying, allows us to study the relative importance of market and exchange rate risk premia, as well as their dynamics in an international environment.

These results highlight the importance of conditional analysis. In contrast to the results of the unconditional ICAPM, the exchange rate premium is an explanatory factor of the return.

Subsequently, the objective of the study conducted by Phylaktis and Ravazzolo (2004) is to develop an international asset pricing model that includes exchange rate risk and examines the impact of financial market liberalization and the Asian financial crisis (97) on the volatilities of equity and exchange rate returns.

Thus, their main contribution is to incorporate currency risk into the valuation of equity returns for markets with varying degrees of integration.

Based on the results of the significance of exchange rate risk, this study assumes full market segmentation before liberalization and full integration afterwards.

The dynamic integration framework was applied to equity market returns, foreign exchange market returns, and global market returns.

Phylaktis and Ravazzolo (2004) employed a multivariate GARCH process to estimate the conditional dynamics of the model. Their analysis focuses on the Pacific Rim countries (Indonesia, Korea, Malaysia, the Philippines, Taiwan, and Thailand), with monthly sample data covering the period from January 1980 to May 2000.

The analysis proves that the limited relationship found in de Santis and Imrohoroglu (97) between risk and return is due to the omission of currency risk. Thus, this study seeks to identify whether the contribution of currency risk improves the performance of the dynamic integration of the CAPM of De Santis and Imrohoroglu (97), in the evaluation of market risk.

Like Dumas and Solnik (95) and De Santis and Gérard (98), the authors found strong support for the specification of an ICAPM that includes market and exchange rate risk.

They find that exchange rate returns are related to their risk, so their covariances with local equity market returns before liberalization and with the world market return after liberalization are important explanatory factors.

[1] The violation of purchasing power parity implies that countries have different commodity prices, stochastic exchange rate variations are associated with changes in these prices, constituting additional sources of risk in asset pricing models. Thus, recent work testing the conditional version of models has been interested in the contribution of the exchange rate premium to the total risk premium, in order to determine whether exchange rate risk is remunerated in developed country markets.

The results prove that country market risk is remunerated before liberalization in all countries except Korea, while global market risk after liberalization is remunerated for all countries in the sample. Thus, the statistical significance of the price coefficients of global market risk shows that Pacific basin financial markets are integrated after liberalization, which is consistent with Bekaert and Harvey (95).

Empirical evidence shows that the currency risk premium makes up a large part of the total premium when markets are segmented. In the crisis period it became negative across all countries.

Thus, the important result of the analysis is that the exchange rate risk is remunerated before and after liberalization. This evidence is consistent with previous studies by Dumas and Solnik (95) for the United States, De Santis and Gérard (98) for developed markets and Carrieri (2001) for European markets.

In general, the evidence suggests that an international model without exchange rate risk is misspecified. It is an important component in equilibrium models of international financial markets even during periods when markets are not formally open to international investment.

In the same vein, Chu-Sheng Tai (2004) examined exchange rate risk in Asian emerging markets, with the estimation of a conditional dynamic version of the international CAPM where PPP is not checked, while employing a multivariate GARCH process. The study focuses on Hong Kong, Singapore and Malaysia, and the results indicate that foreign exchange risk is remunerated and is a potential source of risk premium.

In the same research direction, our study will focus on the emerging markets of the Mediterranean area, this region presents an interesting framework for study. Indeed, following the financial liberalization, the financial markets of these countries have experienced a tremendous development.

From this observation, we thought it would be useful to see if the price of exchange rate risk exists and if it is significant in these countries, as it has been proven for developed countries.

In this respect, we will try to focus on the determinants and dynamics of the international risk premium for the emerging markets of the Mediterranean area, in order to determine the contribution of the exchange rate premium to the formation of the total risk premium and to identify, therefore, the scope of the exchange rate risk in the framework of the valuation of financial assets for the emerging countries of this region.

The second section of the paper presents an empirical study of emerging Mediterranean countries. We test a conditional version of the asset pricing model with constant risk prices, using the multivariate GARCH methodology

The third section specifies the methodology used to estimate this model, the fourth section presents the database and preliminary analyses, the fifth section shows the different empirical results and the sixth section concludes.

II- THE CAPM IN THE CONTEXT OF EMERGING COUNTRIES

Our empirical method adopted is that of De Santis and Gerard (98), it is structured as follows:

*CAPM with constant risk prices

Our analysis focuses on a version of the ICAPM with a constant price of market risk as well as the price of exchange rate risk, while the conditional covariances vary over time. This restriction was used by De Santis and Gérard (98).

The model to be estimated is in fact as follows:

$$R_{it} = \delta_m \operatorname{cov}_{t-1}(R_{it}, R_{mt}) + \sum_{c:1}^{n} \delta_c \operatorname{cov}_{t-1}(R_{it}, R_{n+c,t}) + \varepsilon_{it}, i = 1.......N \qquad \text{Eq.(1)}$$

With :

R_{it} : the return on asset i in excess of the risk-free rate

δ_m the world price of market risk

R_{mt} : the return on the world market portfolio

$\operatorname{cov}(R_{it}, R_{mt})$: the covariance of the return on asset i with the return on the world market

δ_c : exchange rate risk price of currency c

$R_{n+c,t}$ the return on the currency exchange rate at time t

n : the number of countries.

N : the number of markets.

$\text{cov}(R_{it}, R_{n+c,t})$: the covariance between the return on asset i and the return on the exchange rate.

ε_{it} : error term.

III- THE ECONOMETRIC SPECIFICATION

We consider a world composed of L+1 countries, one of which is used as the reference currency country. For each country, two types of assets are considered:

- A portfolio of risky assets.
- A short-term deposit, denominated in local currency.

To estimate the model, all returns must be converted into the reference currency of the reference country. Since short-term currency deposits are risk-free when measured in local currency, their only risk when measured in reference currency is exchange rate risk, measured by the return on the exchange rate between the local currency and the reference currency.

Next, the returns on the assets are arranged in a vector of dimension (m, 1) with: m= 2L+2. The first L+1 elements in the vector include the returns on all country indices, the next L include the returns on currency deposits, and the last element includes the return on the global portfolio. Thus, if we note by the return on asset i, the system of equations can be presented as follows:

$$\begin{cases} E(R_1) = \delta_m \text{cov}(R_1, R_M) + \sum_{c=1}^{L} \delta_c \text{cov}(R_1, R_{L+1+c}) \\ \vdots \\ E(R_{L+1}) = \delta_m \text{cov}(R_{L+1}, R_M) + \sum_{c=1}^{L} \delta_c \text{cov}(R_{L+1}, R_{L+1+c}) \\ \vdots \end{cases}$$

$$\begin{cases} E(R_{L+2}) = \delta_m \text{cov}(R_{L+2}, R_M) + \sum_{c=1}^{L} \delta_c \text{cov}(R_{L+2}, R_{L+1+c}) \\ \vdots \\ E(R_{2L+1}) = \delta_m \text{cov}_{t-1}(R_{2L+1}, R_M) + \sum_{c=1}^{L} \delta_c \text{cov}(R_{2L+1}, R_{L+1+c}) \\ \vdots \end{cases}$$

$$E(R_M) = \delta_m \text{cov}(R_M) + \sum_{c=1}^{L} \delta_c \text{cov}(R_M, R_{L+1+c}) \qquad \text{Eq. (2)}$$

The first L+1 equations in the system evaluate equity portfolios (modeling domestic market returns), the next L evaluate currency deposits (to model exchange rate dynamics), the last to evaluate the global market portfolio.

The system of equations can be presented as follows:

$$r_t = \delta_m h_{mt} \sum_{c=1}^{L} \delta_c h_{n+c,t} + \varepsilon_t \quad , \qquad \varepsilon_t / \Im_{t-1} \approx N(O, H_t) \qquad \text{Eq.(3)}$$

With:

r_t : the (s×1) vector of excess returns expressed in reference currency c.

H_t the (s×s) matrix of conditional variances-covariances.

ε_t : the vector (s×1) of residuals.

h_{mt} . : the last column of which includes the conditional covariances between each asset and the market portfolio, and thus measures the exposure to global market risk.

$h_{n+c,t}$ The (n+c)th column of the matrix, which contains the conditional covariances between each asset and the return on the cth currency deposit, and thus measures the exposure to currency risk.

Finally, we impose the assumptions of De Santis and Gérard (98) about the dynamics of , in order to estimate and test the model.

First, we assume that the second-order conditional moments follow a multivariate GARCH process, in which the variances in the matrix depend on the past squared residuals and an autoregressive component, while the covariance depends on the crossed squared residuals and an autoregressive component.
Then, the system is assumed to be stationary covariance, so that the process for is written as follows:

$$H_t = H_0 * (ii' - aa' - bb') + aa' * \varepsilon_{t-1}\varepsilon'_{t-1} + bb' * H_{t-1} \quad \text{Eq. (4)}$$

With H_0 : the unconditional variance-covariance matrix of the residuals, i the unit vector, a and b are two vectors of the unknown parameters to be estimated, and * the element-by-element product of the matrices: Hadamard product.
Since the conditional normality assumption is rarely verified for financial time series, the model is estimated using the quasi-maximum likelihood function, proposed by Bollerslev and Wooldridge (92).
Under certain conditions, the quasi-maximum likelihood estimator is asymptotically normal, the optimization is done using the BHHH algorithm, presented by Berndt, Hall and Hausman (74).
Thus, the log-likelihood function can be presented as follows:

$$\ln L(\Psi) = -\frac{Ts}{2}\ln(2\pi) - \frac{1}{2}\sum_{t=1}^{T}\ln\left|H_t(\Psi)\right| - \frac{1}{2}\sum_{t=1}^{T}\varepsilon'_t(\Psi)H_t(\Psi)^{-1}\varepsilon_t(\psi) \quad \text{Eq. (5)}$$

With Ψ : the vector of unknown parameters and T the number of observations.

VI- DATA AND PRELIMINARY ANALYSIS

Data

The present study focuses on the emerging countries of the Mediterranean zone. In fact and according to the classification of the financial institution S&P, these countries belong to the Middle East and North Africa (MENA) region.
Our sample includes, therefore, 3 emerging countries: Egypt, Israel and Turkey, and one developed country: the United States, which presents the country of the reference currency and the global market.

The observations used are monthly prices at the end of the period from January 1997 to March 2007, i.e. 123 observations. The market prices are taken from Morgan Stanley Capital International (MSCI) and the market portfolio is approximated by the world index: MSCI World Index. These market returns are expressed in dollars and adjusted by dividends. The monthly exchange rates are bilateral nominal exchange rates expressed against the US dollar, these rates are extracted from International Financial Statistics (IFS).

Thus, the system of our model, contains eight equations: four equations for the stock returns of the countries studied (the United States, Egypt, Israel and Turkey), three equations for the variations of the series of the exchange rates (the Egyptian pound, the Israeli shekel and the Turkish lira) and an equation for the world market

The study of normality

The application of the maximum likelihood method on real data requires the application of the normality test on the financial series used. This is what leads us, first, to study our series in terms of normality. The descriptive statistics relating to the different series of returns are recorded in the following two tables:

Table 1. Descriptive statistics and the normality test of the differentiated stock market indices.

	R_EGYPT	R_ Israel	R_TURKEY	R_USA	R_world
Mean	5.279156	0.918541	2.429844	4.849131	5.615566
Std. Dev	-0.328000	2.017500	8.709000	9.875000	13.95650
Skewness	1.293238	-0.244768	-0.033887	-0.476252	-0.664031
Kurtosis	12.37548	5.049918	7.177905	3.487194	3.497418
Jarque-Bera	480.8302	22.57918	88.75238	5.818484	10.22346
Probability	0.000000	0.000013	0.000000	0.054517	0.006026

Table 2: Descriptive statistics and normality test for differentiated exchange rates.

	R.Tc.Egypt	R.Tc.Israel	R.Tc.Turkey
Mean	-0.001002	-0.000547	-0.066723
Std.Dev	0.000000	0.000173	-0.028510
Skewness	-5.415592	-1.562463	-1.748765
Kurtosis	39.58779	7.889954	5.565317
Jarque-Bera	7219.239	166.9809	93.28393
Probability	0.000000	0.000000	0.000000

In the light of these descriptive statistics, we can see that among the three emerging countries studied, Egypt has the highest average market return, despite the fact that for the period between 2001 and 2003 their stock market indexes are characterized by a sharp decline following the events of September 11, the Israeli-Palestinian conflict and the war in Iraq. But everything recovered afterwards.

On the other hand, these phenomena have a negative influence, and more or less persistent, on the stock market indices of Israel, since they present the lowest excess return.

We also notice that the exchange rate series are less volatile than those of the stock market indices. This result is explained by the fact that the latter have higher returns.

With respect to the symmetry hypothesis, the calculated coefficients of the Skewness statistic are negative, indicating that all distributions are left skewed.

According to the Kurtosis test, the series are all leptokurtic.

For the Jarque-Bera normality test, the statistic shows that the distributions deviate from normality, which justifies the use of the near maximum likelihood method in our estimation.

The study of correlation

Table 3: Correlations between stock market index returns.

	R_EGYPT	R_Israel	R_Turkey	R_USA	R_world
R_EGYPT	1.000000	0.118998	0.361467	0.115850	0.191125
R_Israel		1.000000	0.360376	0.495927	0.540787
R_Turkey			1.000000	0.421497	0.475859
R_USA				1.000000	0.950186
R_world					1.000000

Table 4: Correlations between exchange rate returns.

	R.Tc.Egypt	R.Tc.Israel	R.Tc.Turkey
R.Tc.Egypt	1.000000	0.052746	-0.099829
R.Tc.Israel		1.000000	0.112405
R.Tc.Turkey			1.000000

According to the values of the coefficients, the unconditional correlations of the return series and the exchange rate series are all positive. This implies that all markets in the study move in the same direction.

The strongest correlation exists between the US equity market and the world market, it is around 95%. This reflects the economic weight of the US market in the global market. The correlation between the Israeli and American market has a significant value of 49%, which shows the existence of important economic links between these two countries.

Egypt has the lowest correlation with the world market 19%, thus it has a low degree of integration in the world market. In addition, the lowest correlation of exchange rate returns exists between Egypt and Turkey.

The Autocorrelation study

Table 5: Autocorrelation of stock market index returns.

	Order	Autocorrelation	Q sta	Prob
R_EGYPT	1	0.776	75.357	0.000
	2	0.659	130.07	0.000
	3	0.581	172.99	0.000
	4	0.527	208.64	0.000
	5	0.490	239.67	0.000
	6	0.451	266.18	0.000
R_Israel	1	0.101	1.2731	0.259
	2	-0.082	2.1234	0.346
	3	0.234	9.0991	0.028
	4	0.063	9.6160	0.047
	5	0.023	9.6815	0.085
	6	-0.004	9.6833	0.139
R_Turkey	1	0.067	0.5669	0.452
	2	0.045	0.8183	0.664
	3	0.071	1.4577	0.692
	4	0.075	2.1864	0.702
	5	-0.039	2.3863	0.794
	6	-0.058	2.8193	0.831
R_USA	1	-0.039	0.1884	0.664
	2	-0.042	0.4099	0.815
	3	0.067	0.9872	0.804
	4	-0.054	1.3589	0.851
	5	0.068	1.9521	0.856
	6	0.064	2.4930	0.869
R_world	1	0.017	0.0361	0.849
	2	-0.046	0.2998	0.861
	3	0.092	1.3741	0.712
	4	-0.019	1.4182	0.841
	5	0.020	1.4699	0.917
	6	0.100	2.7776	0.836

Table 6: Autocorrelation of exchange rate returns.

	Order	Autocorrélation	Q sta	Prob
R.Tc.Egypt	1	0.115	1.6203	0.203
	2	0.149	4.3459	0.114
	3	0.188	8.7352	0.033
	4	0.043	8.9666	0.062
	5	-0.002	8.9670	0.110
	6	0.000	8.9670	0.175
R.Tc.Israel	1	0.024	0.0740	0.786
	2	-0.010	0.0867	0.958

	3	-0.058	0.5090	0.917
	4	0.045	0.7719	0.942
	5	-0.011	0.7876	0.978
	6	0.080	1.6104	0.952
R.Tc.Turkey	1	0.763	72.254	0.000
	2	0.702	133.93	0.000
	3	0.649	187.10	0.000
	4	0.612	234.71	0.000
	5	0.574	276.95	0.000
	6	0.477	306.42	0.000

In Table 5, the Ljung-Box statistic shows the absence of significant autocorrelations for the stock market index series, with the exception of Egypt. It indicates, therefore, the absence of a linear relationship between the equity market returns, and that the mean equation is well specified.

The same result is also reported for the autocorrelation of exchange rate returns.

Similarly, autocorrelation is absent in the series of squared stock index returns and exchange rate returns . The following two tables mention this result. For most of the series studied, only the first-order autocorrelations are significant, which could be in favor of a possible first-order GARCH modeling.

Table 7: Autocorrelation of the squared returns of the stock market indices.

	Order	**Autocorrelation**	**Q sta**	**Prob**
R_EGYPT	1	0.457	26.061	0.000
	2	0.294	36.970	0.000
	3	0.225	43.392	0.000
	4	0.178	47.449	0.000
	5	0.153	50.456	0.000
	6	0.122	52.408	0.000
R_Israel	1	-0.028	0.1015	0.750
	2	-0.065	0.6293	0.730
	3	0.024	0.6997	0.873
	4	0.002	0.7000	0.951
	5	0.100	2.0014	0.849
	6	-0.074	2.7145	0.844
R_Turkey	1	0.002	0.0005	0.983
	2	-0.016	0.0314	0.984
	3	0.038	0.2198	0.974
	4	-0.020	0.2711	0.992
	5	0.073	0.9678	0.965
	6	0.000	0.9678	0.987
R_USA	1	-0.049	0.2965	0.586
	2	0.030	0.4088	0.815
	3	0.149	3.2162	0.359
	4	-0.146	5.9508	0.203
	5	-0.015	5.9811	0.308
	6	-0.086	6.9566	0.325
R_world	1	-0.011	0.0156	0.901
	2	-0.051	0.3373	0.845
	3	0.221	6.5424	0.088
	4	-0.084	7.4557	0.114
	5	-0.010	7.4695	0.188
	6	-0.050	7.7988	0.253

Table 8: Autocorrelation of the squares of exchange rate returns.

	Ordre	Autocorrelation	Q sta	Prob
R.Tc.Egypt	1	-0.008	0.0075	0.931
	2	0.015	0.0369	0.982
	3	0.035	0.1872	0.980
	4	-0.019	0.2345	0.994
	5	-0.024	0.3064	0.998
	6	-0.021	0.3630	0.999
R.Tc.Israel	1	-0.036	0.1605	0.689
	2	0.088	1.1338	0.567
	3	-0.032	1.2598	0.739
	4	-0.030	1.3752	0.848
	5	-0.031	1.4992	0.913
	6	0.103	2.8833	0.823
R.Tc.Turkey	1	0.637	50.306	0.000
	2	0.601	95.434	0.000
	3	0.545	132.83	0.000
	4	0.535	169.26	0.000
	5	0.486	199.62	0.000
	6	0.286	210.20	0.000

The graphical representations of the differentiated series of stock market index returns and exchange rates[2] clearly show that these financial series are characterized by strong variation and volatility, which constitutes proof of the existence of a heteroscedasticity problem (the variance of the residuals is not constant over time).

Thus, in this case the ARCH model is the best adopted to the financial data because it takes into account the ARCH effect on the residuals. So, in what follows we will be interested in performing the Ljung-Box test on the residuals as well as on the squares of the residuals, in order to identify the heteroscedasticity problem.

The ARCH-LM test

We apply this test to see if the residuals contain additional ARCH effects, the results are reported in the following two tab les:

Table 9 : ARCH-LM effect test on stock index returns

	F Sta	TR^2
R_EGYPT	14.00895	50.50526
R_Israel	0.658560	4.058009
R_Turkey	0.193920	1.225162
R_USA	1.207663	7.230643
R_world	1.572829	9.242795

Table 10: ARCH-LM effect test on exchange rate returns.

	F Sta	TR^2
R.Tc.Egypt	0.046227	0.294908
R.Tc.Israel	0.473157	2.945521
R.Tc.Turkey	0.088148	0.560421

For all the series of stock market index returns as well as exchange rates, the ARCH-LM test statistic is higher than the F-Statistic, so we reject the hypothesis of the existence of the ARCH effect.

[2] Appendices 1, 2

V-Empirical results

To estimate our international asset pricing model, we use the stock market indices of 5 markets: Egypt, Turkey, Israel, the world and the United States, all returns are measured in dollars. Thus, 3 sources of currency risk are considered. They are related to the Israeli shekel, the Turkish lira, and the Egyptian pound, to estimate this risk, we include the returns on the exchange rates in our financial asset pricing system, and lastly, we use the MSCI world index as a proxy for the market portfolio. In sum, we analyze eight markets.

So let's recall our model:

$$R_{it} = \delta_m \operatorname{cov}_{t-1}(R_{it}, R_{mt}) + \sum_{c:1}^{3} \delta_c \operatorname{cov}_{t-1}(R_{it}, R_{n+c,t}) + \varepsilon_{it}, i = 1.......8$$ Eq.(6)

The estimation of this model is done by the Quasi Maximum Likelihood method, based on the monthly dollar returns for the period January 1997 to March 2007.

The representation of the conditional variance covariance matrix H_t is as follows:

$$H_t = H_0 * (ii' - aa' - bb') + aa' * \varepsilon_{t-1}\varepsilon'_{t-1} + bb' * H_{t-1}$$ Eq.(7)

Where a and b are 8×1 constant vectors representing the coefficients of the GARCH model that specifies the dynamics of the variance covariance matrix of the residuals, i is an 8×1 unit vector.

The results of the estimation give us three prices of exchange rate risk, and one price of market risk. Thus, the first four equations describe the equity indices, the next three are related to the exchange rates, and the last one is related to the market portfolio.

Risk price estimators

The parameters relating to the dynamics of the world market risk price and the exchange rate risk prices of currencies are given in the following table:

Table 11: Quasi maximum likelihood estimators of risk prices.

	World	Egypt	Turkey	Israel
World risk price	0,002359			
prob	(0.0000)			
exchange risk price		0,808778	-13,91812	0,219906
Prob		(0.4567)	(0.0320)	(0.0045)

According to the table, the coefficient δ_m is equal to 0.002359, this value indicates that investors in the emerging Mediterranean countries in our sample are poorly remunerated for exposure to market risk, which shows the low integration of these countries in the world economy.

Moreover, De Santis and Gérard (1998) found a value of 0.0279 significant at 20%, they explained this result by the choice of the basic hypothesis according to which the world price of risk is constant.

Concerning the exchange risk prices , they are estimated by the parameter δ_c 0.808778 for the Egyptian currency, -13.91812 for the Turkish currency and 0.219906 for the Israeli currency.

The exchange rate risk premium can take positive as well as negative values, since it depends on the sign of the covariance of asset returns with the exchange rate returns since this conditional covariance is time-varying.

The structure of second moments: GARCH process estimators

The following table presents the structure of the conditional second moments "variance and covariance" using the GARCH specifications.

Table 12: GARCH process estimators for the conditional ICAPM

	Stock market returns					Exchange rate returns		
Paramètre	Egypt	Turkey	Israel	World	usa	Egypt	Turkey	Israel
a	0.768629	0.831510	0.770078	0.762054	0.760555	0.763533	0.760675	0.764906
probabilité	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
b	0.908568	0.740933	0.876931	0.899294	0.898295	0.893915	0.898232	0.866122
probabilité	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

For all the profitability series studied, the parameters a and b are significant and positive. The estimated values of the b vector, "which relates the second moments to their past values", are much higher than those of the a vector, "which relates the second moments to past innovations".
This is evidence of gradual changes in the dynamics of conditional volatility. These results are consistent with previous CAPM studies using the GARCH specification.

Robustness tests: the significance of the price of exchange rate risk

The following table presents the joint hypothesis tests related to the dynamics of the price of exchange risk. In order to verify the significance of the price of this risk. These hypotheses are tested by the Wald robustness test, which consists of testing the null hypothesis of non-significance of the price of risk $H_0 : \delta_c = 0:$ (the estimated coefficients are all equal to zero, i=1.....3.
The Wald test statistic follows a Chi-square. The degree of freedom is the number of parameters, so we accept the null hypothesis of non-significance if the calculated Chi-square is greater than the tabulated Chi-square.

Table 13: Wald significance test for exchange rate risk prices

H_0 : the exchange risk prices are all jointly zero					
Stat Khi Deux	81.51893	df	3	Prob	0.0000
H_0 : the exchange risk price of the Egyptian currency is zero					
Stat Khi Deux	64.77667	df	1	Prob	0.0000
H_0 : the exchange risk price of the Turkish currency is zero					
Stat Khi Deux	2.826981	df	1	Prob	0.0927
H_0 the exchange risk price of the Israeli currency is zero					
Stat Khi Deux	1.1453666	df	1	Prob	0.2845

The hypotheses that the prices of exchange rate risks are individually equal to zero are rejected for all the countries studied at all thresholds. The same is true for the hypothesis that these prices are jointly zero.

This result leads us to conclude that exchange rate risk exists and is significant in the international valuation of emerging Mediterranean markets. This is in line with the result of previous studies "Dumas and Solnik (95) and De Santis and Gerard (98)" which point out that for a financial asset pricing model to be well specified, it must include the exchange rate risk

Risk premium analysis

The econometric approach used in our work allows us to determine a direct estimator of the market and exchange rate risk premiums, since we already have the risk prices and the conditional second moment estimators.
The premiums associated with each risk factor are measured as follows:
The world market risk premium PRM :

The Risk Premium on Mediterranean Emerging Stock Markets

$PRM_{it} = \delta_m \operatorname{cov}(R_{it,} R_{mt})$	Eq.(8)

The exchange rate risk premium PRC :

$PRC_{it} = \sum_{c=1}^{3} \delta_c \operatorname{cov}(R_{it,} R_{n+c,t})$	Eq.(9)

Thus, the total premium PT is equal to :

$PT_{it} = \delta_m \operatorname{cov}(R_{it}, R_{mt}) + \sum_{c=1}^{3} \delta_c \operatorname{cov}(R_{it}, R_{n+c,t})$	Eq.(10)

The following table shows the annualized average total premiums and their decomposition into global market and foreign exchange premiums.

Table 14: Decomposition of total risk premiums on the stock market.

	Total premium	Market premium	Exchange premium
USA	4,28458324	6,32442191	-2,03983867
World	4,10029512	5,64115894	-1,49500074
Egypt	1,08	0,8444013	0,23471828
Turkey	1,58683537	2,13288715	-0,54605178
Israel	0,42247209	0,75800708	-0,33553498

The table prompts several observations:
The size as well as the dynamics of each premium varies between the different markets, with the total premium for the U.S., global, and Turkish market largely explained by the global market premium.

On average, the total premium varies between 0.42 for Israel and 4.28 for the US market. This moderate average value indicates that better diversification may exist as a result of new investment opportunities and imply a decrease in prices and risk quantities.

The global market premium is positive for all countries in the sample, indicating that the investor is compensated for his risk exposure in the stock markets of the Mediterranean emerging countries.

The United States and Turkey have the highest market risk premium because of the strong integration of these markets into the global economy.

The value of this premium in the Egyptian and Israeli markets is moderately low, so the remuneration is not adequate in these markets, which can be considered inefficient and poorly integrated into the world economy.

For the premium associated with the exchange rate risk, it is statistically and economically significant for all the markets studied. On average, with the exception of Egypt, the value of this premium is negative, which suggests that investors in these countries are willing to pay a portion of their total premium to protect themselves against exchange rate fluctuations.

The conclusion that can be drawn from these results is that the exchange rate premium in the countries in our sample is a statistically and economically significant component of the total risk premium. These results are consistent with previous studies.

VI- CONCLUSION

In conclusion, the use of the multivariate GARCH process of De Santis and Gerard (1997) to estimate the CAPMoF for the markets in our sample, namely the United States, the world market, Egypt, Turkey and Israel, allows us to pay particular attention to the exchange rate risk and the evolution of the different components of the risk premium.

Thus, the results provided by this estimation are consistent with those of previous studies: the prices of exchange rate risks are statistically and economically significant for all the markets studied, the decomposition of the total risk premium into the exchange rate premium and the market premium showed that the latter is often the main component of the total premium for the American, Israeli, Turkish and world markets. For the Egyptian market, the contribution of the foreign exchange premium to the formation of the total risk premium is more important.

The variation of the exchange and market premiums over time and from one market to another is explained by the significant reaction of the markets studied to international political, economic and monetary events that induced structural changes in the stock markets.

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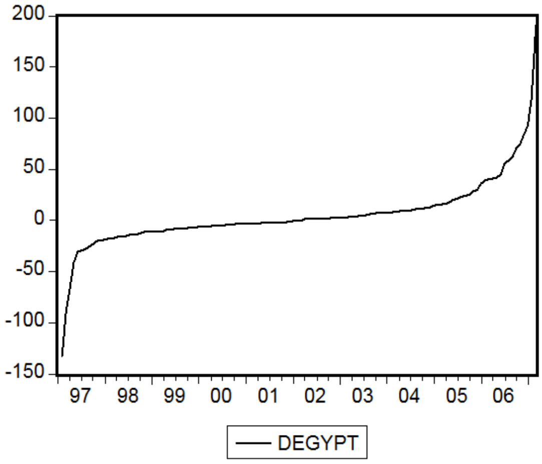
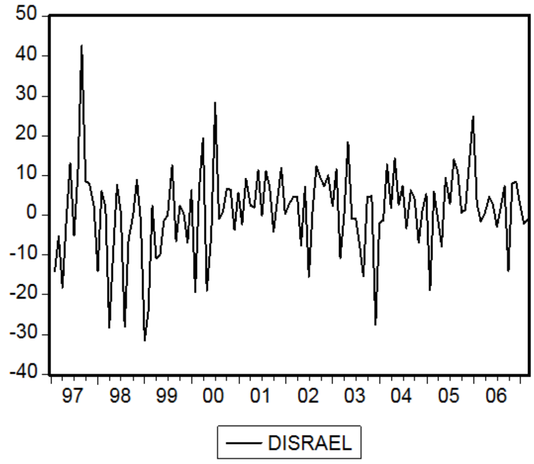
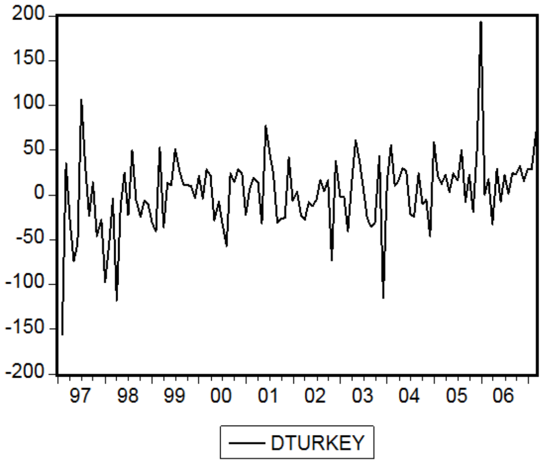
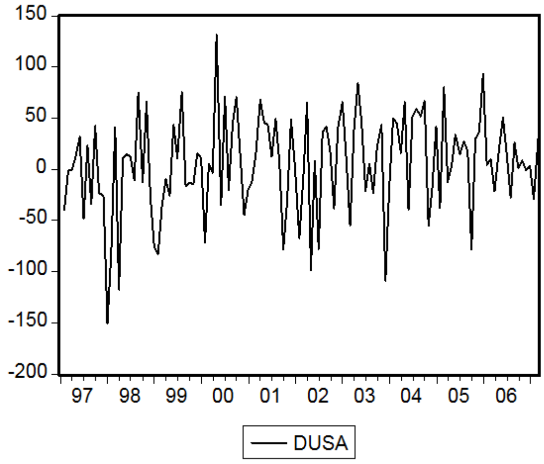
Appendices 1, 2

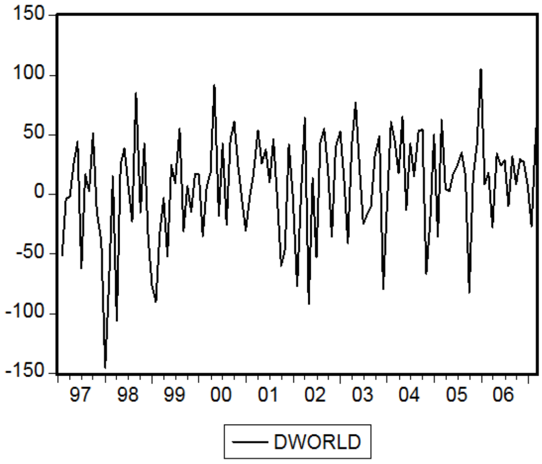
the evolution of the differentiated returns of the stock market indices the evolution of differentiated exchange rate returns

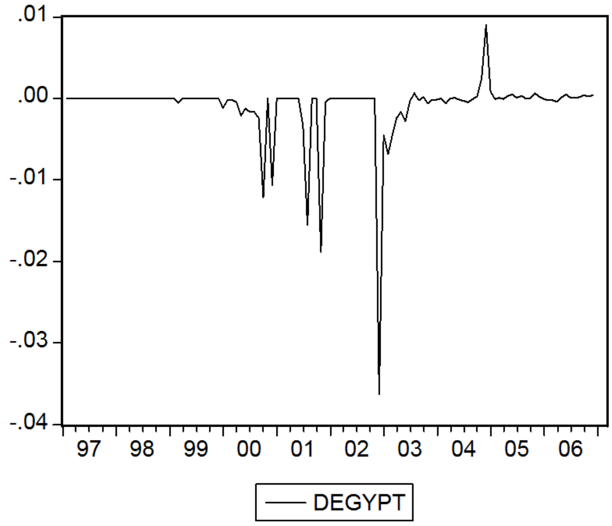








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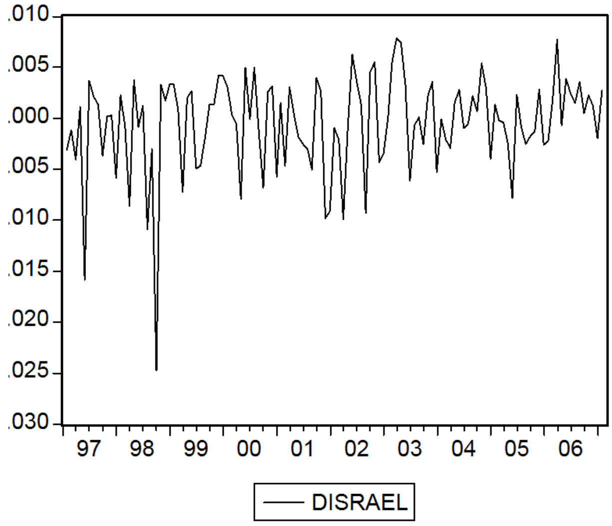
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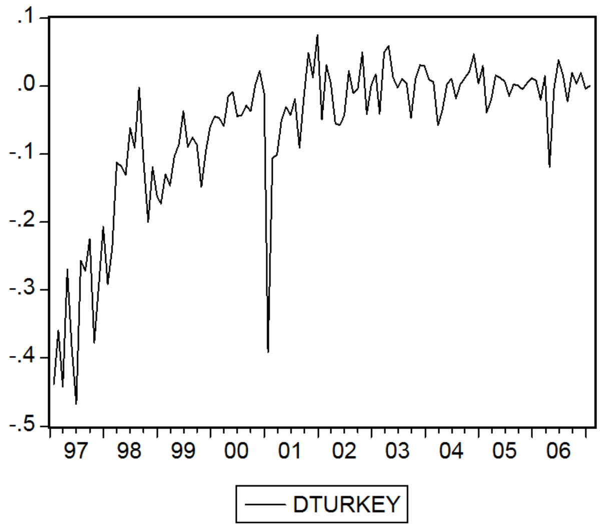
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