Time-varying global, local and currency risk in emerging stock markets

Lamia SEBAI [1] RED-ISGG & Faculty of Economics and Management, University of Sfax

Siwar ELLOUZ [2] Faculty of Economics and Management, University of Sfax

Abstract

Objective: to investigated the importance of global, local and currency risks

Method: The international version of the conditional CAPM and DCC-GARCH

Results: the world market risk together with the currency and local market risks are priced and time-varying on the emerging market stock market. The price of local risk in the stock market emerging is non-time-varying relative to the global market, but time-varying relative to the emerging market.

Originality / relevance: Study the evolution of global, local and foreign exchange rates over a long period and implement several processes to estimate the CAPM, such as a GARCH-DCC multivariate model.

Keywords: Currency risk, global risk, local risk, and DCC-GARCH.

Variation de risque mondial,local et de change sur les marches boursiers

Résumé

Objectif : étudier l'importance des risques mondiaux, locaux et de change

Méthode : MEDAFI et DCC-GARCH

Résultats : le risque mondial, local et de change sont évalués et varient dans le temps. Le prix du risque local sur le marché boursier émergent ne varie pas dans le temps par rapport au marché mondial, mais varie dans le temps par rapport au marché émergent.

Originalité / pertinence : Etudier l'évolution des cours de change global, local et étranger sur une longue période et mettre en œuvre plusieurs processus pour estimer le CAPM, comme un modèle multivarié GARCH-DCC.

Mots-clés : risque de change, risque global, risque local et DCC-GARCH.

1 Email: lamiaisgg2014@gmail.com

2 Email: ellousiw@yahoo.fr

1- Introduction

The past decade has wintnessed a rapid change in the global economic and financial situation, with the development of the emerging markets. Simultaneously, they have started to receive increasing amounts of global investments spurred by their higher returns, favorable risk–return opportunities and better diversification alternatives to global investors.

On the other hand, these markets have raised the question about the risk factors that were associated with these markets, as asset pricing models suggest that the high realized returns should associated with high measures of risk with respect to a number of risk factors.

Previous studies, have identified two different fundamental risk sources that helped to explain the returns in international stock markets including emerging markets, the exposure to local and global risk sources. In the case of strict segmentation the class CAPM propose that the expected equity returns are a function of only the country-specific local risk. In the context of an international capital asset pricing model (ICAPM), De Santis and Gérard (1998), in the absence of puchasing power parity (PPP), optimal portfolios differ across countries and the return that investors expect on their investment includes a premium for both market and exchange risk rates. Phylaktis and Ravazzolo (2004) ;Tai (2008); Saleem and Vaihekoski (2008, 2010) ; Antell and Vaihekoski (2007, 2012) are interested in the pricing of currency risk premium and confirm that the currency pricing risk premium is time-variang. The multivariate GARCH process, inspired from De Santis and Gerard (1998), remains the most common method to evaluate the exchange rate risk, on the one hand, and justify whether the risk pricing is time-varying by calculating the variance-covariance yields with the macroeconomic variables, on the other.

Carrieri et al. (2007) studied the integration of eight emerging markets over the period 1977–2000. They showed that the local pricing factor continues to be relevant in the valuation of emerging-market assets, but none of the considered markets is completely segmented from the world market.

Jacobsen and Liu (2008) have evaluated international asset pricing models and the pricing of global, local, and currency risk in the Chinese and U.S stock markets. Their market portfolios were constructed from the MSCI indices: the world markets, the emerging markets, and the developed markets. Their results show that global risk is priced and time-varying. The price of currency risk, with a negative value, is priced and time-varying in the Chinese markets with respect to the All Country World index, the developed index, and the emerging index.

Tai (2010) finds strong evidence of time-varying foreign exchange risk premium and significant exchange rate betas based on the tests of conditional asset pricing models using MGARCH-M approach where both conditional first and second moments of industry returns and risk factors are estimated simultaneously.

Using a GARCH-in-Mean multivariate specification similar to De Santis and Gérard (1998) to model conditional expectations, covariances and variances, Antell and Vaihekoski(2012) studied the pricing of currency risk as well as global and local market risks on the Finland and Sweden stock markets using monthly data from March 1970 to August 2009. Their results show that the global risk price is time-varying. Unlike the Finnish and Swedish markets, The price of local market risk in the US market is not priced.

Relying on a three-factor international capital asset pricing model, Al-Shboulan and Anwar (2014) examined whether the world market, the local market and the currency risks are priced in the Canadian equity market. Their empirical analysis based on weekly data on the 58 largest Canadian firms indicates that the currency as well as the local and the world market risk premiums, are priced in the canadian equity market. This result holds for all exchange rates proxies and in all the sample periods. They find that the price on the world market, the local market and the currency risks are time varying and that the canadian equity market is partially segmented. Kodongo and Ojah (2014) sought to establish whether the volatile currencies of Africa conduct equity risk premia. Their results show strong evidence of conditional, time-varying currency risk premia in equity returns. They also find strong evidence that the currency risk factor is integrated into the equity price in these stock markets.

In this article, we try to provide an answer to the following question: Does global, local and currency risk being price and time-varying in emerging.

Our study contains two contributions compared to the previous one literature on the evolution of risk prices in emerging markets. First, we consider the evolution of global, local and foreign exchange price over a long period from the first steps of market liberalization from 1994 to 2014. This long period allows us to examine the evolution of the price of risk taking into account several periods of crisis. Second, we implement several processes to estimate the CAPM, such as a multivariate GARCH-DCC model, in order to obtain the terms of variance–covariance between the local and global stock markets.

In this study, we investigated whether global, local and currency risks are priced in 20 emerging markets, using monthly data from April 1994 to April 2014. To this end, we developed a conditional international asset pricing model where PPP is not verified, conditional variances and co-variances follow the multi-varied DCC-GARCH process. The expected returns vary according to national and international factors.

The main purpose was to provide a comprehensive analysis about the valuation of the exchange interest rate risk on emerging stock markets. The remainder of the paper was organized as follows. Section 2 presented the research methodology. Section 3 described the data. Section 4 revealed the empirical results and section 5 concludes.

2- Methodology

Methodologically, this paper based on CAPM, the international capital asset pricing model (ICAPM) proposed by Adler and Dumas (1983) and adopted by Santis and Gérard (1998) by adding the segmented market model of Antell and Vaihekoski (2007-2012), Jacobsen and Liu (2008) and Saleem and Vaihekoski (2010) which expected returns on the local market to be affected by their covariance with the world market and the exchange market and by the variance of the local return.

The model can be written as follows:

$$E[r_{it}^{c}/\Omega_{t-1}] = \delta_{m,t-1}Cov_t(r_{it}^{c}, r_{mt}^{c}/\Omega_{t-1}) + \sum_{k=1}^{L}\delta_{k,t-1}Cov_t\,(r_{it}^{c}, f_{kt}^{c}/\Omega_{t-1}) + \delta_{i,t-1}Var_t(r_{it}^{c}/\Omega_{t-1}) \quad (1)$$

Where $E[r_{it}^{c}/\Omega_{t-1}]$ is the excess return in country i, conditionally on a set of information Ω_{t-1} that is available to investors at $t-1$. Exponent c indicates that returns are expressed in the currency of the reference country. $\delta_{m,t-1}$, $\delta_{i,t-1}$ and $\delta_{k,t-1}$ denote the time-varying prices of global, domestic risk and of currency risk, respectively. r_{it}^{c}, r_{mt}^{c} and f_{kt}^{c} represent(respectively) the expect excess returns on the local market portfolio, the excess returns on the global market portfolio and the excess currency return, conditional on a set of information Ω_{t-1} available to investors to $t-1$. Cov_t and Var_t respectively denote the variance and covariance operators.

For each country i, following Hardouvelis and al.(2006), estimating equation (1) includes various variables that are not observable and need to be estimated.

Equations (2), (3) and (4) below are used to describe the excess stock, at the global and local markets, and currency returns respectively:

$$r_m = \delta_{m,t-1} var\left(r_{m,t}^c\right) + \sum_{k=1}^{L} \delta_{k,t-1} Cov_t\left(r_{m,t}^c; f_{k,t}^c\right) + \varepsilon_t^m \quad (2)$$

$$r_i = \delta_{i,t-1} Var_t\left(r_{it}^c\right) + \sum_{k=1}^{L} \delta_{k,t-1} Cov_t\left(r_{i,t}^c; f_{k,t}^c\right) + \varepsilon_t^l \quad (3)$$

$$f_{k,t}^c = \delta_{m,t-1} cov\left(r_{m,t}^c; f_{k,t}^c\right) + \delta_{k,t-1} var\left(f_{k,t}^c\right) + \varepsilon_t^k \quad (4)$$

$$\varepsilon_t = \left(\varepsilon_t^m; \varepsilon_t^l; \varepsilon_t^k; \varepsilon_t^i / \Psi_{t-1}\right) \sim N(0, H_t)$$

where $\varepsilon_t\left(\varepsilon_t^m; \varepsilon_t^l; \varepsilon_t^k; / \Omega_{t-1}\right) \sim N(0, H_t)$ as vector of unexpected excess returns given the set of information Ω, at time $t - 1$. H_t is the conditional variance-covariance matrix of excess returns.

Equation (5) describes the time-varying conditional covariance matrix of excess returns, H_t, which follows a DCC-GARCH process, proposed by Engle (2002) and Tse and Tsui(2002). Their approach takes the following form:

$$\left\{ \begin{array}{c} H_t = D_t R_t D_t \\ D_t = dig\left(\sqrt{h_{11,t}}, \sqrt{h_{22,t}} \dots \dots \sqrt{h_{NN,t}}\right) \\ R_t = diag(Q_t)^{-\frac{1}{2}} Q_t (digQ_t)^{-\frac{1}{2}} \end{array} \right\} \quad (5)$$

D_t is a diagonal matrix of conditional standard deviations for each of the return following a univariate GARCH. R_t is the time-varying correlation matrix, Q_t as a matrix of unconditional variances-covariances of dimension (N * N), symmetric and positive definite:

$$Q_t = (1 - \theta_1 - \theta_2)\bar{Q} + \theta_1 \mu_{t-1} \mu'_{t-1} + \theta_2 Q_{t-1} \quad (6)$$

Where $\bar{Q}$ is the unconditional matrix of variance-covariance of dimension (N * N) symmetric and positive definite, and $\mu_t = (\mu_{1t}, \mu_{2t}, , , , , \mu_{Nt})$ as a column vector of standardised residuals of the N assets in the portfolio at time t. $\mu_t = \frac{\varepsilon_{it}}{\sqrt{h_{iit}}}$, $i = i, \dots, N$. The coefficient θ_1 and θ_2 are parameters to estimate, that must be less than 1 to satisfy the positivity of matrix Q_t.

Equation (1) includes the global market risk price, the currency risk price and the local market risks price. De Santis and Gérard (1997), Gérard et al. (2003) and Hardouvelis and al. (2006) show that these prices vary over time by an exponential function of macroeconomic and financial instrumental variables. Following these authors, equations (7) to (9), specify the evolution of the risk conditional prices:

$$\delta_{m,t-1} = Exp(\gamma_m Z_{t-1}) \quad (7)$$

$$\delta_{k,t-1} = Exp(\gamma_k Z_{t-1}) \quad (8)$$

$$\delta_{i,t-1} = Exp(\gamma_i Z'_{t-1}) \quad (9)$$

Where Z_{t-1} as the vector of the global instrumental variables observable at $t - 1$ and Z'_{t-1} is the vector of the local instrumental variables observable on the market i at $t - 1$. γ_m, γ_k and γ_i are the weights associated with these variables.

The estimation of the multivariate model parameters is carried out by the maximum likelihood, proposed by Bollerslev and Wooldridge (1992) to avoid the problem of normality in excess returns. The equations subsystem was estimated for excess returns on the global and individual markets and currency return plus the relevant variance-covariance elements for with DCC-GARCH multivariate.This generated the market conditional variance, the exchange rate, their conditional covariances, and the global market prices, the exchange rate risks and the local market risk.

3- Data

Our study focused on the evalution of the conditional risk premium on 20 emerging markets and on the global market. The data covers the period from April 1994 to April 2014.

3.1Stock market and exchange rate returns

The market indices for the 20 emerging markets and on the global market were obtained from Datastream International from April 1994 to April 2014. The monthly stock returns were used.

Real exchange rates represent the local currency value against the U.S. dollar and are extracted from the IMF's International Financial Statistics (IFS) and the U.S. Federal Reserve databases.

3.2 Global and local informational variables for the risk prices

The global information set Z_{t-1}, includes a constant, the dividend yield (dividend-to-price ratio) of the world market portfolio (MSCI World index) in excess of the 30-day Eurodollar interest rate which is denoted by WDY the variation in the US term premium spread measured by the yield on the 10-year US Treasury note in excess of the 1-month T-Bill rate (USTP), the US default premium measured by the difference between Moody's Baa-rated and Aaa-rated corporate bonds (USDP) and the variation in the 1-month euro–dollar deposit rate (1mUSTB). The local information set Z'_{t-1}, contains a constant, the dividend yield of a market(RIDY), the return on the stock market index in excess of the 30-day Euro dollar interest rate (RIR) and the inflation rate (INF). Data were extracted from MSCI and Datatream International.

4- Empirical results

4.1Prices of world market and foreign exchange risks

Table 1 presents the estimated parameters of the world market and foreign exchange risks for the 20 emerging markets.

In the world market, the coefficients associated with the dividend yield of the world market portfolio in excess of the 30-day Eurodollar interest rate, the variation in the US term premium and the return on the S&P's 500 stock market index are significant at the 1%. The three variables explain significantly the world market risk prices dynamics.The variation in the 1-month US Treasury bill yield has insignificant effect on the evolution of the world market risk prices.

Table1: The world market and foreign exchange risks prices

	Constant	WDY	USTP	RSP	1mUSTB
World	-2.735^{***} (0.197)	0.118^{***} (0.028)	0.106^{***} (0.0089)	-0.330^{***} (0.021)	-0.029 (−0.409)
Brazil	-0.003 (0.197)	0.0008 (0.0001	0.0002^{*} (0.0001)	0.0004^{***} (0.798)	0.0004^{**} (0.0001)
Chile	-0.130 (0.089)	0.0408^{*} (0.007)	0.003 (0.003)	-0.009 (0.006)	0.008 (0.010)
Colombia	0.107 (0.07)	-0.036^{*} (0.006)	-0.001 (0.002)	0.028^{***} (0.004)	-0.009 (0.010)
Mexico	-0.299 (0.19)	-0.01 (0.01)	0.013^{*} (0.005)	-0.029^{*} (0.015)	-0.021 (0.027)
Peru	-21.7^{***} (1.4)	0.04^{***} (0.06)	0.05 (0.06)	-0.71^{***} (0.11)	-0.205^{*} (0.004)
Czech Republic	0.22 (0.18)	0.031^{*} (0.017)	-0.007 (0.006)	-0.011 (0.015)	-0.015 (0.026)

Greece	0.03 (0.43)	0.046 (0.04)	−0.001 (0.0016)	−0.033 (0.036)	0.006 (0.063)
Hungary	−2.80 (2.62)	0.80* (0.37)	0.14* (0.086)	−1.43*** (0.036)	−0.38 (0.43)
Egypt	−0.105*** (0.017)	−0.0023 (0.0036)	0.008*** (0.0005)	0.0016 (0.002)	0.0025 (0.003)
Jordan	1.05 (0.341)	−2.71 (4.11)	−0.19 (1.28)	−0.68 (3.06)	2.07 (5.57)
South Africa	−20.92*** (1.88)	0.19 (0.21)	−0.43*** (0.081)	0.027 (0.15)	0.79* (0.307)
Turkey	0.35*** (0.099)	−0.031** (0.008)	−0.004 (0.003)	0.010 (0.007)	0.010 (0.015)
China	1.36 (5.62)	−0.76 (0.40)	−0.22 (0.17)	0.07 (0.39)	0.15 (0.73)
India	1.73*** (0.099)	0.004 (0.007)	−0.032*** (0.001)	−0.0002 (0.001)	0.004 (0.014)
Indonesia	−0.027 (0.049)	−0.05*** (0.003)	0.003* (0.0018)	−0.0013 (0.006)	0.006 (0.008)
Korea	−0.61 (2.97)	−0.89*** (0.21)	−0.10 (0.09)	1.70*** (0.75)	0.003* (0.0018)
Malaysia	−0.38 (0.27)	0.09*** (0.015)	0.021* (0.012)	−0.054*** (0.007)	0.79* (0.41)
Philippines	−0.61 (2.37)	−0.32 (0.21)	0.134* (0.007)	−0.06 (0.214)	−0.11 (0.41)
Taiwan	−0.0007 (0.002)	−0.0003 (0.0002)	−0.0001* (0.000008)	−0.00005 (0.0002)	−0.0001 (0.0004)
Thailand	0.237 (0.063)	−0.001** (0.007)	0.0001 * (0.0001)	0.002*** (0.0002)	0.0011* (0.0005)

*This table presents the estimation results of the system 1 for the world market and four real exchange index returns of 20 emerging markets.WDY, USTP, RSP and 1mUSTB refer respectively to the dividend yield of the world market portfolio in excess of the 30-day Eurodollar interest rate, the variation in the US term premium, the return on the S&P's 500 stock market index, and the variation in the 1-month US Treasury bill yield. ***,** , * Indicate that the coefficients are significant at the 10%, 5%, and 1% levels, respectively.*

Accordingly, the Wald test results of nullity and constancy restrictions on the world market risk price, reported in table 2, reject the null hypotheses that the latter is equal to zero and constant, which confirms the findings of previous studies including those of Bekaert and Harvey (1995), De Santis et Gérard(1998) ; Carrieri (2001) ; De Santis et al. (2003) ; Hardouvelis et al. (2006) and Carrieri et al. (2007).

For the Latin American countries, the price of currency risk for Brazil is explained by four variables WDY, USTP, RSP and 1mUSTB. For the Peruvian market, the currency risk price is

determined by three variables WDY, USTP and 1mUSTB. For Mexico and Colombia, the currency risk price is determined by two variables. Only the Chilean market, price of currency risk is explained by WDY.

For the European countries, the currency risk price for Hungary is explained by three variables WDY, USTP and RSP. Hawever, only the WDY is significant at the 10% in the Czech Republic.

For Africa and the Middle East zone countries , all the variables are not significant for Jordan. This result shows that these variables do not explain the prices dynamics in Jordan.

Concerning South Africa, the price of the risk is explained by the USTP and 1mUSTB.These variables are significant, at the 1% level. For Egypt and Turkey, the currency risk price is explained by only one variable.

For the Asian countries, Korea; Malaysia and Thailand, all the variables explain satisfactorily the currency risk price dynamics. For Indonesia ,the currency risk is explained by two variables WDY, USTP.

For the Philippines and Taiwan, the currency risk is determined by the WDY. In addition, all the variables are not significants in the Indian market. Moreover, the economic significance of the risk factors was studied by analyzing the null hypotheses that prices are equal to zero or constant, respectively.

The Wald test results, reported in Table 2, reject the null hypotheses at the 1% level for all the markets considered. Our results show the importance of the currency risk price in the valuation of the financial assets issued by the emerging markets. The currency risk price varies over time, which confirms the findings of previous studies including those of Bekaert and Harvey (1995) and Carrieri et al. (2007).

4.2 Local market risk price

Table2 : Specification test of the world and exchange risks price

Null hypothesis	x^2	df	$p - value$
Is the world risk price null ? $H_0: \lambda_t = 0$	3459 .	5	0.000
Is the world risk price constant ?$H_0: \lambda_t = 1$	23531	4	0.000
Is the price of exchange rate risk in Brazil zero? $H_0: \lambda_t = 0$	161.0	5	0.000
Is the price of exchange rate risk in Brazil constant? $H_0: \lambda_t = 1$	41.60	4	0.000
Is the price of exchange rate risk in Chile zero? $H_0: \lambda_t = 0$	35.87	5	0.000
Is the price of exchange rate risk in Chile constant? $H_0: \lambda_t = 1$	176	4	0.000
Is the price of exchange rate risk in Colombia zero? $H_0: \lambda_t = 0$	74.42	5	0.000
Is the price of exchange rate risk in Colombia constant? $H_0: \lambda_t = 1$	27082	3	0.000
Is the price of exchange rate risk in Mexico zero? $H_0: \lambda_t = 0$	74.42	5	0.000
Is the price of exchange rate risk in Mexico constant? $H_0: \lambda_t = 1$	50913	4	0.000
Is the price of exchange rate risk in Peru zero? $H_0: \lambda_t = 0$	3725	5	0.000
Is the price of exchange rate risk in Peru constant? $H_0: \lambda_t = 1$	2029	4	0.000
Is the price of exchange rate risk in Greece zero? $H_0: \lambda_t = 0$	155	5	0.000
Is the price of exchange rate risk in Greece constant? $H_0: \lambda_t = 1$	6843	4	0.000
Is the price of exchange rate risk in Czech Republic zero? $H_0: \lambda_t = 0$	602	5	0.004
Is the price of exchange rate risk inCzech Republic constant? $H_0: \lambda_t = 1$	434	4	0.000
Is the price of exchange rate risk in Hungary zero? $H_0: \lambda_t = 0$	34.93	5	0.000
Is the price of exchange rate risk in Hungary constant? $H_0: \lambda_t = 1$	191.6	4	0.000
Is the price of exchange rate risk in Egypt zero? $H_0: \lambda_t = 0$	529.4	5	0.000
Is the price of exchange rate risk in Egypt constant? $H_0: \lambda_t = 1$	39432	3	0.000
Is the price of exchange rate risk in Jordan zero? $H_0: \lambda_t = 0$	118	5	0.000
Is the price of exchange rate risk in Jordan constant? $H_0: \lambda_t = 1$	3.80	4	0.000
Is the price of exchange rate risk in South Africa zero? $H_0: \lambda_t = 0$	979	5	0.000
Le prix de risque de change in South Africa constant? $H_0: \lambda_t = 1$	383.1	4	0.000
Is the price of exchange rate risk in Turkey zero? $H_0: \lambda_t = 0$	44.31	5	0.000

Is the price of exchange rate risk in Turkey constant? $H_0: \lambda_t = 1$	13911	4	0.000
Is the price of exchange rate risk in China zero? $H_0: \lambda_t = 0$	10.86	5	0.000
Is the price of exchange rate risk in China constant? $H_0: \lambda_t = 1$	93.91	4	0.000
Is the price of exchange rate risk in India zero? $H_0: \lambda_t = 0$	712. 1	5	0.000
Is the price of exchange rate risk in India constant? $H_0: \lambda_t = 1$	712. 1	5	0.000
Is the price of exchange rate risk in Indonesia zero? $H_0: \lambda_t = 0$	261.9	5	0.000
Is the price of exchange rate risk in Indonesia constant? $H_0: \lambda_t = 1$	36530	4	0.000
Is the price of exchange rate risk in Malaysia zero? $H_0: \lambda_t = 0$	139.2	5	0.000
Is the price of exchange rate risk in Malaysia constant? $H_0: \lambda_t = 1$	41009	4	0.000
Is the price of exchange rate risk in Korea zero? $H_0: \lambda_t = 0$	141.9	5	0.004
Is the price of exchange rate risk in Korea constant? $H_0: \lambda_t = 1$	241.2	4	0.000
Is the price of exchange rate risk in Philippines zero? $H_0: \lambda_t = 0$	11.78	5	0.037
Is the price of exchange rate risk in Philippines constant? $H_0: \lambda_t = 1$	368.9	4	0.000
Is the price of exchange rate risk in Taiwan zero? $H_0: \lambda_t = 0$	12.96	5	0.000
Is the price of exchange rate risk in Taiwan constant? $H_0: \lambda_t = 1$	2350	4	0.000
Is the price of exchange rate risk in Thailand zero? $H_0: \lambda_t = 0$	93.21	5	0.000
Is the price of exchange rate risk in Thailand constant? $H_0: \lambda_t = 1$	9233	4	0.000

Table 3 presents the estimated parameters for the local market risk price. The RIDY is statistically significant at the 1% threshold for all the Latin American countries except Colombia and Peru. The INF is statistically significant for all these countries except for Mexico and Peru. The RIR is statistically significant for all the Latin American countries except for Chile. Thus, it can be ascerted that the information variables explain satisfactorily the price dynamics relative to the local risk for the countries of Latin America. The local risk price varies over time on their-own markets.

Considering the countries of Europe, the Hungarian market has statistically significant macroeconomic variables at the 1% threshold. These variables explain the local risk prices dynamics for this market. For the Czech Republic, only the RIDY is statistically significant at the threshold of 1%. As for Greece, the information variables do not explain the dynamics of the local risk prices.

For Africa and the Middle East zone countries our results show that the RIDY is statistically significant for Turkey and South Africa. The other variables are not significant.

The RIDY is statistically significant for all the Asian countries except for Indonesia and Thailand. The INF is not significant for the Indian, Chinese and Malasian markets. The RIR variable, however, it is not significant for the Asian countries. We can therefore say that the local risk price is explained by RIDY and INF.

The hypothesis that the price of local risk is equal to zero or constant can also is rejected at the 1% significance level for all the markets considered (table 4). Our results show the importance of local risk in the valuation of the financial assets issued by the emerging markets. The local risk price varies over time in emerging markets. This confirms the findings of previous studies including those of Antell and Vaihekoski(2012) and Jacobsen and Liu (2008). This suggests that international investors have to consider also local sources of risk, for example when conducting portfolio analysis.

Table 5 summarizes an analysis of the model's residuals in terms of normality, autocorrelation, and conditional heteroscedasticity. The 1982 Engle test for conditional heteroscedasticity of the standardized residuals indicates that ARCH effects no longer exist in all cases, thus revealing the appropriateness of the GARCH modeling approach.

Table 3: Local market risk price

	Constant	RIDY	INF	RIR

Brazil	0.35^{***} (0.019)	0.0018^{*} (0.008)	−0.003 (0.025)	1.2716^{**} (0.11)
Chile	-5.47^{***} (1.38)	-1.10^{***} (0.007)	−3.846 (2.66)	0.076 (2.27)
Colombia	1.66 (2.47)	−0.007 (0.066)	−3.92 (2.51)	-1.94^{***} (2.27)
Mexico	−3.527 (3.22)	-2.59^{***} (0.18)	-0.56^{***} (0.35)	−7.2 (6.27)
Peru	−26.8 (4.67)	−0.03 (0.191)	-0.24^{*} (0.11)	0.97^{***} (0.11)
Czech Republic	0.02 (0.05)	-0.015^{***} (0.02)	11.16 (8.41)	0.039 (0.128)
Greece	-7.87^{***} (0.89)	−0.025 (0.11)	−0.6 (0.74)	6.58 (3.02)
Hungary	-0.001^{**} (0.04)	-0.0007^{***} (0.00007)	1.47^{**} (0.49)	-0.023^{***} (0.0034)
Egypt	-0.015^{***} (0.003)	−0.0001 (0.002)	0.38 (0.29)	0.015 (0.0034)
Jordan	−0.0098 (0.066)	0.003 (0.028)	1.34 (0.673)	−0.31 (0.0326)
South Africa	0.28^{***} (0.005)	-0.0036^{***} (0.00037)	1.00 (0.69)	−0.007 (0.012)
Turkey	−0.0004 (0.066)	-0.0001^{***} (0.00008)	−0.15 (0.001)	0.001 (0.0015)
China	-0.040^{*} (0.016)	−0.0007 (0.0007)	1.75 (2.87)	0.29^{***} (0.082)
India	0.027 (0.027)	-0.018^{***} (0.0016)	−2.97 (2.80)	−0.019 (0.052)
Indonesia	00.48^{*} (0.002)	0.0039 (0.004)	0.58^{***} (0.10)	−0.0044 (0.0034)
Korea	-0.08^{***} (0.0007)	-0.0009^{***} (0.00004)	−0.19 (0.157)	0.005 (2.80)
Malaysia	−0.0079 (0.007)	-0.006^{***} (0.0006)	1.19 (1.38)	0.54 (0.006)
Philippines	1.99^{*} (0.96)	-0.59^{***} (0.05)	−1.48 (1.48)	1.53 (1.74)
Taiwan	−0.002 (0.034)	-0.007^{**} (0.002)	1.66 (0.79)	0.33 (0.29)
Thailand	-5.74^{***} (1.27)	−0.13 (0.096)	0.39^{*} (0.16)	−0.74 (0.058)

****,** , * Indicate that the coefficients are significant at the 1%, 5%, and 10% levels, respectively.*

Table: 4 Specification tests of price of local market

Null hypothesis	x^2	df	$p-value$
Is the local risk price in Brazil zero? $H_0: \lambda_t = 0$	604	4	0.000

Is the local risk price in Brazil constant? $H_0: \lambda_t = 1$	434	3	0.000
Is the local risk price in Chile zero ?$H_0: \lambda_t = 0$	324	4	0.000
Is the local risk price in Chile constant? $H_0: \lambda_t = 1$	1026	3	0.000
Is the local risk price in Colombia zero?$H_0: \lambda_t = 0$	18.10	4	0.000
Is the local risk price in Colombia constant? $H_0: \lambda_t = 1$	247	3	0.000
Is the local risk price in Mexico zero?$H_0: \lambda_t = 0$	245	4	0.000
Is the local risk price in Mexico constant? $H_0: \lambda_t = 1$	444	3	0.000
Is the local risk price in Peru zero?$H_0: \lambda_t = 0$	108	4	0.000
Is the local risk price in Peru constant? $H_0: \lambda_t = 1$	72.8	4	0.000
Is the local risk price in Greece zero?$H_0: \lambda_t = 0$	114.4	4	0.000
Is the local risk price in Greece constant? $H_0: \lambda_t = 1$	87.65	3	0.000
Is the local risk price in Czech Republic zero?$H_0: \lambda_t = 0$	602	5	0.004
Is the local risk price in Czech Republic constant? $H_0: \lambda_t = 1$	434.6	4	0.000
Is the local risk price in Hungary zero?$H_0: \lambda_t = 0$	154.3	4	0.000
Is the local risk price in Hungary constant? $H_0: \lambda_t = 1$	165	3	0.000
Is the local risk price in Egypt zero?$H_0: \lambda_t = 0$	28.56	4	0.000
Is the local risk price in Egypt constant? $H_0: \lambda_t = 1$	24608	3	0.000
Is the local risk price in Jordan zero?$H_0: \lambda_t = 0$	1.01	4	0.000
Is the local risk price in Jordan constant? $H_0: \lambda_t = 1$	1266	3	0.000
Is the local risk price in South Africa zero?$H_0: \lambda_t = 0$	9165	4	0.000
Is the local risk price in South Africa constant? $H_0: \lambda_t = 1$	73358	3	0.000
Is the local risk price in Turkey zero?$H_0: \lambda_t = 0$	591.4	5	0.000
Is the local risk price in Turkey constant? $H_0: \lambda_t = 1$	14300	4	0.000
Is the local risk price in China zero?$H_0: \lambda_t = 0$	20.4 4	4	0.000
Is the local risk price in China constant? $H_0: \lambda_t = 1$	16930	3	0.000
Is the local risk price in India zero?$H_0: \lambda_t = 0$	137.1	4	0.000
Is the local risk price in India constant? $H_0: \lambda_t = 1$	39176	3	0.000
Is the local risk price in Indonesia zero?$H_0: \lambda_t = 0$	58.77	4	0.000
Is the local risk price in Indonesia constant? $H_0: \lambda_t = 1$	13682	3	0.000
Is the local risk price in Malaysia zero?$H_0: \lambda_t = 0$	107	4	0.000
Is the local risk price in Malaysia constant? $H_0: \lambda_t = 1$	27788	3	0.000
Is the local risk price in Korea zero?$H_0: \lambda_t = 0$	679	4	0.004
Is the local risk price in Korea constant? $H_0: \lambda_t = 1$	53700	3	0.000
Is the local risk price in Philippines zero?$H_0: \lambda_t = 0$	124.8	4	0.037
Is the local risk price in Philippines constant? $H_0: \lambda_t = 1$	912	3	0.000
Is the local risk price in Taiwan zero?$H_0: \lambda_t = 0$	12.10	4	0.016
Is the local risk price in Taiwan constant? $H_0: \lambda_t = 1$	20319	3	0.000
Is the local risk price in Thailand zero?$H_0: \lambda_t = 0$	27.03	4	0.000
Is the local risk price in Thailand constant? $H_0: \lambda_t = 1$	150.6	3	0.000

****,** , * Indicate that the coefficients are significant at the 10%, 5%, and 1% levels, respectively.*

Tableau 5 : Residuals analysis

	Skewness	Kurtosis	JB	Q(2)	ARCH (6)
World	-2.224	9.56	626.57***	0.0552	1.1
Brazil	-0.76	4.86	58.08***	0.0029	2.1
Chile	-0.073	3.88	8.064***	0.58	0.57
Colombia	0.67	5.59	85.32***	0.139	0.137
Mexico	-1.13	5.46	111.66***	1.05	1.03
Peru	-2.87	13.7	1477.3 ***	0.32	0. 31
Czech Republic	-0.058	3.39	1.28***	0.065	0.064
Greece	-0.012	3.4	1.65***	0.31	0. 312
Hungary	-0.073	3.88	8.064***	0.58	0.57
Egypt	4.95	38.97	13868.41***	0.321	0.316
Jordan	2.94	32.93	9271***	0.0011	0.0011
South Africa	-7.69	68.30	4829.28***	0.022	0.0222
Turkey	1.30	11.00	706.73***	0.048	0.04809
China	-1.19	11.63	799.9***	0.026	0.0261
India	0.31	10.60	580.25***	0.409	0.403
Indonesia	3.51	38.15	12800***	0.56	0.558
Korea	3.00	24.49	4961.3***	0.0002	0.00024
Malaysia	-6.11	52.07	25471***	0.03	0.034
Philippines	-1.32	11.90	858.7***	0.239	0.235
Taiwan	-1.30	11.98	872.0***	0.237	0.233
Thailand	2.41	21.63	3690.8***	0.073	0.017

Notes : *JB, Q(2), et ARCH(6) are, respectively, the empirical statistics of the Jarque-Bera test for normality, the Ljung–Box test for serial correlation of order 2, and Engles(1982) test for conditional heteroscedasticity*,**,***indicate that the null hypothesis of normality and zero autocorrelation is rejected at the 10%, 5% and 1% levels, respectively.*

5- Conclusion

The objective of this paper was to investigate the importance of local and currency risks for emerging market equities.We have evaluated the international asset pricing model with DCC-GARCH and priced the global, local, and currency risks in the emerging markets and U.S. stock markets using monthly data from April 1994 to April 2014. Our results show that the global risk of emergent markets is priced and time varying. Moreover, the currency and local risks are significantly different from zero and time-varying for a number of emerging markets. Consistent with prior research (Antell and Vaihekoski (2007), Chaieb and Errunza (2007), Jacobsen and Liu (2008) and Saleem and Vaihekoski (2010)), we also find that global, local, and currency risks are priced and time-varying in emerging markets.The price of local market risk is not priced in the US market; whereas, it is priced and time-varying for emerging equity markets.

The local and global market risk, currency risk can have very important implications for the portfolio management. Our results should be very useful for both companies and international investors who are interested in investing in emerging markets, or diversifying their portfolios internationally.

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