Australia's Integration Into The ASEAN-5 Region

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ABSTRACT

This paper attempts to evaluate the time-varying integration of Australian stock market in ASEAN-5 region (ASEAN + Australia, Korea, China, India and Japan) by using a conditional version of the international capital asset pricing model (ICAPM) allowing for dynamic changes in the degree of market integration, regional market risk price, currency risk price and domestic market risk price. Main findings are as follows: i) the prices of risk in Australia are extremely sensitive to major international economic and political events such as the different monetary and financial crises in international financial market; ii) the level of market openness and development of the stock market satisfactorily explain the time-varying degree of Australian stock integration.

Keywords: ICAPM; ASEAN-5 Region Market Integration; Exchange Rate Risk

1. INTRODUCTION

Face of increasing levels of integration of ASEAN-5 markets, reducing *a priori* the potential gains from international portfolio diversification, the development of emerging financial markets is generally considered likely to offer new opportunities. It has become traditional to restructure research opportunities and investments according to logic of large geographic poles as the Latin America, Eastern Europe, Middle East and Asia. This geographical diversification does not really account for the heterogeneity of each of these clusters, heterogeneity which is obviously financial integration factors.

Geographical classification is to arbitrate major divisions between them, and should therefore lead to financial integration and the realization of the law of single international price risk. However, such a design requires an adjustment of the foreign exchange market. In addition, when we look at the international diversification of portfolios of emerging markets, we can a priori doubt about the realization of the law of one price risk to the extent that exchange rate regimes are being a more or less strict regulation by local authorities. Moreover, in the literature, the work on the process of regionalization are generally based on the analysis of trade flows of goods (Freudenberg et al. 1998) and the flow of intra-regional direct investment (Petri, 2006). But these methods of analysis remain inadequate since they do not account for interactions between local factors and international integration.

That is, the study of regionalization must be attached to financial valuation models of financial assets that can both identify common risk factors and measuring unit compensation associated with these factors. In such context, Stulz (1981) explains that completely integrated financial market is described as a situation where investors earn the same risk adjusted expected return on similar financial markets. Rezai (2007) proves that a stock market is considered to be more integrated if there are stronger domestic returns depend on shocks of international market. This definition underlines not only the openness of stock markets but also measures the extent to which shocks are transferred across financial markets. The transfer of a shock requires both the removal of barriers and the capital flows across markets in order to take advantage of market opportunities. It is considered that, in case of a more fully integrated stock financial market, the country's economy and the subject market will not be separated from any outside influence. Choudhry et *al.* (2007) mentioned that financial markets development improves the degree of integration among these markets. Moreover, financial integration among markets has gained considerable attention of both the finance specialists and policy makers.

To summarize, we will refer to Adler and Dumas (1983), Carrieri et *al.* (2007) and Tai, (2007) conclusions. We consider, in addition to the systematic risks associated with regional and local markets, changes in exchange rates, which are, according to previous studies, a relevant source of risk in pricing emerging market assets. Our study contributes to the existing literature by examining the dynamic regional integration of Greek stock market in the context of the partially integrated ICAPM whose theoretical foundations have recently developed in Guesmi and Nguyen (2011).

Our empirical results show that level of market openness and the development level of the stock market meaningfully affects changes in ASEAN-5 region. They also point to the validity of the model we estimate and indicate that local and exchange rate risk is priced regionally. As in previous studies, we find that stock market integration involves through time and its changing patterns differ across studied markets.

The remainder of the article is organized as follows. Section 2 presents the empirical approach we use to examine the dynamics of regional financial integration. Section 3 describes the data and their statistical properties. Section 4 reports and discusses the obtained results. Section 5 provides some concluding remarks.

2. THE MODEL

Our empirical asset pricing model takes its point of departure of the Bekaert and Harvey's article (1995), but was extended using a DCC-GARCH model to take into account the dynamic correlation of expected returns. Our study is also inspired by the theoretical models of partial integration of Black (1974), Stulz (1981), Cooper and Kaplanis (2000), Hardouvelis (2006), Guesmi and Nguyen (2011), Arouri et al. (2012) and Guesmi et al. (2013). These authors confirm the partial integration hypothesis and time-varying world market integration for most individual markets. Exchange rate risk is also found to be priced in the context of both developed and emerging markets.

In our study, we adopt a partially integrated conditional ICAPM with three sources of systematic risk that globally reflect fluctuations in regional stock market, national stock market, and exchange rate. The conditional mean excess return can be written as:

$$
\begin{aligned}
&E(R_{Austria,t}|\pi_{t-1}) = \Theta_{t-1}\left[\eta_{reg,t-1}Cov(R_{Austria,t}, R_{reg,t}|\pi_{t-1}) + \eta_{k,t-1}Cov(R_{Austria,t}, R_{k,t}|\pi_{t-1})\right] \\
&+(1-\Theta_{t-1})\eta_{t-1}Var(R_{Austria,t}|\pi_{t-1}) \\
&E(R_{Austria,t}|\pi_{t-1}) = \eta_{reg,t-1}Var(R_{Austria,t}|\pi_{t-1}) + \eta_{k,t-1}Cov(R_{Austria,t}, R_{k,t}|\pi_{t-1}) \\
&E(R_{k,t}|\pi_{t-1}) = \Theta_{t-1}\left[\eta_{reg,t-1}Cov(R_{k,t}, R_{reg,t}|\pi_{t-1}) + \eta_{k,t-1}Cov(R_{Austria,t}, R_{k,t}|\pi_{t-1})\right] \\
&+(1-\Theta_{t-1})\eta_{t-1}Cov(R_{Austria,t}, R_{k,t}|\pi_{t-1}) \\
&\eta_{reg,t-1} = Exp(\delta'_{reg}G_{t-1}) \\
&\eta_{t-1} = Exp(\gamma' D_{t-1}) \\
&\eta_{k,t-1} = (\delta'_k G_{t-1}) \\
&\Theta_{t-1} = Exp(-|\alpha_0 + \alpha_1 IMO_{t-1} + \alpha_2 SMD_{t-1}|)
\end{aligned}
\tag{1}
$$

with G_{t-1} (regional information variables), D_{t-1} (local information variables) and F_{t-1} (integration variables) denote three vectors available at time.

$R_{Austria,t}$, $R_{reg,t}$ and $R_{k,t}$ are respectively expected excess returns on the local market portfolio, the excess return on *ASEAN-5 region (ASEAN + Australia, Korea, China, India and Japan)* and the excess currency return, conditionally on a set of information π_{t-1} that is available to investors up to time *t*-1.

$\eta_{reg,t-1}$, η_{t-1} and $\eta_{k,t-1}$ denote respectively the expected prices of a unit of risk, related to the regional market, the local market and the currency risk, respectively.

Θ_{t-1} is the conditional probability of transition between segmentation and integration states, which falls within the interval [0,1] and can be thus interpreted as a conditional measure of integration of market *i* into the regional one. α_i is a vector of region-specific parameters (including a constant) IMO and SMD are the International Market Openness and Stock Market Development. If $\Theta_{t-1}=1$, only the regional common risk is priced and the strict segmentation hypothesis is rejected; the market of country i is perfectly integrated at the regional level. If $\Theta_{t-1}=0$, the country-specific risk is non-diversifiable regionally, only the domestic risk is priced and the market of country i is strictly segmented from the regional market.

We add a disturbance term ε_t, orthogonal to the information available at the end of time *t-1,* and assume the conditional volatility follows a dynamic conditional correlation - GARCH (DCC-GARCH) model of Engle (2002).

$$
\begin{aligned}
&\varepsilon_t = (\varepsilon_{Japan,t}, \varepsilon_{reg,t}, \varepsilon_{k,t} \left| \psi_{t-1}) \sim \mathcal{N}(0, H_t) \right. \\
&H_t = V_t L_t V_t' \\
&L_t = (diag(Q_t))^{-1/2} Q_t (diag(Q_t))^{-1/2} \\
&V_t = diag(\sqrt{h_{Japan,t}}, \sqrt{h_{reg,t}}, \sqrt{h_{k,t}})
\end{aligned}
\tag{2}
$$

We model H_t by using a multivariate GARCH-DCC model. L_t is the (3×3) symmetric matrix of dynamic conditional correlations. D_t is a diagonal matrix of conditional standard deviations for each of the return series, obtained from estimating a univariate GARCH process. Q_t is a (3×3) variance-covariance matrix of standardized residuals ($u_t = \varepsilon_t / \sqrt{h_t}$).

Our model extends the literature in that we simultaneously take account of currency risks and dynamic in the volatility and correlation processes to accommodate the so-called leverage effect.

In line with previous work, we estimate the system (1) as follows.* In the first stage, we use the quasi-maximum likelihood estimation (QMLE) method to estimate the system of equations corresponding to excess return on regional market and the exchange rate index. This step gives us the risk premiums associated with regional market and exchange rate risk as well as the conditional variance of the regional market and exchange rate index. In the second stage, we estimate the complete system with three equations to identify the regional financial integration.

3. DATA

We use monthly stock returns in excess of the one-month Eurodollar interest rate which is considered as a risk-free rate. Monthly stock returns are calculated from stock market indices with dividends reinvested according to the formula $R_{it} = \ln(P_t / P_{t-1})$. Market index data are obtained from Thomson Datastream International. Real exchange rates represent the value of local currency against the U.S. dollar and come from the IMF's International

*Errunza et al. (1992), Cooper and Kaplanis (2000) and Bhattacharya and Daouk (2002) also adopt this procedure to estimate their partially segmented ICAPM.

Financial Statistics (IFS) and the U.S. Federal Reserve databases. Our study period runs from January 1996 through December 2007.

To condition the time-variations in the prices of risk related to regional stock market, we use a constant (*ECON*), dividend yields in excess of the 30-day regional market risk-free rate (*EDIV*), regional market portfolio returns in excess of the risk-free rate (*ERETURN*) and interest rate spread (*ESPR*), measured by the yield difference between the 10-year U.S. Treasury notes and the 3-month U.S. Treasury bills. All these monthly data are extracted from MSCI (Morgan Stanley Capital Index) and Datastream International databases.

The local instrumental variables, which are used to infer changes in the local price of risk, include the dividend yield of the local market portfolio (*GDIV*), the return on the local stock market index in excess of the one-month Eurodollar interest rate (*GRETURN*), and the monthly change in the trade-weighted average regional inflation rate (*GINF*). These data are obtained from Datastream International and MSCI databases.

Two information variables are used in this study to capture the evolution of market integration. They are the level of market openness (LMOP) measured by the ratio of imports plus exports to GDP and the development level of the stock market (DLSM) as measured by the ratio of market capitalization to GDP.

4. EMPIRICAL RESULTS

Our study period runs from January 1996 through December 2010. It excludes episodes of the recent international financial crisis that could generate biased estimates.

Table 1: Descriptive Statistics of Return Series

	Mean (%)	Std. dev. (%)	Skewness	Kurtosis	ARCH(6)
JRETURN	-0.532	1.343	-0.311	7.426	65.184^{+++}
RRETURN	0.654	2.451	-0.507	6.385	54.326^{++}
REER	0.174	6.173	-0.514	6.743	35.044^{+++}

Notes: ARCH(6) is the empirical statistics of the Engle (1982)'s test for the 6th order of ARCH effects. $^{+}$, $^{++}$, and $^{+++}$ indicate that the null hypothesis of no ARCH effects is rejected at the 10%, 5% and 1% levels respectively.

Table 1 presents the descriptive statistics for stock market and the REER. The average stock return is negative with the negative skewness coefficient, denoting that the returns distributions are skewed toward the left and that the probability of observing extreme negative returns is higher than that of a normal distribution. The kurtosis coefficient is significant, and greater than three, and thus reveal the leptokurtic behavior of returns distributions. Altogether, the non-normality of returns series is clearly confirmed by the Jarque-Bera test. Besides, the Engle (1982) test highlights the existence of ARCH effects in all the returns series, which obviously supports our decision to model the conditional volatility of returns by a GARCH-type process.

The price of exchange rate risk is mainly determined by dividend yield (*EDIV*) and stock returns (*ERETURN*) of the regional markets. It is positively associated with dividend yield, but negatively associated with stock returns. When local markets offer higher returns, increasing trading activity in stock exchanges may potentially imply higher volatility in foreign exchange markets owing to increased foreign investments.

We investigate the economic significance of the risk factors considered by testing the null hypotheses that the prices of risk are zero and constant, respectively. The results from Wald tests, reported in Table 2, indicate the rejection of these null hypotheses at the 1% level. These findings effectively concur with those of previous studies, including for example Adler and Dumas (1983), Carrieri et *al.* (2007) Hardouvelis et *al.* (2006) and Guesmi and Nguyen (2011) and Guesmi et al. (2013).

Table 2: Determinants of the Price of Exchange Rate and Regional Market Risk

	ECON	*EDIV (×10)*	*ERETURN*	*ESPR*
Panel A - Price of Exchange Rate Risk				
	0.237^{**}	0.015^{***}	-0.023^{**}	-0.015
	(0.163)	(0.001)	(0.001)	(0.004)
Panel B - Price of Regional Market Risk				
	-0.012	0.056^{***}	0.060^{***}	-0.071^{***}
	(0.021)	(0.001)	(0.002)	(0.002)

Panel C - Specification Tests for the Relevance of Prices of Regional Market and Exchange Rate Risk

Null Hypotheses	χ^2	p-value
Is the price of regional market risk null?	82.117^{+++}	0.000
Is the price of regional market risk constant?	89.129^{+++}	0.000
Is the price of exchange rate risk in Australia zero?	124.993^{+++}	0.000
Is the price of exchange rate risk in Australia constant?	107.331^{+++}	0.000

Notes: This table shows the determinants of exchange rate and regional market risk prices. *ECON*, *EDIV*, *ERETURN* and *ESPR* represent the constant term, dividend yield, regional market returns and interest rate spread. The numbers in parentheses are the associated standard deviations. χ^2 is the empirical statistics of the Wald test examining the null hypotheses of nullity and constant coefficients. *, **, and *** indicate significance at the 10%, 5% and 1% rate respectively. $^{+}$, $^{++}$, and $^{+++}$ indicate rejection of the null hypotheses at the 10%, 5% and 1% rate respectively.

The result in Table 3 also shows that the prices of local market risk in all the studied markets vary over time. This is also confirmed by the Wald test as it rejects the null hypotheses that local risk prices are constant.

Table 3: Specification Test of Prices of Local Market Risk

Null Hypotheses	χ^2	p-value
Is the price of local risk in Australia null?	44.312^{+++}	0.000
Is the price of local risk in Australia constant?	851.97^{+++}	0.000

Notes: χ^2 is the empirical statistics of the Wald tests examining the null hypotheses of nullity and constant coefficients. $^{++}$, and $^{+++}$ indicate rejection of the null hypotheses at the 5% and 1% rate respectively.

Table 4 presents a detailed analysis of the model's residuals where we examine their normality, autocorrelation and conditional heteroscedasticity. We find that normality condition is rejected. However, the Ljung-Box test cannot reject the hypothesis of no autocorrelation in all cases, while the Engle (1982) test for conditional heteroscedasticity indicates that ARCH effects no longer exist. These results thus reveal the suitability and usefulness of the multivariate GARCH modeling approach. Taken together, our empirical model is appropriate to model the time-variations of stock market returns in selected markets.

Table 4: Analysis of Residuals

	Skewness	Kurtosis	J.B	Q(12)	ARCH(6)
	0.419	1.965	3.613	13.140	0.058

Notes: J.B, Q(12), and ARCH(6) are the empirical statistics of the Jarque-Bera test for normality, the Ljung-Box test for serial correlation of order 12, and the Engle (1982) test for conditional heteroscedasticity. $^{+++}$ indicate that the null hypothesis of normality, no autocorrelation and no ARCH effect is rejected at the 1% levels respectively.

Table 5 report the obtained results as well as the basic integration measure statistics estimated. Overall, the results confirm the identification of driving factors for integration as its dynamics is significantly explained by the selected variables whatever the market.

Table 5: Dynamics of Regional Integration

Panel A – Determinants of Market Integration	**Constant**	**LMOP**	**DLSM**
	0.108^{***}	0.166^{***}	0.258^{***}
	(0.087)	(0.022)	(0.034)
Panel B –Levels of market integration	**Θ mean**	**Θ max**	**Θ min**
	0.864^{***}	0.998	0.578
	(0.081)		

Notes: This table shows the estimation results of the system (3) using the degree of trade openness and the level of stock market development as determinants of financial integration. The numbers in parentheses are standard deviations. ***indicate significance at the 1% rate.

Australia experienced increases in the degree of integration, which reached levels below 99% over certain sub-periods and has become very important in the study area from the last years. Petri (1993) finds that the effects of geographical proximity are not significant in the Asian region, indicating that the strategy of developing Asian countries turned to the conquest of foreign markets. These results are verified by Frankel et *al.* (1999), and Guesmi (2012), and show that intra-regional trade integration in Asia is more influenced by the rapid growth of the country by a genuine commitment to economic integration. Moreover, there is no obvious indication of intensified regional financial market integration. Nonetheless, this seems to reveal a close correspondence between measures of financial integration, and the extent of the development of financial markets in general. The high-income economies of Australia are fairly highly integrated with regional capital markets. The recent pace of liberalization in ASEAN post-crisis is also intensifying the country's extent of both regional and international financial integration.

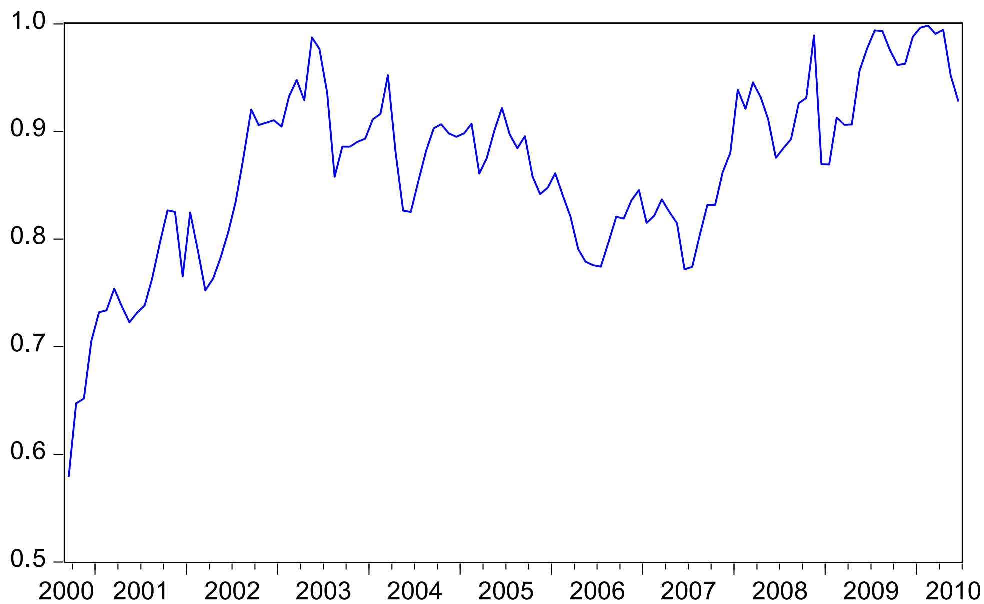

Figure 3: Time-Varying Market Integration

5. CONCLUSION

We developed a conditional ICAPM in the presence of exchange rate risk to study the dynamics of financial integration. Our empirical analysis is conducted on the basis of a nonlinear framework, which relies on the multivariate DCC-GARCH model. By allowing the prices of risk and the level of market integration to vary through time, we show that Australia experienced decreases in the regional degree of integration, which reached levels below 99% over certain sub-periods.

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REFERENCES

1. Adler, M., Dumas, B., 1983. International portfolio selection and corporation finance: A synthesis. *Journal of Finance 38*, 925-984.
2. Arouri, M., Nguyen, D.K., Pukthuanthong, K., 2012. An international CAPM for partially integrated markets: Theory and empirical evidence. *Journal of Banking and Finance 36*, 2473-2493.
3. Bhattacharya, U., Daouk, H., 2002. The world price of insider trading. *Journal of Finance 57*, 75-108.
4. Bekaert, G., Harvey, C.R., 1995. Time-varying world market integration. *Journal of Finance 50*, 403-444.
5. Black, F., 1974. International capital market equilibrium with investment barriers. *Journal of Financial Economics 1*, 337ñ352.
6. Carrieri, F., Errunza, V., Hogan, K., 2007. Characterizing world market integration through time. *Journal of Financial and Quantitative Analysis*, *42*, 915-940.
7. Choudhry, T. Lin, L. and Peng, K., 2007, Common stochastic trends among Far East stock prices: Effects of the Asian financial crisis, *International Review of Financial Analysis*, *16*, 242-261.
8. Cooper, I. A., and Kaplanis E., 2000. Partially segmented international capital markets and international capital budgeting. *Journal of International Money and Finance*, *19*, 309-329.
9. Engle, R., 1982. Autoregressive conditional heteroskedasticity with estimates of the variance of U.K Inflation. *Econometrica*, *50*, 987-1008.
10. Engle, R., 2002. Dynamic conditional correlation: A simple class of multivariate GARCH models. *Journal of Business and Economic Statistics*, *20*, 339-350.
11. Errunza, V., Losq E., and Padmanabhan P., 1992. Tests of integration, mild segmentation and segmentation hypotheses. *Journal of Banking and Finance*, *16*, 949-972.
12. Freudenberg, M., Fontagne, L., Peridy, N., 1998. Commerce international et structures de marché : une vérification empirique. *Économie et Prévision*, *135*, 147-167.
13. Guesmi, K., Nguyen, D.K., 2011. How strong is the global integration of emerging market regions? An empirical assessment. *Economic Modelling*, *28*, 2517-2527.
14. Guesmi, K., 2012. Characterizing South-East Asian Stock Market Integration through Time, *International Journal of Business*, *17*(1), 100-112.
15. Guesmi, K., Teulon, F., Arouri, M., Moisseron, J.I, 2013. Integration in Middle East stock markets: determinants, effects and evolutions, *Journal of Applied Business Research*, *26*(5), Forthcoming.
16. Hardouvelis, G.A., Malliaropulos, D., Priestley, R., 2006. EMU and European stock market integration. *Journal of Business*, *79*, 365-373.
17. Hibou, B., 1997. La Grèce dans l'Europe: le révélateur budgétaire. *Cahiers d'Etude sur la Méditerranée Orientale et le monde Turko-Iranien*, *23*, 12-18.
18. Hodrick, R., Prescott, E., 1997. Post war US business cycles: A descriptive empirical investigation. *Journal of Money*, *Credit and Banking*, *29*(1), 1-16.
19. Petri, P.A., 2006. Is East Asia becoming more interdependent? *Journal of Asian Economics 17*, 381-394.
20. Rezai, S., 2007. Breaking Out: The Dynamics of Immigrant Owned Businesses. *Journal of Social Sciences*, *3*, 94-105.
21. Stulz, R. M., 1981. A model of international asset pricing. *Journal of Financial Economics*, *9*, 383-406.
22. Tai, C-S., 2007. Market integration and contagion: Evidence from Asian emerging stock and foreign exchange markets. *Emerging Markets Review*, *8*, 264-283.

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