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Can the exchange rate, inflation and domestic risk factors be overlooked in international asset pricing?

Mª Begoña Font Belaire*

Abstract

This paper analyses the economic relevance of several factors on asset pricing in the international stock market over the last thirty years for twenty-two countries of different economic regions. We reject the hypothesis of financial integration. Moreover, exchange rate and inflation risks are significantly priced for the EMU previous years while only exchange rate risk premiums are significant in the post-euro period. Besides, market, inflation and exchange premias are less important after the adoption of euro whereas domestic risk premias for regions are more important than before. Furthermore, the causality and time-variation of the prices of these risks drives the predictable variation of returns.

Keywords: International asset-pricing models; Exchange rate risk; Inflation risk; Domestic risk; Time-varying beta risks and risk premiums; European Union.

JEL classification: F36, G12, G15.

Resumen

Este trabajo estudia la relevancia económica de un amplio grupo de factores en la valoración de activos en el mercado internacional de capitales durante estos últimos treinta años para veintidós países de varias regiones económicas. Nuestros resultados pueden resumirse de la siguiente manera. Rechazamos la hipótesis de integración financiera. Las primas asociadas a los factores de riesgo de tipo de cambio y de inflación son significativas para los años previos a la UME mientras que sólo las primas asociadas al tipo de cambio son significativas en los años posteriores a la adopción del euro. Además, mientras que las primas económicas asociadas al mercado, la inflación y tipo de cambio son menores en el periodo post-euro, las primas económicas asociadas al riesgo doméstico son más relevantes que con anterioridad. Más aún, nuestros resultados indican que la causalidad y variación temporal de los precios de estos riesgos explican la variación predecible de los rendimientos.

Palabras clave: Modelos de valoración internacionales; Riesgo asociado al tipo de cambio; Riesgo asociado a la inflación; Riesgo doméstico; Variación temporal de los riesgos beta y primas al riesgo; Unión Europea.

Clasificación JEL: F36, G12, G15.

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1. INTRODUCTION

The widely known benefits of international portfolio diversification and the every day more open financial markets to foreign investors favour the allocation of an important portion of investors' portfolio holdings in foreign assets. To manage the risk of international portfolios, investors need to know the risk factors that explain the expected returns on risky assets. Moreover, the analysis of sources of risk motivates the investigation of three related questions. First, it is important to determine whether each risk is a priced factor in international financial markets. Second, if this risk is priced, it becomes important to measure the economic compensation that investors can expect for assuming such risk. Third, the investors need to know the effects of the changes in every significant price of risk on the variation of their total economic risk premium. Obviously, the answers to these questions have direct implications for portfolio international management.

Several studies have documented that exchange rate and the international market factors are important determinants of asset returns (see, e.g., Dumas and Solnik (1995), De Santis and Gerard (1998) and Zhang (2006) among others). There is also evidence that the inflation risk per se can also explain a significant part of the expected returns (see, e.g., Vassalou (2000) and Font and Grau (2010)). However, these papers consider financial markets that are assumed international perfect (e.g. the largest equity markets in the world or the financial markets of the euro zone) and thus, they nearly ignore that domestic risk factors can also contribute to explain the asset returns significantly and the omission of these factors can cause a misleading measure of the economic risk premium attributed to a recognized source of risk. This paper contributes to this literature by testing for the presence of exchange rate, inflation and domestic risk premiums in the cross-section of asset returns, measuring their economic risk impact on predictable returns, and analyzing the asset-pricing mechanisms of market that causes the future economic risk premium of a given source of risk. The study uses the total returns of 72 sorted B/M ratio portfolios from 22 markets of four different economic regions, namely the North America region, the Asia Pacific region, the Euro area and the out-of-Euro area.

The analysis, taking the perspective of a U.S. investor, is addressed in a conditional setting using the Adler and Dumas (1983) asset-pricing model in the overparametrized version proposed by Vassalou (2000) and the "nationalized" version (see, e.g., Stehle (1977)) of the same. Hence, we can examine the effect of exchange rate, inflation and domestic risks, the effect of the European Monetary Union (EMU), and the differences across countries on our predictions of the portfolio returns. Our findings reveal that both inflation and exchange rate risks are significantly priced. The premiums for region-domestic risks are significant, i.e. the international market is less than a perfectly integrated market. Moreover, the adoption of euro (on 1 January 1999) marks a structural change in the prices of risks, the inflation risks left to be significantly priced, and there is a diminution in the economic risks (premias) associated to market, exchange rate and inflation risk factors combined with a large increase in the economic risks associated to region-domestic risk factors. Finally, we find that the joint time-variation of market, inflation and exchange rate premiums explains a large proportion of the forecast variation of region-domestic risk premiums, and thus it causes significant domestic risk premias.

The rest of the paper is organized as follows. Section 2 reviews the literature and empirical evidences on international asset-pricing models. Section 3 outlines the methodology. Section 4 describes the data. Section 5 discusses the empirical results and Section 6 concludes the paper with a summary.

2. INTERNATIONAL ASSET-PRICING MODELS: A BRIEF REVIEW

Over the last fifty years, stock markets have become more open to foreign investors and a vast literature looks at the effects of this liberalization on asset prices (see e.g., the reviews of Solnik (1977), Stulz (1995) and Karolyi and Stulz (2003)). The purpose of this Section is to describe the main international asset-pricing models and empirical results which motivate our study.

In a world with identical investment-opportunity sets but different consumption-opportunity sets across countries[1], Adler and Dumas (1983) provide a general asset-pricing model where the expected excess returns of risky assets are linear functions of their betas with respect to the international market portfolio and the inflation (or, under some assumptions, exchange rate) risk factors. The Adler and Dumas (AD) model assumes that investors of K+1 countries have potentially different consumption preferences and hence they measure inflation by different price indices, there are N risky assets of which the first n=N-K are stock securities and the remainder K are nominal bank deposits denominated in the K currencies (i.e., they are nominally risky when they are expressed in terms of the reference currency), and the K+1st security is a bank deposit denominated in units of the reference country (i.e., it is nominally riskless). In equilibrium, an investor of a country k holds a combination of the international market portfolio and an inflation portfolio that hedges against the inflation of his country, and the expected excess return of asset j (over the risk-free interest rate denominated in units of the reference country) obeys the following equation:

$$E(r_j) = \gamma_0 + \gamma^m \beta_j^m + \sum_{k=1}^{K+1} \gamma_k^\pi \beta_{jk}^\pi \qquad [1]$$

Where; $E(r_j)$ is the expected excess of asset j; γ^m is the expected excess return of the international market portfolio (market risk premium); β_j^m is the regression beta of asset j with the excess return on the international market portfolio; γ_k^π is the expected excess return of a portfolio that is as highly correlated as possible with the inflation rate in country k (inflation risk premium of country k); and β_{jk}^π is the regression beta of asset j with the inflation of country k. The AD model implies $\gamma_0 = 0$, $\gamma^m = E(r^m) - \gamma_0$ and $\gamma_k^\pi = E(i_k) - \gamma_0$ where r^m denotes the excess of the international market portfolio and i_k the inflation rate of country k. However, the Eq. [1] including γ_0 also supports, in the case of $\gamma_0 \neq 0$, a Black (1972)-type version of the AD model where the return of the zero-beta portfolio should be equal to the risk-free rate plus γ_0.

The AD model collapses into the model presented by Solnik (1974) and revised by Sercu (1980) (the S-S model as we will call it) on the assumptions that there is an asset for each country whose price is constant in the currency of that country, there are as many assets as there are countries and investors consume only the asset that has zero inflation in their country or whose inflation is no stochastic. In this case, an investor of country k holds a combination of the international market portfolio and the bond of his country, and the expected excess returns of risky

[1] The consumption opportunity sets differs across countries when the relative prices of goods depend on where they are located and/or there are differences between the existing goods in each country and/or there are differences in tastes that determine a different basket of goods. Whereas investment-opportunity sets differs across countries when the barriers to the investment drives a wedge between returns on assets for residents and for nonresidents.

assets are linear functions of their betas with respect to the international market and exchange rate risk factors. Similarly, the AD model collapses into the model derived by Grauer, Litzenberger and Stehle (1976) (namely it GLS model) when we assume that inflation is stochastic but the consumption opportunity sets across countries are identical, and into the international capital asset-pricing model (ICAPM) when we assume identical consumption-opportunity sets across countries and zero or no stochastic inflation or when investors have logarithmic utility (see e.g., Adler and Dumas (1983) and Stulz (1995)). In the former, the expected excess return of risky assets are linear functions of their betas with respect to the international market portfolio and the reference-country inflation risk factor, and in the latter they are linear functions of their beta with respect to the international market portfolio.

The AD model allows us to test for the pricing of inflation risk, but not the relative importance of exchange rate and inflation risks because, in the model, the former is embedded in the latter. Therefore, Vassalou (2000) proposes a 'nested' version of AD, S-S and GLS models into one specification, overparameterizing the AD model (we call it AD-V model) in the following manner[2]:

$$E(r_j) = \gamma_0 + \gamma^m \beta_j^m + \sum_{k=1}^{K+1} \gamma_k^\pi \beta_{jk}^\pi + \sum_{k=1}^{K} \gamma_k^f \beta_{jk}^f \qquad [2]$$

Where; the inflation terms are stated in the currency of the reference country K+1; γ_k^f is the expected excess return (exchange risk premium of country k) of a portfolio which is as highly correlated as possible with the return of bond of country k expressed in the reference currency (i.e. the exchange rate between currency k and the reference currency K+1); and β_{jk}^f is the regression beta of asset j with the exchange rate between currencies k and K+1.

All these models in its traditional static specifications assume that the first and second moments are constant and, consequently, the investment opportunity sets are identical across countries. Nevertheless, Merton (1973) shows that in an intertemporal model investors need to hedge against changes in the investment opportunity set. Hence, the assumption of a stochastic investment opportunity set can be introduced easily in the previous models assuming that they are satisfied in a conditional form (i.e., that their first and second moments are the result of the available information).

2.1. THE HYPOTHESIS OF FINANCIAL INTEGRATION

However, all previous models assume stock markets perfectly integrated. This hypothesis is accepted implicitly in the ICAPM and GLS formulations because for these models, the purchasing power parity holds, and in the S-S model because the risk associated with the currency can be perfectly hedged[3]. In addition, this hypothesis is also assumed (explicitly) in the AD model and AD-V models because in an international setting these models are estimated taking the same value of risk premium across countries. Thus, using these models, we can measure the impact of international market, inflation and exchange rate risks on pricing but we cannot measure the risk due to invest internationally in several different financial markets not necessarily perfectly integrated.

[2] The AD-V model does not reduce to the AD model when the price of exchange rate risk is zero because, in the AD-V model, the inflation terms are stated in the reference currency rather than in the local currency.
[3] See the section VII of Adler and Dumas's (1983) paper and specially footnote number 86.

To measure these risks due to lack of integration we suggest, as in Solnik (1974) and Stehle (1977)'s papers[4], estimate and test a "nationalized" version of the considered asset-pricing model. In a perfectly integrated market, the country indices are diversifiable. Therefore to investigate if the market is integrated or not, and measure the effect of this possible lack of integration in the pricing of equities, we can test if the domestic risk associated to the local market portfolios is significantly priced, and if it is, quantify the economic impact associated to this domestic risk. Assuming, e.g., the AD-V model, we will estimate and test the "nationalized" AD-V model stated as follows:

$$E(r_j) = \gamma_0 + \gamma^m \beta_j^m + \gamma^d \beta_{jk}^d + \sum_{k=1}^{K+1} \gamma_k^\pi \beta_{jk}^\pi + \sum_{k=1}^{K} \gamma_k^f \beta_{jk}^f \quad [3]$$

Where; the domestic factor is the index of the residuals obtained from the projection of the excess returns of the market portfolio of each country k (r^k) on the excess returns of the international market portfolio (r^m) through the regression: $r^k = \alpha_k^{dm} + \beta_k^{dm} r^m + e_k$, $k = 1,..., K+1$; γ^d is the expected return of the orthogonal domestic factor (domestic risk premium); and β_{jk}^d is the regression beta of asset j with the orthogonal domestic factor. Thus, γ^d can be interpreted as the expected compensation for a risk, which is domestically but not internationally diversifiable.

2.2. EMPIRICAL EVIDENCE

How well do these international asset-pricing models perform? The early empirical studies of international asset-pricing models provide unconditional tests of the ICAPM model with monthly returns on national stock indices testing both the ICAPM model and the assumed hypothesis of financial integration. The results are rather weak, probably due to the lack of integration and the static approach (see e.g., Solnik (1974), Stehle (1977), Jorion and Schwartz (1986) and Mittoo (1992)).

Nowadays with the increase in integration of international financial markets, recent studies investigating international asset in a conditional setting give more support to the ICAPM, S-S and AD models. De Santis and Gerard (1997) with monthly dollar-denominated returns on stock indices for the G7 countries (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States) and Switzerland in the 1970-94 period find that the international market risk is equally priced across countries, the price of country-specific risk is not different from zero and the international market premium is highly significant. Using monthly returns on stock index for Germany, the United Kingdom, Japan and the United States, Dumas and Solnik (1995) in the 1970-91 period and De Santis and Gerard (1998) in 1973-94 period give strong support to the S-S model. Additionally, Dahlquist and Sällström (2002) and Zhang (2006), considering portfolios constructed using various stock characteristics and comparing the conditional performance of the ICAPM, S-S and the two factor (market and HML) Fama and French (1998)'s models, conclude that the S-S model is the best asset-pricing model.

Finally, Vassalou (2000) with eight portfolios for country constructed from the stock returns of 10 countries (Australia, Canada, France, Italy, Switzerland, the Netherlands, Japan, Germany, the United Kingdom and the United States) in an unconditional setting find that exchange rate and foreign inflation risks are significantly priced. And Font and Grau (2010), using country, sector and size and B/M ratio portfolios constructed from the stock returns of the Euro Zone countries (Austria, Belgium-Luxemburg, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal,

[4] Other papers applying this methodology are Jorion and Schwartz (1986), Mittoo (1992) and, recently, Font and Grau (2010).

and Spain) and the United Kingdom (reference country), conclude that the UK and excluding-UK risk premium are significant, quantify the premias associated a these risks, and show how the inflation risk premiums also affect the degree of financial integration of European stock markets.

However, most academic research on portfolio choice and asset pricing focuses only on local factors when investigating the determinants of portfolio choice and expected returns on risky assets. In our opinion, the case of ignoring international determinants of stock risk premiums has no basis in a day by day global world, but we cannot either ignore that the financial markets are not internationally perfect. The papers of Dumas and Solnik (1995), De Santis and Gerard (1997, 1998), Dahlquist and Sällström (2002) and Zhang (2006) do not investigate whether the inflation risk is per se significantly priced when the factor inflation is a crucial topic in portfolio management (see, for instance, Estep and Hanson (1980)). Whereas, Vassalou (2000) documents that exchange and inflation factors are important determinants of asset returns. In reference to the hypothesis of integration, De Santis and Gerard (1997) investigate whether the international market risk is equally priced across countries, and Vassalou (2000) estimates different premiums for country. However, none of them measures the impact of a domestic risk not internationally diversifiable. With all due respect, exchange, inflation and domestic risks must be jointly investigated as international determinants of asset prices. Up to I know Font and Grau (2010) is the only paper that makes an attempt to analyse this factors together despite it is limited to Euro zone plus the UK stock markets.

This paper is different from the others because it analyzes exchange, inflation and domestic risks as international determinants of asset prices, measures the economic impact of these sources of risk, and makes an attempt to discover the asset-pricing mechanisms of the market that causes the future economic risk premiums and have relevant implications in portfolio management.

3. METHODOLOGY

The aims of this Section are to describe the two conditional versions of the AD-V model analyzed in this paper and outline our econometric approach and methodology.

3.1. ASSET-PRICING MODELS AND ECONOMETRIC APPROACHES

To make our main analysis we consider the conditional AD-V model with US as reference country, applying Vassalou (2000)'s purposes for reducing the dimensionality in exchange rate factors and modelling foreign inflation risks.

Specifically, to reduce the dimensionality of exchange rates (see Vassalou (2000) for more details), we combine the information of K changes in exchange rates in two indices. The common component index (r^{λ}), which measures movements that tend to be common across all exchange rates and the residual exchange rate index (r^{e}), which aggregate the fluctuations that are specific to the individual exchange rate. The procedure is as follows. We project the changes in exchange rates in each one of the K countries on the remaining K-1 exchange rates through the following regressions for k=1, …, K:

$$r_k^f = \delta_{0k} + \sum_{j \neq k} \delta_{jl} r_j^f + e_k \qquad [4]$$

Where; r_j^f is the logarithmic change in exchange rate expressed in US dollars between the currency j and the US currency, j=1,…,K. Thus, the residual e_k represent the component of r_k^f that is not explained by the changes in the remaining exchange rates, i.e. their residual component;

$t_k = r_k^f - \delta_{0k} - e_k$ is the common (or systematic) component of the K exchange rates; and $n_k = t_k - \bar{t}$ is the deviation of the common component of the K exchange rates from its mean. We then construct two equally weighted indices corresponding to the two sets of residuals: the common exchange rate factor defined by $r^\lambda = \frac{1}{K}\sum_{k=1}^{K} n_k$ that describes the average common component shared by changes in the same exchange rates, and the residual exchange factor defined by $r^e = \frac{1}{K}\sum_{k=1}^{K} e_k$ i.e. the average residual component of changes in all exchange rates.

Similarly, to model inflation we consider the US inflation factor (r^i) that measures the US inflation uncertainty, and the excluding-US inflation (r^D) that measures the inflation uncertainty that is unrelated to US inflation. To calculate these factors: first, we filter the inflation rate series (US dollar-denominated) using an ARIMA(0,1,1) model, we denote these series by i_k, k=1,…, K+1. Second, we make the US inflation factor equal to the innovations of the US inflation rate series, i.e. $r^i = i_{K+1}$. Third, we construct the GDP weighted index[5] of other than the US inflation rates, i^g, from the innovations of the inflation rate series of all sample countries, i.e. $i^g = \sum_{k=1}^{K} \varphi_k i_k$, where φ_k is a GDP weight that proxy national wealth weights. Finally, since we are interested in the pricing of the international inflation that is residual to the US inflation risk, we render the two series orthogonal to each other projecting the GDP weighted index of other than the US inflation rates on the US inflation factor:

$$i^g = \nu_0 + \nu_1 i_{K+1} + \nu \qquad [5]$$

And taking the excluding-US inflation as the residuals of this projection, i.e. $r^D = \nu$.

In addition, to approximate the international market portfolio, we use the EAFE weighted index[6] of the country index portfolios. Finally, to estimate the conditional international AD-V model we use the scaling procedure[7] proposed by Cochrane (1996) with two instrumentals variables: the dividend yield (div) and the US term spread (term). Both instrumental variables are chosen for their capacity to predict the evolution of economic cycle in the long-medium and short term[8].

Based on the conditional approach followed in this paper the conditional international AD-V model in its marginal version becomes:

$$\begin{aligned} E(r_j) = {} & \gamma_0 + \gamma^m \beta_j^m + \gamma^i \beta_j^i + \gamma^D \beta_j^D + \gamma^\lambda \beta_j^\lambda + \gamma^e \beta_j^e + \gamma^{m\cdot div} \beta_j^{m\cdot div} + \gamma^{i\cdot div} \beta_j^{i\cdot div} + \gamma^{D\cdot div} \beta_j^{D\cdot div} \\ & + \gamma^{\lambda\cdot div} \beta_j^{\lambda\cdot div} + \gamma^{e\cdot div} \beta_j^{e\cdot div} + \gamma^{m\cdot term} \beta_j^{m\cdot term} + \gamma^{i\cdot term} \beta_j^{i\cdot term} + \gamma^{D\cdot term} \beta_j^{D\cdot term} \\ & + \gamma^{\lambda\cdot term} \beta_j^{\lambda\cdot term} + \gamma^{e\cdot term} \beta_j^{e\cdot term} + \gamma^{div} \beta_j^{div} + \gamma^{term} \beta_j^{term} \end{aligned} \qquad [6]$$

[5] The AD model motivates the weighting scheme employed. See footnote 6 of Vassalou's (2000) paper.
[6] The EAFE weights are computed by Morgan Stanley Capital International (MSCI) for the construction of several global and regional composite indices. The MSCI data set has been widely used in previous work.
[7] Whereas in the scaling procedure the dynamics are added on the discount factors of the basic pricing equation in the alternative solution, proposed by Dumas and Solnik (1995), the dynamics are added on the risk premiums directly.
[8] See e.g., Fama and French (1988, 89), Cochrane (1996) and Ferson and Harvey (1991, 99).

Where; $E(r_j)$ is the expected excess of asset j US dollar-denominated; γ^F, F= m, i, D, λ, e are the risk premiums associate with the international market, US inflation, excluding-US inflation, common exchange rate and residual exchange rate risk factors respectively; β_j^F, F= m, i, D, λ, e are the beta risks of asset j with the international market, US inflation, excluding-US inflation, common exchange rate and residual exchange rate risk factors respectively; $\gamma^{F\cdot I}$ and $\beta_j^{F\cdot I}$, F= m, i, D, λ, e, I=div, term have the same interpretation but referred to the cross effects of each risk factor with the economic cycle (predicted by the two instrumental variables lagged one-month); and γ^I and β_j^I I=div, term are the risk premiums and beta risks associated with the economic cycle.

Moreover, to investigate the hypothesis of financial integration, we also analyse a "nationalized" version of the previous conditional international asset-pricing model in which we distinguish four region-specific and region-domestic risks, namely the Asia Pacific, North America, Euro area and out-of-Euro area regions. The conditional "nationalized" AD-V model in its marginal version can be written as:

$$\begin{aligned}E(r_j) = {} & \gamma_0^j + \gamma^m\beta_j^m + \gamma^i\beta_j^i + \gamma^D\beta_j^D + \gamma^\lambda\beta_j^\lambda + \gamma^e\beta_j^e + \gamma_{ap}^d\beta_{j,ap}^d + \gamma_{na}^d\beta_{j,na}^d + \gamma_{ea}^d\beta_{j,ea}^d + \gamma_{oea}^d\beta_{j,oea}^d \\ & + \gamma^{m\cdot div}\beta_j^{m\cdot div} + \gamma^{i\cdot div}\beta_j^{i\cdot div} + \gamma^{D\cdot div}\beta_j^{D\cdot div} + \gamma^{\lambda\cdot div}\beta_j^{\lambda\cdot div} + \gamma^{e\cdot div}\beta_j^{e\cdot div} + \gamma_{ap}^{d\cdot div}\beta_{j,ap}^{d\cdot div} + \gamma_{na}^{d\cdot div}\beta_{j,na}^{d\cdot div} \\ & + \gamma_{ea}^{d\cdot div}\beta_{j,ea}^{d\cdot div} + \gamma_{oea}^{d\cdot div}\beta_{j,oea}^{d\cdot div} + \gamma^{m\cdot term}\beta_j^{m\cdot term} + \gamma^{i\cdot term}\beta_j^{i\cdot term} + \gamma^{D\cdot term}\beta_j^{D\cdot term} + \gamma^{\lambda\cdot term}\beta_j^{\lambda\cdot term} \\ & + \gamma^{e\cdot term}\beta_j^{e\cdot term} + \gamma_{ap}^{d\cdot term}\beta_{j,ap}^{d\cdot term} + \gamma_{na}^{d\cdot term}\beta_{j,na}^{d\cdot term} + \gamma_{ea}^{d\cdot term}\beta_{j,ea}^{d\cdot term} + \gamma_{oea}^{d\cdot term}\beta_{j,oea}^{d\cdot term} + \gamma^{div}\beta_j^{div} + \gamma^{term}\beta_j^{term}\end{aligned} \quad [7]$$

Where; γ_0^j is the region-specific risk of the asset j for belonging to its economic region; each region-domestic risk factor is the EAFE weighted index of the residuals obtained from the projection of the excess returns of the market index of the countries which belong to the economic region on the excess returns of the international portfolio; γ_{region}^d, region=ap (Asia Pacific), na (North America), ea (Euro area), oea (out-of-Euro area) is the risk premium associate with the region-domestic risk factor; $\beta_{j,region}^d$, region=ap, na, ea, oea is the beta risks of asset j with the region-domestic factor; and $\gamma_{region}^{d\cdot I}$ and $\beta_{j,region}^{d\cdot I}$, I=div, term have the same interpretation but referred to the cross effects of each region-domestic risk factor with the economic cycle.

3.2. ESTIMATION AND TESTING PROCEDURES

To estimate these models we use monthly dollar-denominated total returns and a version of the two-stage procedure proposed by Fama and MacBeth (1973). This classic methodology offers some appealing features for this study. Particularly, this method generates the series of conditional betas and risk premiums associated to each factor of risk[9] and it allows the analysis of the reward for each source of risk as the result of time-varying economic conditions.

The applied estimation procedure could be explained as follows. In the first step we obtain the series of conditional betas associated to each risk factor regressing, using the ordinary least squares (OLS) method, the excess returns on the risk factor and the two cross-risk factors for the time series of months t–48 to t–1. The slope coefficients in the time-series regressions provide the conditional beta given the information available at month t–1. The second step is to estimate the corresponding

[9] This was the method used by Ferson and Harvey (1991, 99) to construct the series of conditional betas and risk premiums.

cross-sectional regression for each month of the excess returns on the estimated betas. These cross-sectional regressions, which provide the conditional series of risk premiums given the information available at month t–1, are estimated, also using the lineal square method (LS), from the excess returns and estimated conditional beta risks of months t–47 to t. Finally, the risk premiums for the whole period, and pre- and post-euro periods are jointly estimated applying the seemingly unrelated regression (SUR) method, iterating on the weighting matrix and coefficient vector simultaneously, from the conditional risk premium series regressing them on a constant for the whole period, or on two dummies variables for the pre- and post-euro periods. From the results of this last estimation, we also obtain the T-statistics of each parameter to test if the own market, inflation, currency, and (if it proceeds) region-domestic and their cross-effects with instrumentals are significantly priced, and the Wald test statistics to evaluate the joint hypothesis over prices for the market, inflation, currency, and (if it proceeds) region-domestic risks.

The analysis of the results of estimation is completed with the estimation of the economic premium (or premia) associated to each source of risk for the whole and the pre- and post-euro periods, and the statistical analysis of the dynamics of their components. Specifically, to estimate the premias we follow the method proposed by De Santis, Gerard and Hillion (2003) decomposing the estimated (or predictable) excess total returns of each asset (see Eq. [6] and [7]) in the following parts:

Market premia:	$\gamma^{m}\beta_{j}^{m} + \gamma^{m\cdot div}\beta_{j}^{m\cdot div} + \gamma^{m\cdot term}\beta_{j}^{m\cdot term}$
US-inflation premia:	$\gamma^{i}\beta_{jk}^{i} + \gamma^{i\cdot div}\beta_{jk}^{i\cdot div} + \gamma^{i\cdot term}\beta_{jk}^{i\cdot term}$
Excluding-US inflation premia:	$\gamma^{D}\beta_{jk}^{D} + \gamma^{D\cdot div}\beta_{jk}^{D\cdot div} + \gamma^{D\cdot term}\beta_{jk}^{D\cdot term}$
Common exchange rate premia:	$\gamma^{\lambda}\beta_{jk}^{\lambda} + \gamma^{\lambda\cdot div}\beta_{jk}^{\lambda\cdot div} + \gamma^{\lambda\cdot term}\beta_{jk}^{\lambda\cdot term}$
Residual exchange rate premia:	$\gamma^{e}\beta_{jk}^{e} + \gamma^{e\cdot div}\beta_{jk}^{e\cdot div} + \gamma^{e\cdot term}\beta_{jk}^{e\cdot term}$
Region-domestic premias (if it proceeds):	$\gamma_{region}^{d}\beta_{j,region}^{d} + \gamma_{region}^{d\cdot div}\beta_{j,region}^{d\cdot div} + \gamma_{region}^{d\cdot term}\beta_{j,region}^{d\cdot term}$, region=ap, na, ea, oea
Rest of premias (/if it proceeds):	$\gamma_{0}(/\,\gamma_{0}^{ap} + \gamma_{0}^{na} + \gamma_{0}^{ea} + \gamma_{0}^{oea}) + \gamma^{div}\beta_{j}^{div} + \gamma^{term}\beta_{j}^{term}$

We compute each part using the conditional series of beta risks and gamma risk premiums obtained from the first and second stage of Fama and MacBeth's (1973) estimation of the asset-pricing model respectively. Finally, we get the average and standard errors for the whole period from the estimation, using SUR, of the system of each premia on a constant. Similarly, the average and standard errors for the pre- and post-euro periods are obtained from the estimation, using SUR, of the system of each premia on two dummies variables for the pre- and post-euro periods.

4. DATA

Our study uses monthly dollar-denominated total returns (in percentage) on 73 sorted-B/M ratio portfolios from 22 countries, namely Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Malaysia, the Netherlands, New Zealand, Norway, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States. All the return data are downloaded from Kenneth R. French Data Library[10]. Data for US consist of the ten deciles portfolios obtained sorting US firms (firms with negative book equity excluded) into B/M ratio in descending order extracted from "portfolio formed on book-to-market" file. Data for the rest of countries consist of three sorted-B/M ratio portfolios also in descending order top 30%, middle 40% and bottom 30% B/M ratio. The top 30% and bottom 30% B/M ratio portfolios are extracted directly from "country portfolios formed on B/M, E/P, CE/P and D/P" file, and the returns of middle B/M ratio portfolio (r_{middle}) are constructed from the return index (r_{index}) and the returns of top (r_{top}) and bottom (r_{bottom}) B/M ratio portfolios as follows: $r_{middle} = (r_{index} - 0.3r_{top} - 0.3r_{bottom})/0.4$. The sample period is from January 1977 to December 2007, for 372 monthly observations. In the rest, we will consider four economic regions: Asia Pacific (Australia, Hong Kong, Japan, Malaysia New Zealand and Singapore), North America (Canada and the United States), Euro area (Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands and Spain), and out-of-Euro area (Denmark, Norway, Sweden, Switzerland and the United Kingdom). In addition, we will distinguish two periods in the sample: the pre-euro period (from January 1977 to December 1998) and the post-euro one (from January 1999 to December 2007).

In the rest of the paper, all the excess returns are calculated in excess of the one-month Treasury bill rate provided by International Financial Statistics. We proxy the international market portfolio using the "weighted world index portfolio" provided by Kenneth R. French Data Library in the "international index portfolio formed on B/M, E/P, CE/P, and D/P" file. In addition, the region-domestic risk factors are calculated from the country index portfolios provided in the same file and their weights are proportional to their EAFE weights[11].

The currency exchange rates and the gross domestic product (GDP) are obtained from International Financial Statistics. And the inflation risk factors are calculated from the per cent change of consumer prices over previous year facilitated by International Financial Statistics with monthly frequency for every country excepting Australia and New Zeland (quarterly) and Hong Kong (provided by Census Statistics Department of Hong Kong).

Finally, the instrumental variable dividend yield is computed from the series of monthly returns of world index with and without dividend adjustments facilitated by Kenneth R. French Data Library, as described in Fama and French (1988). In addition, the US term spread is calculated from the difference between the one-month 3-year government bond yield and the Treasury bill rate, both extracted from International Financial Statistics. The IPI denotes the Industrial Production Index of the United States; this index, widely used in the literature to measure the economic activity and the state of the economy, is obtained from International Financial Statistics.

[10] http://mba.tuck.darmouth.edu/pages/faculty/ken.french/data_library.html. The methodological notes included in this website provide a detailed description of the data.

[11] The EAFE weights used in the construction of region-domestic index are the ones used to compute the MSCI Standard ACWI Free Index with data as of October 1, 2001. The data were published by MSCI in October 9, 2001.

Figure 1 depicts the average returns and standard deviations of sorted-B/M ratio portfolios and market line for reference. Overall, the summary statistics[12] are consistent with those in the literature, and we reject the hypothesis of normality at 5% level for all the series with the exception of the top 30% and middle 40% B/M ratio Denmark portfolios, the middle 40% B/M ratio Malaysia portfolio, and the bottom 30% B/M ratio New Zealand portfolio. However, the multivariate GARCH model does not seem suitable because of lack of autocorrelations in squared returns of 29 portfolios. In terms of magnitude, the total excess returns are significant at the 5% level and positive for 50 portfolios, which include all of the US returns excepting the 10-decile US portfolio, and all of the Belgium, France, Switzerland and the UK returns (see Figure 1). Besides, if there is a B/M effect, firms with higher B/M ratios should have higher mean returns. The B/M effect is present in Australia, Austria, Hong Kong, Japan, Norway, the United Kingdom, and the United States.

As regards the summary statistics for the risk factors, the hypothesis of normality is also rejected (at the 1% level) for every factor. In terms of magnitude, the market risk factor is significant (at 5% level) and positive and the common exchange rate risk factor is significant at 1% level and negative. Finally, our results confirm the previous literature (see e.g., Fama and French (1988, 89)) related to the capacity of the dividend yield to predict the evolution of economic cycle in the long-medium term (it shows the higher correlations with the log(IPI) from 42 to 62 lags), and the capacity of US term spread to predict it in the short term (it shows the higher correlation with log(IPI) from 1 to 18 lags). Further, we reject at the 1% level the hypothesis of unit root for both variables.

5. EMPIRICAL RESULTS

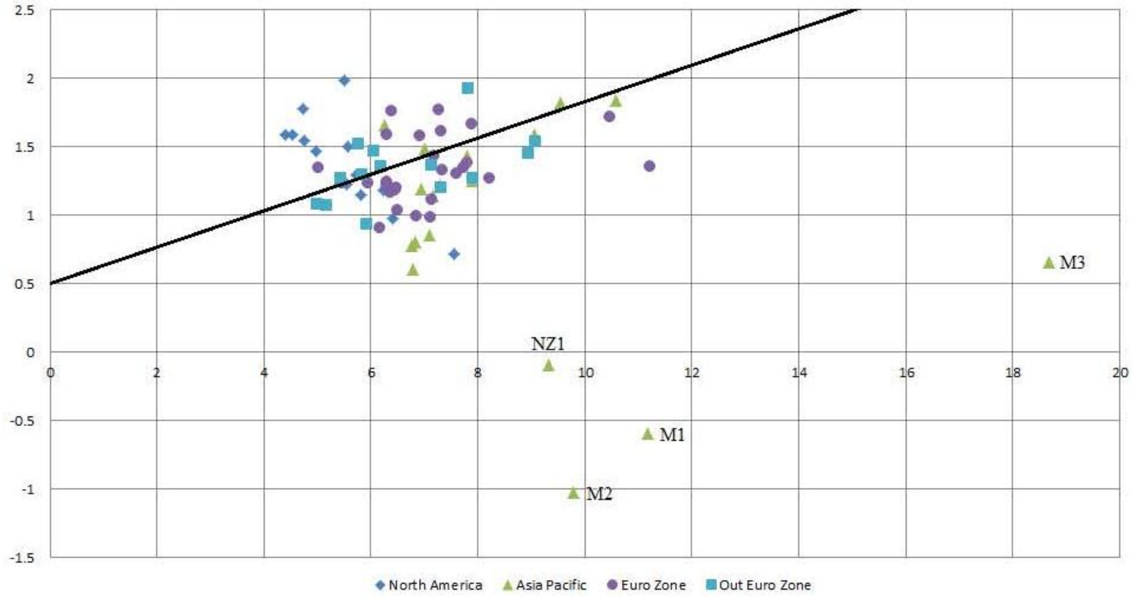
Let us turn to the main aim of this paper; this is to investigate the effects of the market, exchange rate, inflation and region-domestic risk factors on explaining the within-country and cross-country differences in the returns of international equities in the last thirty years. We proceed in three stages. First, we estimate the AD-V model in its econometric approach (see Eq. [6]) for the whole period to provide a joint estimation of the market, currency and inflation risk premiums. Second, having established the significance of these factors in asset pricing, we proceed to measure explicitly the premium associated with each source of risk (namely it, risk premia). Third, we consider the effects of the Economic and Monetary Union (EMU) and the hypothesis of financial integration. To make this analysis we proceed to re-estimate the AD-V model with pre- and post-euro coefficients for testing the possibility of a different pricing of risks between the pre- and post-euro periods and, having established the significant difference between the coefficients of two periods, to estimate the “nationalized” AD-V model (see Eq. [7]) with pre- and post-euro coefficients for analysing both subjects simultaneously. Finally, we re-examine the findings looking at the time-variation of premia and premium series.

5.1. THE PRICE OF MARKET, EXCHANGE RATE AND INFLATION RISKS

Table 1 contains parameter estimates and some specification tests of the AD-V asset-pricing model (see Eq. [6]) for the whole period and distinguishing pre- and post-euro periods. In Panel A, we report the estimated risk premiums[13] and their individual level of significance for the whole period

[12] For reason of space, the summary statistics of sorted-B/M ratio porfolios, factors and instrumental are not reported, but they are available from the author.

[13] It is worth to notice for a better understanding of the results the difference in scale of excluding-US inflation and, specially, residual exchange rate risk factors in relation with the rest of factors of risks. The



M1, M2, M3 denotes the Malaysia top 30%, middle 40% and bottom 30% B/M ratio portfolios respectively, and NZ1 the New Zealand top 30% B/M ratio portfolio.

Figure 1: Sorted-B/M ratio portfolios returns

Panel A: Cross-sectional estimates of the risk premiums for the AD-V model

Panel A.1: Overall

	γ_0	γ^{m}	γ^{i}	γ^{D}	γ^{λ}	γ^{e}	$\gamma^{m\cdot div}$	$\gamma^{i\cdot div}$	$\gamma^{D\cdot div}$	$\gamma^{\lambda\ div}$
Jan 1977-Dec 2007	0.124	-0.437**	-0.121**	0.0695**	-0.0642	1.31E-14**	3.27**	0.195**	0.0186	-2.41**
	$\gamma^{e\ div}$	$\gamma^{m\cdot term}$	$\gamma^{i\cdot term}$	$\gamma^{D\cdot term}$	$\gamma^{\lambda\ term}$	$\gamma^{e\ term}$	γ^{div}	γ^{term}		
Jan 1977-Dec 2007	-2.09E-14^	0.515**	-0.0556**	-0.00884	0.217**	-7.62E-16	-1.33**	-0.0709*		

Panel A.2: Pre- and post-euro periods

	γ_0	γ^{m}	γ^{i}	γ^{D}	γ^{λ}	γ^{e}	$\gamma^{m\cdot div}$	$\gamma^{i\cdot div}$	$\gamma^{D\cdot div}$	$\gamma^{\lambda\ div}$
Jan 1977-Dec 1998	0.0193	-0.576**	-0.141**	0.0975**	-0.0639	8.01E-15**	4.65**	0.242**	0.012	-2.37**
Jan 1999-Dec 2007	0.379*	-0.0982	-0.073*	0.00126	-0.0649	2.57E-14**	-0.118	0.0788	0.0345	-2.52**
	$\gamma^{e\ div}$	$\gamma^{m\cdot term}$	$\gamma^{i\cdot term}$	$\gamma^{D\cdot term}$	$\gamma^{\lambda\ term}$	$\gamma^{e\ term}$	γ^{div}	γ^{term}		
Jan 1977-Dec 1998	3.03E-14*	0.445*	-0.0439**	-0.0131	0.256**	-1.41E-14**	-1.3**	-0.0682*		
Jan 1999-Dec 2007	-1.46E-13**	0.687*	-0.0842**	0.00164	0.12	3.18E-14**	-1.41**	-0.0776		

	γ_0	γ^{m}	γ^{i}	γ^{D}	γ^{λ}	γ^{e}	$\gamma^{m\cdot div}$	$\gamma^{i\cdot div}$	$\gamma^{D\cdot div}$	$\gamma^{\lambda\ div}$
H_0: Are … equal in both periods?	3.36^	3.43^	3.85*	43.5**	3.53E-05	15.10**	4.99*	4.82*	0.586	0.0227
	$\gamma^{e\ div}$	$\gamma^{m\cdot term}$	$\gamma^{i\cdot term}$	$\gamma^{D\cdot term}$	$\gamma^{\lambda\ term}$	$\gamma^{e\ term}$	γ^{div}	γ^{term}	All	
H_0: Are ... equal in both periods?	54.63**	0.4296	2.033	0.637	0.662	59.83**	0.0549	0.0220	581.11**	

Panel B: Specification tests

H_0	Jan 1977-Dec 2007	Jan 1977-Dec 1998	Jan 1999-Dec 2007
$\gamma^{m} = \gamma^{m\cdot div} = \gamma^{m\cdot term} = 0$	90.82**	117.36**	5.65
$\gamma^{i} = \gamma^{i\cdot div} = \gamma^{i\cdot term} = \gamma^{D} = \gamma^{D\cdot div} = \gamma^{D\cdot term} = 0$	265.52**	279.78**	49.87**
$\gamma^{i} = \gamma^{i\cdot div} = \gamma^{i\cdot term} = 0$	118.35**	104.61**	23.85**
$\gamma^{D} = \gamma^{D\cdot div} = \gamma^{D\cdot term} = 0$	102.81**	155.88**	2.04
$\gamma^{\lambda} = \gamma^{\lambda\cdot div} = \gamma^{\lambda\cdot term} = \gamma^{e} = \gamma^{e\cdot div} = \gamma^{e\cdot term} = 0$	241.34**	265.93**	107.75**
$\gamma^{\lambda} = \gamma^{\lambda\cdot div} = \gamma^{\lambda\cdot term} = 0$	57.10**	43.23**	14.56**
$\gamma^{e} = \gamma^{e\cdot div} = \gamma^{e\cdot term} = 0$	74.63**	73.23**	91.59**
$\gamma^{div} = \gamma^{term} = 0$	35.71**	24.01**	11.77**

^ significant at the 10%, * at the 5% and ** at the 1% levels.

Table 1: Cross-sectional estimation of the risk premiums for the AD-V model

(Panel A.1), and the same for pre- and post-euro periods together with the Wald test statistics to analyse whether premiums are individual and jointly equal in both periods (Panel A.2). In Panel B, we show a number of Wald test statistics to evaluate the joint hypothesis on the prices of market, currency and inflation risk risks for the whole period and the pre- and post-euro periods. In addition, Table 2 summarizes the results of the estimated risk premias for the sorted-B/M ratio portfolios in the whole period (Panel A) and the pre- and post-euro periods (Panels B and C) through the number of portfolios with significant (at 5% level) premia and their average and standard deviation premia for premia and economic region.

We start our analysis with the overall results. Consistently with the conditional approach followed in this article, we reject at the 1% level the hypothesis of instrumental risk premiums equal to zero. Besides, the price of market risk is significant (at 1% level) but negative, and we reject (at 1% level) the null hypothesis that the market premium and the prices of cross-effects of market risk factor and both instrumental variables are simultaneously equal to zero. For the prices of exchange rate and inflation risks, we compute two different tests to determine whether both exchange rate/inflation risk premiums are simultaneously equal to zero and, if not, examine the significance of its components. The test results show that exchange rate risk premiums and inflation risk premiums are jointly significant (at the 1% level). Moreover, its components are also jointly significant (at the 1% level). Furthermore, the US inflation, the cross-effects of US inflation, the excluding-US inflation, the cross-effects of common exchange rate and the residual exchange rate risks are significantly (at the 1% level) priced.

These results give us some interesting insights. First, they show that common and residual components of currency risk are significantly priced, and hence, investors were rewarded by the exposure of their currency to US currency (obviously related to the common component of currency risk), and for their exposure to other US-countries currency risks (related to the residual component of currency risk). A conclusion that is consistent with the findings of Dumas and Solnik (1995), De Santis and Gerard (1998), and Zhang (2006) about currency risk significantly priced. Second, investors are significantly rewarded (at the 1% level) for their exposure to US and excluding-US inflation risks. This factor of risk, which has been overlooked in the majority of previous studies (the exceptions are the papers of Vassalou (2000) and Font and Grau (2010)), is highly significant priced. Finally, the test results for sorted-B/M ratio portfolios (not solely for country indices) implies that not only do the currency and inflation risks explain cross-country but also within-country differences in the returns of equities.

Despite the important implications on pricing assets and hedging of significant exchange rate and inflation premiums, the economic impact of this fact is dependent on how much an asset is exposed to these sources of risk. Therefore, we also measure and analyse the economic premium associated with each source of risk (see Panel A in Table 2). By and large and assuming a significant level of 5%, the market, currency and inflation premia[14] are economically significant for 63.01% of sorted-B/M ratio portfolios. Moreover, the results clearly show the differences in risk premia related to the economic region. The market, excluding-US inflation and residual exchange rate premias are significant for all the portfolios of the North America region, and the common exchange rate and US inflation premias are significant for 12 and 9 (of 13) portfolios of the North

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effects of this difference of scale are clearly noticeable in the estimation of residual rate risk premiums and betas.

[14] However, in our opinion, these evidences must be re-analysed (and we will do in the Subsections 5.2 and 5.3) to consider the effects of EMU and the degree of financial integration.

Panel A: Overall (Jan 1977-Dec 2007)

		Market	US-I	EUS-I	Com-E	Res-E	Rest
NA Region	Number	13	9	13	12	13	3
	Average	-4.97	2.13	6.67	-2.6	8.1	4.36
	SD	2.86	0.53	1.74	0.52	2.63	0.87
AP Region	Number	10	16	16	12	8	17
	Average	-9.47	3.41	9.56	-3.64	0.23	9.31
	SD	7.07	5.28	7.42	5.97	7.89	6.24
EA Region	Number	17	18	22	22	16	24
	Average	-4.15	-0.37	7.88	-2.31	3.2	7.29
	SD	4.41	4.66	6.24	4.83	5.55	3.33
OEA Region	Number	12	11	14	10	9	13
	Average	-5.07	-2.07	10.2	-3.91	1.92	6.88
	SD	1.88	4.07	7.78	5.61	6.24	3.29
All	Number	52	54	65	56	46	57
	Average	-5.59	0.82	8.55	-2.94	3.82	7.64
	SD	4.63	4.75	6.34	4.66	6.1	4.43

Panel B: Pre-euro period (Jan 1977-Dec 1998)

		Market	US-I	EUS-I	Com-E	Res-E	Rest
NA Region	Number	13	10	13	9	13	0
	Average	-6.22	2.62	8.58	-1.91	5.77	---
	SD	3.55	0.86	2.21	1.91	1.33	---
AP Region	Number	13	15	15	13	11	10
	Average	-8.98	3.66	14.12	-3.3	3.25	7.99
	SD	9.48	7.86	10.33	8.13	5.09	4.31
EA Region	Number	16	20	23	19	12	15
	Average	-3.72	-1.01	9.65	-2.79	1.25	5.82
	SD	7.46	6.18	9.29	7.02	4.68	2.56
OEA Region	Number	9	8	15	9	6	9
	Average	-6.13	-4.49	12.42	-4.51	3.88	5.64
	SD	3.71	5.95	11.09	6.82	3.26	2.8
All	Number	51	53	66	50	42	34
	Average	-6.12	0.47	11.09	-3.07	3.55	6.41
	SD	6.89	6.63	9.17	6.57	4.14	3.29

Panel C: Post-euro period (Jan 1999-Dec 2007)

		Market	US-I	EUS-I	Com-E	Res-E	Rest
NA Region	Number	3	3	0	9	12	7
	Average	-5.36	1.4	---	-5.2	14.88	8.43
	SD	0.82	3.64	---	1.45	5.66	4.63
AP Region	Number	7	11	5	7	12	15
	Average	-7.06	3.81	5.33	-3.57	-1.06	19.02
	SD	10.85	4.9	2.04	8.48	15.91	12.35
EA Region	Number	8	14	5	9	16	24
	Average	-6.17	1.81	3.36	-4.55	6.87	12.62
	SD	4.86	3.8	0.63	3.99	9.21	4.33
OEA Region	Number	5	7	3	7	10	12
	Average	-6.07	0.63	3.8	-6.24	1.4	13.33
	SD	2	3.36	1.87	4.86	13.8	3.27
All	Number	23	35	13	32	50	58
	Average	-6.31	2.17	4.22	-4.89	5.8	13.92
	SD	6.38	4.1	1.72	4.9	12.69	7.79

Average in percentage per year.

Table 2: Summary of the significant (at the 5% level) economic risk premiums from the AD-V model

America region respectively. Interestingly, for the Asian Pacific and out-of-Euro area regions the more important source of significant premias are the inflation risks, being US inflation and excluding-US inflation premias significant for 16 and 16 (of 18) portfolios of the Asia Pacific region and for 11 and 14 (of 15) portfolios of the out-of-Euro area respectively. In addition, the excluding-US inflation and the common exchange rate premias are significant for 22 (of 27) portfolios of the Euro area.

To summarize our findings about measuring the economic relevance of these risks, we calculate the average and standard deviation of significant premias; the results are as follows. The variation in the significant premias is higher in the Asia Pacific, Euro area and out-of-Euro area portfolios than in the North American portfolios (recall that the US and Canada are traditionally integrated markets). In average, the inflation risk premias and exchange rate risk premias, in both or one of their components, are higher than the market risk premia for all the economic regions. Futhermore, considering the extreme differences, the market risk premia in average is equal to -5.59% on an annual basis whereas the average residual exchange rate risk premia is equal to 8.1% on an annual basis for the North American portfolios. Moreover, the average excluding-US inflation risk premia is equal to 9.56%, 7.88% and 10.2% on annual basis for the Asia Pacific, Euro area and out-of-Euro area portfolios respectively.

It is worthy of notice that our findings confirm the ones of De Santis and Gerard (1998), Carrieri (2001), and De Santis, Gerard and Hillion (2003), in this case for the period between January 1977 and December 2007, about an exchange risk economically significant. In addition, our results also show the significant economic implications of overlooking inflation factors in pricing. Notice that the average excluding-US inflation premia for North America, Asia Pacific, Euro area, and out-of-Euro area portfolios is positive and varies from 6.67% per year for North American portfolios to 10.2% for Asia Pacific portfolios. This means that, contrary to a popular belief, not only domestic inflation may be priced in the equities of a given country, and the omission of these risk factors would have produced, in average, an underestimation of asset returns in this period.

5.2. THE PRE- AND POST-EURO PRICE OF MARKET, EXCHANGE RATE AND INFLATION RISKS

On 1 January 1999, eleven countries of the European Union (Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain) replaced their currencies by the Euro that became the shared currency for every transaction in the monetary and stock markets. On 1 January 2001 Greece joined them and on 1 January 2002 these twelve countries put euro-denominated notes and coins into circulation. These measures were the culmination of an intensive liberalization process to achieve the EMU, and thus they would represent a potential structural change in the prices of risks. We investigate this issue repeating the analysis of previous Subsection distinguishing pre- and post-euro periods. Table 1: Panels A.2 and B, and Table 2: Panels B and C resume the results of this study.

Let us start with the estimation of risk premiums for pre- and post-euro periods. We begin the study analysing if this presumed structural change in the dynamics of risks exists of not, testing whether each risk premium is equal for both periods (see Wald tests in Table 1: Panel A.2). The global Wald test, with a value of 581.11 lead us to reject the hypothesis of equality of risk premiums for both periods at any level of significance. Moreover, the US inflation, excluding-US inflation and residual exchange rate risk premiums, the price of cross-effects with dividend yield of market, US-inflation and residual exchange rate risk, and the price of cross-effects with US term spread of residual exchange rate risk are significantly different (all at 5% level).

Having established the existence of this structural change, we revise our previous finding for the whole period (see Table 1: Panels A.2 and B). As before, consistently with the conditional approach followed in this article, we reject at the 1% level the hypothesis of instrumental risk premiums equal to zero for both periods. In addition, the price of market risk is significant (at 1% level) but negative. For the pre-euro period the market risk is significantly priced (at 1% level) but negative, and we reject (at 1% level) the null hypothesis that the market premium and the prices of cross-effects of market risk factor and both instrumental variables are simultaneously equal to zero. In contrast, for the post-euro period, the market premium is not significant (at 10% level) and we cannot reject (at 10% level) the joint hypothesis. Related to the exchange and inflation risk premiums our tests show that both risk premiums are jointly significant (at the 1% level) for the two periods. Moreover, the common and residual exchange rate risk premium components for both periods, the US inflation and excluding-US inflation risk premium components for pre-euro period, and the US inflation risk premiums component for the post-euro period are also jointly significant (all at 1% level). However, we cannot reject (at 10% level) the hypothesis that excluding-US inflation premiums are simultaneously equal to zero for the post-euro period. Therefore, we can conclude that, after the euro adoption, the inflation risk factor remains significantly priced in some components but it has a more limited impact in asset pricing.

To complete the picture, we re-calculate the risk premia for pre- and post-euro periods (see Table 2: Panels B and C). Overall, the results (all at 5% level) show a reduction in the number of portfolios with significant market, inflation or common exchange rate risk premias combined with a little increase in the number of portfolios (from 42 to 50) with significant residual exchange rate premia for the post-euro period. In addition, we observe an important increase in the number of portfolios (from 34 to 58) with significant rest of premias, which we will attempt to explain this last finding in next Subsection analysing the hypothesis of financial integration. In reference to the economic relevance of these risks, after the euro adoption we also observe a reduction in magnitude and variability of the differences between the significant market, inflation and common exchange risk premias of North American portfolios and the rest of region portfolios. In contrast, we appreciate an increase in the size and variance of residual exchange rate premia for the portfolios of all regions; in particular, the average premia of North American portfolios is equal to 14.88% on annual basis, for the post-euro period. These conclusions are consistent with the findings of Font and Grau (2010) for the Euro zone plus the United Kingdom about a reduction in the economic impact of inflation and exchange rate risk premiums of country and size-B/M portfolios for the post-euro period.

It is worth to notice that the currency changeover has reduced the economic relevance of inflation and common exchange rate risks. However, the economic impact of inflation and exchange rate risk remains noticeable for some portfolios in the post-euro period. Therefore, we cannot agree at posterior with the De Santis et al (2003) prediction about the limited impact of the adoption of the single currency on international asset prices. Furthermore, we will see in the next Subsections that the adoption of euro has resulted surprisingly, and due to the increase of residual exchange rate premium, in a reduction in the degree of international financial integration of North American and Euro area stock markets.

5.3. THE EFFECT OF THE INTERNATIONAL STOCK MARKET DEGREE OF INTEGRATION

Our previous results are based on the assumption of a perfectly integrated international market, but the international stock market (the United States and 21 countries more) can exhibit some type of partial or full segmentation. Hence, it could pay for an economic region-specific risk related with certain sources of risk that are not perfectly hedgeable, like differential tax treatment, and for a region-domestic risk domestically but not internationally diversifiable. In this Subsection, we analyse whether the international stock market is a completely integrated market and, if not, the effect of segmentation on pricing the market, currency and inflation risks. To conduct the analysis we test, using the AD-V asset-pricing model (see Eq. [6]) whether the risk premiums are equal across regions and, if not, we measure the effect of lack of perfect financial integration using the "nationalized" AD-V asset-pricing model (see Eq. [7]). Table 3 reports the results of Wald test of equality of risk premiums across regions based on the AD-V model (see Eq. [6]) in Panel A, and the parameter estimates and relevant specification tests for the "nationalized" AD-V model (see Eq. [7]) distinguishing between pre- and post-euro periods in Panels B and C respectively. In addition, Table 4 shows the results of the estimated risk premias in the pre- and post-euro periods. In Panel A, it summarizes the results for the premias of the sorted-B/M ratio portfolios through the number of portfolios with significant (at 5% level) premia and their average and standard deviation premia for premia and economic region. And in Panel B, it shows the average estimated risk premias and significance level of the EAFE weighted Asia Pacific, North American, Euro area, and out-of-Euro area indices.

Our findings can be summarized as follows. Not surprisingly (see Table 3: Panel A) we reject the joint hypothesis of equality risk premiums across regions at any level of significance confirming the previous results of Vassalou (2000). Moreover, we also reject (at 1% level) this hypothesis for each risk premium. Therefore, we focus our attention in the estimation of the "nationalized" AD-V model. We start analysing whether each risk premium is equal for both pre- and post-euro periods. Our results (see Table 3: Panel B) show that the p-value of the Wald test lead us to reject the hypothesis of equality of all risk premiums for both periods at any level of significance. Interestingly, we cannot reject (at 5% level) the hypothesis of equal region-specific risks for both periods. Moreover, the region-specific risks are not significant (at 5% level), i.e. the region-specific risks are practically negligible for the whole period.

Hence, having established also the existence of a structural change, we distinguish between pre- and post-euro estimation results (see Table 3: Panels B and C). As before, consistently with the conditional approach followed in this article, we reject at the 1% level the hypothesis of instrumental risk premiums equal to zero for the pre-euro period. However, we cannot reject at the 10% level the same hypothesis for the post-euro period. In addition, the price of market risk is not significant (at 10% level) in pre- and post-euro periods, though we reject (at 1% level) the null hypothesis that the market premium and the prices of cross-effects of market risk factor and both instrumental variables are simultaneously equal to zero for both periods.

Related to the exchange and inflation risk premiums our tests show that both risk premiums are jointly significant (at the 1% level) for the pre-euro period, while only exchange rate risk premiums are jointly significant (at 1% level) for the post-euro period. Moreover, we cannot reject (at 10% level) the hypothesis that US-inflation, excluding-US inflation and common exchange rate risk premiums are simultaneously equal to zero for the post-euro period. Turning back our attention to the hypothesis of financial integration, our results indicate that all the region-domestic risk

Panel A: Previous test (AD-V model):

	γ_0	γ^{m}	γ^{i}	γ^{D}	γ^{λ}	γ^{e}	$\gamma^{m\cdot div}$	$\gamma^{i\cdot div}$	$\gamma^{D\cdot div}$	$\gamma^{\lambda\ div}$
H_0: Are ... equal for the 4 economic regions?	75.21**	66.67**	30.10**	66.26**	49.45**	18.98**	24.46797**	49.89**	43.30**	44.97**
	$\gamma^{e\ div}$	$\gamma^{m\cdot term}$	$\gamma^{i\cdot term}$	$\gamma^{D\cdot term}$	$\gamma^{\lambda\ term}$	$\gamma^{e\ term}$	γ^{div}	γ^{term}	All	
H_0: Are ... equal for the 4 economic regions?	29.27**	32.93**	57.51**	77.24**	49.23**	37.61**	21.96398**	12.08**	4343.83**	

Panel B: Cross-sectional estimates of the risk premiums for the "nationalized" AD-V model

	γ_0^{ap}	γ_0^{na}	γ_0^{ea}	γ_0^{oea}	γ^{m}	γ^{i}	γ^{D}	γ^{λ}	γ^{e}	γ_{ap}^{d}	γ_{na}^{d}
Jan 1977-Dec 1998	-0.182	0.204	0.337^	-0.0726	-0.79	-0.23**	0.136**	-0.679**	-2.37E-15	3.48**	-0.0428
Jan 1999-Dec 2007	0.221	-0.165	-0.168	-0.270	0.879	-0.0152	0.01	-0.339	1.28E-14^	-2.56**	0.701^
	γ_{ea}^{d}	γ_{oea}^{d}	$\gamma^{m\cdot div}$	$\gamma^{i\cdot div}$	$\gamma^{D\cdot div}$	$\gamma^{\lambda\ div}$	$\gamma^{e\ div}$	$\gamma_{ap}^{d\cdot div}$	$\gamma_{na}^{d\cdot div}$	$\gamma_{ea}^{d\cdot div}$	$\gamma_{oea}^{d\cdot div}$
Jan 1977-Dec 1998	1.96**	3.65**	14.38**	0.11	-0.165**	-7.20**	6.44E-14**	-7.30**	2.63^	2.38	3.29
Jan 1999-Dec 2007	-1.42**	-0.164	-0.0823	0.267	0.044	-2.07	-2.33E-13**	2.09	-5.59*	-0.761	3.35
	$\gamma^{m\cdot term}$	$\gamma^{i\cdot term}$	$\gamma^{D\cdot term}$	$\gamma^{\lambda\ term}$	$\gamma^{e\ term}$	$\gamma_{ap}^{d\cdot term}$	$\gamma_{na}^{d\cdot term}$	$\gamma_{ea}^{d\cdot term}$	$\gamma_{oea}^{d\cdot term}$	γ^{div}	γ^{term}
Jan 1977-Dec 1998	0.891^	-0.221**	-0.00888	0.965**	-1.35E-14**	-3.31**	0.304	-2.78**	-2.35**	-1.17**	-0.0115
Jan 1999-Dec 2007	2.13**	-0.0164	-0.00201	0.281	1.57E-14^	-3.99**	1.11	-2.86**	-0.45	0.28	-0.138

	γ_0^{ap}	γ_0^{na}	γ_0^{ea}	γ_0^{oea}	γ^{m}	γ^{i}	γ^{D}	γ^{λ}	γ^{e}	γ_{ap}^{d}	γ_{na}^{d}
H_0: Are ... equal in both periods?	2.84^	0.867	1.83	0.419	1.37	8.08**	10.84**	1.36	3.23^	33.44**	2.61
	γ_{ea}^{d}	γ_{oea}^{d}	$\gamma^{m\cdot div}$	$\gamma^{i\cdot div}$	$\gamma^{D\cdot div}$	$\gamma^{\lambda\ div}$	$\gamma^{e\ div}$	$\gamma_{ap}^{d\cdot div}$	$\gamma_{na}^{d\cdot div}$	$\gamma_{ea}^{d\cdot div}$	$\gamma_{oea}^{d\cdot div}$
H_0: Are ... equal in both periods?	27.59**	14.62**	14.71**	0.229	11.84**	11.1**	69.71**	4.24*	9.75**	1.038	0.000198
	$\gamma^{m\cdot term}$	$\gamma^{i\cdot term}$	$\gamma^{D\cdot term}$	$\gamma^{\lambda\ term}$	$\gamma^{e\ term}$	$\gamma_{ap}^{d\cdot term}$	$\gamma_{na}^{d\cdot term}$	$\gamma_{ea}^{d\cdot term}$	$\gamma_{oea}^{d\cdot term}$	γ^{div}	γ^{term}
H_0: Are ... equal in both periods?	2.08	4.75*	0.0262	2.98^	9.073**	1.2	0.914	0.0138	13.25**	6.02*	0.294

All: 3267.35**

Panel C: Specification tests

H_0	Jan 1977-Dec 1998	Jan 1999-Dec 2007
$\gamma_0^{ap} = \gamma_0^{na} = \gamma_0^{ea} = \gamma_0^{oea} = 0$	31.20**	10.49*
$\gamma^{m} = \gamma^{m\cdot div} = \gamma^{m\cdot term} = 0$	158.04**	31.77**
$\gamma^{i} = \gamma^{i\cdot div} = \gamma^{i\cdot term} = \gamma^{D} = \gamma^{D\cdot div} = \gamma^{D\cdot term} = 0$	147.85**	11.36^
$\gamma^{i} = \gamma^{i\cdot div} = \gamma^{i\cdot term} = 0$	103.01**	3.72
$\gamma^{D} = \gamma^{D\cdot div} = \gamma^{D\cdot term} = 0$	73.1**	1.35
$\gamma^{\lambda} = \gamma^{\lambda\cdot div} = \gamma^{\lambda\cdot term} = \gamma^{e} = \gamma^{e\cdot div} = \gamma^{e\cdot term} = 0$	219.13**	175.69**
$\gamma^{\lambda} = \gamma^{\lambda\cdot div} = \gamma^{\lambda\cdot term} = 0$	146.85**	4.84
$\gamma^{e} = \gamma^{e\cdot div} = \gamma^{e\cdot term} = 0$	19.27**	105.19**
$\gamma^{div} = \gamma^{term} = 0$	24.24**	2.49

H_0	Jan 1977-Dec 1998	Jan 1999-Dec 2007
$\gamma_0^{ap} = \gamma_0^{na} = \gamma_0^{ea} = \gamma_0^{oea}$	23.38**	9.68*
$\gamma_{ap}^{d} = \gamma_{ap}^{d\cdot div} = \gamma_{ap}^{d\cdot term} = \gamma_{na}^{d} = \gamma_{na}^{d\cdot div} = \gamma_{na}^{d\cdot term} = \gamma_{ea}^{d} = \gamma_{ea}^{d\cdot div} = \gamma_{ea}^{d\cdot term} = \gamma_{oea}^{d} = \gamma_{oea}^{d\cdot div} = \gamma_{oea}^{d\cdot term} = 0$	593.64**	202.52**
$\gamma_{ap}^{d} = \gamma_{ap}^{d\cdot div} = \gamma_{ap}^{d\cdot term} = 0$	123.581**	77.6999**
$\gamma_{na}^{d} = \gamma_{na}^{d\cdot div} = \gamma_{na}^{d\cdot term} = 0$	5.026163	48.52913**
$\gamma_{ea}^{d} = \gamma_{ea}^{d\cdot div} = \gamma_{ea}^{d\cdot term} = 0$	131.4001**	29.39126**
$\gamma_{oea}^{d} = \gamma_{oea}^{d\cdot div} = \gamma_{oea}^{d\cdot term} = 0$	125.9172**	2.556617

^ significant at the 10%, * at the 5% and ** at the 1% levels.

Table 3: Cross-sectional estimation of the risk premiums for the "nationalized" AD-V model

premiums are jointly significant (at 1% level) for both periods, i.e. we reject the hypothesis of financial integration for both periods. Moreover, the Asia Pacific- and Euro area-domestic risks for both periods, the North America-domestic risk for the post-euro period, and the out-of-Euro area-domestic risks for the pre-euro period are significantly priced at 5% level. Hence, the adoption of the single currency marks a change in the risk components of asset pricing reducing the relevance in asset pricing of the inflation and common exchange rate risk factors.

Overlooking the regional domestic risk factors has also effects on the measurement of the economic relevance of market, inflation and exchange rate risk premiums, the summarized results (see Table 4: Panel A) are as follows. Overall, the omission of domestic risk factors causes the overestimate of the number of portfolios with significant (all at 5% level) market, inflation and exchange risk premias and the undervaluation of the average and variance of the same. In addition, it increases the magnitude of the rest of premias, a predictable source of variation of returns that cannot be easily hedged. By and large, the North America-domestic, Asia Pacific-domestic, Euro area-domestic and/or out-of-Euro area-domestic risk premias are economically significant for 76.7% of sorted-B/M ratio portfolios in both periods. Furthermore, with the exception of the North America-domestic premia, the average and variance of these premias are very large. For the post-euro period, we observe a general reduction in the variance of significant premias accompanied with a reduction in the number of significant market, inflation and exchange rate and rest risk premias. The exceptions are the significant common exchange rate risk premia of North American portfolios (from 1 to 10) and the significant residual exchange risk premia of North American (from 0 to 7) and out-of-Euro portfolios (from 4 to 7). In contrast, the results indicate an increase in the number of significant Asia Pacific-domestic (from 56 to 58), North America-domestic (from 19 to 33) and Euro area-domestic (from 47 to 61) risk premias after the euro adoption. (Recall, the three regions with significant domestic premiums for the post-euro period.) These findings contrast with Font and Grau (2010)'s ones for the Euro zone plus the United Kingdom for the period from January 1999 to December 2004 about a more integrated financial market from the adoption of euro, but these differences are simply due to the considered period. Related with this explanation, it is worth notice that the region-domestic risk premias of EAFE weighted region indices (see Figure 2) increase in variability from the economic contraction of 2001 with peaks for North America-domestic risk premia from 2003(4Q) to 2006(1Q) and troughs of Euro area-domestic risk premia from 2004(2Q) to 2006(2Q). (We will analyse this finding and related results deeply in next Subsection.)

In our point of view, these findings have a clear and interesting interpretation, the date of adoption of euro marks a change in the composition of the sources of risk that are rewarded and must be hedged by investors, and a diminution in the degree of international financial integration of the North America and Euro area stock markets specially. Moreover, the omission of the regional domestic risk factors produces a miscalculation of significant risk premias in magnitude and number. Furthermore, overlooking domestic, inflation and exchange risk factors has a large economic impact in the prediction of some equity returns in any period. Notice e.g., the estimated risk premias for the the EAFE weighted Asia Pacific, North American, Euro area and out-of-Euro area indices[15] (see Table 4: Panel B).

[15] Notice that these indices are not included in the estimation of premiums of any asset-pricing model. The premias are computed from their conditional beta series and the estimated premium series from the "nationalized" AD-V asset-pricing model.

Panel A: Summary of the significant (at the 5% level) economic risk premiums for the pre-/post-euro periods

		Market	US-I	EUS-I	Com-E	Res-E	AP-D	NA-D	EA-D	OEA-D	Rest
NA Region	Number	13 / 0	12 / 0	13 / 1	1 / 10	0 / 7	13 / 10	0 / 4	13 / 12	13 / 0	0 / 0
	Average	-18.39 / ---	7.82 / ---	14.02 / 12.6	14.28 / -11.88	--- / 14.88	-54.71 / 27.25	--- / 18.15	24.06 / -33.4	44.01 / ---	--- /---
	SD	5.17 /---	1.8 / ---	2.61 / ---	--- / 2.48	--- / 1.71	19.83 / 8.75	--- / 4.24	6.12 / 8.64	13.17 /	--- / ---
AP Region	Number	8 / 3	11 / 6	15 / 7	13 / 12	7 / 7	11 / 13	5 / 4	7 / 17	13 / 6	6 / 3
	Average	-8.75 / -0.64	4.46 / 8.26	20.67 / 8.55	-9.64 / -12.8	1.8 / -1.03	-20.78 / 27.58	-0.46 / -33.99	15.69 / -8.4	5.99 / -4.64	27.86 / -53.32
	SD	19.61 / 19.42	15.2 / 7.71	12.82 / 4.76	14.48 / 4.66	9.49 / 23.92	24.12 / 18.7	7.92 / 23.1	13.24 / 29.45	27.65 / 13.99	6.45 / 1.82
EA Region	Number	11 / 9	19 / 6	20 / 6	24 / 12	17 / 10	20 / 25	12 / 17	15 / 21	22 / 15	6 / 0
	Average	9.01 / 10.81	-3.83 / 2.2	11.73 / 6.28	-9.37 / -9.89	-4.4 / 1.33	-45.43 / 38.66	2.07 / 11.11	40.3 / -37.85	24.47 / -12.71	23.4 / ---
	SD	16.91 / 3.59	9.8 / 4.54	13.42 / 5.97	11.69 / 4.34	6.8 / 11.27	34.76 / 19.17	5.69 / 9.22	25.43 / 22.4	20.25 / 9.92	3.83 / ---
OEA Region	Number	7 / 3	11 / 4	15 / 3	10 / 8	4 / 7	12 / 10	2 / 8	12 / 11	12 / 7	3 / 0
	Average	-8.14 / 13.76	-7.73 / 4.17	17.42 / 3.8	-10.43 / -11	-6.9 / -3.53	-63.66 / 43.91	3.9 / 16.92	36.44 / -38.59	44.09 / -18.98	22.4 / ---
	SD	14.52 / 6.36	5.11 / 2.04	14.08 / 11.23	10.69 / 5.18	1.32 / 14.35	36.83 / 11.19	0.93 / 5.73	26.79 / 14.19	29.76 / 8.24	2.04 / ---
All	Number	39 / 15	53 / 16	63 / 17	48 / 42	28 / 31	56 / 58	19 / 33	47 / 61	60 / 28	15 / 3
	Average	-6.84 / 9.11	-0.28 / 4.97	15.69 / 7.15	-9.17 / -11.41	-3.21 / 2.76	-46.65 / 35.11	1.6 / 7.91	31.16 / -28.9	28.63 / -12.55	24.98 / -53.32
	SD	17.53 / 9.69	10.94 / 5.92	12.28 / 6.36	12.43 / 4.26	7.55 / 15.55	33.06 / 17.41	5.97 / 18.97	22.05 / 24.78	26.87 / 11.27	5.17 / 1.82

Panel B: Estimated economic risk premiums for the index portfolios in the pre-/post-euro periods

	Market	US-I	EUS-I	Com-E	Res-E	AP-D	NA-D	EA-D	OEA-D	Rest
NA Index	-1.19* / 0.54	0.45* / 0.16	0.91** / 0.22	-0.23 / -0.8*	-0.53 / 0.69	-4.16** / 2.28**	0.02 / 0.96^	2.16** / -2.24**	3.02** / -0.45	0.14 / -0.11
AP Index	-0.42 / 1.04	-0.45** / 0.07	1.22** / 0.37	-0.54** / -0.18	-0.25^ / 0.32	0.13 / -0.36	0.08 / -0.29	0.46** / -0.92**	0.1 / 0.01	0.41 / -0.11
EA Index	-0.68 / 0.8	-0.34** / 0.15	1.44** / 0.14	-1.13**/ -0.55	-0.64**/ 0.25	-5.11**/ 3.67**	0.2 / 1.06*	3.59**/ -3.32**	3.04** / -1.16^	0.46 / 0.02
OEA Index	-1.48^ / 0.5	-0.44** / 0.13	1.7** / 0.13	-0.37^ / -0.49	-0.43 / 0.22	-6.19** / 2.87*	0.1 / 0.59	2.53**/ -2.24**	5.58** / -0.65	0.26 / -0.07

Average in percentage per year
^ significant at the 10%, * at the 5% and ** at the 1% levels.

Table 4: Summary of estimated economic risk premium from the "nationalized" AD-V model

5.4. THE VARIATION OF ECONOMIC RISK PREMIUMS

The aims of this Subsection is to investigate the changes in the composition of the sources of risk that are rewarded by investors and, specially, the determiners of the increase in the number of significant region-domestic risk through post-euro period. To make this analysis, we will focus on the time-variation in risk premiums. Up to now, our analysis has concentrated on average statistics over the whole period and pre- and post-euro periods. However, these average statistics cannot give a complete picture because we defend a conditional asset pricing approach where time-variation in economic risk premiums is the result of variation in the price of risks as well as variation in the beta exposure to risks.

Our analysis proceeds in the following stages. First, we start with a careful inspection of the graphs of each premia component for the EAFE weighted Asia Pacific, North American, Euro area and out-of-Euro area indices. This study reveals that the risk premias vary over time and consequently the average values could be a very misleading summary statistic. Second, we decompose, as in Ferson and Harvey (1991)'s paper, the variation of economic risk premiums in variation due to changes in beta, changes in the price of beta and interaction of both. Third, having found that time-variation in risk premiums is the primary source of premia variability, we implement a VAR analysis to investigate the causality relationships between market, currency, inflation risk and region-domestic premiums. Finally, we investigate, as in Font and Grau (2010)'s paper but including the cross-effects with instrumentals, the results of these causality relationships in the time-variation in economic risk premiums and how they could explain the increased number of significant region-domestic risk in the post-euro period.

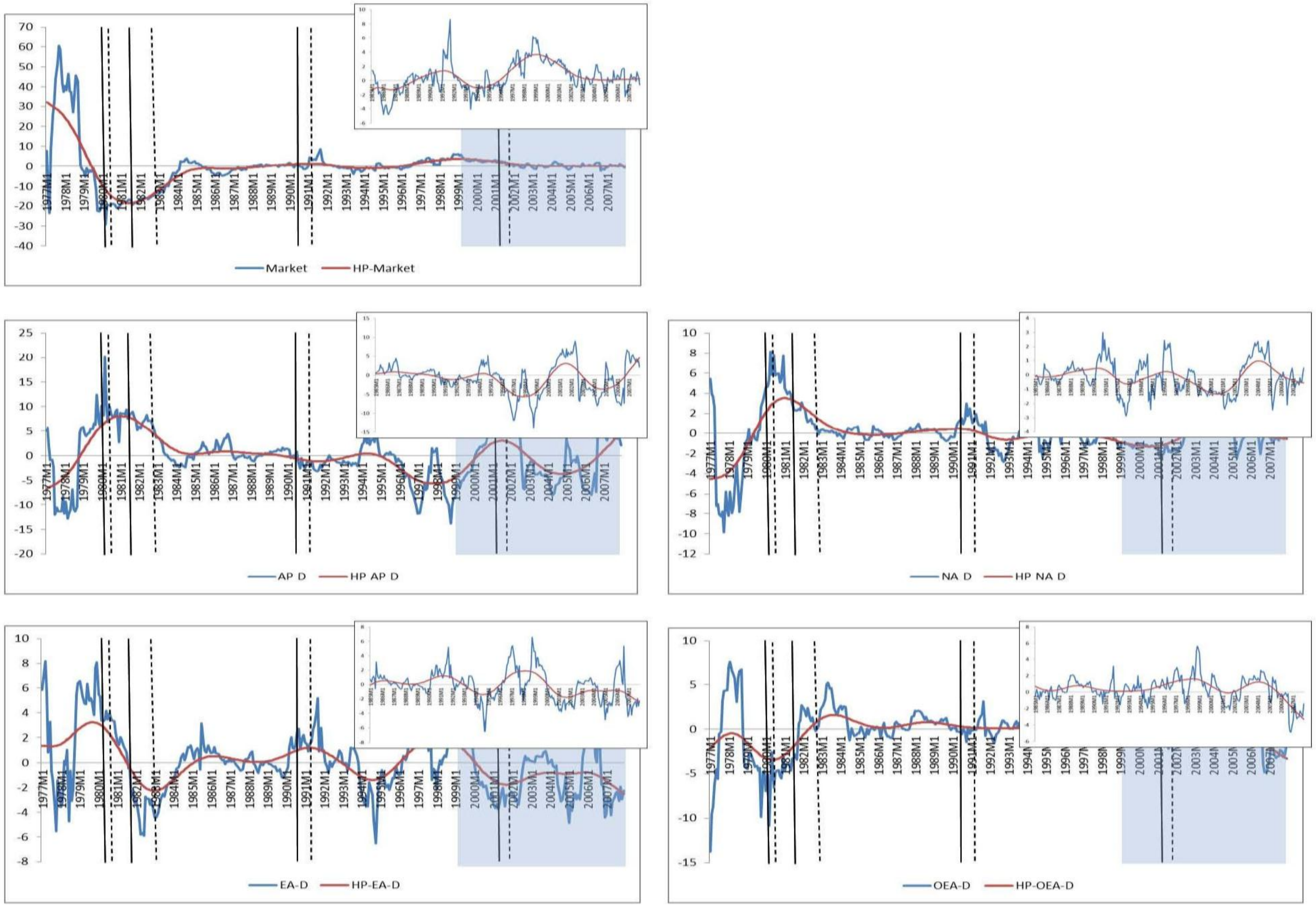
Figure 2 plots the market and region-domestic risk premias[16] for the EAFE weighted Asia Pacific, North American, Euro area, and out-of-Euro area indices together with the Hodrick-Prescott filtered series. It is worth to notice that despite the size and dynamics of each premia vary across markets, the dynamics of premia for the four indices are representative of the ones for portfolios of each economic region. The following regularities emerge from a careful inspection of the graphs. None of the risk premia plots show a common pattern (cyclical or countercyclical) during economic contractions[17]. However, the graphs of market[18], inflation and exchange rate risk premia for the four indices , in many respects, display similar dynamics and show a great reduction in size and variability and, consequently, a graph almost flat (in comparison with previous years) from the mid-eighties. In addition, we also observe the same reduction in size and variability in the graphs of region-domestic risk premias for North America, Euro area and out-of-Euro area indices from the mid-eighties to the "peak" of March 2001. Therefore, the lesser importance of market, inflation and exchange rate risks in asset pricing would be attributed to a general liberalization process, which affects in less degree to Asia Pacific region (the region domestic premias for Asia Pacific index are more volatile), instead of the euro adoption. Furthermore, the decrease in the degree of international financial integration through the post-euro seems to be highly connected with the beginning of economic contraction of 2001 because it is then when the Asia Pacific- and North America-domestic risk premias start to peak and the Euro Area and out-of-Euro premias start

[16] For reason of space, the graphs of the US-inflation, excluding-US inflation, common exchange rate and residual exchange rate risk premias for the four EAFE weighted region indices are not reported, but they are available from the author.

[17] The peaks and troughs of business cycles are the ones reported by the National Bureau of Economic Research.

[18] Interestingly, from January 1988 through the beginning of 2001 and from January 2004 to December 2007, the HP filtered market premia for North American, out-of-Euro area and Euro area indices are positive.

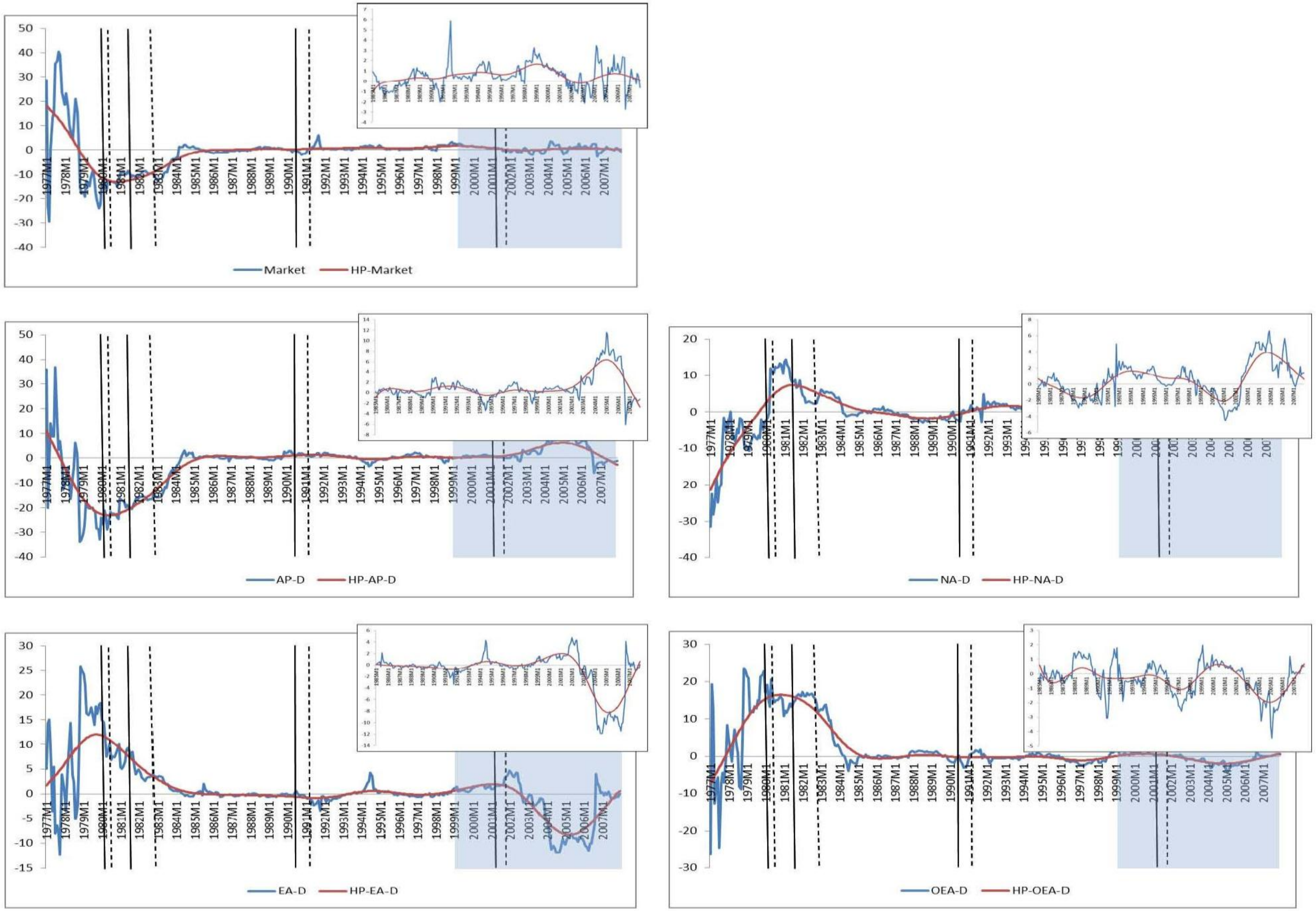
Panel A: Economic risk premiums (premias) for Asia Pacific index



NBER reference business cycle peaks (continuous line) and troughs (dashed line)
Detail of series from Jan 1985 to Dec 2007

Figure 2: Conditional economic risk premium series for indices

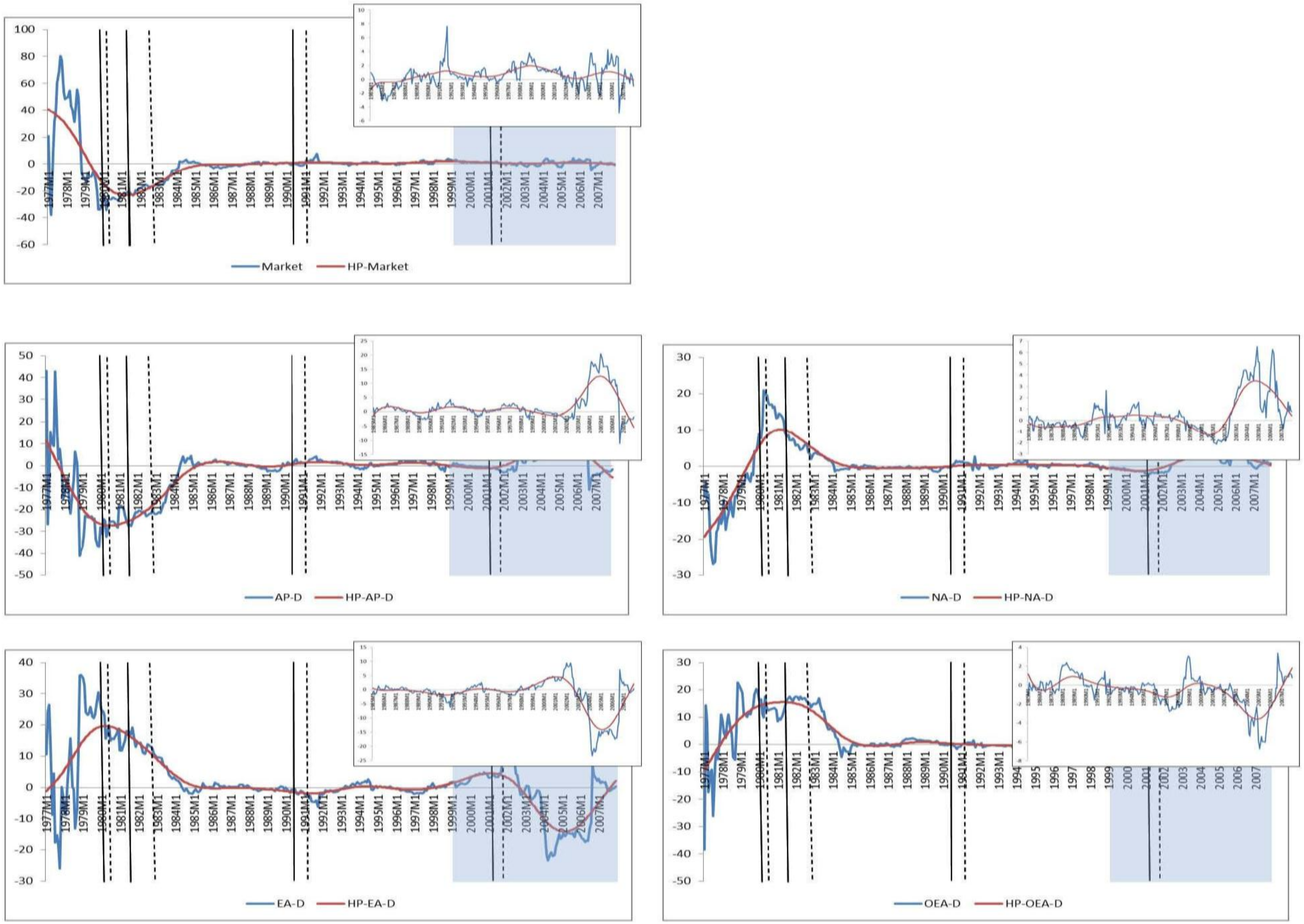
Panel B: Economic risk premiums (premias) for North American index



NBER reference business cycle peaks (continuous line) and troughs (dashed line)
Detail of series from Jan 1985 to Dec 2007

Figure 2 (Continued)

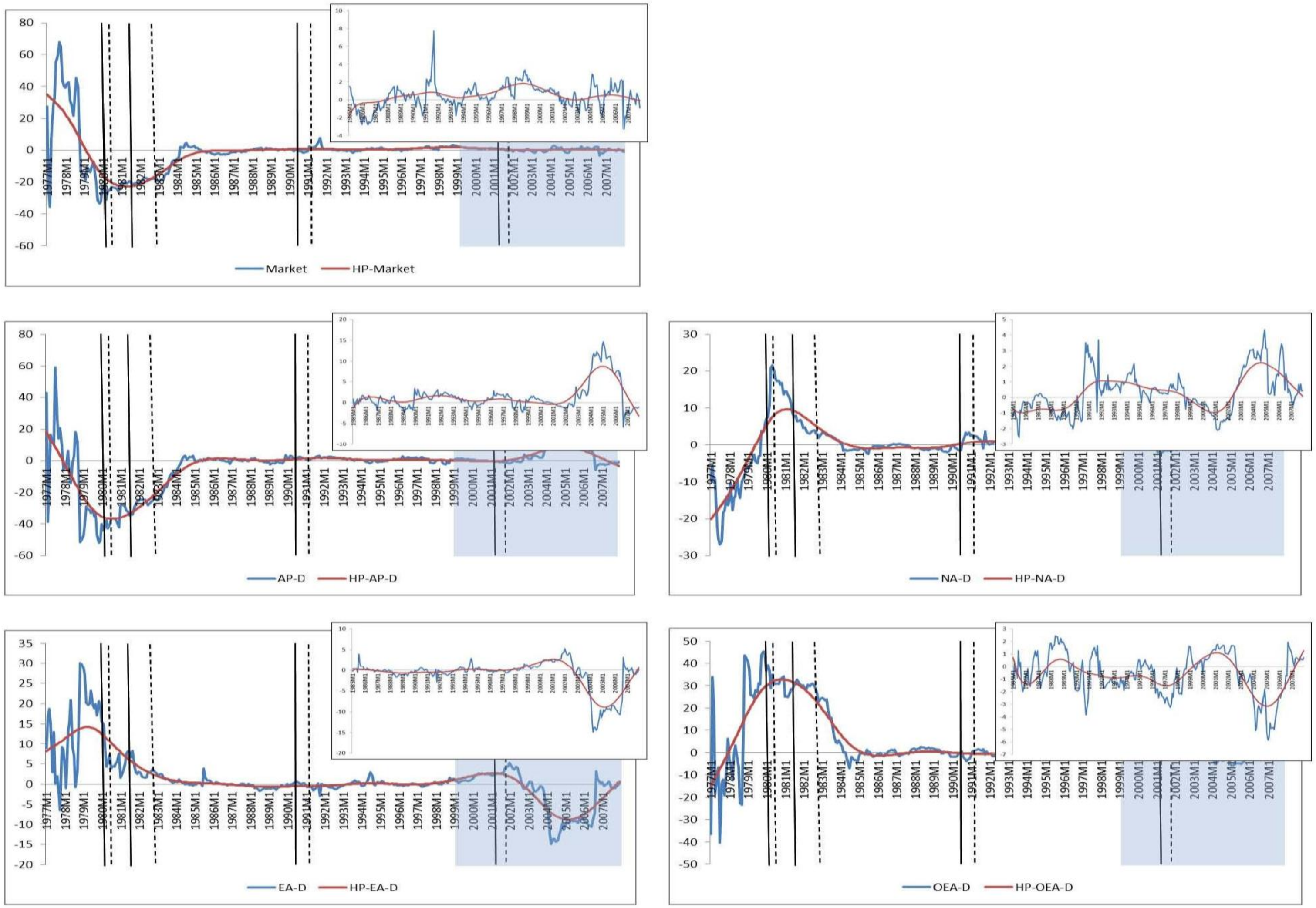
Panel C: Economic risk premiums (premias) for Euro area index



NBER reference business cycle peaks (continuous line) and troughs (dashed line)
Detail of series from Jan 1985 to Dec 2007

Figure 2 (Continued)

Panel D: Economic risk premiums (premias) for out-of-Euro area index



NBER reference business cycle peaks (continuous line) and troughs (dashed line)
Detail of series from Jan 1985 to Dec 2007

Figure 2 (Continued)

to fall. Curiously, the region-domestic premias for Asia Pacific index are not affected by this pattern, being characterized by usually oscillated changes in size from the mid-eighties that causes no significant average means for medium/large subperiods.

We pursue our analysis measuring the relative importance of changes in beta risks and changes in the price of risk in the variation of premias. The decomposition proposed in Ferson and Harvey (1991) for total risk premia and applied to each risk premia in this paper can be expressed for portfolio j and factor of risk F (F=m, i, D, l, e, d-ap, d-na, d-ea, d-oea), as follows:

$$\begin{aligned}\mathrm{Var}\left(\gamma^{F}\beta_j^{F}+\gamma^{F\cdot div}\beta_j^{F\cdot div}+\gamma^{F\cdot term}\beta_j^{F\cdot term}\right) &= E\left(\mathbf{B}_j^{F}\right)^{t}\mathrm{Var}\left(\mathbf{\Gamma}^{F}\right)E\left(\mathbf{B}_j^{F}\right)\\ &+E\left(\mathbf{\Gamma}^{F}\right)^{t}\mathrm{Var}\left(\mathbf{B}_j^{F}\right)E\left(\mathbf{\Gamma}^{F}\right)+\text{interaction terms}\end{aligned} \qquad [8]$$

Where $\mathbf{B}_j^{F}=\left(\beta_j^{F},\beta_j^{F\cdot div},\beta_j^{F\cdot term}\right)^{t}$ and $\mathbf{\Gamma}^{F}=\left(\gamma^{F},\gamma^{F\cdot div},\gamma^{F\cdot term}\right)^{t}$, and the variances and means are estimated from the sample variance and mean of conditional beta and premium series.

Table 5 summarizes the results of the variance decomposition (see Eq. [8]) showing the percentage of variance of explained by changes in beta, in the premiums or due to interaction of both for each premia of the four region indices[19]. Our findings for market premia are consistent with the ones of reported by Ferson and Harvey (1991), i.e. the most of the variation in market premia is associated with variation in the market premiums, and very little of the variance could be attributed to independent movements in the market betas. However, we also notice that the interaction effect accounts for the market premia variance of more than 40% of sorted-B/M portfolios. In addition, our results for the other premias also confirm the principal importance of the changes in the premiums and the little relative importance of changes in beta risks. Hence, the observed similarity in the premia patterns of sorted-B/M ratio portfolios and indices. Despite these findings, we have also to recognize that the importance of interaction effect, which reflects co-variation between beta and risk premiums, is more than a secondary explanation of some inflation, residual exchange rate, and region-domestic risk premias of region indices and sorted-B/M ratio portfolios. Notice for instance that it is really the first source of variation for the North America-domestic premia of Euro area, out-of-Euro area and Asia Pacific indices.

Assuming that the principal source of time-variation in economic risk premiums is the time-variation in the prices of risks, we will attempt to explain our findings through the joint time-variation of premiums. To investigate these dynamics and establish, if they exist, the causality relationships between market, exchange rate, inflation, and region-domestic risk premiums; we estimate three multivariate VAR(1) models on the residuals series of (own) premiums, cross-premiums with the dividend yield, and cross-premiums with the US term spread estimated from the "nationalized" AD-V asset-pricing model (see Eq. [7]). Where these residual series are obtained jointly by the projection of the risk premium components of each premia on two dummies for the pre- and post-euro periods and the average of the respective conditional beta risk series. Finally, in order to get a better understanding of the main results, we summarize the empirical results through the forecast variance decomposition and the impulse response[20] of each risk premium to one

[19] For reason of space, we do not report the percentage of variance of each premia explained by changes in beta, in the premiums or due to interaction of both for the 73 sorted B/M ratio portfolios but they are available from the author.

[20] While the forecast error variance decomposition of a variable separates the variation in this variable into the components shocks to the VAR, the impulse response function of a variable traces the effect of a one-time shock to one of the innovations on current and future values of the variable.

Panel A: Total variation (standard deviation)

	Market	US-I	EUS-I	Com-E	Res-E	AP-D	NA-D	EA-D	OEA-D
AP_ind	11.31	2.2	2.81	3.23	2.38	5.12	2.3	2.63	2.63
NA_ind	7.6	3.23	3.98	3.23	5.47	8.99	5.23	5.61	6.5
EA_ind	14.23	2.1	5.51	4.17	4	11.62	5.47	9.65	6.68
OEA_ind	12.72	1.42	5.2	3.54	4.41	14.07	5.48	6.27	12.43

Panel B: Percentage of total variation by changing premiums

	Market	US-I	EUS-I	Com-E	Res-E	AP-D	NA-D	EA-D	OEA-D
AP_ind	115.84	67.51	455.98	47.8	114968.12	400.26	24.94	137.82	1104.41
NA_ind	72.82	63.96	5.83	51.66	5769.25	24.68	58.89	23.6	41.71
EA_ind	69.74	6.51	89.12	79.47	22073.24	64.67	4.07	49.92	63.93
OEA_ind	56.21	242.94	15.16	93.64	7070.74	36.77	3.94	14.27	55.88

Panel C: Percentage of total variation by changing betas

	Market	US-I	EUS-I	Com-E	Res-E	AP-D	NA-D	EA-D	OEA-D
AP_ind	0.08	10.58	138.89	8.78	436.38	25.16	0.43	52.85	120.52
NA_ind	0.84	3.27	21.59	6.57	514.77	5.73	0.02	8.26	8.27
EA_ind	0.05	12.85	14.08	2.31	1830.72	5.27	0.09	3.07	29.04
OEA_ind	0.16	11.43	31.44	2.89	686.31	2.17	0.07	10.24	4.08

Panel D: Percentage of total variation by interaction effects

	Market	US-I	EUS-I	Com-E	Res-E	AP-D	NA-D	EA-D	OEA-D
AP_ind	-15.93	21.91	-494.87	43.42	-115304.5	-325.43	74.62	-90.67	-1124.93
NA_ind	26.34	32.77	72.57	41.77	-6184.02	69.59	41.09	68.14	50.02
EA_ind	30.21	80.64	-3.2	18.22	-23803.96	30.05	95.84	47	7.04
OEA_ind	43.63	-154.36	53.4	3.47	-7657.05	61.06	95.99	75.49	40.04

Table 5: Decomposition of the economic risk premiums variation from the "nationalized" AD-V model

standard deviation, using the Cholesky decomposition with the aim of isolating the conditional effects of each premium in the order that they have been introduced by the literature.

Table 6 reports the decomposition of error variance of the (orthogonalized) risk premiums for 24 months ahead. In addition, Figure 3 plots the associated impulse response function of the (orthogonalized) risk premium to one standard deviation innovations. Our results have not an easy interpretation because of the complex dynamics between the premiums but they reveal the importance of the variation of inflation and region-domestic risk premium in the premia forecasts.

We can summarize our findings as follows. The forecast variation of market premiums is explained as usual for the variation of these premiums but also, in a large percentage, for the variation of Asia Pacific-domestic and common exchange rate risk premiums in the case of own effects; the variation of out-of-Euro- and Asia Pacific risk-domestic premiums, in the case of cross-effects with dividend yield; and the variation of Asia Pacific-domestic and excluding-US inflation risk premiums, in the case of cross-effects with term spread. Moreover, the effects of these premiums extend for more than two years; being the accumulative effect of one standard deviation of the region-domestic risk premiums large, negative and persistent for the market premium and the price of cross-effects of market with term spread, and persistent and challenging (with a minimum of -5.3% and a maximum of 5.2% for predictions for 1 to 8-month ahead) for the price of cross-effects of market with dividend yield. In reference to the forecast variation of common exchange rate premiums, this variation is explained for the variation of these premiums but also, in an important percentage for the variation of market and Asia Pacific-domestic risk premiums, in the case of own effects and cross-effects with dividend yield; and for the variation of market, Asia Pacific- and Euro area-domestic and residual exchange rate risk premiums, in the case of cross-effects with term spread. Finally, the forecast variation of residual exchange rate premiums is explained for the variation of these premiums and, in addition, for the variation of market and common exchange risk premiums, the variation of North America- and out-of-Euro area-domestic risk premiums, and the variation of North America-domestic and excluding-US inflation risk premiums in the cases of own, and cross-effects with the two instrumental respectively. However, in these cases the effects are lower and lesser persistent than in the case of market risk premium.

Our results also highlight that the forecast variation of region-domestic risk premiums is explained for the variation of these region-domestic premiums, but also, in a large percentage, for the variation of market, common exchange rate, and excluding-US inflation premiums in the case of own effects, for the variation of US and excluding-US inflation risk premiums in the case of cross-effects with dividend yield, and for the variation of market and US inflation risk premiums in the case of cross-effects with term spread.

Let us end this Subsection turning our attention to the explanation of the increase in the number of significant region-domestic premias through the post-euro period. To investigate this issue, we will analyse the effect on domestic premias forecasting of large and sudden movements of premiums from the adoption of euro, i.e. changes of prices of market, exchange rate and inflation risks superior or inferior to 2 standard deviations. The evidences are as follows, the prices of residual and residual with dividend yield exchange rates risk factors soar in May 1999. The residual exchange rate risk premium also picks in March 2001 (NBER peak). The price of market with dividend yield risks drops in August 2002. The prices of excluding-US inflation and excluding-US inflation with spread term risks drop, while the price of excluding-US inflation with dividend yield picks in November 2005. Moreover, the market, market with spread term and US-inflation with spread term premiums drop in September 2006. Next, we attempt to discover the hidden

Panel A: Own effects

	SD	γ^{m}	γ^{i}	γ^{D}	γ^{λ}	γ^{e}	γ_{ap}^{d}	γ_{na}^{d}	γ_{ea}^{d}	γ_{oea}^{d}
γ^{m}	10.63	26.33	0.16	2.45	20.74	4.66	35.73	3.29	2.42	4.22
γ^{λ}	2.236	33.41	5.78	1.17	12.88	2.47	20.53	9.24	9.67	4.85
γ^{e}	6.24E-14	16.72	2.82	4.35	20.21	39.61	6.71	3.74	1.77	4.08

Cholesky Ordering: γ_{ap}^{d}, γ_{na}^{d}, γ_{ea}^{d}, γ_{oea}^{d}, γ^{m}, γ^{λ}, γ^{e}, γ^{i}, γ^{D}

	SD	γ^{m}	γ^{i}	γ^{D}	γ^{λ}	γ^{e}	γ_{ap}^{d}	γ_{na}^{d}	γ_{ea}^{d}	γ_{oea}^{d}
γ_{ap}^{d}	10.63	20	1.86	0.71	16.03	1.09	53.77	3.04	0.97	2.54
γ_{na}^{d}	10.63	4.11	6.65	21.85	3.68	4.08	2.79	45.81	4.5	6.53
γ_{ea}^{d}	10.63	9.91	1.87	2.16	5.07	2.15	12.56	1.51	59.98	4.79
γ_{oea}^{d}	10.63	15.84	0.94	1.11	22.52	0.52	2.29	2.01	1.16	53.62

Cholesky Ordering: γ_{ap}^{d}, γ^{m}, γ_{na}^{d}, γ_{ea}^{d}, γ_{oea}^{d}, γ^{λ}, γ^{e}, γ^{i}, γ^{D} (for γ_{ap}^{d}); γ_{na}^{d}, γ^{m}, γ_{ap}^{d}, γ_{ea}^{d}, γ_{oea}^{d}, γ^{λ}, γ^{e}, γ^{i}, γ^{D} (for γ_{na}^{d}); γ_{ea}^{d}, γ^{m}, γ_{ap}^{d}, γ_{na}^{d}, γ_{oea}^{d}, γ^{λ}, γ^{e}, γ^{i}, γ^{D} (for γ_{ea}^{d});γ_{oea}^{d}, γ^{m}, γ_{ap}^{d}, γ_{na}^{d}, γ_{ea}^{d}, γ^{λ}, γ^{e}, γ^{i}, γ^{D} (for γ_{oea}^{d})

Panel B: Cross-effects with dividend yield

	SD	$\gamma^{m\cdot div}$	$\gamma^{i\cdot div}$	$\gamma^{D\cdot div}$	$\gamma^{\lambda\cdot div}$	$\gamma^{e\cdot div}$	$\gamma_{ap}^{d\cdot div}$	$\gamma_{na}^{d\cdot div}$	$\gamma_{ea}^{d\cdot div}$	$\gamma_{oea}^{d\cdot div}$
$\gamma^{m\cdot div}$	26.033	56.06	0.44	5.81	2.87	2.03	8.65	7.32	2.6	14.23
$\gamma^{\lambda\cdot div}$	11.572	26.7	4	2.49	39.46	0.59	12.28	2.59	1.61	10.28
$\gamma^{e\cdot div}$	2.36E-13	4.29	0.39	1.96	5.04	59.82	5.2	11.99	3.91	7.39

Cholesky Ordering: $\gamma_{ap}^{d\cdot div}$, $\gamma_{na}^{d\cdot div}$, $\gamma_{ea}^{d\cdot div}$, $\gamma_{oea}^{d\cdot div}$, $\gamma^{m\cdot div}$, $\gamma^{\lambda\cdot div}$, $\gamma^{e\cdot div}$, $\gamma^{i\cdot div}$, $\gamma^{D\cdot div}$

	SD	$\gamma^{m\cdot div}$	$\gamma^{i\cdot div}$	$\gamma^{D\cdot div}$	$\gamma^{\lambda\cdot div}$	$\gamma^{e\cdot div}$	$\gamma_{ap}^{d\cdot div}$	$\gamma_{na}^{d\cdot div}$	$\gamma_{ea}^{d\cdot div}$	$\gamma_{oea}^{d\cdot div}$
$\gamma_{ap}^{d\cdot div}$	26.033	3.99	0.75	11.36	0.32	2.68	50.3	20.22	2.34	8.04
$\gamma_{na}^{d\cdot div}$	26.033	2.51	5.55	10.63	1.52	4.69	0.33	69.85	0.48	4.44
$\gamma_{ea}^{d\cdot div}$	26.033	1.62	1.29	7.36	0.23	3.16	15.06	19.1	42.64	9.55
$\gamma_{oea}^{d\cdot div}$	26.033	3.19	0.56	4.68	0.35	7.38	7.39	21.74	5.3	49.41

Cholesky Ordering: $\gamma_{ap}^{d\cdot div}$, $\gamma^{m\cdot div}$, $\gamma_{na}^{d\cdot div}$, $\gamma_{ea}^{d\cdot div}$, $\gamma_{oea}^{d\cdot div}$, $\gamma^{\lambda\cdot div}$, $\gamma^{e\cdot div}$, $\gamma^{i\cdot div}$, $\gamma^{D\cdot div}$ (for $\gamma_{ap}^{d\cdot div}$); $\gamma_{na}^{d\cdot div}$, $\gamma^{m\cdot div}$, $\gamma_{ap}^{d\cdot div}$, $\gamma_{ea}^{d\cdot div}$, $\gamma_{oea}^{d\cdot div}$, $\gamma^{\lambda\cdot div}$, $\gamma^{e\cdot div}$, $\gamma^{i\cdot div}$, $\gamma^{D\cdot div}$ (for $\gamma_{na}^{d\cdot div}$); $\gamma_{ea}^{d\cdot div}$, $\gamma^{m\cdot div}$, $\gamma_{ap}^{d\cdot div}$, $\gamma_{na}^{d\cdot div}$, $\gamma_{oea}^{d\cdot div}$, $\gamma^{\lambda\cdot div}$, $\gamma^{e\cdot div}$, $\gamma^{i\cdot div}$, $\gamma^{D\cdot div}$ (for $\gamma_{ea}^{d\cdot div}$); $\gamma_{oea}^{d\cdot div}$, $\gamma^{m\cdot div}$, $\gamma_{ap}^{d\cdot div}$, $\gamma_{na}^{d\cdot div}$, $\gamma_{ea}^{d\cdot div}$, $\gamma^{\lambda\cdot div}$, $\gamma^{e\cdot div}$, $\gamma^{i\cdot div}$, $\gamma^{D\cdot div}$ (for $\gamma_{oea}^{d\cdot div}$)

Panel C: Cross-effects with US term spread

	SD	$\gamma^{m\cdot term}$	$\gamma^{i\cdot term}$	$\gamma^{D\cdot term}$	$\gamma^{\lambda\cdot term}$	$\gamma^{e\cdot term}$	$\gamma_{ap}^{d\cdot term}$	$\gamma_{na}^{d\cdot term}$	$\gamma_{ea}^{d\cdot term}$	$\gamma_{oea}^{d\cdot term}$
$\gamma^{m\cdot term}$	7.118	20.57	8.51	16.71	1	8.27	33.57	8.94	1.09	1.33
$\gamma^{\lambda\cdot term}$	3.041	14.96	0.44	3.17	44.09	10.7	4.82	7.79	9.31	4.73
$\gamma^{e\cdot term}$	7.78E-14	4.14	5.06	7.9	2	58.57	3.51	13.55	3.89	1.39

Cholesky Ordering: $\gamma_{ap}^{d\cdot term}$, $\gamma_{na}^{d\cdot term}$, $\gamma_{ea}^{d\cdot term}$, $\gamma_{oea}^{d\cdot term}$, $\gamma^{m\cdot term}$, $\gamma^{\lambda\cdot term}$, $\gamma^{e\cdot term}$, $\gamma^{i\cdot term}$, $\gamma^{D\cdot term}$

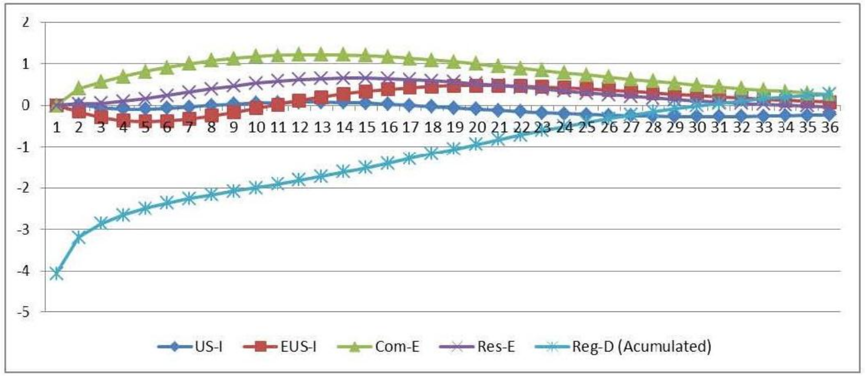
	SD	$\gamma^{m\cdot term}$	$\gamma^{i\cdot term}$	$\gamma^{D\cdot term}$	$\gamma^{\lambda\cdot term}$	$\gamma^{e\cdot term}$	$\gamma_{ap}^{d\cdot term}$	$\gamma_{na}^{d\cdot term}$	$\gamma_{ea}^{d\cdot term}$	$\gamma_{oea}^{d\cdot term}$
$\gamma_{ap}^{d\cdot term}$	7.118	22.94	2.39	1.98	0.5	2.48	45.71	1.69	9.81	12.52
$\gamma_{na}^{d\cdot term}$	7.118	0.26	23.1	3	0.37	4.16	0.06	61.78	1.88	5.37
$\gamma_{ea}^{d\cdot term}$	7.118	2.13	18.89	0.86	1.83	1.6	0.25	14.28	59.32	0.85
$\gamma_{oea}^{d\cdot term}$	7.118	11.86	5.26	5.59	2.04	0.93	6.36	3.43	3.04	61.48

Cholesky Ordering: $\gamma_{ap}^{d\cdot term}$, $\gamma^{m\cdot term}$, $\gamma_{na}^{d\cdot term}$, $\gamma_{ea}^{d\cdot term}$, $\gamma_{oea}^{d\cdot term}$, $\gamma^{\lambda\cdot term}$, $\gamma^{e\cdot term}$, $\gamma^{i\cdot term}$, $\gamma^{D\cdot term}$ (for $\gamma_{ap}^{d\cdot term}$); $\gamma_{na}^{d\cdot term}$, $\gamma^{m\cdot term}$, $\gamma_{ap}^{d\cdot term}$, $\gamma_{ea}^{d\cdot term}$, $\gamma_{oea}^{d\cdot term}$, $\gamma^{\lambda\cdot term}$, $\gamma^{e\cdot term}$, $\gamma^{i\cdot term}$, $\gamma^{D\cdot term}$ (for $\gamma_{na}^{d\cdot term}$); $\gamma_{ea}^{d\cdot term}$, $\gamma^{m\cdot term}$, $\gamma_{ap}^{d\cdot term}$, $\gamma_{na}^{d\cdot term}$, $\gamma_{oea}^{d\cdot term}$, $\gamma^{\lambda\cdot term}$, $\gamma^{e\cdot term}$, $\gamma^{i\cdot term}$, $\gamma^{D\cdot term}$ (for $\gamma_{ea}^{d\cdot term}$); $\gamma_{oea}^{d\cdot term}$, $\gamma^{m\cdot term}$, $\gamma_{ap}^{d\cdot term}$, $\gamma_{na}^{d\cdot term}$, $\gamma_{ea}^{d\cdot term}$, $\gamma^{\lambda\cdot term}$, $\gamma^{e\cdot term}$, $\gamma^{i\cdot term}$, $\gamma^{D\cdot term}$ (for $\gamma_{oea}^{d\cdot term}$);

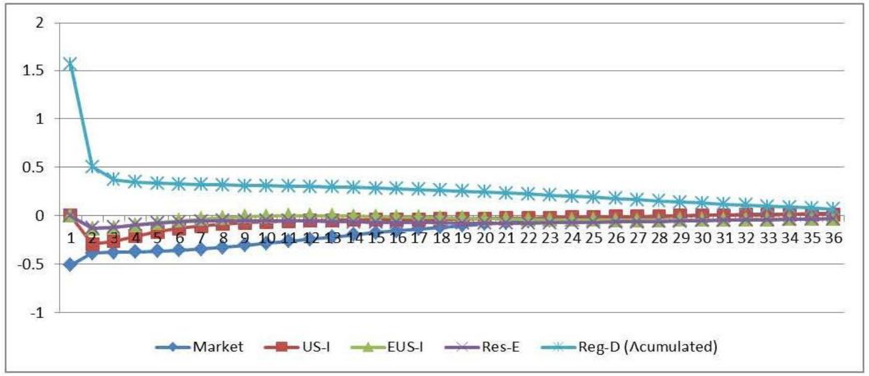
Table 6: Forecast error variance decomposition for 24-month ahead of the premiums from the AD-V model

Panel A: Own effects on premium to one standard deviation

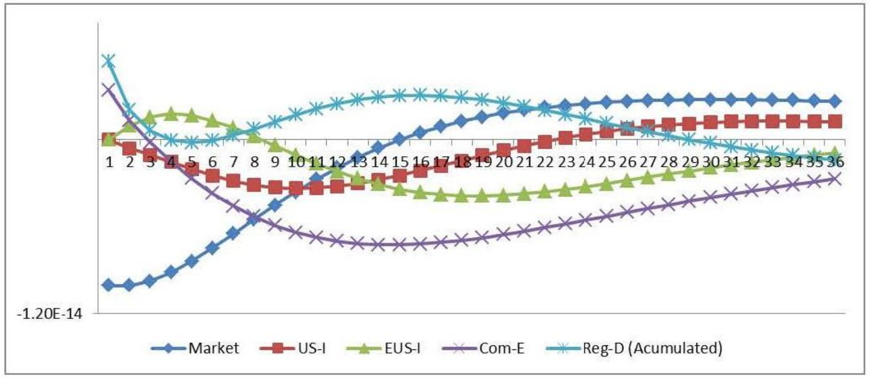
Response of the (orthogonalized) market premium



Response of the (orthogonalized) common exchange rate premium



Response of the (orthogonalized) residual exchange rate premium

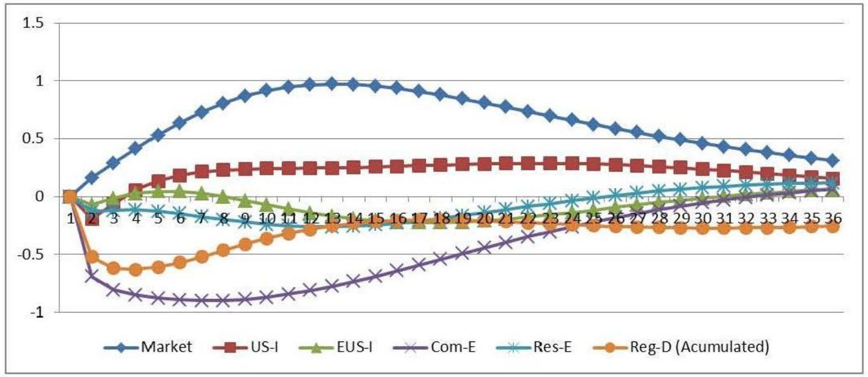


See Cholesky decompositions in Table 6

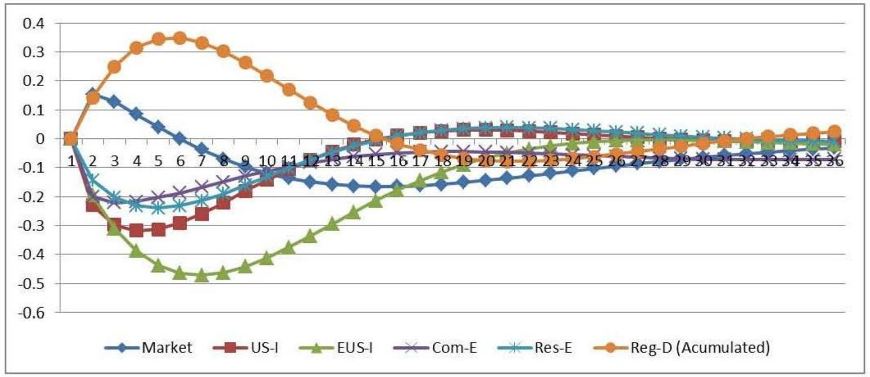
Figure 3: Response of premium to Cholesky one SD innovations

Panel A (Continued)

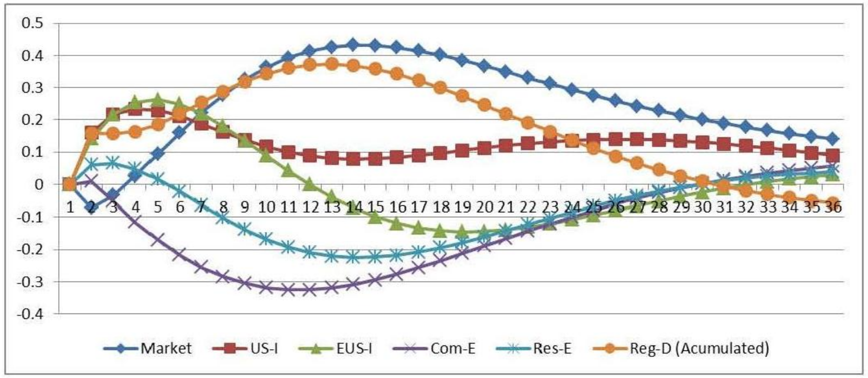
Response of the (orthogonalized) Asian Pacific-domestic risk premium



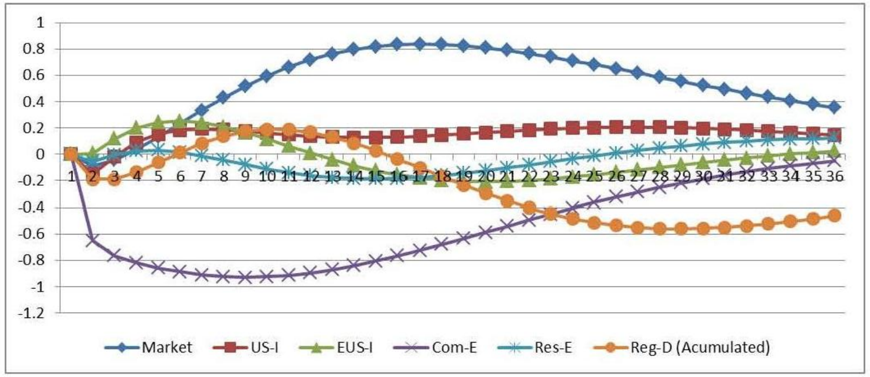
Response of the (orthogonalized) North America-domestic risk premium



Response of the (orthogonalized) Euro area-domestic risk premium



Response of the (orthogonalized) out-of-Euro area-domestic risk premium

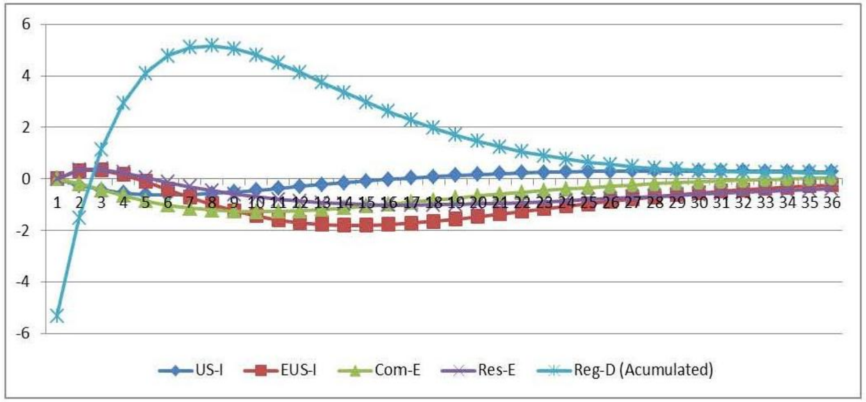


See Cholesky decompositions in Table 6

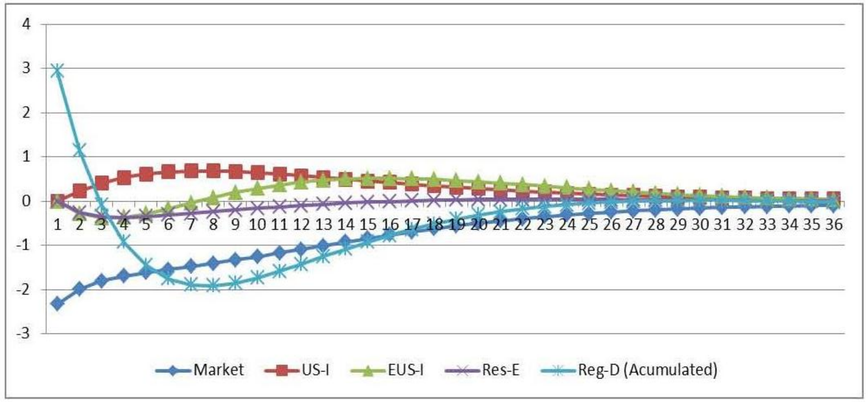
Figure 3 (Continued)

Panel B: Cross with dividend yield effects on premium to one standard deviation

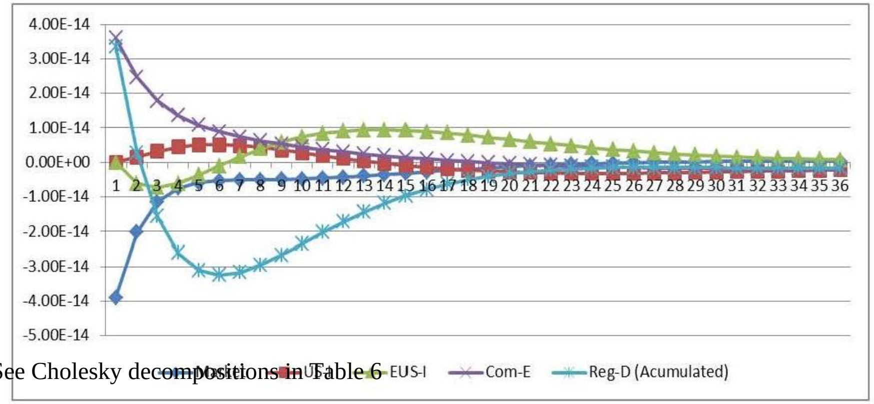
Response of the (orthogonalized) market premium



Response of the (orthogonalized) common exchange rate premium



Response of the (orthogonalized) residual exchange rate premium

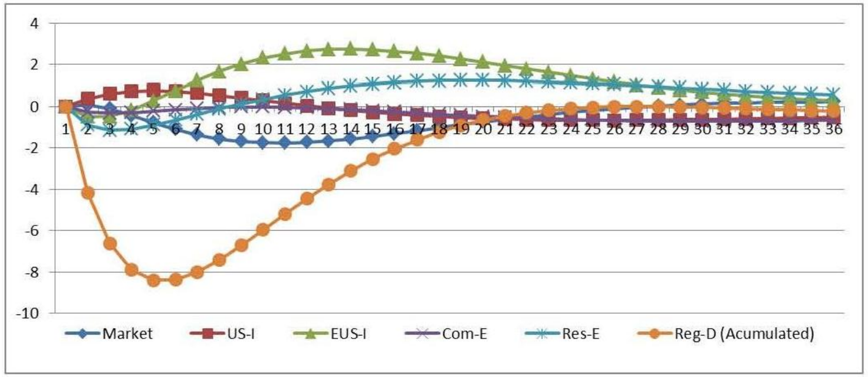


See Cholesky decompositions in Table 6

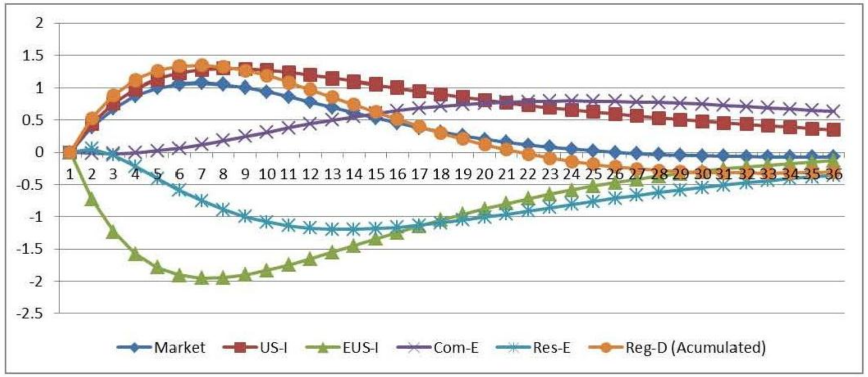
Figure 3 (Continued)

Panel B (Continued)

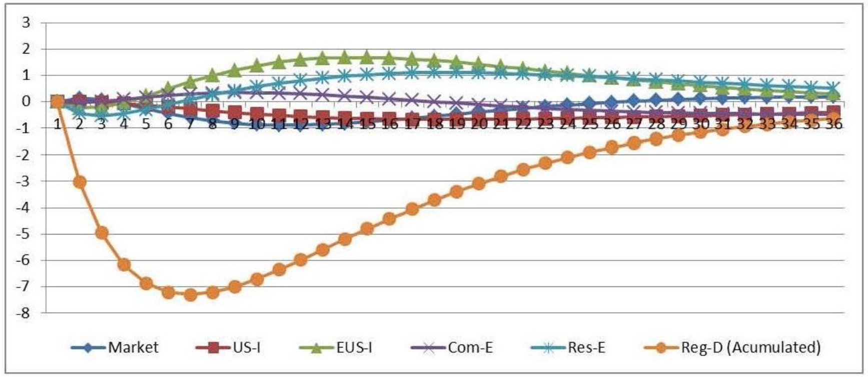
Response of the (orthogonalized) Asian Pacific-domestic risk premium



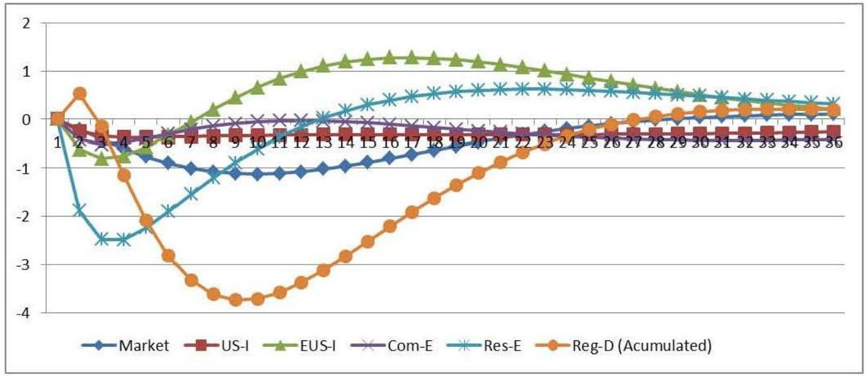
Response of the (orthogonalized) North America-domestic risk premium



Response of the (orthogonalized) Euro area-domestic risk premium



Response of the (orthogonalized) out-of-Euro area-domestic risk premium

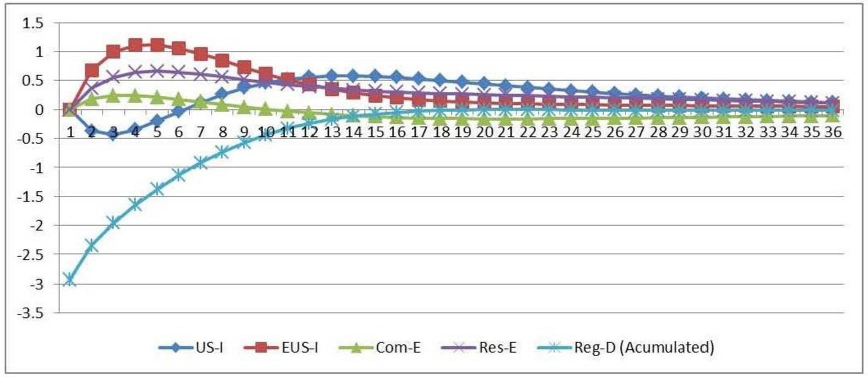


See Cholesky decompositions in Table 6

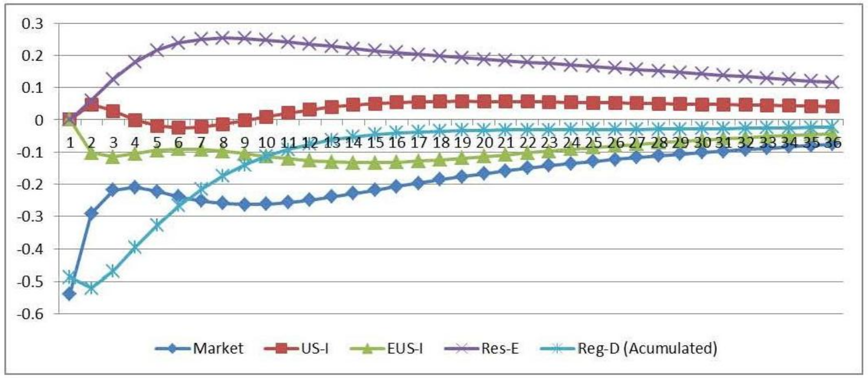
Figure 3 (Continued)

Panel C: US spread term effects on premium to one standard deviation

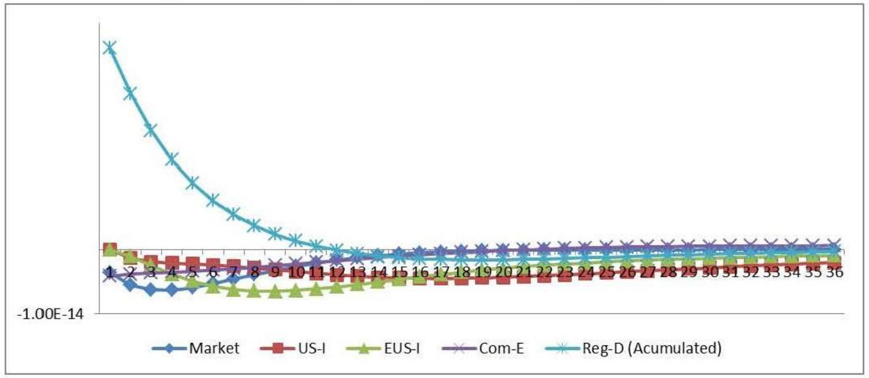
Response of market premium



Response of the (orthogonalized) common exchange rate premium



Response of the (orthogonalized) residual exchange rate premium

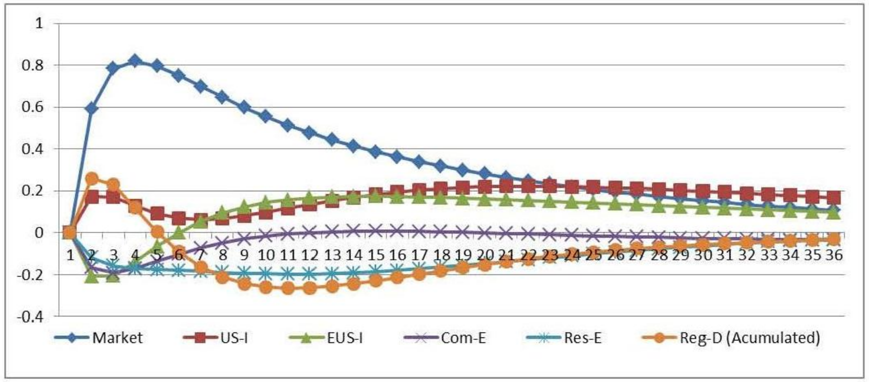


See Cholesky decompositions in Table 6

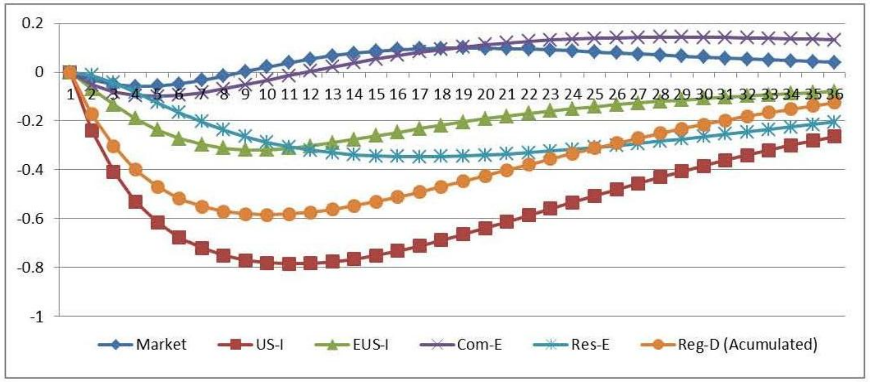
Figure 3 (Continued)

Panel C (Continued)

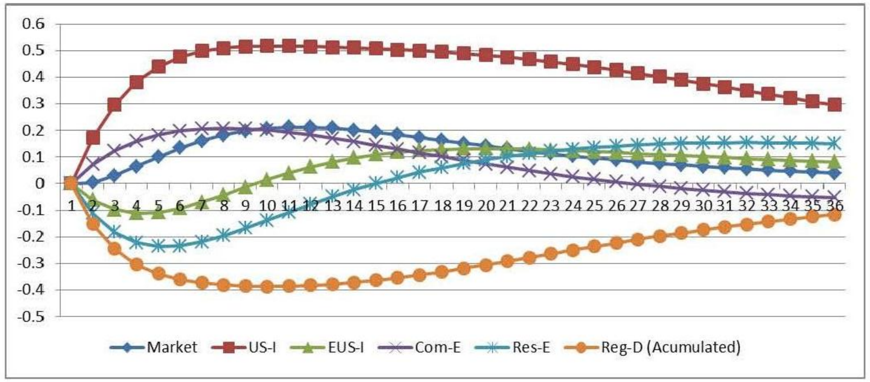
Response of the (orthogonalized) Asian Pacific-domestic risk premium



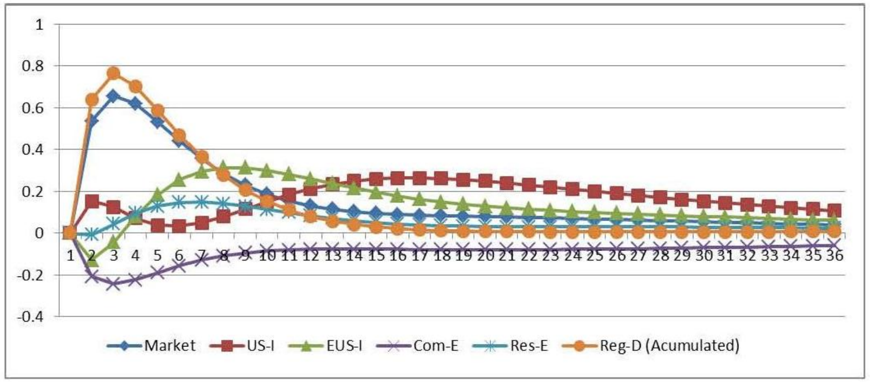
Response of the (orthogonalized) North America-domestic risk premium



Response of the (orthogonalized) Euro area-domestic risk premium



Response of the (orthogonalized) out-of-Euro area-domestic risk premium



See Cholesky decompositions in Table 6

Figure 3 (Continued)

asset-pricing mechanism that generates region domestic premias combining this information with the level of exposure to these risks[21] and the impulse response functions in Figure 3.

Our findings complete and confirm the ones of Font and Grau (2011) signalling the involvement of time-variation of exchange rate and inflation risk premiums in the explanation of the domestic risk premias. The results are the following; the increase in residual exchange rate premium in May 1999 has a negative and persistent effect on the North America-domestic premiums. This effect combined with a significant (in average beta series) positive beta produces a reduction in the domestic risk premia, which would explain the decline (documented for the four indices) of North America domestic premia from May 1999 to March 2001. Moreover, the increase in residual exchange rate with dividend yield has a negative and very persistent (up to 36-months ahead) effect on the North America-domestic premiums (small up to 8-months ahead) that combined with a significant negative beta causes a positive effect in the domestic risk premia that favours the posterior increase of North America domestic premia. Thus, the origins of the increase of North America domestic risk premia are from the very beginning of the adoption of euro. Therefore, it is the conjunction of the adoption of euro and the economic recession that lead a loss of financial integration.

The new increase in residual exchange rate (March 2001) has a negative and persistent effect (up to 24-month) on the Asia Pacific-domestic premiums that combined with a significant (in average beta series) negative beta produces an increase in the Asia Pacific-domestic risk premia. Moreover, with a relative little lag, this increase in residual exchange rate has a negative and persistent effect on the Euro area-domestic premium (from 6 to 29 months ahead) and on the out-of-Euro area-domestic premium (from 8 to 25 months ahead). These effects combined with a significant (in average beta series) positive beta produce a reduction in the Euro area and out-of-Euro area-domestic risk premias respectively. In contrast, the same increase in residual exchange rate premium, with a similar combination, decelerates the increase of North America domestic premia. Similarly, the effect of the reduction in the price of market with dividend yield risk in August 2002 causes a persistent (up to 24-months ahead) reduction in the Asia Pacific- domestic risk premia, favours the reduction in North America-domestic risk premia, and produces a persistent (from 5- to 24-months ahead) increase of the Euro area-domestic premia. The variation of the excluding-US inflation premiums (November 2005) explains a lagged persistent reduction in the Asia Pacific- (from 9- to 29 months ahead) and North America-domestic (from 6- to 36 months ahead) risk premias. In addition, it also produces a lagged persistent increase of the Euro area- (from 12- to 31-months ahead) and out-of-Euro area domestic (from 12- to 36-months ahead) risk premias. Finally, in September 2006 the documented variations in premiums would explain a persistent (up to 36-months ahead) increase in the Asia Pacific-domestic risk premia.

To sum up, it is worth to notice how useful can be for investors the knowledge of these hidden asset-pricing mechanisms of the market for their implication in a successful hedging of risks.

[21] For reason of space, we do not report the mean estimate of average beta series for pre- and post-euro periods and the parameter estimates of the average beta series and cross with dividend yield and US term spread beta series obtained from the projection of the risk premium components of each premia, but they are available from the author.

6. CONCLUSION

In this paper, we attempt to measure the economic relevance of market, exchange rate, inflation and domestic risk factors on asset pricing in the international stock market over the last thirty years for twenty-two countries of four economic regions: Asia Pacific, North America, Euro area and out-of-Euro area. In this context, the relevant issues are analysing whether the international stock markets are financial integrated and, if they are not, how this lack of integration affect or not to the predictive variation of returns. In addition, the study completes examining the time-variation of economic risk premiums to investigate whether the inflation risks are significantly priced and, if they are, how they affect or not to the price of currency risks and the reward for the investors' exposure to all these sources of risks. The main findings can be summarized as follows.

- We reject the hypothesis of financial integration. Therefore the domestic risk factors cannot be overlooked in international asset pricing.
- The EMU marks a change in the risk components of asset pricing. Exchange rate and inflation risks are significantly priced in the pre-euro period while only exchange rate risk premiums are significant in the post-euro period.
- The market, inflation and exchange premias are less important after the adoption of euro whereas the domestic risk premias for regions are more important than before. Our results show from pre- to post-euro a clear diminution in the number of significant premias for market, US-inflation, excluding-US inflation and common exchange rate risks accompanied with an increase in the number of significant premias for the residual exchange rate risk and Asian Pacific, North America and Euro area domestic risks.
- The risk premias vary over time and consequently the average values could be a very misleading summary statistic. It is worth notice that none of the risk premia plots show a common pattern (cyclical or countercyclical) during economic contractions, and the market, inflation and exchange rate risk premia graphs show the great reduction in size and variability of premias from the mid-eighties. Furthermore, the region-domestic risk premias for North America, Euro area and out-of-Euro area indices also share the same reduction from the mid-eighties to the "peak" of March 2001.
- The principal source of time-variation in economic risk premiums is the time-variation in the prices of risks. Therefore, it is the joint time-variation of market, inflation and exchange rate premiums what explains a large proportion of the forecast variation of region-domestic risk premiums, and thus it causes the magnitude of domestic risk premias.

In conclusion, an international investor would not ignore any of these risks. Moreover, the causality and time-variation of the prices of these risks drive the predictable variation of returns, and hence, the international investor must be aware of the variation of these premiums for foreseeing changes in economic risk premiums and being able to hedge them. This paper highlights some of these asset-pricing mechanisms of the market, but future research focus on the materialisation of hedging strategies could be welcomed by real investors and produce very practical results.

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