Integration of Sovereign Bonds Markets:

Time Variation and Maturity Effects

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Abstract

We examine time varying integration of developed (DM) and emerging (EM) market government bonds. Although we find an upward trend for most countries and maturity bands, we do observe reversals and negative trends among both DMs and EMs and for some maturities during the financial crisis. We study potential factors that could explain integration and show that together, enhanced institutional quality, higher credit quality and better future investment opportunities significantly contribute to a higher degree of integration for the long versus the short maturity bonds.

Keywords: market integration, term structure of integration, sovereign bond markets, political risk, developed markets, emerging markets, sovereign risk.

JEL Classification: G15, G12, E44, F31, C5.

Introduction

Although, there is a large body of literature on bond pricing, term structure models and the determinants of yield spreads, the investigations of world market integration for fixed-income securities are modest despite its size and importance for policy makers and practitioners.[1] In recent years, there have also been major innovations including market liberalizations to reduce barriers to cross-border portfolio flows, as well as the advent of exchange traded bond funds. We would expect these market innovations in conjunction with the improved institutional, investment, and credit factors to play an important role in further integrating bond markets with attendant reduction in funding costs. Further, the issue of what drives bond market integration has remained quite elusive. Hence, we estimate the evolution of sovereign bond markets' integration over time and examine factors that could explain the differences in the level and dynamics of integration across the different maturity segments of the yield curve.

Our paper makes three important contributions to the existing literature. First, we extend and exploit the existing analytical and empirical frameworks to examine the time variation in the degree of market integration for a large sample of sovereign bonds from both the developed markets (DMs) and emerging markets (EMs). Specifically, we use the integration measure as defined in Errunza and Losq (1985) that accommodates market segmentation. We would expect the tremendous increase in the trading of bond funds, closed-end funds and ETFs over the last few years to further integrate the international bond markets.[2] The time varying integration index (II) accounts for the role of such assets and spans the entire range from full integration (II=1) to complete segmentation (II=0).

Second, given that investors are heterogeneous and target different maturity segments and to the extent that the sovereign funding costs are also maturity specific and determined by the level of

[1] As of September 2011, the outstanding amounts in the global bond market are 95 trillion U.S. dollars and are much larger than the global equity market which had a market capitalization of around 55 trillion U.S. dollars. Government bonds accounted for 40% of the total. (Source: Bank for International Settlements).

[2] As of 2011, there were 365 fixed-income ETFs with 217 billion USD of asset under management. Fixed-income ETFs represent 15% of total ETF assets under management. The greatest proportion of investment is concentrated in government bonds, comprising around 30% of fixed income ETFs (see Kosev and Williams, 2011).

integration, we examine integration of different maturity bands and analyse the slope of the term structure of integration indices. The "term structure of bond integration" refers to the integration indices at different maturities. The key questions we confront are, (1) does the term structure of integration differ over time and across countries?; and (2) are there systematic differences in the integration dynamics among short term and longer term bonds?

Third, we investigate the factors that could explain the difference in the level and dynamics of integration across the different maturity segments of the yield curve. Specifically, we examine five potential determinants of the term structure of bond integration, (1) the quality of the domestic institutional environment, (2) sovereign risk, (3) habitat-preferences, (4) future investment opportunities, and (5) push factors. Finally, we assess the economic importance of these factors in further integrating the bond markets.

We first estimate the integration index for 21 developed markets from 1986 or later to 2012 and eight emerging markets from 1998 or later to 2012. The analysis is at the monthly frequency. The results show an upward trend in the integration of sovereign bond markets for most countries. Nevertheless, there are interesting differences across countries in the dynamics of integration. Finland, Austria, and Belgium are the most integrated, whereas New Zealand, UK, and Singapore are the least integrated among the developed markets. In general, the Euro area countries are more integrated across the five maturity segments compared to European Union (EU) non-euro countries. However, there are clear differences between core and periphery countries in the euro area specifically after the European sovereign debt crisis. The integration of EMs sovereign bond markets is lagging behind DMs and is also more volatile. During the sample period, the average integration for the EM pool is 0.49 compared to 0.68 for DMs. Czech Rep. followed by Poland stand out as the most integrated among the EMs, while South Africa domestic government bond is the least integrated. Although in general there is a positive trend, we do observe reversals and negative trends among both DMs and EMs especially during the recent financial crisis.

We next investigate integration dynamics of different maturity bands. The results show an upward trend with significant differences in the dynamics of integration across maturities of 1-3, 3-5, 5-7, 7-10, and 10+ years for the entire sample of countries. The adoption of the Euro has led to higher integration of the short relative to the long segment as a result of the harmonized monetary policy. The term structure of integration inverted following the Lehman bankruptcy for EU members as well as Switzerland and Sweden. We also observe striking differences across EMs. For example, over most of the sample period, the term structure of integration for Taiwan is downward sloping, while it is upward sloping for South Africa. Additionally, we find that a positive slope of the term structure of bond market integration predicts higher integration of the future short maturity segment.

We then examine what factors might drive the relative integration of the long versus short maturities within each country in the sample. We find that when a country moves from the 25th percentile to the 75th percentile, the integration of the long versus the short maturity bonds increases by 15% as a result of enhanced institutional quality, higher credit quality and better future investment opportunities. Under very simplifying assumptions, this translates into a differential long versus short maturity segment funding cost of 1.5% per annum. Our results are robust to additional controls, choice of maturity segments, effects of subcomponents of the political risk index, subperiods, and sample composition. We also find that the interaction of the US monetary base with credit quality positively affects the integration differential due to long term investors' flight to quality.

Empirical studies that have investigated sovereign bond market integration focus on major DMs, European markets and on the impact of the Euro's introduction on regional and global integration. Barr and Priestley (2004) use Bekaert and Harvey (1995) model and find evidence for partial integration but not for time-variation in the level of integration of the G5 government bond markets. [Similar methodology is used in Lamedica and Reno, 2007, and Abad et al., 2010, 2014]. Abad et al. (2014) find evidence of time-varying integration of 16 EU members with the German market. Christiansen (2012) uses the R-square integration measure of Pukthuanthong and Roll (2009) and finds higher integration for European Monetary Union (EMU) than non-EMU members. Diebold, Li and Yue (2008) analyze the term structure of government bond yields for Germany, Japan, the UK and the US over 1985-2005 and show that global yield factors explain a significant fraction of country yield curve dynamics, with interesting differences across countries and maturities.[3]

Other studies measure market integration using correlations. Cappiello, Engle and Sheppard (2006) find a high correlation between the returns of government bonds of different countries. Kumar and Okimoto (2011) measure the time-varying dependence of the G6 bond markets using the copula approach and uncover low and stable correlation among short rates and a high and increasing correlation among the long rates. However, the literature on stock market integration shows that correlation may not be an appropriate measure of market integration, see for example, Carrieri, Errunza and Hogan (2007, henceforth CEH) and Pukthuatong and Roll (2009).[4] Relative to these studies, we examine the dynamics of integration for a large set of DM and EM countries, over the full maturity spectrum, and explore the economic underpinnings of the difference in integration between the long and the short maturities. It is particularly reassuring that the three most significant factors that enhance long dated bond market integration, namely a higher quality of the countries' institutions, lower sovereign risk, and better future investment opportunities, are directly under the control of each country's economic policy. This set of results is thus helpful for devising fiscal and monetary policies leaning towards higher integration of the international bond market.

The rest of the paper is organized as follows. Section I presents the integration measure and its empirical implementation. Section II discusses the data. Section III reports our integration estimates for DMs and EMs and characterizes their evolution over time for each maturity segment. Section IV details factors that are related to the differences in integration of the long and short bonds and presents corresponding results. Section V provides robustness tests. Conclusion follows.

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[3] Market segmentation of bonds has also been studied in local markets. For example, Singleton (2000) examines the Japanese government bond market. He argues that institutional and accounting issues influence how government bonds respond to economic events and, in particular, bonds with identical maturities may effectively be priced by the market using different discount functions.

[4] Several studies examine the international bond market co-movements and determinants of the yield spreads. See for example, Codogno et al. (2003), Geyer et al. (2004), and Pagano and von Thadden (2004). More recent studies include, among others, Pan and Singelton (2008), Longstaff et al. (2011), Ehrmann et al. (2011), Bernoth and Erdogan (2012), Jotikasthira et al. (2013). These studies document high co-movement in sovereign spreads before the financial crisis. Using principal component analysis, Volosovych (2011) document a J-shaped long-run trend in bond market integration for 11 developed markets over the 1875-2009 period.

I. The integration measure

A. Definition

It is well recognized that cross-border portfolio flows encounter explicit and implicit barriers. Explicit barriers include legal restrictions on ownership, foreign exchange controls that are imposed by the governments of borrowing and creditor countries as well as those related to institutional constraints/mandates, for example, investors may have limited funding capacity. Implicit barriers encompass risks related to political uncertainty, incomplete, inaccurate or asymmetric information, quality of governance, market size, illiquidity, and market regulation. The nature, extent and severity of these barriers vary widely among markets. Generally they are not onerous among major developed markets during tranquil times but they may be prohibitive for markets that are not well developed, undergoing a financial/currency crisis or have defaulted in recent past.[5] Together, these barriers determine international investors' ability to access and willingness to invest in foreign securities either directly or through substitute assets such as different types of bond funds. The cross-border capital flows and the substitute assets play a major role in the market integration of equities and would be expected to play a similar role for bonds as well. To investigate this issue, we use the time-varying integration measure as defined in Errunza and Losq (1985) for a large cross-section of developed and emerging markets and their different maturity segments.

The integration measure is equal to one minus the ratio of the variance conditional on the set of substitute assets, $var\left(r_{I,t}^{(n)} \,|\underline{r_e}\right)$, to the total variance, $var\left(r_{I,t}^{(n)}\right)$, where $r_t^{(n)}$ is the holding period return on n-year bond segment from time $t-1$ to time t and $\underline{r_e}$ is the vector of returns on all substitute assets that can be bought by all investors irrespective of their nationality. Let the diversification portfolio, DP, be the return on the portfolio (of $\underline{r_e}$) that is most highly correlated with the government bond segment of maturity n. DP is constructed from the projection of the n-year bond segment return on the space of substitute assets returns, i.e. DP is the fitted value from the regression,

[5] Their bonds may be more prone to fire sale risk, and therefore investors could abstain from investing in public bonds of such markets. The reluctance of foreign investors to buy sovereign bonds of Greece and Argentina is well documented.

$$r_{I,t}^{(n)} = \beta_{1,t}^{'} r_{W,t} + \beta_{2,t}^{'} r_{UST,t} + \beta_{3,t}^{'} r_{BF,t} + \beta_{4,t}^{'} r_{ETF,t} + u_{I,t}^{(n)} \tag{1}$$

where $r_{W,t}$ is the return on the world bond index; $r_{UST,t}$ is the return on the US Treasury bonds, $r_{BF,t}$ *and* $r_{ETF,t}$ are the returns on the bond funds and ETFs, respectively; and $\beta_{j,t}^{'}$ are time-varying portfolio weights, *j=1,..,4*. As in CEH, we use dummies set to one at the introduction of new substitute assets to obtain time-varying weights.

Under the null that $r_{I,t}^{(n)} = r_{DP,t}^{(n)} + u_{I,t}^{(n)}$, we have $var\left(r_{I,t}^{(n)} | \underline{r}_e\right) = var\left(r_{I,t}^{(n)}\right) - var\left(r_{DP,t}^{(n)}\right) = var\left(r_{I,t}^{(n)}\right) - cov\left(r_{I,t}^{(n)}, r_{DP,t}^{(n)}\right) = var\left(r_{I,t}^{(n)}\right)\left(1 - \rho_{I^{(n)},DP^{(n)}}^{2}\right)$, where $\rho_{I^{(n)},DP^{(n)}}$ is the correlation coefficient between the *n*-year bond segment and its DP. However, conditioning on time, the three different parameterizations are not equivalent. As in Carrieri, Chaieb and Errunza (2013), we use the correlation based parameterization because it ensures that the integration index is bounded at every point in time *t* by 0 and 1 . Our time-varying integration index is then given by,

$$\Pi_{I,t}^{(n)} = \frac{cov_{t-1}\left(er_{I,t}^{(n)}, er_{DP,t}^{(n)}\right)^2}{var_{t-1}\left(er_{I,t}^{(n)}\right) var_{t-1}\left(er_{DP,t}^{(n)}\right)} = \rho_{I^{(n)},DP^{(n)},t-1}^{2} \tag{2}$$

where $er_{I,t}^{(n)}$ *and* $er_{DP,t}^{(n)}$ are excess returns defined as $er_{j,t}^{(n)} = r_{j,t}^{(n)} - r_{f,t-1}$, $j = I, DP$ and $r_{f,t-1}$ is the log yield on the one-month Treasury-bill. It is important to note that the integration index takes into account the globalization of markets as a result of substitute assets including global bond index returns, US Treasury bond returns, global bond funds, country bond funds, as well as exchange traded bond funds. Indeed, the construction of the diversification portfolio includes the bond funds as they come to market. If the *n*-year government bond return can be fully spanned, the index takes on the value of one and the maturity segment is considered effectively integrated. The *n*-year government bond segment is completely segmented if none of the variation can be explained by the returns on substitute assets.

The integration index is robust to model misspecification and method of estimation (see Chaieb and Errunza, 2014). Pukthuatong and Roll (2009) propose the R-square of a regression of returns on common factors as a measure of integration. When the common factors are extracted from benchmark assets that include the substitute assets, the two measures are similar.[6]

B. *Empirical methodology*

Many studies have analyzed market integration, co-movement, and predictability of bond excess returns using bond indices, which typically hold maturity constant. Therefore, the relationship between the risk premium and maturity cannot be examined. Some other studies use data on individual (benchmark) long-term bonds. In this paper, we use bond indices with different maturity bands to study the dynamics of market integration of different maturity segments of the yield curve.

Following Harvey (1991) and assuming sufficient distributional conditions that imply linear conditional expectations, we postulate that investors process information using a linear filter. There is also strong evidence for time-variation in the risk premiums of government bonds.[7] Thus, the predictable variation in excess bond returns and its corresponding DP is related to global and local information variables as follows,

$$er_{I,t}^{(n)} = \beta_{I,n}' Z_{t-1} + {\varepsilon_{I,t}}^{(n)}, \tag{3}$$

$$er_{DP,t}^{(n)} = \beta_{DP,n}' Z_{t-1} + {\varepsilon_{DP,t}}^{(n)} \tag{4}$$

where Z_{t-1} is a vector of global and local information variables at *t-1*, $\beta_{I,n}'$ and $\beta_{DP,n}'$ are time-invariant vectors of weights the investor uses to derive the conditional expected return of, respectively, the *n*-year bond segment and its DP. The vector of residuals ${\varepsilon_t}^{(n)} = \left[{\varepsilon_{I,t}}^{(n)}, {\varepsilon_{DP,t}}^{(n)}\right]'$ follows a normal

[6] Another measure is the Bekaert et al. (2011) segmentation index based on earnings yield differentials. Unfortunately, the construction of their index for bonds is not feasible.

[7] Excess bond returns are predictable by the yield spread (see, for instance, Fama and Bliss (1987) and Campbell and Shiller (1991), by a linear combination of forward spreads (Cochrane and Piazessi, 2005), by macroeconomic variables (Ludvigson and Ng, 2009; Cooper and Priestley, 2009; Joslin, Priebsch, and Singleton, 2010) and by a hidden factor (Duffee, 2011). In the global context, Solnik (1993) forecasts long-term bond returns using the local term spread and Ilmanen (1995) finds evidence of predictability with global and local factors. More recently, Dahlquist and Hasseltoft (2013) find strong predictability for Germany, Switzerland, the UK, and the US excess bond returns by a global factor, which is a GDP-weighted average of the local factors constructed as in Cochrane and Piazzesi (2005).

distribution with covariance matrix H_t. We use the multivariate full BEKK GARCH to model the dynamics of bond excess returns.[8] Specifically,

$$H_t = CC' + A'\varepsilon_t^{(n)}\varepsilon_t^{(n)\prime}A + BH_{t-1}B' \tag{5}$$

where C is a lower triangular matrix, A and B are 2×2 matrices of coefficients.

The full BEKK specification allows for cross-market dependences in conditional volatility. We can then examine the volatility spillovers between the country's government bond index and its DP, which is globally traded.

The integration index is estimated from

$$II_t^{(n)} = \frac{h^2_{I^{(n)},DP^{(n)},t}}{h_{I^{(n)},I^{(n)},t}\,h_{DP^{(n)},DP^{(n)},t}}, \tag{6}$$

where $h_{i,j,t}$ are the elements of H_t, specifically, $h_{I,DP,t}$ the time-varying covariance, $h_{I,I,t}$ and $h_{DP,DP,t}$ the time-varying variances.

II. Data

The estimation of the integration indices requires three groups of data. First, returns data on the sovereign bond indices. Second, data on the substitute assets used to construct the diversification portfolios. Third, the global and local conditioning variables to derive the conditional expected return. The data used for the panel regressions is detailed in Appendix B and discussed in Section III.

A. Sovereign bond indices

We use local currency-denominated government bond indices with maturity bands of 1-3, 3-5, 5-7, 7-10, and 10+ years. The returns are sampled at a monthly frequency for 21 developed markets

[8] Cappiello, Engle and Sheppard (2006) find weak evidence of asymmetries in conditional volatility for bond returns.

(Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, and UK). The bond indices are from Citigroup (CITI/SSS) except for Canada, Germany, Japan, and Portugal, we use the Bank of America Merrill Lynch (BOA ML) and for Singapore, we use JP Morgan because of longer historical span. For emerging markets, only eight countries have bond indices by maturities. We then use CITI/SSS bond indices for Malaysia, Mexico and Taiwan, and JP Morgan bond indices for Czech Republic, Hungary, Korea, Poland, and South Africa. All bond indices are market cap-weighted rebalanced monthly.[9] The return data are available through Datastream. The sample has different starting dates for each country and maturity, depending on when the data become available. All maturity segments are available except for Mexico's 7-10. We removed the 10+ segment of Norway as it is extremely illiquid with monthly zero returns in 86% of the sampling period. All returns are in dollar terms, continuously compounded and in excess of the one month T-Bill rate available from Kenneth French website.

[Insert Table 1]

Panel A of Table 1 presents summary statistics for excess returns across countries and maturities. The annualized mean excess return of the bond index with all maturities included for the DM sample ranges from 0.02% in Greece to 6.5% in Australia. With the exception of Ireland, Portugal, and especially Greece, the standard deviations are quite similar across the DMs. The 10+ maturity segment tends to yield higher returns on average but is also more volatile. Non-normality is present in the excess bond returns of Australia, Canada, Denmark, Japan, New Zealand, Norway, Singapore, UK, as well as the euro peripheral and intermediate and long segments of the euro core countries. The excess bond returns for Sweden across all the five segments, as well as, the excess bond returns of the short maturity segments of the core euro area countries appear to be normally distributed. The annualized mean excess return of the sovereign bond index with all maturities included for the EM sample ranges from 2% in Taiwan to 10% in Czech Rep. Standard deviation

[9] Other providers include Barclays Capital, DataStream, FTSE, and the International index company who provides the Markit iBoxx indices. We use CITI/SSS and BOA ML because of their large cross-section and time series span.

ranges from 5.6% in Taiwan to 23.0% in South Africa. Except for Taiwan, emerging market bonds' excess returns are characterized by relatively higher volatility compared to major DMs and appear to be non-normal as depicted by the Bera-Jarque test. Among DMs and EMs, only Greece, Japan, New Zealand, Portugal, and UK show evidence of autocorrelation in their returns as indicated by the $Q(z)_{12}$ statistics. Furthermore, the Ljung-box test statistic for 12th-order serial correlations in the squared returns, $Q(z^2)_{12}$, strongly suggests the presence of time-varying volatility for most DMs and EMs. The Engle–Ng test statistic indicates the presence of negative (positive) asymmetry in about 21% (35%) of the 172 country-maturity tests.

Panel B of Table 1 depicts for each country the correlations between maturities. The excess returns are highly correlated across maturities. But the correlations are lower between the 10+ and the other maturities for most DMs likely due to their lower liquidity.

B. Substitute Assets and the Diversification Portfolios

The substitute assets include the global bond world index proxied by the BOA ML Global Government Index, the US Treasury bonds, the closed-end bond funds (CEFs), and the bond ETFs.[10] From the universe, we select funds that are classified as international or worldwide bond funds by Morningstar. These include funds that invest only in foreign markets as well as those that invest in both foreign and US markets. According to the 2011 investment company's Factbook, bond funds were the largest segment of the Closed-End Fund market at the end of 2010. Nevertheless, the global bonds funds account for only 6% of the total CEFs i.e. about 14 billion dollars while the municipal and taxable domestic bond funds represent the largest fraction of CEFs.

Government bond returns and the substitute assets are available over different time periods. We then create three cohorts of countries and of substitute assets. The first one has returns data available since 1986. The second one has returns data available from 1994. The third has returns data since 2000. The 1986 set of substitute assets comprise the world bond, the US government bonds with

[10] Sovereign CDS are widely accessible to institutional investors. Nevertheless, data limitations preclude their inclusion among the substitute assets. This should not be consequential as the inception of bond funds precedes that of CDS contracts.

different maturity bands and one bond fund (Aberdeen Asia Pacific Income Fund). The 1994 set is augmented by eight more bond funds that became available after 1986 and no later than end of 1993. The 2000 set is further augmented by two more bond funds available before 2000. We run stepwise regressions of the return on the *n*-year bond segment on the substitute assets (matching the sample) and obtain corresponding *DPs*.

We then include country, regional and global ETFs for all three cohorts as they become available. The providers of the ETFs of our sample are iShares Barclays Term, iShares eb-rexx, PowerShares, and SPDR Barclays.[11] The first non-US incepted ETF is the Canadian iShares CDN Bond Index Fund, which was introduced on 11/2000. The iShares eb.rexx® Government Germany Bond Index Fund became available on 02/2003. iShares eb.rexx 1.5-2.5, 2.5-5.5, 5.5-10.5, and 10.5+ were introduced in 2005. We allow the weights assigned to previous securities to vary upon the availability of new funds as in CEH. Specifically, we use three dummies for 2000, 2003 and 2005. The fitted value from this regression is the return on the corresponding diversification portfolios, *DPAUGs* used in the estimation of the equations (3-6). Note that the set of substitute assets is common for all the government bonds (DMs and EMs).[12] Appendix A details the substitute assets.

Panel C of Table 1 shows the pairwise correlations between the world bond index, government bond indices, and their diversification portfolios. The correlation between the bond indices and their respective diversification portfolios is the highest with *DPAUG* and is on average higher for DMs than for EMs. It reaches 0.97 for Finland. As expected, for each country, the correlation between the diversification portfolio and the world bond index is higher than the corresponding correlation between the country bond index and the world bond index.

[11] All of these providers use a full physical (in-kind) replication. However, PowerShares does not purchase all of the securities in the underlying index; instead, the Fund utilizes a "sampling" methodology.

[12] Between 2006 and 2007, eight more ETFs from Canada, UK, Euro Region and the World became available. We augment further the substitute assets with those ETFs. Because of limited degrees of freedom, we cannot include all of the eight additional ETFs. Instead we run regressions on the previous securities augmented by one security of the 2007 ETFs. We then create the *DPAUG2* using the security that yields the highest adjusted R-squares. However, *DPAUG2* is very close to the *DPAUG* and does not improve on the correlation with the bond index returns. For the rest of the paper, we therefore use the *DPAUG*.

C. Global and Local Conditioning Variables

The global instruments include: (1) the US term spread measured by the yield difference between the 10-year T-bond and the 3-month T-bill, (2) the US Fed Fund rate, (3) the US default spread measured by the yield difference between Moody's Baa and Aaa rated bonds, and (4) the excess return on the world bond index. The local instruments include: (1) the local term spread measured by the 10-year bond and the 2-year bond, (2) the local short rate (1-month T-bill or the monetary policy rate), (3) the local stock market index proxied by the MSCI free index, (4) the change in (nominal or real) exchange rate, (5) the yield spread measured as the difference between the yield on a country j bond with maturity *n* and the US bond with matching maturity. All instruments are one month lagged. The redemption yield on benchmark bonds with maturities 2-, 5-, 7-, and 10- years are from Datastream. Given the paucity of yield spread data for EMs, this variable is not included for EMs. We use instead the CDS spread but only as robustness check on the estimated integration indices since the data on CDS start from 2001 or later. The CDS data is from Markit.[13] We use quotes for the 1-, 3-, 5-, 7-, and 10-year maturities.[14]

Additionally, our bond returns expressed in dollar terms are unhedged and part of the predictability is that of the exchange rate. We have added interest rate differentials to control for predictability in changes in exchange rate, but results are unchanged. This is expected since the predictive power of the forward premium is small as documented in the extant literature. Barr and Priestley (2004) show that the use of hedged and unhedged returns yields similar results. In our case, running the estimation in local currency will not prevent exposure to currency risk because the substitute assets are dollar based.

[13] We use CDS quoted in USD on foreign currency sovereign debt. Restructuring clauses vary by region. For each country, we select the most common restructuring clauses that ensures the highest liquidity and longest time span. We then select Cumulative Restructuring (CR) clause for Europe, North America, Asia, and Emerging Markets. For Australia and New Zealand, we select the Modified Restructuring (MR).

[14] There are occasionally missing observations in the monthly time series of the Markit CDS data for the emerging countries. We use linear interpolation techniques to obtain a complete set of monthly estimates of credit quality for all countries at different maturities.

Overall, there is strong evidence of predictability of the n-year bond segments and of their corresponding DPs. For most countries and maturities we reject the null hypothesis that local and global conditioning variables can be excluded. As expected, local instruments, specifically the yield spread, are more significant for the n-year bond segments, while global instruments, especially the default spread, are more significant for their corresponding DPs. [15]

III- Sovereign bonds' integration estimates

Table 2 provides descriptive statistics for the estimated integration indices by country and by maturity, as well as for different pools, namely DM pool that includes the 21 DMs, EU pool that includes the 17 EU members, Euro Area pool that includes the 11 euro area members, the Euro Periphery pool that includes the five peripheral euro area countries, and the EM pool that includes the eight EMs. We also present the trend coefficient and t-statistics from a regression of $II_t^{(n)}$ or their pools on a constant and a trend. We compute Newey-West (1987) heteroskedasticity and autocorrelation robust standard errors with six lags for the trend tests in the individual regressions, while we cluster standard errors by country and time in the pooled regressions. Figure 1 plots the per year averaged integration indices by country and across the five-maturity spectrum.

[Insert Table 2 and Figure 1]

The trend coefficient for the developed markets' sovereign bond index with all maturities included is positive and highly significant for 16 countries. However, not all maturity segments of the 16 countries are trending up. For example, the integration of Japan 1-3 and 7-10 maturity segments remained quite flat, while New Zealand 10+ maturity segment shows a reversal, albeit insignificant. Also, a pooled regression of all DMs reveals an upward trend in integration of only 1.7% per annum and no difference on average across the maturity bands. Nevertheless, we do see interesting

[15] Since our estimates of the integration measures depend on the choice of the conditioning variables, we make sure our integration indices are robust to different combinations of the conditioning variables. The estimation of the integration indices is also robust to the choice of the bond index. Results on these robustness checks, on the descriptive statistics of the conditioning variables and on the predictability and diagnostic tests, are available from the authors.

differences across the countries and the five maturity segments. Finland, Austria and Belgium are the most integrated, although the 10+ year maturity segment of Finland shows on average similar level of integration as the rest of euro area countries. New Zealand, UK, and Singapore are the least integrated among the developed markets. Barr and Priestley (2004) and more recently Christiansen (2012) find UK to be the least integrated among their sample of, respectively, five and 17 developed markets.[16]

In general, the Euro area countries are more integrated across the five maturity segments compared to EU non-euro countries. However there are clear differences among core and periphery countries in the euro area specifically since 2010 following the European sovereign debt crisis. Albeit insignificant, the trend is negative for Greece 3-5 maturity segment and for Portugal all maturity segments except the short one. The reversals for the Periphery countries could be explained by the "wake-up call" contagion (see Goldstein 1998, Bekaert et al., 2013, and Beirne and Fratzscher, 2013). These findings are consistent with the OECD 2009-2013 reports that show an upward trend in foreign holdings for euro-area core countries, while buyers of government debt in peripheral markets are increasingly local investors (notably domestic banks) as risk averse foreign investors – in light of the euro debt crisis – return to their home markets. The decrease in the level of integration during the euro sovereign debt crisis for the distressed periphery countries is also consistent with the recent evidence in Augustin (2012) who shows a higher contribution of domestic risk factors to explain the changes in sovereign CDS spreads in crisis periods and for countries undergoing financial turmoil.

The Italian and Canadian markets experienced the largest upward trend in all their maturity segments. For Canada, we observe a significant increase in the level of integration of the different maturity segments on November 2000 corresponding to the introduction of the iShares Canadian ETF. According to the OECD reports, the investor base in Italian government bonds has widened and has become more international over time. Since 2003 and until 2011, the investor base was split almost equally between domestic and non-resident holders. The trend in integration and foreign holdings has been reversed for Italy after the euro debt crisis, while Canada continued to display strong resiliency because of the low exposure of its banking system to the subprime crisis.

[16] Barr and Priestley (2004) suggest that a sequence of large public sector surpluses in the 80s greatly reduced the volume of debt outstanding with consequent effects on liquidity.

The integration of EMs sovereign bond markets is lagging behind DMs. This is not surprising in view of the lack of maturity of the EM local government bond market and youth of its yield curve. The average integration for the EM pool is 0.49 compared to 0.68 for DMs. Czech Rep. followed by Poland stand as the most integrated among the EMs, while South Africa domestic government bond is the least integrated. Although Czech Rep., Hungary and Poland joined the EU at the same time on 2004, the level of integration of their government bond market differs. Such differences are apparent across all maturity bands including the short maturities. The integration of the short segment shows a negligible upward trend of no more than 0.4% per annum for Czech Rep. and Poland, while it is downward sloping for Hungary likely due to its recent political turmoil. In fact, all these countries have not yet met the convergence criteria of the euro area. The EM pool shows a positive trend but we observe reversals in five cases across the eight EMs and five maturity segments. Also, we see large differences in the level and dynamics of integration across the maturity spectrum. The reversals are even more significant during the financial crisis. Indeed, during the latter, foreign investors naturally reduced their exposure to riskier securities. According to 2009 OECD report, debt management offices from EMs expressed their concern that the diminishing risk appetite of foreign investors and associated outflow of foreign capital are affecting especially the long-end of these countries' yield curves.

A pooled regression of all countries reveals an upward trend in integration of about 1.2% per annum for the different maturity bands. However, after the 2008 financial crisis, the trend becomes negative and significant across all maturity bands and is about -2% per annum. The inclusion of substitute assets such as ETFs did not help integrating the markets during the crisis. Interestingly, Drenovak, Urosevic and Jelic (2012) document a deterioration of ETF's tracking performance during the crisis period.

In addition, we test for the effects of major financial and currency crisis on the level of the estimated integration indices across the five maturity segments. They are the exchange rate mechanism (ERM) crisis of September 1992-August 1993, the East Asia crisis on June-December 1997, the January-December 1998 Russian Default and Long-Term Capital Management (LTCM) crisis, the

August-September 2008 second stage of the subprime crisis, and the January 2010-December 2012 euro sovereign debt crisis. For each maturity segment, we run DM and EM pooled regressions of the integration indices on a constant, a trend, and the dummy D_{crisis} that takes the value of one over the crisis period and zero otherwise. All of the regressions include country fixed effects. Table 3 reports the estimated coefficients and their standard errors clustered by country and time. For all regressions, the trend is positive and highly significant. The ERM crisis has a negative effect on the integration indices of all maturity segments with larger effect on the longer maturities. The Asian crisis has a negative impact on the integration indices of all maturity segments but only significant for the short maturities 1-3 and 3-5. The LTCM crisis negatively affected the integration level of all maturity segments but is only significant for the long (10+) maturity. The subprime crisis has an overall insignificant effect on the integration of the different maturity segments. The euro sovereign debt crisis has a negative and significant impact on the level of integration for all the five maturity bands with larger impact on the longer maturities. Thus, in general, financial crises have negative impact on bond market integration with different intensities across maturity segments. The negative impact of these crises is consistent with increasing importance of the domestic factors.

[Insert Table 3]

IV. Term structure of bond integration

The "term structure of bond integration" refers to the integration of each country bond indices estimated for different maturities. Figure 2 plots the difference in integration indices for long (LT) vs. short (ST) maturities. The term structures of integration differ over time and across countries. For Australia, Canada, and New Zealand, the long segment is more integrated than the short. This is also the case for the euro area core countries such as Austria, Belgium, France, Germany, and Netherlands before their adoption of the Euro. Interestingly, the peripheral countries, namely Ireland, Italy, Portugal, and Spain, show an inverted term structure of integration around 1997-1999.

We observe higher short term bond integration compared to longer term bonds after 2001 for EMU member countries. This pattern can be explained as follows: the convergence among EMU markets (primarily through the short end as a result of a harmonized monetary policy), led to a reduction in local premia for ST compared to local premia for LT bonds. The term premia on LT bonds is also higher. Hence, if we assume that the global premia is similar for ST and LT segments, it would mean a relatively lower total risk premia on ST compared to LT bonds after joining the EMU and before the euro sovereign debt crisis which is consistent with a relatively higher integration index on ST compared to LT maturity segments.

We also observe striking differences across EMs. For example, over most of the sample period, the term structure of integration for Taiwan is downward sloping, while it is upward sloping for South Africa. Moreover, the differential in integration between the long and the short maturity segments is much more volatile in EMs than in DMs with the exception of Greece, Japan, New Zealand, and UK.

[Insert Figure 2]

Does a positive slope of the term structure of bond market integration predict an expected increase in the integration of the future short segment? To shed light on this question, we examine the impact of the slope of the term structure of integration that is of the difference between the long and the short maturity segments on the next month's change in the level of integration of the short maturity segment. We run the DM and EM pooled regression:

$$II_{i,t}^{short} - II_{i,t-1}^{short} = C + \underset{(0.009)}{\overset{\gamma_1}{0.100}} \left(II_{i,t-1}^{long} - II_{i,t-1}^{short}\right) + \varepsilon_{i,t}, \ \ adjusted\ R^2 = 3\% \tag{7}$$

The estimated coefficient γ_1 and its standard error (in parenthesis) are reported in Equation (7). As conjectured, γ_1 is positive and significant for the DM and EM pool as well as the DM only pool. Controlling for the lagged change in the integration of the short segment and for the lagged term spread does not affect the estimate of γ_1. The slope predicts future increase in integration of the short segment for up to ten months. Also, allowing for a country specific slope, we obtain a positive and significant coefficient in 14 of the 29 countries. The coefficient is negative but insignificant for Czech Rep., Poland, and Taiwan. This analysis shows that the slope of the integration term structure has some predictive power in explaining the future expected integration of the short maturity segment. The information content of the integration index slope parallels the expectation hypothesis statement for the term structure of interest rates.

What factors can explain the difference in the level and dynamics of integration across the different segments of the yield curve? To shed light on this question, we regress the differential in integration between the long and the short maturities on factors that presumably affect the term structure of sovereign bond markets' integration. We use the difference in the estimated integration index of the long but still liquid maturity segment (7-10) and the short maturity segment (1-3) as dependent variable and relate it to a number of factors. The advantage of using the spread rather than the level of integration of the long and the short is to alleviate the concern with missing factors that would affect similarly the integration of the long and the short maturity segments. The analysis considers five main potential determinants of the term structure of bond integration, (1) the institutional environment, (2) sovereign risk, (3) habitat-preferences, (4) future investment opportunities, and (5) push factors.[17] We estimate various specifications of the following pooled OLS regression:

$$
\begin{aligned}
& II_{i,t}^{long} - II_{i,t}^{short} = \\
& c + \beta_1 (Institutional\ environment)_{i,t-1} + \beta_2 (Sovereign\ risk)_{i,t-1} + \\
& \beta_3 (Habitat - preferences)_{i,t-1} + \beta_4 (Future\ investment\ oportunities)_{i,t-1} + \\
& \beta_5 (push\ factors)_{i,t-1} + X_{i,t-1}' \gamma + \varepsilon_{i,t} \qquad (8)
\end{aligned}
$$

where X_{it} is the set of control variables. Obviously, the correlation patterns are subject to endogeneity and omitted variables critiques. However, relying on lagged variables alleviates the former issue.

[17] Bekaert et al. (2011), and Carrieri et.al. (2013) use liquidity proxies to explain market integration for EM equities. Unfortunately, data on similar indicators such as turnover or bid ask spreads, are difficult to obtain at the index level for sovereign bonds or are only available towards the end of the period and for a small cross-section.

A- Analysis of explanatory variables

Institutional environment: The role of the legal system and of political institutions on financial development and economic growth is well established in the literature (see among others La Porta et al. 1997, 1998; Rajan and Zingales, 2003; Stulz, 2005; Djankov, Liesh, and Shleifer, 2007). Past studies on the determinants of the integration of the stock markets uncover a significant role for political risk (see Bekaert et al., 2011, Carrieri et al., 2013). Political institutions affect corporate credit markets (see Qi et al., 2010). Foreign investors are attracted to safe countries with strong institutions. We conjecture that political stability and the strength of the legal system should matter even more for investors in long term sovereign bonds and especially for those who pursue passive investment strategies focused on a long term investment horizon. This leads us to hypothesize that the relatively higher integration of the long relative to the short maturity segment should be positively associated with a better institutional environment. To capture the relevance of the quality of the institutional environment we use the political risk index (*POL*). This index is computed by the Political Risk Services' International Country Risk Guide (ICRG) by combining several components, such as quality of institutions, conflict, democratic tendencies, and government actions, which make a country less attractive to foreign investors. The range of the index goes from 0 to 1. A higher number indicates lower political risk.

Sovereign risk: Differences in the credit quality of sovereign issuers have effects on the relative pricing of their bonds. A highly indebted country with high leverage, weak fiscal discipline and rising credit risk would have to offer a higher yield to draw investors into holding especially its long term bonds. We therefore conjecture that the integration of the long versus the short maturity segment should be more sensitive to sovereign risk, to higher leverage and to a higher fiscal deficit. To proxy for sovereign risk, we use the S&P credit rating, *Rating_LT*, linearly transformed into a numerical format ranging from 1 (Default) to 21 (AAA). Alternatively we use the yield spreads or CDS spreads as proxies for sovereign risk.[18] The yield spread (*YS10*) is the redemption yield on 10-year benchmark

[18] Beber, Brandt, and Kavajecz (2009) show that sovereign yield spreads are mainly explained by differences in credit quality, while liquidity matters in times of heightened market uncertainty.

domestic sovereign bonds minus the redemption yield on 10-year US sovereign bonds. We use the sovereign CDS quotes for 5-year maturities (*CDS5*). Sovereign risk measures are related to fiscal space and leverage measures. We then control for the level of debt in the country proxied by the public debt to GDP ratio (*PD/GDP*). Following Aizenman et al. (2013), we use the fiscal space (*FS*) measured as the inverse of tax-years it would take to repay the public debt as proxy for fiscal fragility.

<u>Preferred-habitat view and supply effect:</u> Greenwood and Vayanos (2012) and Krishnamurthy and Vissing-Jorgensen (2011) show that the relative supply of long-term and short-term Treasuries affects their relative yields. Using an event study methodology over the 2008-11 period characterized by the Federal Reserve quantitative easing policies, Krishnamurthy and Vissing-Jorgensen (2011) show that long-term Treasury yields fell relative to short-term yields as a result of supply reduction of long-term Treasuries. They attribute this to demand for extremely safe assets of specific maturities. Vayanos and Vila (2009) show that investors' preference for certain types of bonds, combined with risk aversion by bond market arbitrageurs, can result in bond return predictability not directly attributable to real interest rate risk or inflation risk, but to market segmentation. This segmentation is the result of bond market arbitrageurs not fully offsetting the positions of "habitat investors" in response to shocks in the bond market. Greenwood and Vayanos (2012) show that relative supply of long and short Treasuries is related to the slope of the yield curve. In the absence of perfect maturity arbitrage, we thus expect the increase in the relative supply of long bonds to result in a relative increase in their expected return. To theoretically relate this increase to changes in relative integration of the long versus the short maturity segment requires too many simplifying assumptions (in particular regarding the term structure of interest rate volatilities). Hence, in the absence of a well-defined theoretical prediction, we treat this as an empirical issue. We use as proxy for the relative supply effect the gross bond issuance of local currency-denominated long and short bond maturities as fraction of total amount issued at month *t*. We compile time series of bond issuance in local currency at different maturities from Bloomberg. We then consider two groups of bonds: short-term bonds with maturities of less than three years (*AI_short*), and long-term bonds with maturities greater than seven years (*AI_long*). A similar measure is used in Broner, Lorenzoni and Schmukler (2013) for foreign-denominated bond issuance of

emerging markets. Interestingly, over our sample period, we notice a general trend for developed and emerging governments to shift issuance to shorter maturities even before the start of the financial crisis. Nevertheless, there are striking differences across countries and time in bond issuance activity.

Ideally, we should also control for a demand effect captured by the foreign sovereign bond holdings by maturity. However, such data are available for only 12 EU countries and do not span the full 1986-2012 period and their maturity breakdown is simply not available. Hence, we include domestic institutional holdings by pension funds and insurance companies (*IH*). Holdings of pension funds and insurance companies are mainly geared towards long dated bonds and hence may serve as a good proxy for foreign holdings of long dated domestic government bonds especially for EU countries.

Future investment opportunities: Foreign investors' investment decisions are affected by local future macro-economic conditions. We use real GDP growth (*ΔGDP*), monetary policy conditions proxied by the domestic short real interest rate (*SR*), the local term spread (*TS*), and the foreign currency appreciation (ΔFX) to capture the expected future investment opportunities of the sovereign bond issuing country. A steep slope of the yield curve and a high level of interest rates predict high excess returns on long term bonds. Also high GDP growth and a strong currency should attract long-horizon foreign investors. We then expect the relative integration of long bonds versus short bonds to increase with improving future investment opportunities. In addition, we control for the level of the real short rate in the US market (*SR_US*). We run an alternative specification replacing the two real short rates with the differential between one-month foreign and US euro deposit rates (*ID1M)*, while keeping the other proxies for the future investment opportunities.[19]

Push factors: A loose monetary policy in US could lower risk aversion. Investors seek more risk when real interest rates are low and invest more in riskier domestic and foreign long term bonds. As push factors, we then use the US real interest rate (*SR_US*). We also use a measure of US market sentiment (*SENT*) constructed in Baker and Wurgler (2007) as well as the implied volatility of the S&P index (*VIX*).

[19] The differential in the foreign and US short rates together with the foreign currency appreciation could also capture the currency carry trade.

Since economic and market development factors have been linked by Bekaert et al. (2011) and Carrieri et al. (2013) to the degree of equity market integration, we include two control variables: trade to GDP (*TR/GDP*) as a measure of economic openness and private credit to GDP (*PC/GDP*) as a measure of banking development. More detailed explanation of all the variables and their sources is provided in Appendix B.

Table 4 reports descriptive statistics for these explanatory variables as well as their cross-correlations. Notice that some of the variables are available only for a subset of the cross-section.[20] As in all cross-country empirical studies, data availability issues affect sample size. Panel A shows means for the explanatory variables by country. There are significant heterogeneities in most variables across countries, especially across DMs vs. EMs. We then include an EM dummy in all the panel regressions to ensure we are not capturing an emerging country effect.

Panel B presents correlation coefficients for the regression variables. Of the 120 pairwise correlations among the independent variables, 19 are significant at the 5% or lower. As expected, *Rating_LT* is highly negatively correlated with the alternative proxies *YS10* and *CDS5*. Also, political risk is correlated with sovereign risk rating (0.6), yield spread (-0.7), *CDS5* (-0.5), and *FS* (-0.8). In a recent paper, Bekaert et al. (2014) suggest to extract the political risk component from sovereign yield spreads. They show that, on average, one third of the sovereign spread reflects political risk. The foreign currency appreciation is negatively correlated with the interest rate differential and also strongly negatively correlated with the 10-year yield spread.

Also the cross-correlations indicate that a better quality of institutions is related to lower sovereign risk, lower level of debt, stronger fiscal discipline and a stronger currency. The sign of the correlations between the relative integration of the long vs. the short and the explanatory variables are in general as expected albeit only two are significant. Long-term bonds show relatively higher

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[20] Note that some of our variables are not available at the monthly frequency such as data on *PC/GDP*, *PD/GDP*, and *FS* which are annual, while *ΔGDP* and *IH* are quarterly. Since our estimation is at the monthly frequency, we use standard linear interpolation. As these variables are quite persistent, the interpolation method should not have a material impact on our results. Section V offers robustness tests on this issue.

integration when political risk is low, sovereign risk is low, interest differential is high, relative amount issued of long and of short bonds is high and public debt as fraction of GDP is low.

Panel C of Table 4 presents descriptive statistics of the variables used in the panel regressions. The average across DMs and EMs of political risk rating is 0.8 and of sovereign bond rating is 18, which corresponds to AA-. The median spreads on 10-year sovereign benchmark bonds are about 7 basis points higher than the corresponding US Treasuries. The median CDS spreads on 5-year contracts are 53 basis points but the spread is highly skewed with a mean almost double the median. The average fraction of short maturity bond issuance is about three times that of the long maturities bond issuance. The average institutional holdings of sovereign bonds is 18% with significant differences across the EU countries. The average 1-month euro-currency deposit rates are about 11 basis points higher than the corresponding US rate.

[Insert Table 4]

B- Main results

We report the estimated coefficients and their standard errors from the various specifications of equation (8) in Table 5 for the entire sample of DM and EM countries.[21] In all regressions, we do not include time and country fixed effects since some of the variables such as *POL* and *Rating_LT* are highly persistent over time. However, we cluster standard errors by country and period to account for correlations among error terms within country and within the month (see Petersen, 2009). The use of the estimated integration indices as dependent variables in the panel yields consistent estimates of the coefficients. However, the reported standard errors ignore the sampling error and hence likely understate the true standard errors.

Before we turn to the different specifications of the pooled OLS regression, we estimate a model with only country and time fixed effects to determine an upper R-squared bound for these regressions. As reported in Column (1) of Table 5, we can explain up to 32.5% of the total variation of the

[21] Untabulated results from univariate regressions are overall consistent with the predicted signs of the explanatory variables.

difference in integration indices between the long and the short. The cross-sectional variation is more significant. The explanatory power of the country-only (time-only) fixed effect model is 27% (3.8%). We also plot the time fixed effects and country fixed effects coefficients in, respectively, Panels A and B of Figure 3. We observe a striking downward trend in the relative integration of the long versus the short maturity segments following the Lehman bankruptcy and the euro sovereign debt crisis. The country-fixed effects confirm the heterogeneity in the term structures of bond integration. The country effects for all non-EU markets except Switzerland are all quite positive. Euro area peripheral countries show a lower relative integration of the long versus the short due to the negative influence of the euro sovereign debt crisis on long term foreign investors. This lower trend in long term relative to short term maturity segments' integration can also be observed in the case of Switzerland, Sweden, and Taiwan.

[Insert Table 5 and Figure 3]

In Column (2) of Table 5, we first examine the impact of the quality of institutions and report the estimation of model (1), where we impose $\beta_j = 0, j = \{2,3,4,5\}$. The coefficient on political risk is positive and highly significant suggesting that a better quality of a country's institutions is followed by a higher integration of the long vs. the short maturity segment. A one-standard-deviation increase in *POL* of 6.5% increases the relative integration of the long by 0.02. In model (2), we impose $\beta_j = 0, j = \{1,3,4,5\}$. We next examine the role of sovereign risk and therefore run model (2) with the three alternate proxies for sovereign default risk, namely, *Rating_LT* (model 2a), *YS10* (model 2b), and *CDS5* (model 2c). The use of CDS reduces significantly the size of the pool since data on CDS are only available from 2001 or later. All three explanatory variables, *Rating_LT*, *YS10*, and *CDS*5 come with the expected sign but only *Rating_LT* is significant.[22] In these regressions we also control for the country leverage and fiscal discipline. *PD_GDP* is negative in all three regressions and is significant when YS10 or CDS5 are used as proxies for credit risk. Fiscal space is unexpectedly positive. A one-standard-deviation increase in credit quality as measured by *Rating_LT* of 3.09 increases the relative

[22] As expected the results are unchanged with alternative maturities because of the high co-movement in the CDS across the maturity spectrum as shown in Pan and Singleton (2008). The coefficients on 1-, 2-, 3-, 7-, and 10- year CDS spreads are negative but insignificant.

integration of the long by 0.06 which confirms our conjecture that lower sovereign risk is particularly important for long term passive foreign investors. In model (3), we further impose $\beta_j = 0, j = \{1,2,4,5\}$ to examine bond supply and demand effects. We run a regression with the relative supply effect (3b) and one controlling for the demand effect (3b). *AI_long* and *AI_short* are both positive but insignificant. After adding local institutional holdings, our sample includes only EU countries. In (3b), *AI_long* remains positive, while *AI_short* switches sign but both are insignificant. As predicted, the coefficient on IH – our proxy for the demand by long term foreign investors– is positive and significant. A one standard deviation increase in local institutional holdings of 0.12 is followed by an increase in the relative integration of the long by 0.02. In model (4), we impose $\beta_j = 0, j = \{1,2,3,5\}$. We then examine the impact of future investment opportunities of each country on its relative integration. In the regression (4a) where we include separately the local and US real short rates, we obtain a positive and significant coefficient on the local real short rate and real GDP growth which corroborates our conjecture that better investment opportunities are followed by a higher relative integration of the long although economically the effect is quite small. The term spread and change in exchange rate are positive as expected although insignificant. The US short rate is positive and insignificant. Alternatively in (4b), we replace the local and US real short rates with the one-month interest rate differential. We get positive coefficients but insignificant on $ID1M$ and TS. Real GDP growth remains positive and significant. Finally, in model (5), the push factors are insignificant and have a very low explanatory power.[23] In all the specifications 1-5, we include an emerging country dummy but impose $\gamma = 0$, i.e. controls are not included. Overall, we can conclude from these various specifications that sovereign risk has the largest explanatory power (11%) on the relative integration of the long versus the short bond market segments, followed by institutional quality (2%) and future investment opportunities (2%).

The full multivariate specification reported in model (6) confirms our hypotheses and our previous results. However, only *POL, Rating_LT*, and *SR* preserve their significance. Countries with

[23] In unreported results, we replace *VIX* with the alternative measure of investor sentiment, *SENT*. The coefficient on *SENT* is insignificant and the explanatory power of the push factors remains very low.

less political risk, better credit quality, and a higher real short rate exhibit higher integration level at the long maturity end. [24] In model (6), we also control for trade openness and banking development. The coefficients on *PC/GDP and TR/GDP* are negative and insignificant suggesting that trade openness and a better banking system are followed by a higher integration of the short maturity segment. We run the full model with the local and US real short rates separately (6a) or using instead the one-month interest rate differential (6b). In (6b) six emerging markets are dropped because of lack of data on interest rate differential. Therefore (6b) comprises essentially DMs. The main results are unchanged. The adjusted R^2 of models (6a) and (6b) are 13% and 17%, respectively. We rely on these two specifications for further analysis of the economic significance of our results. We combine the estimated coefficients in models (6a) and (6b) with the cross-sectional distribution of the explanatory variables and assume a joint increase from the 25th percentile to the 75th percentile in the variables proxying for the quality of institutions, sovereign risk, and future investment opportunities. As reported in Panel C of Figure 3, we find that the relative integration of the long versus the short maturity segments increases by about 15% as a result of an improved institutional environment, lower sovereign risk and improved future investment opportunities. Under very simplifying assumptions, this translates into a differential long versus short segment funding cost for the sovereign of 1.5% per annum.[25]

V- Robustness of results

We examine the robustness of our findings to additional control variables, choice of maturity segment, effects of subcomponents of the political risk index, subperiods, time dynamics, and sample composition. Models (R1)–(R7) in Table 6 thus include a set of estimations that extend the analysis from our main specification of model (6a). Overall, these additional analyses support our main results.

[24] Note that in the full model we exclude *TS* as it is highly correlated with *Rating_LT*. Additionally, *FS* is highly correlated with *POL*, *Rating_LT* and *PD/GDP*. Inclusion of this variable in (6a) and (6b) does not affect any of our results albeit its removal makes *ΔGDP* highly significant.

[25] We assume that the global market and currency risk premia are the same for both segments.

[Insert Table 6 here]

A- Additional controls

The difference in the integration index between the long and the short segments depends on the volatility of bond returns within each maturity segment. It is well established that volatility increases in uncertain times and in bear markets. The higher integration of the long term bonds could then result from their higher sensitivity – for instance as proxied by their duration - to interest rate volatility during crisis periods. We control for the volatility of the long and short bonds' returns using their realized returns' volatility constructed by cumulating the square of daily bond index returns of the long (7-10) and of the short (1-3) segments. The non-availability of higher frequency data precludes the use of intraday returns as used by Andersen et al. (2003). We follow Bekaert et al. (2014) and take a 12-month moving average of the monthly bond volatility measure. As expected this measure is highly positively correlated with our estimated volatility from the bivariate GARCH model presented in Section II. The correlation is on average 0.7. Controlling for bond returns' volatility using difference in volatilities between the long and the short (VOL_{710}-VOL_{13}) does not change our main inferences with respect to the significance of political risk, sovereign risk and future investment opportunities as depicted by model (R1a). Results are the same using the volatilities of the long and short term bonds' returns separately.

Our sample period encompasses quantitative easing (QE) programs in response to the recent financial crisis. Specifically, the large purchases of long-term debt by the Federal Reserve (Fed) result in lower nominal rates on US long-term government bonds. Reduced supply of safe Treasury assets might push investors into safe but higher yielding foreign long term bonds. We therefore analyse the effect of QE policies pursued by the Fed on the differential in integration between the long and the short segments. Specifically, we add the change in US monetary base (ΔUSM) as well as its interaction with *Rating_LT* to model (6a) in addition to the U.S. interest rate that is in the base model and run the specification over the 2008/01-2012/12 period. We are agnostic regarding the sign on ΔUSM but would predict a positive coefficient on the interaction term given the well documented flight to quality. The coefficient on ΔUSM, reported in model (R1b), is negative and marginally significant implying that an increase in the US monetary base is associated with higher integration of the short relative to the long segment. However, the interaction coefficient between the change in the monetary base and the sovereign rating variables is positive and significant implying that, as conjectured, the effect of an enhanced credit rating is stronger conditional on the US monetary base expansion. Additionally, political risk and the local real short rate remain significant, while the US real short rate - which now proxies for the US future investment opportunities- is now negative and significant.

B- *Bond Maturity*

Results of model (6a) but using the integration index for the 10+ maturity segment instead of the 7-10 remain unchanged. We control for volatility using the difference in realized volatility measures between the 10+ and 1-3 segments (VOL_{10+}-VOL_{13}). The results of this specification are summarized in model (R2). All of *POL*, *SR,* and *Rating_LT* retain their sign and significance, while *POL* becomes even more economically significant. Interestingly, the difference in volatility is now positive and also significant. In unreported specifications, we looked at the determinants of the differential between the medium and the short maturity bands. Sovereign default risk rating is once again the most significant variable and it has a larger coefficient compared to the regression based on the long minus short maturity segments.

C- *Political risk subcomponents and legal institutions*

Following Bekaert, Harvey and Lundblad (2005) and Bekaert et al. (2014) we group the 12 political risk subcomponents into four categories: (1) Quality of institutions (*QIS*), which include *Law and Order*, *Bureaucratic Quality*, and *Corruption*; (2) Conflict, which includes *Internal Conflicts*, E*xternal Conflicts*, R*eligious Tensions*, and *Ethnic Tensions;* (3) Democratic Tendencies (*DEMTEN*), which includes *Military in Politics* and *Democratic Accountability*; (4) Government Actions (*GOVACT*), which includes *Government Stability, Socioeconomic Conditions*, and *Investment Profile.* In unreported univariate regressions, all of the four subcomponents have positive coefficients, but only the quality of institutions is statistically significant. We report the specification with all four political risk subcomponents and no additional controls in model (R3a). Again only the quality of institutions is positive and significant. We then replace in model (6a) the political risk index by its four subcomponents. Results are reported in model (R3b). The positive and significant effect of *QIS* remains intact. *GOVACT* becomes positive and marginally significant, while *DEMTEND* is unexpectedly negative and significant. Collectively, these findings lend support to the conjecture that lower political risk and in particular better quality of institutions are important determinants of the higher integration of the long compared to the short maturity segments. In specification (R3b), *Rating_LT* becomes marginally significant, while *SR* retains its sign, size and significance. Controlling for other aspects of political risk such as electoral process, political pluralism, and functioning of the government summarized in the political rights index (*Political-Rights)* of Freedom House does not affect our results.[26]

The institutional environment could also be captured by legal institutions. We follow La Porta et al. (1998) and Djankov et al. (2007) and proxy legal institutions with the creditor rights index (*Creditor-Rights)*.[27] The index ranges from zero to four and a higher score corresponds to stronger creditor rights. We run model (6a) augmented with *Creditor-Rights*. The results of this regression are in Model (R3c). As expected, the coefficient on *Creditor-Rights* is positive and significant implying that greater creditor rights are followed by higher relative integration of the long maturity segment. Including *Creditor-Rights* lowers the importance of political risk, however it still remains positive and significant. In unreported regression, we also include the interaction between political risk and creditor rights. The interaction term is negative and insignificant, creditor rights coefficient is positive and insignificant, but political risk remains positive and significant. These last results suggest that there is some complementarity between political risk and creditor rights but the former seems more relevant.

D- Euro adoption and sample composition

[26]This political rights index has been used by Qi et al. (2010). It ranges from one to seven, where a higher rating corresponds to lower political rights. See Appendix B for further details on its components.

[27] The index is available from Djankov et al. (2007) from the start of our sample till 2003. We follow Qi et al. (2010) and assume a constant value of the index from 2003 till 2012.

In model (R4), we control for the effects of Euro adoption. We add to model (6a) the indicator, $EURO_{it}$, which takes the value of one in month t if the country is part of the Euro area, and zero otherwise. Adding the EURO indicator does not affect the main results. Indeed, we still observe that enhanced political stability, lower sovereign risk and improved future investment opportunities increase the integration of the long relative to the short maturity segment. In addition, the $EURO$ indicator is negative and significant. The difference in integration between the long and the short segments is 6% lower between Euro area member countries. As expected, monetary unification resulted in higher integration of the short relative to the long maturity segment.

All our specifications of Table 4 were estimated on developed and emerging markets pooled regressions. Unreported results show that our findings are unchanged for the developed markets sample and that no single country or region is driving the explanatory power of the full sample.

E- Subperiod analysis

We examined different subperiods. The main findings are overall unchanged but sovereign risk is less significant over 2001-2010. Over this period, Longstaff et al. (2011) show that sovereign risk is more driven by global market factors than by country-specific fundamentals. In (R5a) and (R5b), we report two specifically interesting sub-periods, 01/1993-01/1999 that includes only DMs before the launch of the euro and 01/2008-12/2012 that includes the DMs and EMs during the subprime and euro crisis periods. *POL* and *Rating_LT* are positive and significant over the two subperiods. Over the first subperiod, *SR* loses its significance, while ΔGDP is statistically and economically significant. Over the second subperiod, the local and US real short rates are highly significant and of the expected sign, while ΔGDP is not. Moreover, VIX is positive and significant. All of the results from the full sample or subperiods are robust to inclusion of trend or year dummies for the crisis periods.

F- Frequency and outliers effects

Some of the independent variables are measured at quarterly or yearly frequency. We redo the estimations at the annual frequency. We time aggregate the monthly integration indices by taking an average over each year. Much information is potentially lost with the time series aggregation, but the aggregation should potentially reduce the effects of sampling variation. We report results in model (R6). The positive and significant effect of *POL*, *Rating_LT*, *ΔGDP,* and *SR* continues to hold.

Finally, to make sure that we are not capturing outlier effects, we re-run model (6a) after winsorizing extreme values that fall in the upper and lower 1% of the distribution of the integration differential. Results displayed in model (R7) are unchanged. The explanatory power of model (R7) is the same as the one observed for the non-winsorized model (R6a).

Conclusion

We study the impact of major innovations including market liberalizations to reduce barriers to cross-border portfolio flows, development of significant local currency bond markets in emerging economies as well as the advent of exchange traded bond funds on world market integration of sovereign bonds. Based on the integration measure of Errunza and Losq (1985) that accommodates market segmentation, we examine time varying integration of 21 developed markets and eight emerging markets. We also examine the level of integration across maturity bands of 1-3, 3-5, 5-7, 7-10, and 10+ years and develop their corresponding term structure. Our integration measure accounts for the role of substitute assets such as bond funds, closed-end funds, and ETFs that play a major role in integrating markets. We next examine the economic importance of various factors that may explain the differences in the level and dynamics of integration across the long and short maturity bonds.

Our results indicate a general upward trend in the integration for most countries and across different maturities. Nevertheless, there are interesting differences in the level and dynamics of integration across maturities and countries. For example, Finland, Austria and Belgium are the most integrated, whereas New Zealand, UK and Singapore are the least integrated among the developed markets. Czech Rep. followed by Poland stand out as the most integrated among the EMs, while South

Africa domestic government bond is the least integrated. The integration of EMs sovereign bond market is lagging behind DMs and also more volatile. The average integration for the EM pool is 0.49 compared to 0.68 for DMs. We do observe reversals and negative trends especially during the financial crisis. We show that the slope of the term structure of integration predicts the expected future short term integration level of each country. Finally, the integration of the long versus the short maturity bonds increases by 15% on average, when a country moves from the 25^{th} percentile to the 75^{th} percentile as a result of enhanced institutional quality, lower sovereign risk, and improved future investment opportunities. These findings are robust to additional controls, choice of maturity segments, effects of subcomponents of the political risk index and of creditors' rights, subperiods, and sample composition.

The set of results obtained in this study is useful for managing global fixed income portfolios. It is particularly relevant for policy makers for devising fiscal and monetary policies leaning towards higher integration of the international bond market.

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Appendix A
Substitute Assets

Fund name	Market	Inception date	Exchange
World Income Funds			
Aberdeen Asia-Pacific Income Fund Inc (FAX)	Asia-Pacific	17.04.1986	AMEX
Templeton Global Income Fund (GIM)	world	17.03.1988	NYSE
Aberdeen Global Income (FCO)	world	12.03.1992	NYSE
DWS Global High Income (LBF)	world	24.07.1992	NYSE
Strategic Global Income Fund (SGL)	world	24.01.1992	NYSE
Global High Income (GHI)	world	30.09.1993	NYSE
Morgan Stanley Emerging Markets Debt Fund (MSD)	EM Region	16.07.1993	NYSE
Templeton Emerging Markets Income Fund (TEI)	EM Region	23.09.1993	NYSE
Western Asset Emerging Markets Income Fund (EMD)	EM Region	18.06.1993	NYSE
Western Asset Worldwide Income Fund (SBW)	world	23.12.1993	NYSE
PIMCO Strategic Global Government Fund (RCS)	world	18.03.1994	NYSE
ETFs			
iShares Canadian Universe Bond Index	Canada	20.11.2000	Toronto Stock Exchange
iShares eb.rexx® Government Germany	Germany	06.02.2003	Deutsche Börse
iShares eb.rexx® Government Germany 5.5-10.5	Germany	31.01.2005	Deutsche Börse
iShares eb.rexx® Government Germany 1.5-2.5	Germany	31.01.2005	Deutsche Börse
iShares eb.rexx® Government Germany 2.5-5.5	Germany	31.01.2005	Deutsche Börse
iShares eb.rexx® Government Germany 10.5	Germany	28.09.2005	Deutsche Börse
iShares eb.rexx® Government Germany 10.5+	Germany	28.09.2005	Deutsche Börse
iShares Canadian Government Bond Index Fund	Canada	06.11.2006	Toronto Stock Exchange
iShares FTSE UK All Stocks Gilt	UK	01.12.2006	London Stock Exchange
iShares Barclays Capital Euro Government Bond 1-3	Euro Region	05.06.2006	London Stock Exchange
iShares Barclays Capital Euro Government Bond 3-5	Euro Region	08.12.2006	London Stock Exchange
iShares Barclays Capital Euro Government Bond 7-10	Euro Region	08.12.2006	London Stock Exchange
iShares Barclays Capital Euro Government Bond 15-30 Fund	Euro Region	08.12.2006	London Stock Exchange
PowerShares Emerging Mkts Sovereign Debt	EM Region	30.11.2007	NYSEArca
SPDR Barclays Capital International Treasury Bond	World	05.10.2007	NYSEArca

Appendix A presents the list of bond funds and ETFs used as part of the substitute securities, their inception date, underlying market, and the exchange where they trade. The list of closed-end bond funds is from Lipper, Wall Street Journal, and Barron's. The list of ETFs is from Morningstar, Bloomberg, official websites of ETFs, and index providers. Given that the Euro region ETFs are listed on multiple exchanges, we use the listings with the longest time series. Hoding period returns data on these securities are from CRSP and Datastream.

Appendix B
Variable definition

Variable	*Name*	Description
Variables used in the main regressions (Section IV of the paper)		
Institutional Environment		
Political risk	*POL*	Political risk ratings based on the sum of 12 weighted variables covering both political and social attributes. The index has 100 points. It is scaled to range from 0 (high risk) to 1 (low risk). Frequency: Monthly. Source: International Country Risk Guide (ICRG).
Sovereign risk		
Sovereign Credit Ratings	*Rating_LT*	S&P sovereign ratings of long term foreign bond transformed linealry into a numerical format ranging from 1 (Default) to 21 (AAA). Frequency: Monthly. Source: Bloomberg and Standard&Poor's.
Yield Spread	*YS10*	Redemption yield on 10-year benchmark domestic sovereign bonds minus redemption yield on 10-year US sovereign bonds expressed in percentage per month. Frequency: Monthly. Source: Datastream.
CDS spread	*CDSn*	Sovereign Credit Default Spread for *n* -year maturities, *n = 1, 2, 3, 5, 7, 10* expressed in percentage per month. Frequency: Monthly. Source: Markit.
Public Debt/GDP	*PD/GDP*	Total public debt divided by Gross Domestic Product (GDP). Frequency: Annual. Source: World Bank Development Indicators (WDI).
Fiscal Space	*FS*	Inverse of tax-years it would take to repay the public debt following Aizenman et al. (2013). The denominator, Tax base, is tax revenue/GDP. Public Debt is public debt/GDP. Frequency: Annual. Source: WDI.
Habitat-preferences and supply effect		
Government Bond Issuance	*AI_long, AI_short*	Amount issued of long (AI_long) and of short (AI_short) maturity bonds as fraction of total amount issued at month t. Amount issued is the gross amount of local currency-denominated bond. The gross amount is grouped by maturity segments n = {less than 1-year, 1-3, 3-5, 5-7, 7-10, over 10}. Short maturity is less than 3 years and long maturity is over 7 years. Frequency: Monthly. Source: Bloomberg.
Local Institutional Holdings of Sovereign bonds	*IH*	Holdings of local financial institutions (including pension funds, insurance, social security funds, mutual funds) as fraction of total sovereign bond holdings. Frequency: Quarterly. Source: Bruegel database of sovereign bond holdings developed in Merler and Pisani-Ferry (2012) completed with data from Debt Management Office of UK.
Future Investment Opportunities		
Interest rate differential	*ID1M*	Interest rate differential computed as the 1-month foreign currency (FC) deposit rate minus USD deposit rate expressed in percentage per month. Frequency: Monthly. Source: Datastream.
Currency appreciation	ΔFX	Percenatge change in exchange rate measured as USD/FC. Frequency: Monthly. Source: Datastream.
Term Spread	*TS*	Redemption yield differential on benchmark domestic sovereign bonds (10-year minus 2-year) expressed in percentage per month. Frequency: Monthly. Source: Datastream.
Local Real Interest Rate	SR	Real interest rate calculated as the difference between the country's short interest rate (proxied by the 1-month T-bill or the monetary policy rate depending on data availability and time span) and the inflation rate. SR is expressed in percentage per month. Frequency: Monthly. Source: Datastream.
GDP growth	ΔGDP	Growth of real gross domestic product (GDP). Frequency: quarterly. Source: OECD website and Oxford Economics through Datastream.

Variable	Name	Description
Push Factors		
US Real Interest Rate	SR_US	Real interest rate calculated as the difference between the US fed fund rate and the inflation rate expressed in percentage per month. This variable exhibits only time-series variation. Frequency: Monthly. Source: Datastream.
Investor Sentiment	*VIX, SENT*	VIX is the option volatility index from Chicago Board Option Exchange. SENT, is the first principal component of 6 proxies (trading volume; the dividend premium; the closed-end fund discount; the number and first-day returns on IPOs; and the equity share in new issues) as used in Baker and Wurgler (2007). Data available at http://www.stern.nyu.edu/ jwurgler. VIX and SENT exhibit only time-series variation. Data on SENT is from 01/1986-12/2010. Frequency: Monthly.
Controls		
Private Credit to GDP	*PC/GDP*	Private credit divided by GDP. Credit to private sector refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable that establish a claim for repayment. Frequency: Annual. Source: World Economic Outlook.
Trade to GDP TR/GDP	*TR/GDP*	Sum of monthly exports and imports of goods and services measured as a share of annual GDP. Frequency: Monthly. Source: International Financial Statistics (IFS) of IMF and WDI.

Variables used in the robustness regressions (Section V of the paper)

Difference in Realized volatility	VOL_{710} - VOL_{13}	Difference in realized volatility of the long (7-10) maturity segment and the short (1-3) maturity segment. The realized volatility is obtained by cumulating the square of daily bond segment returns of maturity n over month t. We then take a 12-month moving average of the monthly bond volatility measure. Frequency: Monthly. Source: Datastream.
Change in US monetary base	ΔUSM	Change in monetary base (not seasonally adjusted) in trillion US dollars. Monetary base is the sum of total balances maintained plus currency in circulation. Frequency: Monthly. Source: Board of Governors of the Federal Reserve System available through Datastream.
Quality of institutions	*QIS*	The sum of ICRG political risk sub-components: Law and Order, Bureaucratic Quality, and Corruption. The index has 16 points. It is scaled to range from 0 (weak instituions) to 1(strong institutions). Frequency: Monthly. Source: International Country Risk Guide (ICRG).
Conflict	*CONFLICT*	The sum of ICRG political risk sub-components: Internal Conflicts, External Conflicts, Religious Tensions, and Ethnic Tensions. The index has 36 points. It is scaled to range from 0 (no conflicts) to 1 (intense conflicts). Frequency: Monthly. Source: International Country Risk Guide (ICRG).
Democratic Tendencies	*DEMTEN*	The sum of ICRG political risk sub-components: Military in Politics and Democratic Accountability. The index has 12 points. It is scaled to range from 0 (weak democracy) to 1 (strong democracy). Frequency: Monthly. Source: International Country Risk Guide (ICRG).
Government Actions	*GOVACT*	The sum of ICRG political risk sub-components: Government Stability, Socioeconomic Conditions, and Investment Profile. The index has 36 points. It is scaled to range from 0 (weak government actions) to 1(strong government actions). Frequency: Monthly. Source: International Country Risk Guide (ICRG).
Political rights index	*Political Rights*	The political rights index is based on a checklist questions that are grouped into three subcategories, electoral process (three questions), political pluralism (four questions), and functioning of the government (three questions). For each question, zero to four points are awarded, where zero indicates the smallest degree and four the greatest degree of rights. These scores are then combined to form the political rights index. The index ranges from one (weak political rights) to seven (strong political rights) and is constructed for every year from 1972 to 2012. Frequency: annual. Source: Freedom House (2013).
creditor rights index	*Creditor-Rights*	An index aggregating creditor rights, following La Porta and others (1998). A score of one is assigned when each of the following rights of secured lenders are defined in laws and regulations: First, there are restrictions, such as creditor consent or minimum dividends, for a debtor to file for reorganization. Second, secured creditors are able to seize their collateral after the reorganization petition is approved, i.e. there is no "automatic stay" or "asset freeze." Third, secured creditors are paid first out of the proceeds of liquidating a bankrupt firm, as opposed to other creditors such as government or workers. Finally, if management does not retain administration of its property pending the resolution of the reorganization. The index ranges from 0 (weak creditor rights) to 4 (strong creditor rights) and is constructed as at January for every year from 1978 to 2003. Index values for the years 2004–2012 are set equal to the index values of the year 2003. Frequency: annual. Source: Djankov et al. (2007), see also La Porta et al. (1998).
Euro indicator	$EURO_{it}$	An indicator that takes the value of one in month t if the country is part of the Euro area, and zero otherwise. Zero for all countries before 1999.

Table 1
Summary statistics for government bond excess returns and their diversification portfolios by country and maturity
Panel A- Statistics for government bond excess returns

	Start date	Annualized Mean	Annualized Std. Dev.	B-J	p-value	Rho	$Q(z)_{12}$	p-value	$Q(z^2)_{12}$	p-value	EN-AN	p-value	EN-AP	p-value
Panel A1- Developed markets														
Australia														
All	Jan-85	6.51%	12.76%	145.76	0.00	0.00	10.26	0.59	20.71	0.05	-3.17	0.00	-0.60	0.28
1-3	Jan-85	5.32%	11.96%	128.01	0.00	0.03	9.62	0.65	29.38	0.00	-3.82	0.00	-0.73	0.23
3-5	Jan-85	6.21%	12.38%	133.00	0.00	0.01	9.76	0.64	20.29	0.06	-3.40	0.00	-0.81	0.21
5-7	Jan-85	6.95%	12.85%	149.02	0.00	0.00	10.22	0.60	17.32	0.14	-3.08	0.00	-0.58	0.28
7-10	Jan-85	7.36%	13.46%	132.92	0.00	-0.01	11.44	0.49	16.04	0.19	-2.65	0.00	-0.45	0.33
10+	Jan-85	7.95%	14.39%	126.70	0.00	-0.01	11.64	0.48	20.80	0.05	-2.34	0.01	-0.14	0.45
Austria														
All	Oct-92	2.79%	10.72%	9.31	0.02	0.09	10.44	0.58	28.44	0.00	0.78	0.22	2.34	0.01
1-3	Oct-92	0.96%	10.32%	3.07	0.17	0.06	9.56	0.65	19.60	0.08	1.03	0.15	0.39	0.35
3-5	Oct-92	2.26%	10.50%	4.55	0.08	0.07	9.61	0.65	19.71	0.07	1.13	0.13	1.26	0.10
5-7	Oct-92	3.04%	10.74%	6.50	0.04	0.08	10.23	0.60	22.64	0.03	1.08	0.14	1.97	0.02
7-10	Oct-92	3.58%	11.08%	12.91	0.01	0.10	11.52	0.49	30.12	0.00	0.71	0.24	2.45	0.01
10+	Aug-97	6.14%	12.60%	9.73	0.02	0.10	11.18	0.51	30.76	0.00	-0.14	0.44	2.07	0.02
Belgium														
All	Jan-91	3.48%	11.14%	17.84	0.00	0.11	12.81	0.38	12.65	0.40	1.18	0.12	1.60	0.06
1-3	Feb-93	1.60%	10.30%	3.74	0.12	0.07	10.22	0.60	20.91	0.05	1.08	0.14	0.41	0.34
3-5	Feb-93	2.81%	10.49%	4.49	0.08	0.09	10.02	0.61	18.17	0.11	1.25	0.11	1.07	0.14
5-7	Feb-93	3.65%	10.83%	7.39	0.03	0.10	9.65	0.65	18.67	0.10	1.06	0.14	1.79	0.04
7-10	Feb-93	4.21%	11.34%	19.00	0.00	0.10	10.28	0.59	24.39	0.02	0.44	0.33	2.41	0.01
10+	Feb-93	4.83%	12.28%	46.42	0.00	0.10	13.56	0.33	41.18	0.00	-0.93	0.18	3.16	0.00
Canada														
All	Jan-86	4.81%	8.87%	93.26	0.00	-0.03	5.77	0.93	13.95	0.30	-0.74	0.23	0.29	0.38
1-3	Jan-86	3.26%	7.58%	184.81	0.00	-0.04	6.37	0.90	50.37	0.00	-0.86	0.20	1.93	0.03
3-5	Jan-86	4.33%	8.14%	90.75	0.00	-0.03	6.39	0.90	26.15	0.01	-0.68	0.25	1.17	0.12
5-7	Jan-86	4.86%	9.80%	169.04	0.00	-0.12	11.03	0.53	35.30	0.00	-0.65	0.26	2.46	0.01
7-10	Jan-86	5.42%	9.45%	57.80	0.00	-0.04	6.78	0.87	13.05	0.37	-1.05	0.15	-0.41	0.34
10+	Jan-86	6.75%	10.65%	47.38	0.00	-0.03	6.48	0.89	13.61	0.33	-1.58	0.06	-0.60	0.27

	Start date	Annualized Mean	Annualized Std. Dev.	B-J	p-value	Rho	$Q(z)_{12}$	p-value	$Q(z^2)_{12}$	p-value	EN-AN	p-value	EN-AP	p-value
Denmark														
All	Apr-89	4.48%	10.85%	40.67	*0.00*	0.04	16.03	*0.19*	26.97	*0.01*	1.22	*0.11*	2.72	*0.00*
1-3	Apr-89	2.74%	10.70%	16.41	*0.00*	0.05	14.88	*0.25*	16.43	*0.17*	0.90	*0.18*	0.56	*0.29*
3-5	Apr-89	3.78%	10.87%	18.82	*0.00*	0.03	16.22	*0.18*	19.42	*0.08*	1.26	*0.10*	1.51	*0.07*
5-7	Apr-89	4.61%	11.10%	24.35	*0.00*	0.03	17.18	*0.14*	23.80	*0.02*	1.45	*0.07*	2.22	*0.01*
7-10	Apr-89	5.34%	11.48%	27.51	*0.00*	0.02	20.45	*0.06*	32.31	*0.00*	1.02	*0.15*	2.87	*0.00*
10+	Feb-92	6.96%	13.13%	570.44	*0.00*	0.03	12.22	*0.43*	7.53	*0.82*	0.44	*0.33*	1.89	*0.03*
Finland														
All	Feb-95	3.51%	10.65%	2.85	*0.19*	0.10	9.81	*0.63*	22.68	*0.03*	1.49	*0.07*	1.57	*0.06*
1-3	Feb-95	0.92%	10.36%	2.59	*0.22*	0.05	9.22	*0.68*	18.12	*0.11*	1.16	*0.12*	-0.25	*0.40*
3-5	Feb-95	2.34%	10.45%	3.76	*0.12*	0.09	10.14	*0.60*	21.19	*0.05*	1.40	*0.08*	1.30	*0.10*
5-7	Feb-95	3.37%	10.65%	4.90	*0.07*	0.09	10.33	*0.59*	21.16	*0.05*	1.14	*0.13*	2.34	*0.01*
7-10	Feb-95	5.06%	11.35%	4.26	*0.09*	0.13	10.59	*0.56*	29.77	*0.00*	1.01	*0.16*	2.73	*0.00*
10+	Feb-96	2.22%	10.46%	42.39	*0.00*	0.08	12.23	*0.43*	47.07	*0.00*	0.07	*0.47*	3.98	*0.00*
France														
All	Jan-85	4.52%	11.15%	8.05	*0.02*	0.06	8.62	*0.74*	19.56	*0.08*	1.48	*0.07*	2.66	*0.00*
1-3	Jan-85	2.83%	10.70%	3.94	*0.11*	0.03	6.44	*0.89*	10.63	*0.56*	1.25	*0.11*	0.99	*0.16*
3-5	Jan-85	4.06%	10.84%	4.14	*0.10*	0.04	6.63	*0.88*	12.73	*0.39*	1.74	*0.04*	1.68	*0.05*
5-7	Jan-85	4.73%	11.17%	5.10	*0.07*	0.04	7.34	*0.83*	16.10	*0.19*	1.64	*0.05*	2.30	*0.01*
7-10	Jan-85	5.25%	11.64%	9.35	*0.02*	0.06	9.40	*0.67*	19.92	*0.07*	1.35	*0.09*	2.56	*0.01*
10+	Jan-85	6.22%	12.82%	11.36	*0.01*	0.06	16.22	*0.18*	31.12	*0.00*	0.69	*0.25*	3.47	*0.00*
Germany														
All	Jan-86	3.64%	11.46%	5.47	*0.06*	0.06	8.30	*0.76*	18.13	*0.11*	1.02	*0.16*	3.11	*0.00*
1-3	Jan-86	2.30%	11.15%	3.88	*0.12*	0.05	6.49	*0.89*	10.69	*0.56*	0.72	*0.23*	1.56	*0.06*
3-5	Jan-86	3.33%	11.35%	3.74	*0.13*	0.05	7.13	*0.85*	11.35	*0.50*	1.06	*0.15*	2.35	*0.01*
5-7	Jan-86	4.04%	11.61%	4.00	*0.11*	0.05	7.80	*0.80*	16.59	*0.17*	1.24	*0.11*	3.04	*0.00*
7-10	Jan-86	4.18%	12.09%	5.28	*0.06*	0.05	10.24	*0.59*	21.59	*0.04*	0.98	*0.16*	3.07	*0.00*
10+	Jun-86	4.73%	13.53%	129.60	*0.00*	0.11	24.38	*0.02*	22.06	*0.04*	0.75	*0.23*	1.63	*0.05*

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	Start date	Annualized Mean	Annualized Std. Dev.	B-J	p-value	Rho	$Q(z)_{12}$	p-value	$Q(z^2)_{12}$	p-value	EN-AN	p-value	EN-AP	p-value
Greece														
All	May-00	0.02%	30.28%	1603.15	*0.00*	0.11	41.10	*0.00*	51.46	*0.00*	-1.28	*0.10*	1.68	*0.05*
1-3	May-00	-6.13%	17.96%	856.26	*0.00*	0.33	61.70	*0.00*	50.25	*0.00*	-4.02	*0.00*	-1.18	*0.12*
3-5	May-00	-6.73%	20.48%	1450.80	*0.00*	0.17	31.28	*0.00*	26.15	*0.01*	-2.04	*0.02*	-0.80	*0.21*
5-7	May-00	-6.38%	21.36%	1022.13	*0.00*	0.15	25.12	*0.01*	39.60	*0.00*	-2.40	*0.01*	-0.77	*0.22*
7-10	May-00	-6.48%	21.45%	593.38	*0.00*	0.16	22.16	*0.04*	43.60	*0.00*	-2.28	*0.01*	-0.83	*0.20*
10+	May-00	1.24%	31.78%	1132.82	*0.00*	0.05	31.39	*0.00*	48.78	*0.00*	-1.62	*0.05*	1.83	*0.03*
Ireland														
All	Nov-92	3.29%	13.26%	129.52	*0.00*	0.00	7.52	*0.82*	38.50	*0.00*	-0.65	*0.26*	1.63	*0.05*
1-3	Nov-92	2.46%	10.54%	22.50	*0.00*	-0.06	11.69	*0.47*	37.65	*0.00*	-0.51	*0.31*	0.70	*0.24*
3-5	Nov-92	3.42%	12.09%	167.13	*0.00*	0.00	16.95	*0.15*	67.93	*0.00*	-1.03	*0.15*	2.05	*0.02*
5-7	Nov-92	2.37%	11.10%	303.05	*0.00*	-0.05	10.73	*0.55*	34.35	*0.00*	-1.69	*0.05*	0.72	*0.24*
7-10	Nov-92	4.87%	13.86%	313.52	*0.00*	-0.02	8.55	*0.74*	35.90	*0.00*	-0.49	*0.31*	1.77	*0.04*
10+	Nov-92	4.53%	15.13%	478.97	*0.00*	-0.01	8.34	*0.76*	19.42	*0.08*	-0.88	*0.19*	0.34	*0.37*
Italy														
All	Jan-85	4.80%	12.57%	37.16	*0.00*	0.05	7.55	*0.82*	18.68	*0.10*	0.82	*0.21*	1.55	*0.06*
1-3	Jan-85	3.77%	11.57%	36.37	*0.00*	0.03	8.57	*0.74*	13.01	*0.37*	0.73	*0.23*	1.53	*0.06*
3-5	Aug-86	3.72%	12.06%	38.52	*0.00*	0.05	11.45	*0.49*	14.69	*0.26*	1.11	*0.13*	1.43	*0.08*
5-7	Dec-89	2.79%	11.96%	74.98	*0.00*	0.05	11.76	*0.47*	42.73	*0.00*	0.68	*0.25*	2.23	*0.01*
7-10	Apr-91	2.79%	12.65%	63.91	*0.00*	0.03	9.56	*0.65*	82.01	*0.00*	-0.29	*0.39*	2.32	*0.01*
10+	Jan-94	5.86%	14.69%	7.17	*0.03*	0.13	12.36	*0.42*	27.66	*0.01*	0.44	*0.33*	0.01	*0.50*
Japan														
All	Jan-86	2.87%	12.53%	23.34	*0.00*	0.08	30.75	*0.00*	18.80	*0.09*	0.86	*0.19*	3.56	*0.00*
1-3	Jan-86	1.24%	11.70%	26.69	*0.00*	0.06	32.60	*0.00*	12.74	*0.39*	1.35	*0.09*	2.43	*0.01*
3-5	Jan-86	2.26%	12.09%	30.03	*0.00*	0.07	31.01	*0.00*	14.64	*0.26*	1.27	*0.10*	2.91	*0.00*
5-7	Jan-86	3.02%	12.61%	25.30	*0.00*	0.09	30.91	*0.00*	18.30	*0.11*	0.76	*0.22*	3.41	*0.00*
7-10	Jan-86	3.65%	13.36%	17.79	*0.00*	0.09	31.31	*0.00*	31.60	*0.00*	0.01	*0.50*	3.78	*0.00*
10+	Jan-86	4.10%	14.24%	23.12	*0.00*	0.09	27.70	*0.01*	18.14	*0.11*	1.31	*0.09*	3.77	*0.00*

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	Start date	Annualized Mean	Annualized Std. Dev.	B-J	p-value	Rho	$Q(z)_{12}$	p-value	$Q(z^2)_{12}$	p-value	EN-AN	p-value	EN-AP	p-value
Netherlands														
All	Jan-85	3.89%	11.41%	7.20	*0.03*	0.07	7.91	*0.79*	18.73	*0.10*	0.60	*0.27*	2.71	*0.00*
1-3	Jan-85	2.50%	11.10%	4.91	*0.07*	0.05	6.64	*0.88*	10.65	*0.56*	0.53	*0.30*	1.10	*0.14*
3-5	Jan-85	3.44%	11.24%	4.16	*0.10*	0.06	6.83	*0.87*	10.32	*0.59*	0.87	*0.19*	1.66	*0.05*
5-7	Jan-85	4.11%	11.51%	4.14	*0.10*	0.06	7.30	*0.84*	15.08	*0.24*	0.73	*0.23*	2.41	*0.01*
7-10	Jan-85	4.39%	11.92%	7.93	*0.02*	0.07	9.37	*0.67*	23.00	*0.03*	0.48	*0.31*	2.85	*0.00*
10+	Jan-85	5.09%	12.74%	11.37	*0.01*	0.07	10.92	*0.54*	41.37	*0.00*	-0.09	*0.46*	3.76	*0.00*
New Zealand														
All	Oct-93	5.95%	12.62%	33.39	*0.00*	0.01	24.73	*0.02*	40.58	*0.00*	-0.43	*0.33*	-0.18	*0.43*
1-3	Oct-93	6.53%	11.83%	24.23	*0.00*	-0.03	24.18	*0.02*	32.36	*0.00*	-0.82	*0.21*	-0.01	*0.50*
3-5	Oct-93	4.98%	12.14%	44.92	*0.00*	0.01	29.96	*0.00*	54.36	*0.00*	-0.99	*0.16*	0.33	*0.37*
5-7	Feb-06	4.48%	12.04%	58.62	*0.00*	0.01	17.80	*0.12*	46.47	*0.00*	-1.00	*0.16*	0.16	*0.44*
7-10	Oct-93	6.82%	13.36%	24.04	*0.00*	0.01	20.22	*0.06*	24.28	*0.02*	0.09	*0.46*	0.04	*0.48*
10+	Oct-93	7.71%	12.25%	0.31	*0.50*	0.06	16.69	*0.16*	12.50	*0.41*	-0.38	*0.35*	1.05	*0.15*
Norway														
All	Feb-95	3.85%	11.26%	7.56	*0.03*	-0.01	7.70	*0.81*	8.03	*0.78*	-1.82	*0.04*	-0.25	*0.40*
1-3	Feb-95	1.99%	10.81%	11.23	*0.01*	0.01	11.43	*0.49*	9.09	*0.69*	-2.18	*0.02*	-0.08	*0.47*
3-5	Feb-95	3.36%	11.16%	7.05	*0.03*	0.01	6.99	*0.86*	7.19	*0.84*	-1.70	*0.04*	-0.10	*0.46*
5-7	Feb-95	3.28%	11.30%	14.52	*0.01*	-0.05	8.85	*0.72*	9.00	*0.70*	-2.09	*0.02*	-0.43	*0.33*
7-10	Feb-95	4.92%	11.71%	11.50	*0.01*	-0.02	7.72	*0.81*	8.96	*0.71*	-1.63	*0.05*	-0.16	*0.43*
10+	na													
Portugal														
All	Oct-93	3.37%	14.17%	95.26	*0.00*	-0.07	34.82	*0.00*	168.43	*0.00*	-3.98	*0.00*	2.20	*0.01*
1-3	Oct-93	3.09%	11.84%	91.07	*0.00*	-0.07	20.62	*0.06*	51.56	*0.00*	-1.88	*0.03*	1.70	*0.05*
3-5	Jun-95	3.05%	14.67%	126.11	*0.00*	-0.13	54.67	*0.00*	180.99	*0.00*	-4.46	*0.00*	1.93	*0.03*
5-7	Aug-96	3.16%	17.24%	183.98	*0.00*	-0.12	58.86	*0.00*	216.35	*0.00*	-4.83	*0.00*	2.15	*0.02*
7-10	Dec-93	4.29%	16.07%	140.45	*0.00*	-0.07	36.66	*0.00*	247.73	*0.00*	-4.52	*0.00*	1.90	*0.03*
10+	Apr-98	-2.10%	19.02%	182.28	*0.00*	-0.06	12.41	*0.41*	17.44	*0.13*	-1.34	*0.09*	2.98	*0.00*

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	Start date	Annualized Mean	Annualized Std. Dev.	B-J	p-value	Rho	$Q(z)_{12}$	p-value	$Q(z^2)_{12}$	p-value	EN-AN	p-value	EN-AP	p-value
Singapore														
All	Oct-03	5.55%	7.27%	17.79	*0.00*	-0.12	16.09	*0.19*	8.80	*0.72*	0.81	*0.21*	2.00	*0.02*
1-3	Dec-99	2.35%	5.78%	91.62	*0.00*	-0.10	22.53	*0.03*	18.10	*0.11*	-1.00	*0.16*	0.43	*0.33*
3-5	Dec-99	3.63%	6.62%	41.64	*0.00*	-0.09	18.69	*0.10*	10.96	*0.53*	0.14	*0.44*	0.21	*0.42*
5-7	Dec-99	4.75%	7.43%	11.57	*0.01*	-0.07	20.19	*0.06*	14.28	*0.28*	0.60	*0.27*	0.51	*0.31*
7-10	Oct-03	6.76%	8.67%	9.39	*0.02*	-0.10	18.22	*0.11*	6.65	*0.88*	1.55	*0.06*	2.15	*0.02*
10+	Oct-03	7.73%	10.21%	4.51	*0.07*	-0.05	11.93	*0.45*	21.74	*0.04*	0.77	*0.22*	3.62	*0.00*
Spain														
All	Jan-91	2.60%	12.48%	34.81	*0.00*	0.01	9.20	*0.69*	21.85	*0.04*	-0.82	*0.21*	0.71	*0.24*
1-3	Jan-91	1.60%	11.32%	13.75	*0.01*	0.03	10.50	*0.57*	17.48	*0.13*	-1.03	*0.15*	-0.20	*0.42*
3-5	Jan-91	2.58%	12.05%	17.54	*0.00*	0.00	9.22	*0.68*	20.13	*0.06*	-0.87	*0.19*	0.01	*0.50*
5-7	Feb-92	3.32%	12.74%	25.96	*0.00*	0.00	6.85	*0.87*	25.91	*0.01*	-1.21	*0.11*	0.25	*0.40*
7-10	Jan-91	3.72%	13.43%	40.90	*0.00*	-0.02	8.35	*0.76*	21.92	*0.04*	-1.00	*0.16*	0.48	*0.31*
10+	Jan-91	2.80%	13.56%	210.57	*0.00*	0.04	11.21	*0.51*	38.87	*0.00*	-1.04	*0.15*	2.39	*0.01*
Sweden														
All	Jan-91	3.45%	12.02%	1.15	*0.50*	0.09	10.02	*0.61*	14.95	*0.24*	-1.53	*0.06*	-0.41	*0.34*
1-3	Jan-91	1.63%	11.78%	4.59	*0.08*	0.09	6.65	*0.88*	14.61	*0.26*	-2.94	*0.00*	-1.30	*0.10*
3-5	Jan-91	2.74%	11.89%	0.98	*0.50*	0.07	7.66	*0.81*	11.91	*0.45*	-1.96	*0.03*	-0.99	*0.16*
5-7	Jan-91	3.65%	12.15%	0.34	*0.50*	0.07	9.50	*0.66*	13.42	*0.34*	-1.32	*0.09*	-0.61	*0.27*
7-10	Jan-91	4.54%	12.68%	0.11	*0.50*	0.08	11.59	*0.48*	15.25	*0.23*	-0.91	*0.18*	-0.12	*0.45*
10+	Jan-91	5.60%	13.72%	0.27	*0.50*	0.10	14.79	*0.25*	14.61	*0.26*	-0.57	*0.29*	0.45	*0.33*
Switzerland														
All	Jan-85	3.20%	12.41%	4.65	*0.08*	0.03	9.12	*0.69*	7.27	*0.84*	0.77	*0.22*	1.87	*0.03*
1-3	Jan-85	1.83%	12.20%	5.53	*0.06*	0.01	8.31	*0.76*	11.00	*0.53*	-0.46	*0.32*	1.61	*0.05*
3-5	Jan-85	2.48%	12.24%	4.13	*0.10*	0.02	8.21	*0.77*	7.84	*0.80*	0.00	*0.50*	1.60	*0.06*
5-7	Jan-85	3.02%	12.35%	5.25	*0.06*	0.03	8.70	*0.73*	7.01	*0.86*	0.24	*0.41*	1.69	*0.05*
7-10	Jan-85	3.55%	12.53%	3.70	*0.13*	0.03	9.87	*0.63*	6.91	*0.86*	0.98	*0.16*	1.93	*0.03*
10+	Jan-85	4.23%	13.21%	3.86	*0.12*	0.03	11.94	*0.45*	11.56	*0.48*	1.49	*0.07*	2.71	*0.00*

(continued)

	Start date	Annualized Mean	Annualized Std. Dev.	B-J	p-value	Rho	$Q(z)_{12}$	p-value	$Q(z^2)_{12}$	p-value	EN-AN	p-value	EN-AP	p-value
UK														
All	Jan-85	4.45%	11.48%	7.75	*0.03*	0.12	30.04	*0.00*	61.51	*0.00*	0.25	*0.40*	1.09	*0.14*
1-3	Jan-85	2.87%	10.05%	19.40	*0.00*	0.08	17.00	*0.15*	34.54	*0.00*	-0.45	*0.33*	1.35	*0.09*
3-5	Jan-85	3.67%	10.41%	12.26	*0.01*	0.10	22.68	*0.03*	56.24	*0.00*	0.23	*0.41*	1.55	*0.06*
5-7	Jan-85	4.28%	10.96%	12.15	*0.01*	0.11	27.35	*0.01*	70.83	*0.00*	0.34	*0.37*	1.46	*0.07*
7-10	Jan-85	4.73%	11.65%	10.15	*0.01*	0.11	31.51	*0.00*	76.83	*0.00*	0.41	*0.34*	1.31	*0.10*
10+	Jan-85	5.23%	13.09%	3.60	*0.14*	0.12	30.75	*0.00*	46.47	*0.00*	0.46	*0.32*	0.35	*0.36*
US														
All	Jan-85	2.52%	4.71%	4.35	*0.09*	0.09	17.21	*0.14*	13.89	*0.31*	0.61	*0.27*	2.10	*0.02*
1-3	Jan-85	0.97%	1.62%	0.79	*0.50*	0.17	21.25	*0.05*	33.43	*0.00*	-0.77	*0.22*	1.80	*0.04*
3-5	Jan-85	2.22%	3.68%	0.80	*0.50*	0.13	19.02	*0.09*	18.98	*0.09*	0.95	*0.17*	2.01	*0.02*
5-7	Jan-85	2.92%	5.02%	0.95	*0.50*	0.11	19.93	*0.07*	12.67	*0.39*	0.98	*0.16*	1.67	*0.05*
7-10	Jan-85	3.34%	6.49%	6.34	*0.04*	0.09	20.69	*0.06*	13.62	*0.33*	0.17	*0.43*	2.27	*0.01*
10+	Jan-85	4.53%	9.90%	29.05	*0.00*	0.05	19.35	*0.08*	48.43	*0.00*	0.12	*0.45*	4.71	*0.00*
Panel A2- Emerging markets														
Czech Rep.														
All	Feb-01	10.07%	14.95%	9.75	*0.02*	-0.01	6.60	*0.88*	15.98	*0.19*	0.79	*0.22*	-0.60	*0.28*
1-3	Feb-01	7.50%	13.63%	5.77	*0.05*	0.02	11.74	*0.47*	18.11	*0.11*	0.65	*0.26*	-0.34	*0.37*
3-5	Feb-01	9.15%	14.19%	6.27	*0.04*	0.02	10.53	*0.57*	20.73	*0.05*	0.71	*0.24*	-0.16	*0.44*
5-7	Feb-01	9.07%	14.96%	11.10	*0.01*	0.00	10.41	*0.58*	16.25	*0.18*	0.78	*0.22*	-0.14	*0.44*
7-10	Oct-04	8.35%	16.89%	10.12	*0.02*	-0.03	9.36	*0.67*	9.19	*0.69*	0.58	*0.28*	-0.94	*0.17*
10+	Feb-01	10.53%	17.19%	18.10	*0.00*	-0.04	7.47	*0.83*	10.06	*0.61*	0.25	*0.40*	0.07	*0.47*
Hungary														
All	Jan-01	7.60%	21.09%	98.79	*0.00*	0.05	10.07	*0.61*	29.28	*0.00*	-1.40	*0.08*	0.86	*0.20*
1-3	Jan-01	7.58%	18.64%	96.21	*0.00*	0.02	8.91	*0.71*	27.15	*0.01*	-0.94	*0.18*	1.29	*0.10*
3-5	Jan-01	7.57%	21.16%	84.31	*0.00*	0.01	9.13	*0.69*	34.92	*0.00*	-1.49	*0.07*	1.08	*0.14*
5-7	Jan-01	6.66%	23.14%	88.14	*0.00*	-0.01	9.57	*0.65*	38.48	*0.00*	-1.73	*0.04*	0.58	*0.28*
7-10	Nov-04	5.27%	27.88%	26.67	*0.00*	-0.03	7.48	*0.82*	24.99	*0.01*	-1.15	*0.13*	-0.16	*0.44*
10+	Nov-04	4.95%	29.42%	19.77	*0.00*	-0.03	7.41	*0.83*	26.55	*0.01*	-1.04	*0.15*	0.14	*0.45*

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	Start date	Annualized Mean	Annualized Std. Dev.	B-J	p-value	Rho	$Q(z)_{12}$	p-value	$Q(z^2)_{12}$	p-value	EN-AN	p-value	EN-AP	p-value
Korea														
All	Jan-01	5.42%	13.88%	252.47	*0.00*	-0.13	16.95	*0.15*	80.15	*0.00*	-8.26	*0.00*	0.63	*0.26*
1-3	Jan-01	4.51%	12.83%	176.52	*0.00*	-0.11	14.12	*0.29*	102.76	*0.00*	-8.82	*0.00*	0.38	*0.35*
3-5	Jan-01	5.21%	13.89%	177.11	*0.00*	-0.13	15.78	*0.20*	81.61	*0.00*	-7.33	*0.00*	0.49	*0.31*
5-7	Jan-01	2.80%	13.83%	412.94	*0.00*	-0.15	19.08	*0.09*	72.46	*0.00*	-8.08	*0.00*	0.83	*0.20*
7-10	Oct-03	4.63%	16.49%	208.88	*0.00*	-0.17	16.25	*0.18*	45.05	*0.00*	-6.75	*0.00*	0.70	*0.24*
10+	Oct-03	4.76%	17.70%	452.80	*0.00*	-0.24	19.18	*0.08*	40.32	*0.00*	-7.04	*0.00*	1.21	*0.12*
Malaysia														
All	Feb-05	4.87%	7.51%	10.88	*0.01*	-0.05	12.36	*0.42*	20.27	*0.06*	-0.78	*0.22*	0.29	*0.39*
1-3	Feb-05	3.92%	6.67%	11.90	*0.01*	-0.09	14.51	*0.27*	18.83	*0.09*	-0.70	*0.24*	0.33	*0.37*
3-5	Feb-05	4.57%	7.12%	9.59	*0.02*	-0.07	12.79	*0.38*	19.10	*0.09*	-0.54	*0.29*	0.13	*0.45*
5-7	Feb-05	5.22%	7.70%	9.41	*0.02*	-0.02	12.49	*0.41*	22.80	*0.03*	-0.78	*0.22*	0.72	*0.24*
7-10	Feb-05	5.59%	9.01%	25.80	*0.00*	-0.01	11.59	*0.48*	15.85	*0.20*	-1.15	*0.13*	-0.10	*0.46*
10+	Feb-05	7.02%	11.00%	55.73	*0.00*	0.05	13.68	*0.32*	17.19	*0.14*	-1.08	*0.14*	0.06	*0.48*
Mexico														
All	Feb-04	5.51%	13.75%	63.59	*0.00*	-0.02	15.18	*0.23*	22.74	*0.03*	-4.55	*0.00*	-2.04	*0.02*
1-3	Feb-04	3.54%	11.42%	102.97	*0.00*	0.08	15.76	*0.20*	16.43	*0.17*	-4.71	*0.00*	-1.80	*0.04*
3-5	Feb-04	4.66%	12.28%	83.67	*0.00*	0.04	13.18	*0.36*	17.24	*0.14*	-4.23	*0.00*	-1.87	*0.03*
5-7	Feb-04	5.46%	13.51%	66.69	*0.00*	-0.01	12.75	*0.39*	19.53	*0.08*	-4.01	*0.00*	-2.03	*0.02*
7-10	na													
10+	Feb-04	8.89%	17.77%	24.10	*0.00*	-0.07	17.61	*0.13*	26.15	*0.01*	-3.99	*0.00*	-2.21	*0.01*
Poland														
All	Oct-98	7.86%	16.80%	27.39	*0.00*	0.07	8.05	*0.78*	8.77	*0.72*	-1.17	*0.12*	-0.79	*0.22*
1-3	Oct-98	7.10%	15.58%	29.23	*0.00*	0.09	11.10	*0.52*	10.22	*0.60*	-1.71	*0.04*	-1.05	*0.15*
3-5	Oct-98	7.64%	16.79%	21.80	*0.00*	0.08	8.57	*0.74*	7.37	*0.83*	-1.32	*0.09*	-0.75	*0.23*
5-7	Oct-98	3.71%	16.68%	26.90	*0.00*	0.02	9.14	*0.69*	15.36	*0.22*	-1.28	*0.10*	-0.73	*0.23*
7-10	Oct-03	8.12%	19.87%	20.80	*0.00*	-0.01	8.41	*0.75*	10.03	*0.61*	-0.55	*0.29*	-1.02	*0.16*
10+	Oct-98	2.36%	17.97%	51.79	*0.00*	0.03	8.42	*0.75*	21.91	*0.04*	-0.49	*0.31*	0.02	*0.49*

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	Start date	Annualized Mean	Annualized Std. Dev.	B-J	p-value	Rho	$Q(z)_{12}$	p-value	$Q(z^2)_{12}$	p-value	EN-AN	p-value	EN-AP	p-value
South Africa														
All	Oct-03	2.33%	23.10%	52.72	*0.00*	-0.07	10.07	*0.61*	2.47	*1.00*	0.17	*0.43*	-0.58	*0.28*
1-3	Oct-03	2.74%	21.37%	50.99	*0.00*	-0.06	7.49	*0.82*	1.26	*1.00*	0.56	*0.29*	0.95	*0.17*
3-5	Oct-03	0.31%	20.05%	26.52	*0.00*	0.00	8.06	*0.78*	4.79	*0.96*	-0.21	*0.42*	-0.57	*0.28*
5-7	Oct-98	6.08%	19.75%	14.83	*0.01*	-0.04	8.12	*0.78*	11.73	*0.47*	-0.85	*0.20*	0.57	*0.29*
7-10	Oct-03	1.74%	22.51%	16.40	*0.01*	-0.11	11.33	*0.50*	5.28	*0.95*	0.05	*0.48*	-0.40	*0.35*
10+	Oct-98	8.58%	24.92%	34.39	*0.00*	-0.03	8.30	*0.76*	2.45	*1.00*	-0.07	*0.47*	0.68	*0.25*
Taiwan														
All	Feb-05	1.98%	5.57%	0.25	*0.50*	0.05	5.99	*0.92*	5.87	*0.92*	0.47	*0.32*	1.20	*0.12*
1-3	Feb-05	0.66%	5.62%	0.81	*0.50*	0.11	8.21	*0.77*	8.02	*0.78*	-0.08	*0.47*	0.33	*0.37*
3-5	Feb-05	1.13%	5.56%	0.53	*0.50*	0.09	7.54	*0.82*	8.45	*0.75*	0.42	*0.34*	0.44	*0.33*
5-7	Feb-05	1.91%	5.60%	0.08	*0.50*	0.07	5.72	*0.93*	7.78	*0.80*	0.71	*0.24*	0.49	*0.31*
7-10	Feb-05	2.19%	5.73%	0.11	*0.50*	0.03	4.97	*0.96*	6.13	*0.91*	0.69	*0.25*	0.59	*0.28*
10+	Feb-05	2.99%	6.26%	2.29	*0.22*	0.06	7.02	*0.86*	6.04	*0.91*	-0.16	*0.43*	0.76	*0.22*

Panel B- Correlations between excess bond returns

	All	1-3	3-5	5-7	7-10	10+	All	1-3	3-5	5-7	7-10	10+	All	1-3	3-5	5-7	7-10	10+	All	1-3	3-5	5-7	7-10	10+
Panel B1- Developed markets																								
Australia							*Austria*						*Belgium*						*Canada*					
All	1.00						1.00						1.00						1.00					
1-3	0.97	1.00					0.96	1.00					0.96	1.00					0.93	1.00				
3-5	1.00	0.99	1.00				0.99	0.99	1.00				0.99	0.99	1.00				0.98	0.97	1.00			
5-7	1.00	0.97	0.99	1.00			1.00	0.97	0.99	1.00			1.00	0.97	0.99	1.00			0.99	0.94	0.99	1.00		
7-10	0.99	0.94	0.97	0.99	1.00		0.99	0.94	0.97	0.99	1.00		0.99	0.93	0.97	0.99	1.00		0.99	0.89	0.96	0.99	1.00	
10+	0.97	0.90	0.95	0.98	0.99	1.00	0.94	0.83	0.88	0.92	0.96	1.00	0.95	0.84	0.89	0.93	0.97	1.00	0.96	0.79	0.89	0.94	0.97	1.00
Denmark							*Finland*						*France*						*Germany*					
All	1.00						1.00						1.00						1.00					
1-3	0.96	1.00					0.97	1.00					0.96	1.00					0.97	1.00				
3-5	0.98	0.99	1.00				0.98	0.97	1.00				0.99	0.99	1.00				0.99	0.99	1.00			
5-7	0.99	0.96	0.99	1.00			0.96	0.92	0.94	1.00			1.00	0.96	0.99	1.00			1.00	0.97	0.99	1.00		
7-10	0.99	0.93	0.97	0.99	1.00		0.99	0.92	0.96	0.96	1.00		0.99	0.93	0.97	0.99	1.00		0.99	0.95	0.98	0.99	1.00	
10+	0.87	0.72	0.79	0.84	0.88	1.00	0.82	0.73	0.76	0.81	0.84	1.00	0.95	0.83	0.89	0.93	0.97	1.00	0.38	0.35	0.36	0.37	0.37	1.00
Greece							*Ireland*						*Italy*						*Japan*					
All	1.00						1.00						1.00						1.00					
1-3	0.64	1.00					0.90	1.00					0.98	1.00					0.98	1.00				
3-5	0.66	0.97	1.00				0.95	0.89	1.00				0.96	0.95	1.00				0.99	0.99	1.00			
5-7	0.66	0.94	0.99	1.00			0.82	0.78	0.75	1.00			0.91	0.87	0.93	1.00			1.00	0.98	0.99	1.00		
7-10	0.66	0.94	0.97	0.99	1.00		0.98	0.85	0.94	0.80	1.00		0.87	0.81	0.87	0.95	1.00		0.99	0.95	0.97	0.99	1.00	
10+	0.98	0.61	0.64	0.65	0.66	1.00	0.98	0.82	0.90	0.81	0.97	1.00	0.95	0.87	0.92	0.95	0.97	1.00	0.87	0.80	0.84	0.87	0.89	1.00
Netherlands							*N. Zealand*						*Norway*						*Portugal*					
All	1.00						1.00						1.00						1.00					
1-3	0.97	1.00					0.94	1.00					0.96	1.00					0.95	1.00				
3-5	0.99	0.99	1.00				0.96	0.91	1.00				0.99	0.96	1.00				0.99	0.95	1.00			
5-7	1.00	0.97	0.99	1.00			0.93	0.86	0.87	1.00			0.97	0.92	0.96	1.00			0.99	0.91	0.99	1.00		
7-10	1.00	0.95	0.97	0.99	1.00		0.99	0.90	0.93	0.92	1.00		0.98	0.92	0.96	0.97	1.00		0.99	0.91	0.97	0.99	1.00	
10+	0.95	0.85	0.89	0.93	0.96	1.00	0.82	0.77	0.74	0.74	0.86	1.00	na	na	na	na	na		0.94	0.83	0.90	0.91	0.95	1.00

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Singapore	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.99	1.00				
3-5	1.00	0.99	1.00			
5-7	0.97	0.96	0.96	1.00		
7-10	0.99	0.97	0.99	0.99	1.00	
10+	0.95	0.94	0.94	0.96	0.97	1.00

Spain	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.97	1.00				
3-5	0.99	0.99	1.00			
5-7	0.99	0.95	0.99	1.00		
7-10	0.99	0.93	0.97	0.99	1.00	
10+	0.85	0.75	0.81	0.87	0.87	1.00

Sweden	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.97	1.00				
3-5	0.99	0.99	1.00			
5-7	1.00	0.96	0.99	1.00		
7-10	0.99	0.93	0.97	0.99	1.00	
10+	0.95	0.85	0.91	0.95	0.98	1.00

Switzerland	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.98	1.00				
3-5	0.99	0.99	1.00			
5-7	1.00	0.98	0.99	1.00		
7-10	1.00	0.97	0.98	0.99	1.00	
10+	0.98	0.92	0.95	0.96	0.98	1.00

UK	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.92	1.00				
3-5	0.96	0.99	1.00			
5-7	0.98	0.96	0.99	1.00		
7-10	0.99	0.91	0.96	0.99	1.00	
10+	0.98	0.83	0.89	0.93	0.97	1.00

US	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.87	1.00				
3-5	0.95	0.96	1.00			
5-7	0.98	0.91	0.98	1.00		
7-10	0.99	0.85	0.94	0.98	1.00	
10+	0.95	0.71	0.82	0.90	0.95	1.00

Panel B2- Emerging markets

Czech Rep	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.97	1.00				
3-5	0.98	0.99	1.00			
5-7	0.99	0.96	0.98	1.00		
7-10	0.99	0.94	0.96	0.99	1.00	
10+	0.97	0.90	0.93	0.96	0.99	1.00

Hungary	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.95	1.00				
3-5	0.96	0.99	1.00			
5-7	0.95	0.98	0.99	1.00		
7-10	0.99	0.97	0.99	0.99	1.00	
10+	0.99	0.96	0.98	0.99	0.99	1.00

Korea	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.93	1.00				
3-5	0.92	0.99	1.00			
5-7	0.94	0.98	0.97	1.00		
7-10	0.99	0.97	0.99	0.98	1.00	
10+	0.97	0.94	0.96	0.98	0.96	1.00

Malaysia	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.96	1.00				
3-5	0.99	0.98	1.00			
5-7	0.99	0.95	0.98	1.00		
7-10	0.97	0.87	0.93	0.97	1.00	
10+	0.90	0.76	0.84	0.89	0.96	1.00

Mexico	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.96	1.00				
3-5	0.99	0.99	1.00			
5-7	0.99	0.96	0.99	1.00		
7-10	na	na	na	na	na	
10+	0.95	0.86	0.91	0.94	1.00	

Poland	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.99	1.00				
3-5	1.00	0.99	1.00			
5-7	0.97	0.96	0.96	1.00		
7-10	0.99	0.97	0.99	0.99	1.00	
10+	0.95	0.94	0.94	0.96	0.97	1.00

South Africa	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.99	1.00				
3-5	1.00	0.99	1.00			
5-7	0.97	0.96	0.96	1.00		
7-10	0.99	0.97	0.99	0.99	1.00	
10+	0.95	0.94	0.94	0.96	0.97	1.00

Taiwan	All	1-3	3-5	5-7	7-10	10+
All	1.00					
1-3	0.99	1.00				
3-5	1.00	0.99	1.00			
5-7	0.97	0.96	0.96	1.00		
7-10	0.99	0.97	0.99	0.99	1.00	
10+	0.95	0.94	0.94	0.96	0.97	1.00

Panel C- Correlations between bond returns, diversification portfolios and global bond index

Panel C1- Developed markets

	Australia						Austria						Belgium					
	All	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**
$\rho\ (R_j, R_W)$	0.42	0.35	0.40	0.42	0.44	0.46	0.85	0.77	0.82	0.84	0.85	0.85	0.81	0.78	0.81	0.83	0.84	0.82
$\rho\ (R_j, DP_j)$	0.69	0.68	0.69	0.69	0.68	0.68	0.86	0.84	0.87	0.88	0.86	0.87	0.83	0.86	0.87	0.86	0.86	0.84
$\rho\ (R_j, DPAUG_j)$	0.74	0.76	0.75	0.74	0.73	0.72	0.91	0.91	0.91	0.92	0.91	0.92	0.88	0.92	0.91	0.91	0.90	0.89
$\rho\ (DP_j, R_W)$	0.60	0.52	0.59	0.61	0.65	0.68	0.98	0.92	0.94	0.96	0.99	0.98	0.98	0.90	0.93	0.97	0.98	0.97
$\rho\ (DPAUG_j, R_W)$	0.61	0.53	0.59	0.62	0.66	0.69	0.91	0.84	0.88	0.91	0.92	0.92	0.92	0.83	0.88	0.91	0.92	0.91

	Canada						Denmark						Finland					
	All	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**
$\rho\ (R_j, R_W)$	0.38	0.28	0.37	0.29	0.40	0.39	0.81	0.74	0.78	0.81	0.82	0.73	0.85	0.79	0.83	0.83	0.86	0.70
$\rho\ (R_j, DP_j)$	0.57	0.49	0.55	0.49	0.62	0.63	0.82	0.80	0.81	0.82	0.82	0.76	0.88	0.87	0.87	0.85	0.87	0.75
$\rho\ (R_j, DPAUG_j)$	0.80	0.80	0.80	0.71	0.80	0.80	0.86	0.86	0.87	0.87	0.87	0.81	0.93	0.93	0.93	0.90	0.92	0.83
$\rho\ (DP_j, R_W)$	0.67	0.57	0.66	0.52	0.66	0.51	0.98	0.93	0.96	0.98	1.00	0.96	0.97	0.91	0.95	0.98	0.99	0.93
$\rho\ (DPAUG_j, R_W)$	0.49	0.36	0.46	0.42	0.52	0.45	0.92	0.85	0.90	0.92	0.94	0.90	0.90	0.82	0.88	0.91	0.93	0.85

	France						Germany						Greece					
	All	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**
$\rho\ (R_j, R_W)$	0.77	0.71	0.75	0.77	0.77	0.76	0.76	0.71	0.75	0.77	0.77	0.73	0.36	0.56	0.54	0.56	0.57	0.37
$\rho\ (R_j, DP_j)$	0.77	0.76	0.78	0.77	0.79	0.79	0.76	0.75	0.77	0.77	0.78	0.75	0.57	0.72	0.67	0.68	0.70	0.61
$\rho\ (R_j, DPAUG_j)$	0.83	0.82	0.83	0.83	0.83	0.84	0.82	0.81	0.82	0.82	0.82	0.80	0.66	0.78	0.74	0.74	0.76	0.69
$\rho\ (DP_j, R_W)$	1.00	0.94	0.97	1.00	0.98	0.96	1.00	0.95	0.98	1.00	0.99	0.97	0.62	0.79	0.80	0.82	0.81	0.62
$\rho\ (DPAUG_j, R_W)$	0.93	0.85	0.90	0.93	0.93	0.92	0.94	0.86	0.91	0.94	0.94	0.91	0.60	0.71	0.72	0.75	0.75	0.61

	Ireland						Italy						Japan					
	All	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**
$\rho\ (R_j, R_W)$	0.74	0.70	0.66	0.60	0.71	0.71	0.64	0.64	0.64	0.56	0.53	0.64	0.67	0.64	0.66	0.66	0.67	0.67
$\rho\ (R_j, DP_j)$	0.75	0.76	0.70	0.68	0.72	0.72	0.67	0.68	0.67	0.59	0.55	0.65	0.70	0.67	0.69	0.69	0.70	0.69
$\rho\ (R_j, DPAUG_j)$	0.82	0.82	0.78	0.72	0.79	0.78	0.74	0.76	0.75	0.72	0.70	0.75	0.74	0.71	0.73	0.73	0.74	0.73
$\rho\ (DP_j, R_W)$	0.98	0.92	0.94	0.89	0.99	0.99	0.96	0.94	0.94	0.96	0.96	0.98	0.96	0.95	0.95	0.96	0.96	0.97
$\rho\ (DPAUG_j, R_W)$	0.89	0.84	0.82	0.83	0.88	0.90	0.84	0.82	0.83	0.76	0.74	0.84	0.88	0.87	0.87	0.88	0.88	0.90

(continued)

	Netherlands						New Zealand						Norway					
	All	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**
$\rho\ (R_j , R_W)$	0.77	0.71	0.75	0.77	0.77	0.75	0.57	0.50	0.54	0.50	0.61	0.52	0.64	0.58	0.61	0.60	0.67	na
$\rho\ (R_j , DP_j)$	0.77	0.75	0.77	0.77	0.77	0.77	0.69	0.64	0.67	0.62	0.70	0.56	0.76	0.74	0.75	0.72	0.75	na
$\rho\ (R_j , DPAUG_j)$	0.82	0.81	0.82	0.82	0.82	0.82	0.75	0.69	0.72	0.68	0.75	0.62	0.81	0.80	0.81	0.77	0.79	na
$\rho\ (DP_j , R_W)$	1.00	0.95	0.97	1.00	1.00	0.97	0.83	0.79	0.80	0.81	0.87	0.92	0.84	0.78	0.82	0.83	0.89	na
$\rho\ (DPAUG_j , R_W)$	0.93	0.86	0.90	0.93	0.94	0.91	0.75	0.73	0.73	0.75	0.80	0.82	0.77	0.70	0.74	0.76	0.82	na

	Portugal						Singapore						Spain					
	All	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**
$\rho\ (R_j , R_W)$	0.61	0.67	0.58	0.53	0.56	0.53	0.70	0.47	0.66	0.70	0.69	0.69	0.72	0.71	0.71	0.71	0.70	0.65
$\rho\ (R_j , DP_j)$	0.67	0.77	0.64	0.58	0.60	0.53	0.76	0.66	0.75	0.75	0.71	0.69	0.75	0.76	0.75	0.74	0.72	0.67
$\rho\ (R_j , DPAUG_j)$	0.73	0.82	0.72	0.66	0.69	0.67	na	0.78	0.78	0.77	na	0.68	0.82	0.84	0.83	0.81	0.80	0.80
$\rho\ (DP_j , R_W)$	0.90	0.87	0.91	0.92	0.94	1.00	0.92	0.71	0.89	0.93	0.97	1.00	0.96	0.93	0.95	0.96	0.98	0.97
$\rho\ (DPAUG_j , R_W)$	0.82	0.80	0.82	0.81	0.83	0.78	na	0.62	0.85	0.91	na	0.99	0.87	0.83	0.85	0.86	0.88	0.81

	Sweden						Switzerland						UK					
	All	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**
$\rho\ (R_j , R_W)$	0.69	0.65	0.68	0.69	0.69	0.67	0.71	0.68	0.69	0.71	0.72	0.71	0.63	0.55	0.59	0.62	0.63	0.62
$\rho\ (R_j , DP_j)$	0.73	0.74	0.74	0.73	0.71	0.69	0.71	0.70	0.71	0.72	0.72	0.71	0.63	0.60	0.61	0.62	0.63	0.64
$\rho\ (R_j , DPAUG_j)$	0.76	0.79	0.78	0.76	0.74	0.71	0.76	0.75	0.76	0.76	0.76	0.75	0.66	0.65	0.66	0.67	0.67	0.67
$\rho\ (DP_j , R_W)$	0.95	0.87	0.91	0.94	0.96	0.98	1.00	0.96	0.97	0.98	1.00	1.00	1.00	0.92	0.96	1.00	1.00	0.97
$\rho\ (DPAUG_j , R_W)$	0.89	0.80	0.85	0.89	0.92	0.94	0.94	0.90	0.91	0.93	0.95	0.95	0.95	0.82	0.88	0.92	0.95	0.95

Panel C2- Emerging markets

	Czech Rep.						Hungary						Korea					
	All	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**
$\rho\ (R_j , R_W)$	0.66	0.66	0.68	0.66	0.67	0.66	0.47	0.54	0.52	0.51	0.49	0.48	0.45	0.48	0.50	0.46	0.51	0.48
$\rho\ (R_j , DP_j)$	0.78	0.82	0.81	0.78	0.80	0.75	0.65	0.71	0.68	0.66	0.69	0.67	0.64	0.68	0.71	0.66	0.72	0.66
$\rho\ (R_j , DPAUG_j)$	0.84	0.88	0.87	0.84	0.75	0.80	0.78	0.81	0.79	0.78	0.57	na	0.73	0.76	0.75	0.76	0.69	na
$\rho\ (DP_j , R_W)$	0.84	0.81	0.84	0.85	0.84	0.89	0.73	0.76	0.76	0.76	0.71	0.72	0.59	0.58	0.70	0.59	0.71	0.57
$\rho\ (DPAUG_j , R_W)$	0.81	0.76	0.79	0.81	0.63	0.85	0.60	0.65	0.66	0.65	0.63	na	0.56	0.56	0.66	0.57	0.55	na

(continued)

	Malaysia						Mexico						Poland					
	All	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**
$\rho\ (R_j, R_W)$	0.48	0.45	0.48	0.48	0.47	0.45	0.30	0.23	0.27	0.30	na	0.29	0.52	0.50	0.52	0.51	0.56	0.51
$\rho\ (R_j, DP_j)$	0.66	0.64	0.68	0.65	0.65	0.63	0.74	0.77	0.77	0.68	na	0.61	0.70	0.70	0.69	0.71	0.73	0.68
$\rho\ (R_j, DPAUG_j)$	na	0.65	0.62	0.42	0.52	na	0.61	na	0.77	0.68	na	na	0.76	0.77	0.76	0.78	0.72	0.74
$\rho\ (DP_j, R_W)$	0.57	0.58	0.58	0.57	0.57	0.70	0.34	0.27	0.34	0.39	na	0.52	0.74	0.72	0.75	0.73	0.78	0.75
$\rho\ (DPAUG_j, R_W)$	na	0.63	0.49	0.15	0.51	na	0.06	na	0.33	0.39	na	na	0.70	0.69	0.72	0.69	0.77	0.71

	South Africa						Taiwan					
	All	**1-3**	**3-5**	**5-7**	**7-10**	**10+**	**All**	**1-3**	**3-5**	**5-7**	**7-10**	**10+**
$\rho\ (R_j, R_W)$	0.37	0.30	0.33	0.33	0.37	0.35	0.52	0.51	0.53	0.50	0.50	0.48
$\rho\ (R_j, DP_j)$	0.64	0.51	0.65	0.52	0.64	0.49	0.62	0.72	0.71	0.65	0.59	0.52
$\rho\ (R_j, DPAUG_j)$	na	0.53	na	0.57	na	0.54	na	na	0.72	na	na	na
$\rho\ (DP_j, R_W)$	0.58	0.47	0.50	0.49	0.57	0.51	0.84	0.70	0.75	0.78	0.85	0.92
$\rho\ (DPAUG_j, R_W)$	na	0.60	na	0.56	na	0.57	na	na	0.74	0.35	na	na

Panels A1 and A2 of Table 1 present descriptive statistics of the excess returns on government bond indices by maturity bands for the developed markets (DMs) and Emerging markets (EMs), respectively. Bond index returns of DMs are proxied by CITI/SSS except for Canada, Germany, Japan, and Portugal, we use the Bank of America Merrill Lynch (BOA ML) and for Singapore, we use JP Morgan because of longer historical span. The emerging markets bond index returns are proxied by the JP Morgan indices. The bond indices for Malaysia, Mexico and Taiwan are from CITI/SSS. The maturity bands are 1-3, 3-5, 5-7, 7-10, and 10+. Returns are monthly percentage, denominated in USD and in excess of the one-month T-bill rate available from Kenneth French website. The period is from May 1986 or later to December 2012. For each country and maturity band, the panels present the annualized averages and standard deviations over the whole sample period. B-J is the Bera-Jarque test for normality based on excess skewness and kurtosis. Q is the Ljung-Box test for autocorrelation of order 12 for the excess returns and the excess returns squared. EN-AN and EN-AP are respectively the Engle-Ng (1993) negative size bias and positive size bias test on the excess returns. Panels B1 and B2 present cross-correlations among the different maturity bands for DMs and EMs, respectively. Panels C1 and C2 present the cross-correlation between each bond index j, its Diversification Portfolio (DP_j) and the World Bond Market Portfolio (W) for DMs and EMs, respectively. The panels also show correlations between DP_j and W. The diversification portfolio is constructed as described in Data Section of the paper. The substitute assets are detailed in Appendix A.

Table 2
Summary statistics on the estimated integration indices

	Mean	Std. Dev.	Trend		Mean	Std. Dev.	Trend		Mean	Std. Dev.	Trend		Mean	Std. Dev.	Trend		Mean	Std. Dev.	Trend	
			Coeff.	*t-stat*			Coeff.	*t-stat*			Coeff.	*t-stat*			Coeff.	*t-stat*			Coeff.	*t-stat*
Panel A- Developed markets																				
Australia					***Austria***				***Belgium***				***Canada***				***Denmark***			
All	0.53	0.18	0.001	*4.67*	0.87	0.10	0.001	*9.49*	0.82	0.15	0.001	*5.40*	0.65	0.29	0.003	*11.89*	0.79	0.20	0.002	*8.94*
1-3	0.50	0.24	0.002	*5.54*	0.87	0.13	0.002	*8.45*	0.86	0.13	0.002	*7.90*	0.52	0.35	0.003	*10.67*	0.78	0.19	0.002	*13.06*
3-5	0.58	0.19	0.002	*5.92*	0.87	0.12	0.001	*8.09*	0.86	0.10	0.001	*7.32*	0.60	0.31	0.003	*11.04*	0.79	0.19	0.002	*12.10*
5-7	0.53	0.19	0.001	*6.24*	0.87	0.11	0.001	*7.54*	0.86	0.08	0.001	*4.11*	0.64	0.31	0.003	*12.09*	0.79	0.18	0.002	*10.53*
7-10	0.54	0.19	0.002	*9.32*	0.87	0.11	0.001	*5.91*	0.84	0.12	0.001	*2.25*	0.70	0.26	0.002	*9.38*	0.78	0.18	0.002	*11.55*
10+	0.54	0.20	0.002	*9.52*	0.87	0.12	0.002	*4.11*	0.81	0.15	0.001	*1.59*	0.69	0.23	0.002	*8.36*	0.76	0.23	0.002	*5.08*
Finland					***France***				***Germany***				***Greece***				***Ireland***			
All	0.90	0.10	0.001	*7.30*	0.71	0.23	0.002	*18.87*	0.73	0.22	0.002	*19.89*	0.72	0.12	0.000	*-0.33*	0.76	0.12	0.000	*2.51*
1-3	0.89	0.12	0.002	*7.68*	0.72	0.23	0.002	*15.28*	0.72	0.24	0.002	*16.23*	0.78	0.11	0.000	*0.77*	0.73	0.20	0.001	*3.66*
3-5	0.88	0.10	0.002	*12.47*	0.73	0.22	0.002	*16.82*	0.73	0.22	0.002	*18.38*	0.72	0.14	-0.001	*-1.24*	0.65	0.23	0.001	*1.51*
5-7	0.85	0.12	0.001	*3.37*	0.72	0.22	0.002	*17.34*	0.73	0.22	0.002	*19.74*	na	na	na	na	0.56	0.20	0.000	*1.29*
7-10	0.88	0.12	0.002	*7.47*	0.72	0.20	0.002	*15.69*	0.74	0.21	0.002	*20.87*	0.72	0.12	0.001	*1.25*	0.62	0.23	0.001	*2.40*
10+	0.69	0.23	0.001	*3.97*	0.70	0.20	0.002	*9.61*	0.70	0.23	0.002	*14.36*	0.64	0.12	0.000	*1.20*	0.65	0.20	0.001	*2.42*
Italy					***Japan***				***Netherlands***				***N. Zealand***				***Norway***			
All	0.54	0.19	0.002	*5.64*	0.61	0.16	0.001	*5.35*	0.77	0.20	0.002	*9.85*	0.51	0.18	0.002	*5.55*	0.67	0.07	0.000	*0.53*
1-3	0.68	0.33	0.004	*8.38*	0.54	0.09	0.000	*1.16*	0.76	0.22	0.002	*9.45*	0.44	0.20	0.002	*6.24*	0.64	0.09	0.001	*5.84*
3-5	0.65	0.33	0.003	*7.33*	0.57	0.09	0.000	*4.37*	0.76	0.21	0.002	*9.61*	0.44	0.21	0.002	*4.44*	0.67	0.09	0.000	*0.88*
5-7	0.62	0.32	0.003	*7.18*	0.60	0.17	0.001	*4.94*	0.77	0.20	0.002	*9.84*	0.41	0.18	0.001	*2.64*	0.62	0.06	0.000	*4.46*
7-10	0.60	0.32	0.003	*7.47*	0.58	0.09	0.000	*1.07*	0.77	0.19	0.002	*9.69*	0.53	0.17	0.002	*6.60*	0.64	0.07	0.000	*0.02*
10+	0.65	0.23	0.003	*6.76*	0.57	0.07	0.000	*4.52*	0.73	0.21	0.002	*10.90*	0.41	0.13	0.000	*-0.68*	na	na	na	na
Portugal					***Singapore***				***Spain***				***Sweden***				***Switzerland***			
All	0.72	0.22	0.000	*-0.15*	0.65	0.18	0.000	*-0.77*	0.71	0.16	0.002	*7.15*	0.65	0.17	0.002	*7.16*	0.66	0.16	0.001	*5.52*
1-3	0.79	0.20	0.000	*0.51*	0.47	0.15	0.002	*3.21*	0.75	0.23	0.003	*10.52*	0.69	0.09	0.001	*5.89*	0.69	0.18	0.002	*6.00*
3-5	0.76	0.24	-0.001	*-1.26*	0.61	0.07	0.000	*2.41*	0.70	0.23	0.003	*7.74*	0.67	0.09	0.001	*5.72*	0.68	0.19	0.002	*5.11*
5-7	0.72	0.24	-0.001	*-1.61*	0.63	0.06	0.000	*1.70*	0.73	0.21	0.002	*6.85*	0.65	0.18	0.002	*9.92*	0.69	0.16	0.001	*5.60*
7-10	0.71	0.21	-0.001	*-1.30*	0.59	0.05	0.000	*1.77*	0.70	0.21	0.002	*5.95*	0.64	0.19	0.002	*7.59*	0.66	0.15	0.001	*5.54*
10+	0.60	0.21	-0.001	*-1.69*	0.50	0.21	-0.001	*-1.09*	0.62	0.25	0.002	*5.68*	0.59	0.20	0.002	*6.49*	0.62	0.12	0.001	*4.46*

	Mean	Std. Dev.	Trend Coeff.	Trend t-stat	Mean	Std. Dev.	Trend Coeff.	Trend t-stat	Mean	Std. Dev.	Trend Coeff.	Trend t-stat	Mean	Std. Dev.	Trend Coeff.	Trend t-stat	Mean	Std. Dev.	Trend Coeff.	Trend t-stat
UK					***Pool DM (21)***				***Pool EU (17)***				***Pool Euro Area (11)***				***Pool Euro Periphery (5)***			
All	0.50	0.07	0.000	-1.78	0.68	0.21	0.001	29.30	0.70	0.21	0.001	23.66	0.75	0.20	0.002	25.26	0.68	0.19	0.001	11.07
1-3	0.47	0.06	0.000	-2.43	0.67	0.24	0.002	36.28	0.72	0.22	0.002	30.19	0.77	0.22	0.002	28.69	0.74	0.24	0.002	16.68
3-5	0.48	0.07	0.000	-0.78	0.68	0.22	0.001	28.71	0.71	0.22	0.001	24.16	0.75	0.22	0.002	23.21	0.69	0.25	0.002	10.64
5-7	0.51	0.06	0.000	1.84	0.67	0.22	0.001	29.24	0.70	0.22	0.001	23.18	0.74	0.22	0.002	22.46	0.65	0.26	0.002	10.28
7-10	0.51	0.09	0.000	2.40	0.68	0.21	0.001	25.06	0.71	0.21	0.001	21.34	0.74	0.22	0.002	20.22	0.66	0.24	0.002	10.54
10+	0.50	0.07	0.000	-1.28	0.64	0.22	0.001	20.85	0.66	0.21	0.001	18.81	0.70	0.22	0.002	20.66	0.63	0.22	0.002	10.56
Panel B- Emerging markets																				
Czech Rep.					***Hungary***				***Korea***				***Malaysia***				***Mexico***			
All	0.64	0.11	0.000	-0.02	0.42	0.12	0.001	2.87	0.35	0.16	0.001	2.31	0.48	0.19	0.000	0.45	0.58	0.26	0.002	2.50
1-3	0.68	0.03	0.000	2.14	0.50	0.09	0.000	-0.13	0.39	0.17	0.000	1.11	0.49	0.12	0.002	2.71	0.47	0.26	0.003	2.81
3-5	0.68	0.03	0.000	1.29	0.46	0.15	0.001	2.17	0.55	0.06	0.000	0.58	0.48	0.12	0.002	3.16	0.53	0.28	0.004	3.49
5-7	0.65	0.09	0.000	0.15	0.44	0.16	0.001	1.61	0.41	0.15	0.000	1.57	0.42	0.16	0.002	2.22	0.47	0.09	0.000	0.60
7-10	0.69	0.08	0.000	0.95	0.55	0.07	0.000	0.27	0.53	0.16	0.000	-0.19	0.49	0.22	0.001	1.04	na	na	na	na
10+	0.61	0.12	0.000	0.78	0.53	0.06	0.000	0.36	0.43	0.21	0.001	1.88	0.44	0.17	0.001	1.47	0.49	0.06	0.00	-0.60
Poland					***South Africa***				***Taiwan***				***Pool EM (8)***				***Pool DM&EM (29)***			
All	0.56	0.12	0.001	3.70	0.43	0.14	0.000	0.15	0.44	0.09	0.000	0.66	0.49	0.18	0.001	3.82	0.65	0.22	0.001	21.89
1-3	0.58	0.10	0.000	1.25	0.33	0.13	0.000	1.29	0.59	0.07	0.000	-0.75	0.51	0.17	0.000	1.26	0.65	0.24	0.001	28.13
3-5	0.57	0.12	0.000	1.21	0.48	0.13	0.001	1.94	0.55	0.09	0.000	-0.30	0.54	0.15	0.000	3.34	0.66	0.22	0.001	24.35
5-7	0.58	0.11	0.001	4.96	0.29	0.16	0.000	1.51	0.50	0.11	0.000	1.41	0.47	0.17	0.001	4.53	0.64	0.23	0.001	22.36
7-10	0.62	0.14	0.001	0.86	0.47	0.15	0.000	0.29	0.45	0.17	0.001	0.95	0.54	0.17	0.000	1.62	0.66	0.21	0.001	36.43
10+	0.51	0.11	0.000	1.00	0.27	0.09	0.000	1.75	0.41	0.17	0.000	0.51	0.46	0.17	0.000	3.73	0.61	0.22	0.001	26.40

Panels A and B of Table 2 contain statistics for the integration indices estimated from the model in Section 1 of the paper for the developed markets and the emerging markets, respectively. The sample period is monthly from May 1986 or later to December 2012. The overall mean, standard deviation, coefficient and t-statistic for a trend are reported for each country and for the pool of observations. The standard errors for the trend tests of the individual regressions are heteroskedasticity and autocorrelation consistent and are obtained from the Newey-West (1987) correction with 6 lags. The standard errors for the trend tests of the pooled regressions are clustered by country and time. The number of countries in the different pools is reported in parenthesis. Some maturity bands have a lower cross-section of countries because of lack of data for that maturity band for some countries.

Table 3
Tests for crises effects on the integration indices

Dependant variables	Independant variables															
	constant	*s.e.*	*Trend/100*	*s.e.*	$D_{ERM\ crisis}$	s.e.	$D_{Asia\ crisis}$	s.e.	$D_{LTCM\ crisis}$	s.e.	$D_{Subprime\ crisis}$	s.e.	$D_{Euro\ Sov.\ Debt\ crisis}$	*s.e.*	*Nobs*	*Adj.* R^2
II_{13}	0.33^{***}	*(0.05)*	0.16^{***}	*(0.00)*	-0.06^{**}	*(0.03)*									6452	61.9%
	0.32^{***}	*(0.05)*	0.16^{***}	*(0.00)*			-0.05^{*}	*(0.02)*							6452	61.8%
	0.32^{***}	*(0.05)*	0.17^{***}	*(0.00)*					-0.02	*(0.02)*					6452	61.8%
	0.32^{***}	*(0.05)*	0.17^{***}	*(0.00)*							0.03	*(0.04)*			6452	61.8%
	0.29^{***}	*(0.06)*	0.19^{***}	*(0.00)*									-0.09^{***}	*(0.03)*	6452	62.9%
II_{35}	0.37^{***}	*(0.05)*	0.15^{***}	*(0.00)*	-0.05^{*}	*(0.03)*									6383	53.6%
	0.36^{***}	*(0.05)*	0.15^{***}	*(0.00)*			-0.05^{***}	*(0.02)*							6383	53.6%
	0.36^{***}	*(0.05)*	0.15^{***}	*(0.00)*					-0.02	*(0.02)*					6383	53.5%
	0.36^{***}	*(0.05)*	0.15^{***}	*(0.00)*							0.02	*(0.04)*			6383	53.5%
	0.32^{***}	*(0.06)*	0.18^{***}	*(0.00)*									-0.11^{***}	*(0.03)*	6383	55.6%
II_{57}	0.35^{***}	*(0.04)*	0.15^{***}	*(0.00)*	-0.09^{***}	*(0.02)*									6321	59.8%
	0.34^{***}	*(0.04)*	0.15^{***}	*(0.00)*			-0.02	*(0.02)*							6321	59.5%
	0.34^{***}	*(0.04)*	0.15^{***}	*(0.00)*					-0.01	*(0.03)*					6321	59.5%
	0.34^{***}	*(0.04)*	0.15^{***}	*(0.00)*							0.018	*(0.02)*			6321	59.5%
	0.29^{***}	*(0.05)*	0.18^{***}	*(0.00)*									-0.12^{***}	*(0.03)*	6321	62.0%
II_{710}	0.38^{***}	*(0.04)*	0.14^{***}	*(0.00)*	-0.08^{***}	*(0.02)*									6186	54.8%
	0.37^{***}	*(0.04)*	0.14^{***}	*(0.00)*			-0.03	*(0.02)*							6186	54.4%
	0.37^{***}	*(0.04)*	0.14^{***}	*(0.00)*					-0.03	*(0.02)*					6186	54.5%
	0.37^{***}	*(0.04)*	0.14^{***}	*(0.00)*							0.01	*(0.01)*			6186	54.4%
	0.32^{***}	*(0.05)*	0.18^{***}	*(0.00)*									-0.13^{***}	*(0.03)*	6186	58.2%
II_{10+}	0.36^{***}	*(0.04)*	0.13^{***}	*(0.00)*	-0.13^{***}	*(0.04)*									5881	51.3%
	0.35^{***}	*(0.05)*	0.13^{***}	*(0.00)*			-0.02	*(0.02)*							5881	50.6%
	0.36^{***}	*(0.05)*	0.13^{***}	*(0.00)*					-0.05^{**}	*(0.02)*					5881	50.8%
	0.35^{***}	*(0.05)*	0.13^{***}	*(0.00)*							-0.02	*(0.03)*			5881	50.6%
	0.30^{***}	*(0.05)*	0.17^{***}	*(0.00)*									-0.13^{***}	*(0.03)*	5881	53.6%

Table 3 contains the parameters of the tests from the pooled regression of the estimated indices on a constant, a time-trend, and a dummy variable for the crises periods. The regressions include country fixed effects. D_{crisis} is the dummy that takes one in the crisis period and 0 otherwise. The crises are the exchange rate mechanism (ERM) crisis of September 1992-August 1993, the East Asia crisis on June-December 1997, the January-December 1998 Russian Default and Long-Term Capital Management (LTCM) crisis, the August-September 2008 subprime crisis, and the January 2010-December 2012 euro sovereign debt crisis. All the standard errors in parentheses are clustered by country and time. Superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 4

Statistics and correlations of the regression variables

Panel A - Descriptive statistics by country

	POL	*Rating_ LT*	*YS10*	*CDS5*	*PD/GDP*	*FS*	*AI_long*	*AI_short*	*IH*	*ID1M*	*ΔFX*	*TS*	SR	*ΔGDP*	*PC/GDP*	*TR/GDP*	*II_Long Short*
Australia	0.84	20.05	0.16%	0.31%	20.28%	0.73	9.42%	30.16%	na	0.18%	0.18%	0.05%	0.33%	0.81%	85.7%	31.7%	0.04
Austria	0.87	20.94	-0.01%	0.41%	64.32%	3.40	27.48%	45.57%	na	-0.01%	0.15%	0.09%	0.11%	0.57%	101.9%	64.8%	-0.01
Belgium	0.81	19.94	0.03%	0.53%	112.42%	4.02	14.95%	56.83%	12.13%	0.02%	0.21%	0.10%	0.19%	0.42%	69.8%	153.8%	-0.02
Canada	0.85	20.64	0.05%	0.25%	82.27%	6.17	12.38%	58.90%	na	0.06%	0.13%	0.07%	0.14%	0.59%	117.3%	55.8%	0.18
Czech Rep.	0.79	15.40	0.04%	0.53%	25.97%	1.77	2.89%	67.24%	na	na	0.21%	0.12%	0.13%	0.59%	50.7%	107.8%	0.01
Denmark	0.86	20.27	0.03%	0.30%	52.43%	1.52	5.35%	19.96%	na	0.09%	0.11%	0.07%	0.17%	0.37%	108.7%	56.0%	0.00
Finland	0.90	20.25	0.04%	0.18%	39.63%	2.09	6.51%	40.61%	18.32%	-0.01%	0.14%	0.09%	0.27%	0.41%	74.0%	54.2%	-0.01
Frances	0.79	20.96	0.02%	0.40%	56.74%	3.07	19.08%	49.25%	29.13%	0.05%	0.18%	0.08%	0.23%	0.45%	93.5%	40.0%	0.00
Germany	0.84	21.00	-0.04%	0.24%	62.25%	5.93	29.47%	41.26%	na	-0.02%	0.21%	0.08%	0.14%	0.31%	103.3%	53.2%	0.02
Greece	0.72	13.24	0.29%	7.01%	98.70%	5.43	24.24%	23.65%	3.03%	0.08%	-0.13%	-0.62%	0.26%	0.25%	58.3%	30.4%	-0.06
Hungary	0.77	12.90	0.31%	1.30%	65.89%	3.03	3.94%	59.93%	na	na	-0.35%	-0.07%	0.17%	0.46%	43.7%	99.9%	0.05
Ireland	0.84	19.11	0.10%	1.78%	69.38%	2.18	4.69%	4.28%	5.64%	-0.01%	0.14%	0.05%	0.26%	0.61%	109.9%	538.7%	-0.10
Italy	0.77	18.11	0.13%	0.92%	109.35%	4.92	21.64%	49.89%	18.17%	0.16%	0.09%	0.09%	0.28%	0.29%	76.2%	7.7%	-0.09
Japan	0.83	19.89	-0.23%	0.36%	134.86%	21.07	45.53%	43.73%	na	-0.20%	0.31%	0.09%	0.08%	0.19%	190.9%	19.9%	0.04
Korea	0.73	15.68	0.14%	0.90%	20.95%	1.40	31.00%	42.47%	na	na	0.01%	0.02%	0.07%	1.50%	92.2%	63.4%	0.14
Malaysia	0.71	14.82	na	0.86%	47.77%	2.79	13.37%	46.96%	na	1.09%	-0.05%	na	0.13%	1.57%	112.9%	152.6%	0.00
Mexico	0.70	11.78	0.35%	1.49%	42.28%	4.88	2.65%	59.93%	na	na	-0.84%	0.13%	0.54%	0.64%	19.5%	44.5%	0.01
Netherlands	0.87	21.00	-0.02%	0.30%	59.37%	2.65	20.61%	48.22%	17.76%	-0.01%	0.21%	0.09%	0.17%	0.54%	129.7%	98.6%	0.01
New Zealand	0.86	19.46	0.13%	0.38%	40.06%	0.91	4.08%	57.91%	na	0.21%	0.17%	0.03%	0.38%	0.61%	98.5%	43.5%	0.09
Norway	0.87	21.00	0.03%	0.14%	41.21%	1.63	3.94%	24.77%	na	0.10%	0.15%	0.03%	0.37%	0.59%	65.4%	51.0%	0.00
Poland	0.73	13.73	0.20%	0.84%	45.97%	2.84	5.11%	48.50%	na	na	-0.34%	0.02%	0.25%	1.06%	32.1%	49.8%	0.02
Portugal	0.80	17.46	0.13%	2.01%	65.16%	3.27	8.40%	27.40%	6.03%	0.09%	0.06%	0.08%	0.17%	0.30%	108.4%	52.1%	-0.10
Singapore	0.83	20.89	na	0.27%	85.66%	6.12	3.88%	58.73%	na	-0.09%	0.19%	na	-0.01%	1.67%	93.9%	287.1%	0.08
South Africa	0.66	12.57	na	1.42%	36.08%	1.39	9.77%	55.31%	na	0.59%	-0.15%	NA	0.31%	0.63%	122.4%	43.9%	0.14
Spain	0.72	19.40	0.11%	0.94%	52.96%	4.45	10.14%	45.70%	18.25%	0.09%	0.11%	0.08%	0.21%	0.55%	116.7%	37.0%	-0.05
Sweden	0.87	20.60	0.07%	0.21%	54.56%	2.41	6.65%	53.92%	na	-0.01%	0.10%	0.06%	0.26%	0.65%	107.4%	57.6%	-0.05
Switzerland	0.89	21.00	-0.17%	0.57%	51.97%	5.82	20.87%	54.76%	na	-0.12%	0.31%	0.07%	0.10%	0.42%	157.5%	57.2%	-0.03
Taiwan	0.78	18.93	na	0.62%	32.66%	na	33.40%	19.61%	na	na	0.11%	na	0.16%	1.50%	na	89.8%	-0.13
UK	0.82	21.00	0.07%	0.47%	46.94%	1.91	30.36%	25.86%	51.87%	0.17%	0.08%	0.03%	0.27%	0.59%	136.0%	39.9%	0.04
Pool	0.80	18.35	0.00	0.01	0.59	3.85	0.15	0.43	0.18	0.00	0.00	0.00	0.00	0.01	0.96	85.6%	0.01

Panel B - Correlations coefficients

	POL	*Rating_ LT*	*YS10*	*CDS5*	*PD/GDP*	*FS*	*AI_long*	*AI_short*	*IH*	*ID1M*	*ΔFX*	*TS*	SR	*ΔGDP*	*PC/GDP*	*TR/GDP*	*II_Long Short*
Rating_LT	0.60																
	0.07																
YS10	**-0.70**	**-0.95**															
	0.03	*0.00*															
CDS5	-0.56	**-0.94**	**0.91**														
	0.09	*0.00*	*0.00*														
PD/GDP	-0.41	-0.52	0.41	0.40													
	0.24	*0.12*	*0.23*	*0.26*													
FS	**-0.83**	**-0.70**	**0.67**	0.58	**0.72**												
	0.00	*0.02*	*0.03*	*0.08*	*0.02*												
AI_long	-0.26	-0.07	0.15	0.18	0.21	0.21											
	0.47	*0.84*	*0.68*	*0.62*	*0.56*	*0.56*											
AI_short	-0.03	0.37	-0.45	-0.46	0.19	0.30	0.18										
	0.93	*0.30*	*0.20*	*0.18*	*0.59*	*0.40*	*0.61*										
IH	0.16	0.61	-0.42	-0.51	-0.46	-0.44	0.58	0.17									
	0.67	*0.06*	*0.23*	*0.13*	*0.18*	*0.20*	*0.08*	*0.63*									
ID1M	-0.57	-0.23	0.42	0.13	0.19	0.37	0.59	0.02	0.46								
	0.08	*0.52*	*0.23*	*0.73*	*0.60*	*0.29*	*0.07*	*0.96*	*0.18*								
ΔFX	0.59	**0.89**	**-0.95**	**-0.90**	-0.23	-0.52	-0.30	0.47	0.23	-0.46							
	0.07	*0.00*	*0.00*	*0.00*	*0.52*	*0.13*	*0.40*	*0.17*	*0.53*	*0.18*							
TS	0.50	**0.84**	**-0.82**	**-0.95**	-0.34	-0.52	-0.36	0.36	0.32	-0.12	**0.87**						
	0.14	*0.00*	*0.00*	*0.00*	*0.34*	*0.12*	*0.30*	*0.31*	*0.36*	*0.74*	*0.00*						
SR	-0.05	-0.17	0.35	0.19	0.02	-0.02	0.23	-0.32	0.28	0.30	-0.37	-0.29					
	0.90	*0.63*	*0.33*	*0.61*	*0.96*	*0.96*	*0.53*	*0.37*	*0.44*	*0.40*	*0.30*	*0.42*					
ΔGDP	0.36	**0.70**	-0.57	-0.52	-0.55	**-0.66**	-0.10	-0.19	0.45	-0.28	0.55	0.45	-0.07				
	0.31	*0.02*	*0.08*	*0.12*	*0.10*	*0.04*	*0.79*	*0.59*	*0.19*	*0.44*	*0.10*	*0.19*	*0.84*				
PC/GDP	0.24	0.55	-0.43	-0.45	**-0.63**	-0.58	0.08	-0.21	0.50	0.09	0.33	0.46	-0.33	**0.74**			
	0.51	*0.10*	*0.21*	*0.19*	*0.05*	*0.08*	*0.83*	*0.55*	*0.14*	*0.80*	*0.35*	*0.18*	*0.35*	*0.01*			
TR/GDP	0.31	0.10	-0.12	-0.02	0.03	-0.38	-0.50	-0.60	-0.34	-0.52	0.26	0.13	0.04	0.51	0.15		
	0.38	*0.79*	*0.75*	*0.96*	*0.93*	*0.28*	*0.14*	*0.07*	*0.34*	*0.12*	*0.47*	*0.72*	*0.90*	*0.14*	*0.67*		
II_LongShort	0.37	0.61	-0.56	-0.42	-0.41	-0.43	0.54	**0.38**	**0.77**	-0.04	0.34	0.15	0.01	0.42	0.30	-0.35	
	0.71	*0.58*	*0.93*	*0.17*	*0.43*	*0.97*	*0.77*	*0.01*	*0.01*	*0.41*	*0.62*	*0.58*	*0.65*	*0.30*	*0.66*	*0.36*	

Panel C- Descriptive statistics of the regression variables

	POL	*Rating_ LT*	*YS10*	*CDS5*	*PD/GDP*	*FS*	*AI_long*	*AI_short*	*IH*	*ID1M*	*ΔFX*	*TS*	SR	*ΔGDP*	*PC/GDP*	*TR/GDP*	*II_Long Short*
Mean	0.80	18.35	0.08%	0.89%	59.25%	3.85	14.89%	43.49%	18.03%	0.11%	0.06%	0.04%	0.21%	0.66%	95.58%	85.59%	0.01
Median	0.82	19.89	0.07%	0.53%	52.96%	2.94	10.14%	46.96%	17.97%	0.06%	0.13%	0.07%	0.19%	0.59%	100.16%	54.20%	0.00
Std. Dev.	0.065	3.086	0.12%	1.28%	27.6%	3.77	11.5%	15.4%	11.9%	0.24%	0.23%	0.13%	0.11%	0.41%	40.40%	102.46%	0.07
1st quartile	0.77	15.68	0.03%	0.30%	41.21%	1.88	5.11%	30.16%	7.56%	-0.01%	0.06%	0.03%	0.14%	0.42%	72.96%	43.51%	-0.03
3rd quartile	0.86	20.89	0.13%	0.92%	65.89%	4.89	21.64%	55.31%	18.31%	0.13%	0.18%	0.09%	0.27%	0.64%	113.83%	89.84%	0.04

	$VOL_{7\text{-}10}$ - $VOL_{1\text{-}3}$	VOL_{10+} - $VOL_{1\text{-}3}$	*QIS*	*CONFLICT*	*DEMTEN*	*GOVACT*	*Political-Rights*	*Creditor-Rights*	*EURO Indicator*	II_{10+} - $II_{1\text{-}3}$	*SR_US*	*VIX*	*SENT*	*ΔUSM (in billion USD)*
Mean	0.56%	0.65%	0.79	0.88	0.91	0.69	1.50	2.09	0.23	-0.04	0.11%	20.43	14.95%	30.65
Median	0.48%	0.72%	0.84	0.89	0.94	0.69	1.00	2.00	0.00	-0.03	0.15%	19.37	4.95%	6.17
Std. Dev.	0.43%	0.81%	0.19	0.06	0.10	0.05	0.98	1.09	0.25	0.08	0.36%	7.77	53.21%	77.44
1st quartile	0.32%	0.56%	0.70	0.85	0.86	0.66	1.00	1.14	0.00	-0.08	-0.08%	14.56	-19.49%	-8.58
3rd quartile	0.60%	0.86%	0.92	0.92	0.99	0.72	1.62	3.00	0.52	0.01	0.33%	24.27	40.75%	55.76

The table presents summary statistics for the regressionn variables. Panel A reports sample means of the main variables used in the panel regressions in Section IV of the paper for each country and for the pool. Panel B reports their cross-correlations and pvalues computed from the time-series averages of each country. In bold, the correlations that are significant at 5% or lower level. Panel C reports summary statistics of all variables used in the panel regressions in Sections IV and V of the paper. *SR_US, VIX, SENT* and *ΔUSM* exhibit only time series variation. For *ΔUSM* we report the statistics over the period January 2008-December 2012 covered in model R1b of Table 6 . The sample period is May 1986 to December 2012. Not all variables are available in every period for every country. The definition of the variables is in Appendix B.

Table 5
Factors related to term structure of integration

Model	*upper R-squared bound*	*(1) Institutional environment*	*(2) Sovereign default risk*			*(3) Preferred-Habitat & relative supply effect*		*(4) Investment opportunities*		*(5) Push factors*	*(6) Full model*	
			(2a)	*(2b)*	*(2c)*	*(3a)*	*(3b)*	*(4a)*	*(4b)*		*(6a)*	*(6b)*
constant		-0.254***	-0.376**	0.018	0.028	-0.002	-0.057	-0.011	-0.004	*0.011*	-0.615***	-0.642***
		(0.09)	(0.17)	(0.02)	(0.02)	*(0.02)*	*(0.02)*	*(0.01)*	*(0.02)*	*(0.01)*	*(0.23)*	*(0.24)*
POL		0.306***									0.352**	0.367**
		(0.11)									*(0.19)*	*(0.18)*
Rating_LT			0.018**								0.015**	0.016**
			(0.01)								*(0.01)*	*(0.01)*
YS10				-4.690								
				(5.74)								
CDS5					-0.092							
					(0.095)							
PD/GDP			-0.022	-0.097*	-0.161***						0.015	0.012
			(0.06)	*(0.06)*	*(0.05)*						*(0.08)*	*(0.08)*
FS			0.006	0.010	0.015***						0.004	0.006
			(0.01)	*(0.01)*	*(0.01)*						*(0.01)*	*(0.01)*
AI_long						0.012	0.012				-0.001	0.000
						(0.02)	*(0.03)*				*(0.02)*	*(0.02)*
AI_short						0.006	-0.035				0.000	-0.004
						(0.02)	*(0.02)*				*(0.01)*	*(0.01)*
IH							0.187***					
							(0.04)					
ID1M									2.806			6.810
									(3.31)			*(6.08)*
ΔFX								0.050	0.038		0.098	0.003
								(0.07)	*(0.10)*		*(0.08)*	*(0.11)*
TS								0.131				
								(0.30)				
SR								2.203***			1.721**	
								(0.82)			*(0.72)*	
ΔGDP								1.092**	1.465***		0.625	0.834*
								(0.44)	*(0.41)*		*(0.47)*	*(0.50)*
SR_US								0.581		1.272	-0.362	
								(0.65)		*(0.88)*	*(0.67)*	

VIX										-0.001	0.000	0.000
										(0.00)	*(0.00)*	*(0.00)*
PC/GDP											0.008	-0.015
											(0.02)	*(0.02)*
TR/GDP											-0.013	-0.010
											(0.01)	*(0.01)*
EM Dummy		0.059*	0.171***	0.042	0.069**	0.030	no	0.019	0.098**	0.034	0.189***	0.265***
		(0.04)	*(0.05)*	*(0.03)*	*(0.03)*	*(0.03)*		*(0.02)*	*(0.04)*	*(0.03)*	*(0.05)*	*(0.07)*
Country + time FE	yes	no	no	no	no	no	no	no	no	no	no	no
Nobs	6186	6133	4715	4336	3128	6181	1901	5173	4789	5888	4175	3666
Adj. R^2	32.3%	2.2%	10.6%	4.3%	13.9%	0.7%	8.5%	1.7%	3.8%	1.0%	13.4%	16.5%

The table reports the estimated coefficients from pooled regressions of the differnce in integration indices between the long (7-10) and short (1-3) maturities on proxies for institutional factors, sovereign default risk, monetary and fiscal policy, habitat-preference view, change in investment opportunites, push factors and other country characteristics. The estimated models are based on the general equation below,

$$II_{i,t}^{long} - II_{i,t}^{short} = \beta_1(Institutional\ environment)_{i,t-1} + \beta_2(Sovereign\ risk)_{i,t-1} + \beta_3(Habitat - preferences)_{i,t-1} + \beta_4(Future\ Investment\ oportunities)_{i,t-1} + \beta_5(push\ factors)_{i,t-1} + X'_{i,t-1}\gamma + \varepsilon_{i,t}$$

We run unbalanced regression as not all the explanatory variables are available for all the cross-sectional units. All explanatory variables are lagged. Standard errors in parentheses are clustered by country and time. The sample period is from 05/1986 to 12/2012. Superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Definition of the variables and data source is in Appendix B.

Table 6
Robustness

	Panel A							**Panel B**			
Model	*(R1) Additional controls*		*(R2) $II_{10+} - II_{13}$ as dependent variable*	*(R3) subcomponents of political risk and legal institutions*			*(R4) EURO effect*	*(R5) Subperiod analysis*		*(R6) Annual Frequency*	*(R7) Outliers effects*
	(a)	*(b)*		*(a)*	*(b)*	*(c)*		*(a)*	*(b)*		
constant	-0.703***	-0.711	-0.903***	-0.071	-0.233	-0.465**	-0.473***	-1.753***	-0.752***	-0.546***	-0.615***
	(0.27)	*(0.22)*	*(0.28)*	*(0.10)*	*(0.25)*	*(0.19)*	*(0.20)*	*(0.45)*	*(0.21)*	*(0.19)*	*(0.23)*
POL	0.362**	0.366*	0.424*			0.285*	0.265*	0.665**	0.406*	0.302*	0.348*
	(0.20)	*(0.22)*	*(0.25)*			*(0.16)*	*(0.16)*	*(0.35)*	*(0.22)*	*(0.18)*	*(0.19)*
QIS				0.328**	0.316**						
				(0.13)	*(0.14)*						
CONFLICT				-0.095	-0.134						
				(0.13)	*(0.14)*						
GOVACT				0.026	0.191*						
				(0.07)	*(0.11)*						
DEMTEN				-0.154	-0.226**						
				(0.12)	*(0.10)*						
Creditor-Rights						*0.019* *					
						(0.01)					
Rating_LT	0.014**	0.015**	0.020**		0.007*	0.010*	0.013**	0.058***	0.014**	0.010**	0.015**
	(0.01)	*(0.01)*	*(0.01)*		*(0.00)*	*(0.01)*	*(0.01)*	*(0.01)*	*(0.01)*	*(0.01)*	*(0.01)*
PD/GDP	0.080	0.015	0.070		0.032	0.018	0.033	-0.063	0.084	0.028	0.016
	(0.07)	*(0.08)*	*(0.09)*		*(0.07)*	*(0.03)*	*(0.07)*	*(0.13)*	*(0.06)*	*(0.04)*	*(0.08)*
FS	-0.001	0.004	0.001		0.000		0.001	0.049	-0.001		0.004
	(0.01)	*(0.01)*	*(0.01)*		*(0.01)*		*(0.01)*	*(0.04)*	*(0.01)*		*(0.01)*
AI_long	-0.011	-0.001	-0.021		0.001	-0.002	-0.003	0.041***	-0.008	0.010	-0.001
	(0.01)	*(0.02)*	*(0.02)*		*(0.01)*	*(0.01)*	*(0.02)*	*(0.01)*	*(0.01)*	*(0.07)*	*(0.02)*
AI_short	0.009	0.000	-0.020		-0.009	0.000	-0.002	-0.041	0.012	0.009	0.000
	(0.01)	*(0.01)*	*(0.02)*		*(0.01)*	*(0.01)*	*(0.01)*	*(0.03)*	*(0.01)*	*(0.03)*	*(0.01)*
ΔFX	0.082	0.160*	-0.016		0.097	0.107	0.118*	-0.027	0.176*	0.160	0.101
	(0.08)	*(0.10)*	*(0.10)*		*(0.08)*	*(0.08)*	*(0.06)*	*(0.28)*	*(0.10)*	*(0.29)*	*(0.08)*
SR	1.603**	1.920***	1.881*		1.526**	2.582***	1.274**	0.327	1.838***	14.640***	1.693**
	(0.66)	*(0.72)*	*(0.92)*		*(0.68)*	*(0.85)*	*(0.62)*	*(3.06)*	*(0.67)*	*(5.63)*	*(0.71)*
ΔGDP	0.715	-0.358	0.501		0.479	0.624	0.290	4.249**	-0.292	2.726**	0.609
	(0.48)	*(0.46)*	*(0.49)*		*(0.51)*	*(0.46)*	*(0.36)*	*(2.14)*	*(0.48)*	*(1.14)*	*(0.47)*

SR_US	-0.281	-3.181***	0.336		-0.108	-0.465	-0.785	-2.190	-2.699***	-0.910	-0.325
	(0.72)	*(0.76)*	*(0.84)*		*(0.68)*	*(0.60)*	*(0.59)*	*(1.73)*	*(0.76)*	*(2.24)*	*(0.67)*
VIX	0.000	0.001	0.000		0.000	-0.001	0.000	-0.001	0.001**	0.000	0.000
	(0.00)	*(0.00)*	*(0.00)*		*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
PC/GDP	0.010	0.026	0.023		0.000	-0.004	-0.006	-0.207	0.033	0.026	0.009
	(0.02)	*(0.02)*	*(0.02)*		*(0.02)*	*(0.02)*	*(0.02)*	*(0.14)*	*(0.02)*	*(0.02)*	*(0.02)*
TR/GDP	-0.015	-0.032	-0.008		-0.019***	-0.013	-0.006	0.123*	-0.033**	-0.009	-0.013
	(0.01)	*(0.01)*	*(0.01)*		*(0.01)*	*(0.01)*	*(0.01)*	*(0.07)*	*(0.01)*	*(0.01)*	*(0.01)*
Δ USM		-0.641*									
		(0.36)									
Δ USM ×Rating_LT		0.036**									
		(0.02)									
$VOL_{7\text{-}10}$-$VOL_{1\text{-}3}$	2.808										
	(2.35)										
VOL_{10+}-$VOL_{1\text{-}3}$			7.551***								
			(2.11)								
EURO indicator							*-0.058* ***				
							(0.02)				
EM Dummy	0.200***	0.234***	0.166***	0.106***	0.198***	0.140***	*0.170* ***	no	0.236***	0.143***	0.190***
	(0.06)	*(0.05)*	*(0.06)*	*(0.04)*	*(0.05)*	*(0.05)*	*(0.05)*		*(0.05)*	*(0.04)*	*(0.05)*
Country + time FE	no	no	no	no	no	no	no	no	no	no	no
Nobs	4097	1424	3923	6133	4430	4981	4175	653	1479	444	4175
Adj. R^2	13.9%	24.8%	16.2%	5.9%	16.6%	11.5%	17.4%	31.1%	25.3%	16.4%	13.6%

The table reports the estimated coefficients from pooled regressions of the differnce in integration indices between the long and short maturities on proxies for institutional factors, sovereign default risk, monetary and fiscal policy, habitat-preference view, change in investment opportunites, push factors and other country characteristics. The estimated models are based on the general equation below,

$$II_{i,t}^{long} - II_{i,t}^{short} = \beta_1(Institutional\ environment)_{i,t-1} + \beta_2(Sovereign\ risk)_{i,t-1} + \beta_3(Habitat - preferences)_{i,t-1} + \beta_4(Future\ Investment\ oportunities)_{i,t-1} + \beta_5(push\ factors)_{i,t-1} + X'_{i,t-1}\gamma + \varepsilon_{i,t}$$

We run unbalanced regression as not all the explanatory variables are available for all the cross-sectional units. All explanatory variables are lagged. Standard errors in parentheses are clustered by country and time. The sample period is from 05/1986 to 12/2012. Superscripts ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Definition of the variables and data source is in Appendix B.

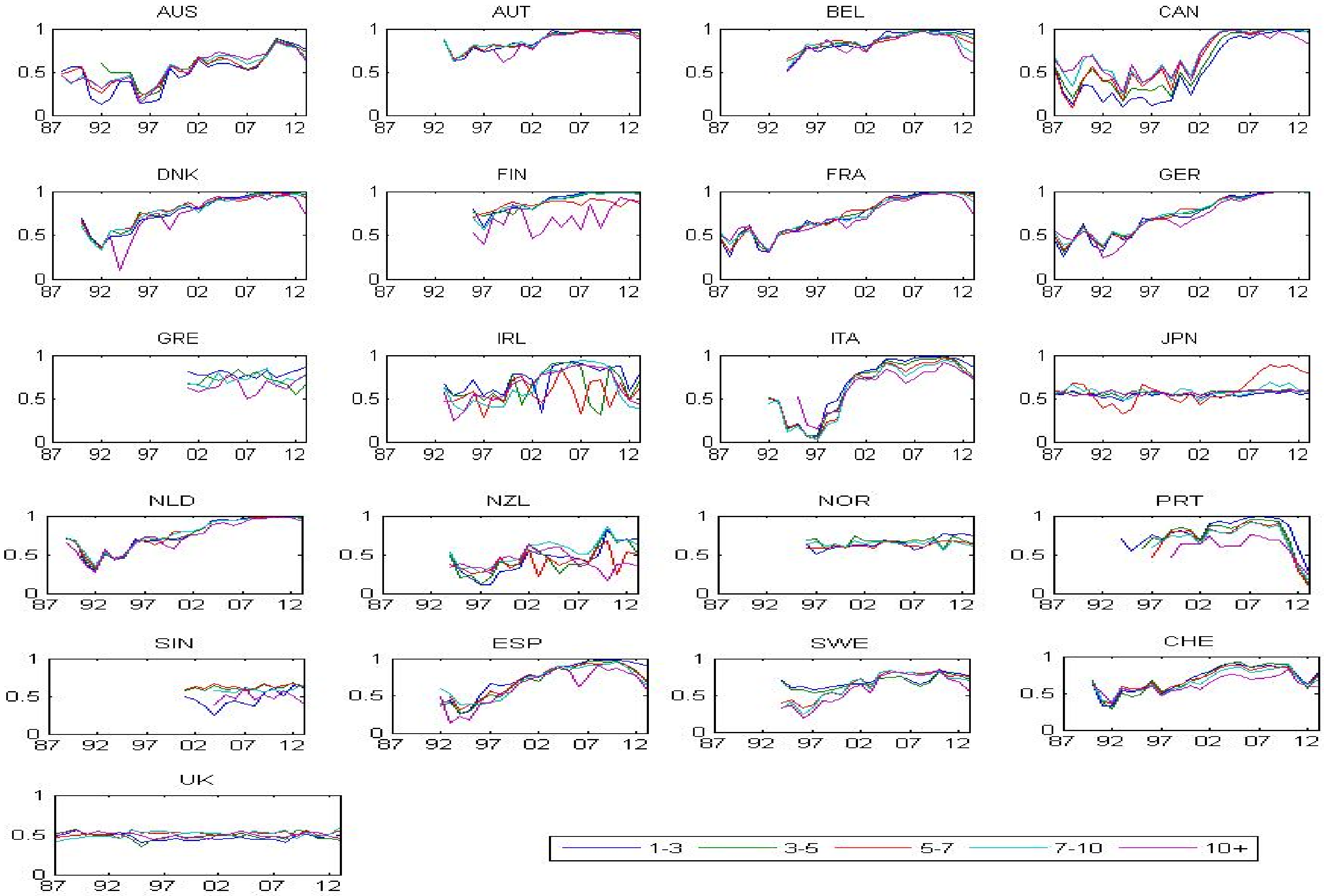

Figure 1. Integration indices by country and maturity bands

Panel A- Developed markets

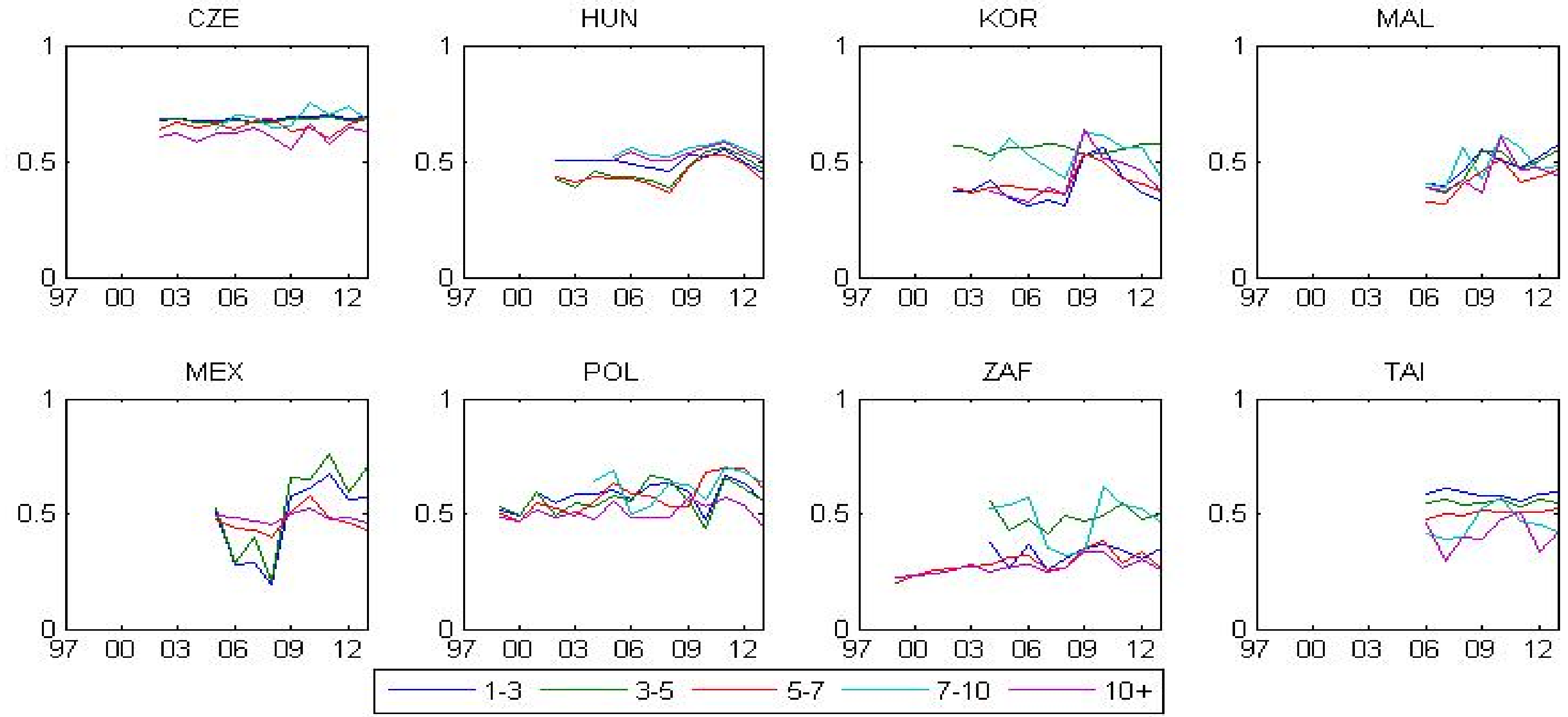

Figure 1. Integration indices by country and maturity bands

Panel B- Emerging markets

The figure plots the per year averages of the estimated integration for the developed markets (Panel A) and emerging markets (Panel B) across the five maturity segments. The sample period is from January 1986 or later to December 2012.

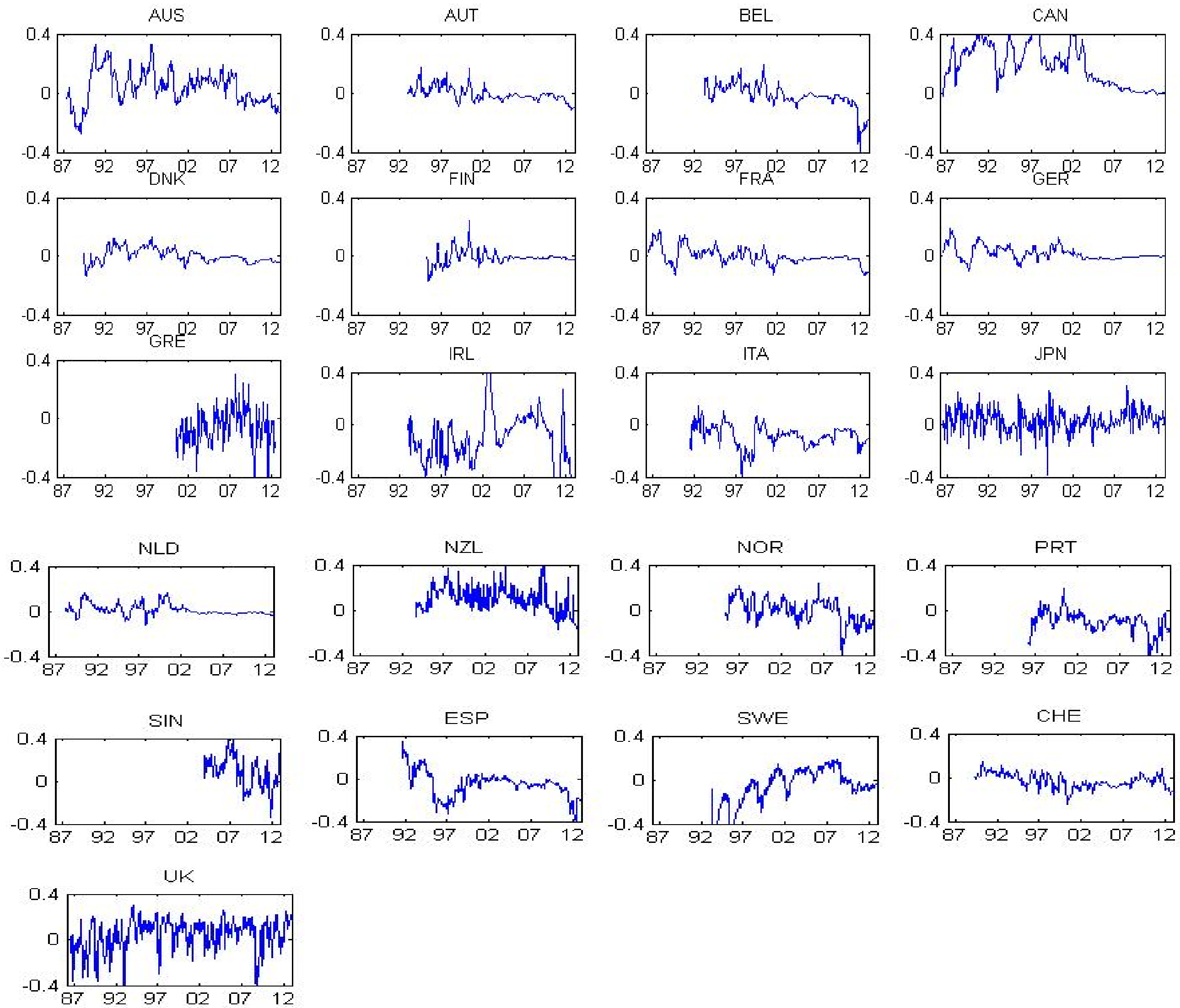

Figure 2- Difference in integration between the long and short maturities
Panel A- Developed Markets

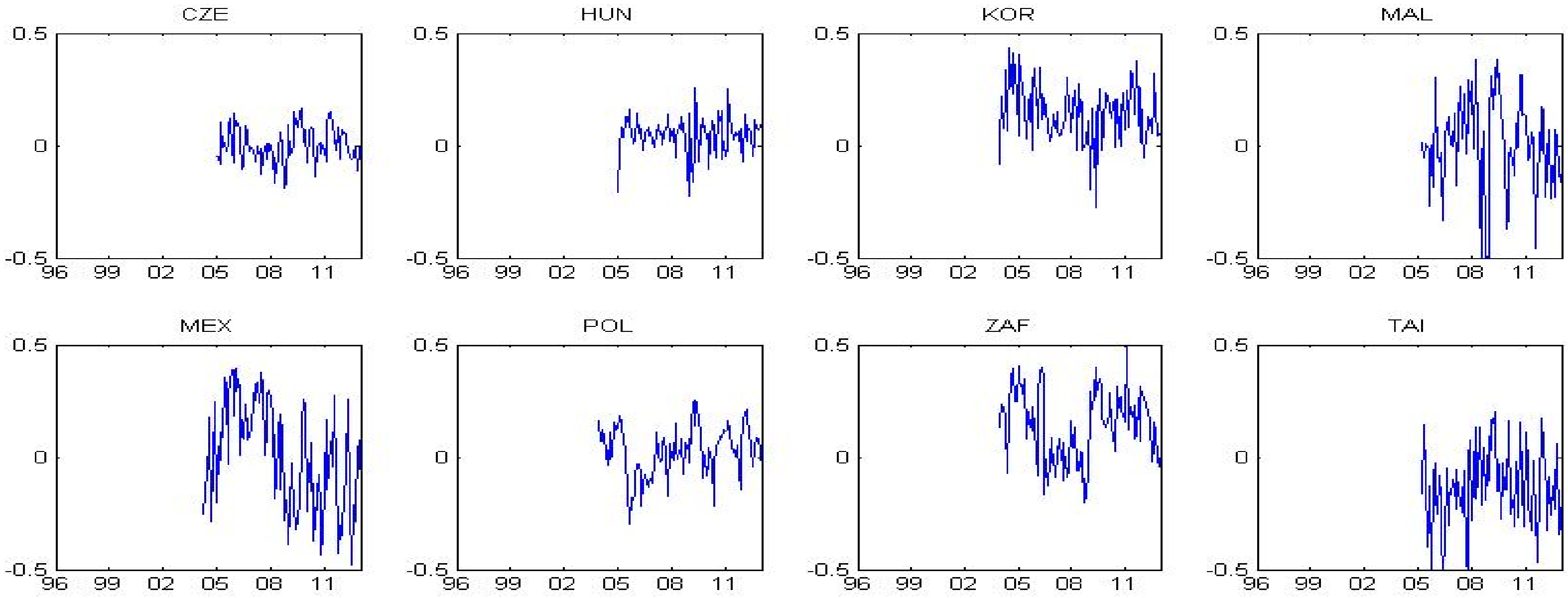

Figure 2- Difference in integration between the long and short maturities
Panel B- Emerging Markets

The figure plots the difference between the estimated integration indices of the long (7-10) and the short (1-3) maturity segments for the developed markets (Panel A) and for the emerging markets (Panel B). The sample period is from January 1986 or later to December 2012.

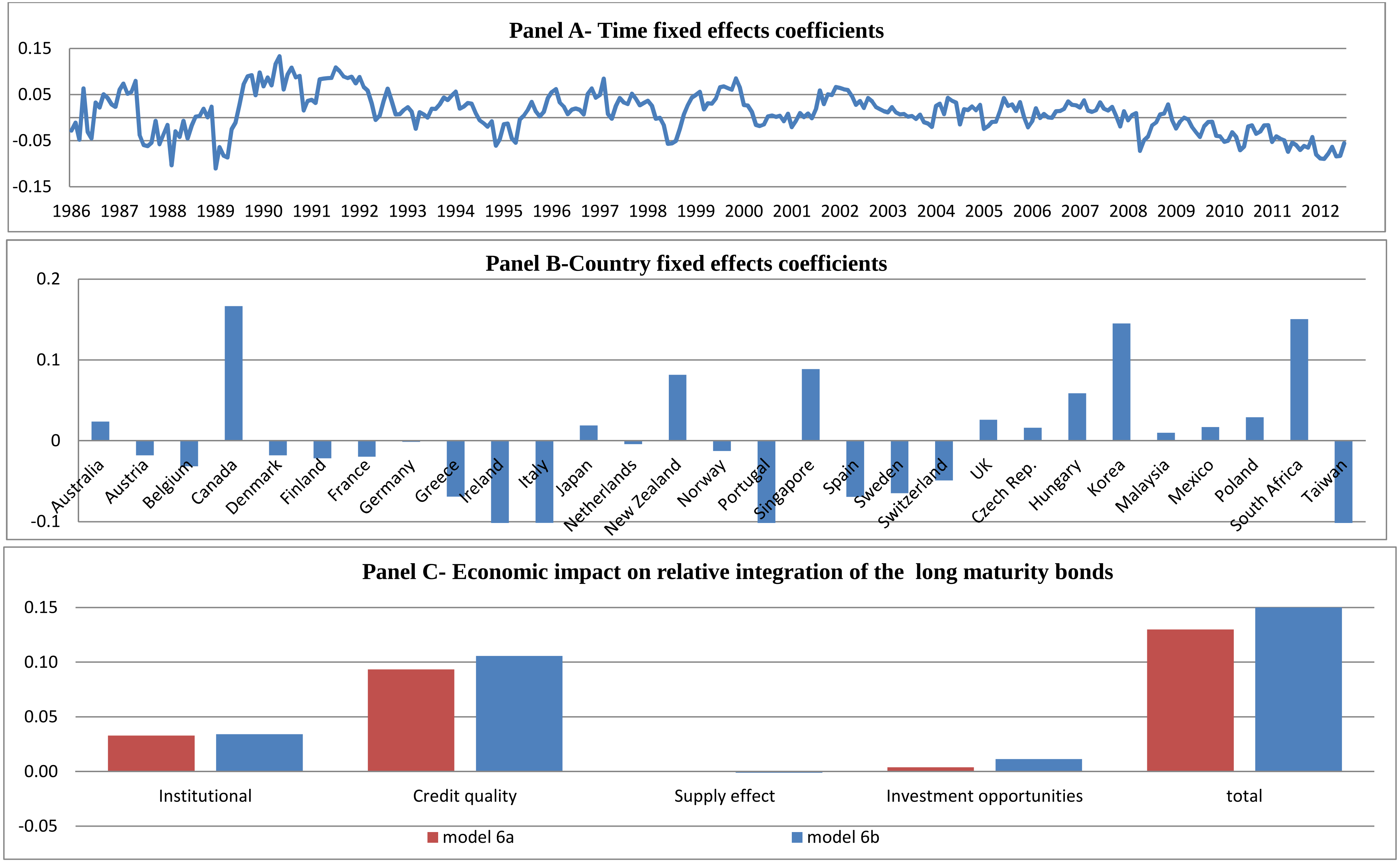

Figure 3

Factors driving differential integration between the long and short bonds