Globalization and Asset Prices

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Abstract

We investigate whether the globalization process of the last thirty years has lead to "convergence" of asset prices in a wide set of countries, encompassing both developed and emerging markets. We examine several measures of convergence for interest rates (real and nominal) and bond and equity returns, and important fundamentals as inflation and earnings growth rates. While doing so, we extensively review the extant literature. Our results do not indicate strong effects of globalization on the convergence of asset prices, even though we document some links. In particular, financial openness matters relatively more than measures of corporate governance and political risk.

1 Introduction

Much ink has flowed discussing the effects of globalization on financial markets and the real economy. The literature is so voluminous that providing a comprehensive survey is nearly impossible. Fortunately, a number of summary articles already exist. Bekaert and Harvey (2003) survey both the real and financial effects of financial openness, mostly focusing on equity markets. The evidence on the real side remains controversial. The survey articles by Eichengreen (2001) and Kose, Prasad, Rogoff and Wei (2009) conclude that the empirical evidence on the benefits and costs of capital account liberalizations remains mixed, whereas Henry (2007)'s reading of the literature sides with Bekaert and Harvey's (2003) view that capital account liberalization has promoted growth. Studies that actually take the dynamics of liberalization seriously such as Bekaert, Harvey and Lundblad (2005), Quinn and Toyoda (2008) and Gupta and Yuan (2008), do find robust positive growth effects. The evidence in terms of the effect of financial openness on real volatility and a country's vulnerability to crises remains mixed (see Bekaert, Harvey and Lundblad (2006), Kose, Prasad and Terrones (2006)). A consensus is growing that the relationship between financial openness and economic growth and volatility is subject to "threshold effects", with countries with better macroeconomic policies and institutions (including better developed financial sectors) responding better.

One important channel through which financial globalization affects the real sector is through its effects on asset prices. Stulz (1999) concludes that opening a country to portfolio flows decreases its cost of capital without adverse effects on its security markets while Karolyi and Stulz (2003) argue that despite globalization, standard international asset pricing theory fails in explaining the portfolio holdings of investors, equity flows, and the time-varying properties of correlations across countries. Both survey articles and Bekaert and Harvey (2003) primarily focus on equity markets, as does the bulk of the academic literature.

In this article, we characterize the link between the globalization process and the comovement of asset prices. To do so, we start by providing a simple quantitative definition of "globalization," distinguishing between economic and financial globalization and between de jure and de facto integration. Folklore wisdom suggests

that integration should lead to "convergence" of asset prices and returns across countries. Using a large panel of data, we examine several measures of convergence and their link to quantitative measures of globalization. We investigate bond and equity returns and several of their components (like real rates, cash flow growth rates etc.). Consequently, our survey casts a wider net than the existing literature in terms of assets considered, extending the evidence beyond equity markets. We also use several different measures of globalization, contrasting, for example, the effects of trade and equity openness. Our comprehensive examination may shed light on why many studies fail to document strong evidence of convergence in returns (see the discussion in Pukthuanthong and Roll (2009)).

The survey article by Stulz (1999) and much of the literature focuses on first moments. We do not provide further evidence regarding the important question whether globalization has reduced the cost of capital in the countries opening up to global capital markets, and we do not provide a comprehensive survey of this literature. For emerging markets, several studies (Bekaert and Harvey (2000), Henry (2000), Kim and Singal (2000)) find that stock market liberalization decreases the cost of capital, although the estimated magnitudes differ. Evidence from American Depositary (ADR) announcements corroborates these findings (see, for example, Foerster and Karolyi (1999)). These studies avail themselves of several broad liberalization programs introduced in many emerging markets at particular points in time. However, documenting the cost of capital effects of the globalization process in general, especially in developed countries, which are gradually integrating in world capital markets, is considerably more difficult. Some limited evidence suggests that the cost of capital decreases when there is an increase in the degree of globalization (see, for example, Hardouvelis, Malliaropoulos and Priestley (2004), De Jong and De Roon (2005)).

We generally find weak evidence of asset price convergence linked to globalization. The evidence is somewhat stronger for interest rates and bond returns than for equity returns. Focusing on risk premiums also yields stronger results. Strong cyclical variation in comovement measures weakens the power of most convergence tests. More powerful evidence in favor of an openness effect results from linking global

betas to openness measures. Within such a framework, we show that financial openness affected convergence more than do measures of corporate governance and political risk.

The remainder of the article is organized as follows. The second section defines and discusses our globalization measures. The third section summarizes the asset return data we examine and reflects on where we should expect convergence and where not. The fourth section explains our general methodology. We investigate 4 different measures of convergence, and discuss the results of each in turn from Sections 5 to 8. The final section summarizes our main results and considers several additional empirical analyses to help interpret them.

2 Defining globalization

We are interested in two aspects of globalization: economic integration, brought about by trade links, and financial integration, brought about by free capital flows. Measuring integration is fraught with difficulty and the topic of a large literature in itself. In particular, de jure openness may not mean that markets are fully integrated because other factors, such as political risk and poor liquidity, may cause segmentation (see Bekaert (1995) and Bekaert, Harvey, Lundblad and Siegel (2009) for related analyses); conversely investment barriers may not prevent actual capital flows. Aizenman and Noy (2000) also show that there are important links between trade openness and financial openness, arguing that capital controls in trade-open countries are likely ineffectual. Our primary interest is "de jure" measures of globalization. This focus is important because ultimately whether the trend towards globalization continues or not is mostly in the hands of policy makers. Also, Bekaert, Harvey and Lumsdaine (2002) identify endogenous dates of market integration from economic and financial data, finding them to be mostly later than dates of market reform, suggesting that de jure financial openness does lead to effective integration, albeit with a lag.

For trade openness, Wacziarg and Welch (2008) built an extensive cross-country data set building on Sachs and Warner's (1995) classification of countries in either open or closed countries based on 5 criteria. These criteria involve the magnitude of tariffs, nontariff barriers, state control of the trade sector, etc. Being a 0/1 dummy, the measure displays very little cross-sectional variation towards the end of the sample, and actually

may not fully reflect the still ongoing trend towards more openness and it cannot capture the reversal in trade openness observed since the start of the 2008-2009 financial crisis. We therefore work instead with a more de facto measure: exports + imports divided by GDP of the current calendar year, denoted by $TO_{i,t}$.

There are in fact substantially more data available on de jure financial globalization. We use a measure that combines information from four sources (with each weighted 1/4), but is skewed towards equity liberalization. The first component is the measure of capital account openness, compiled by Quinn and Toyoda (2008), and based on IMF data. They assess the degree of capital account openness based, inter alia, on the presence of taxes on foreign investment, leading to an index between 0 and 4. We take the data from Bekaert, Harvey and Lundblad (2005), which map the index onto the [0,1] domain. The second component is the official liberalization dummy created by Bekaert and Harvey (2002). The dummy is zero until a country opens its equity market to foreign investment. This measure does not take into account the potentially binding foreign ownership restrictions used by many countries, such as Korea, early on in their liberalization programs. We therefore also use a measure that tracks the market capitalization available to foreigners as a fraction of total market capitalization (see Bekaert (1995), Edison and Warnock (2003)). Finally, we use an adjusted version of the Chinn-Ito (2008) measure of openness. Their measure essentially represents the first principle component of 4 dummy variables on the restrictions on external accounts drawn from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). We map the measure onto a [0,1] scale by subtracting the minimum value of the index over the sample (all countries, all data points) and dividing by the difference between maximum and minimum. We indicate the aggregated measure of the four components by $FO_{i,t}$.

Our final measure of openness focuses on Foreign Direct Investment. FDI can be viewed as a long-term persistent portfolio flow, but increased FDI also tends to increase the real links between countries through trade and technological transfers. We use $IO_{i,t}$ to denote the sum of FDI Assets and FDI Liabilities divided by the GDP of the current calendar year. All data sources and variable definitions are further detailed in the data appendix Table A-1.

Our sample consists of 34 countries, with varying sample sizes. We therefore look at 5 different country groups, which are listed in Table 1. For developed countries we have the longest data sample, and we use data from 1980:1 to 2008:12 for 14 countries. We also consider a subset of 6 EU countries. For a shorter sample starting in 1990, we can also look at 11 emerging countries. We look at them separately and together with a set of developed countries. For this sample, we can also investigate a wider set of 14 EU countries. These sample choices are entirely driven by data availability and the desire to create samples that are as balanced as possible[1]. We wanted data not only on openness, but also on equity and bond returns, interest rates, inflation, etc.

Figure 1 graphs the openness measures averaged over our set of countries over time. The openness level is generally higher in developed than in emerging markets. The capital market openness measures clearly show an overall upward trend, but the trade openness measure, for developed countries, declines before 1990, then again trends upward. Note that because the trade openness measure involves monthly imports and exports, it is much more volatile than the other two measures. We therefore show the 1-year sum of the original numbers in the graph[2]. Towards the very end of our sample, the global recession reduces international trade activity and appears to have reversed the trend towards trade openness. For developed countries, financial openness is almost complete by the beginning of our sample, but still continues during the 1985-1990 period, when countries such as New Zealand, Japan, France, Italy and Belgium further liberalized their capital markets. For emerging markets, a wave of liberalizations occurred in the early 1990s. The FDI openness measures have also increased substantially over time; with, perhaps surprisingly, the rate of increase faster for developed markets than for emerging markets. Conducting trend tests for the various

[1] Appendix Table A-2 contains the various sample periods available per variable and per country, showing the remaining sources of unbalanced samples (e.g. Austria's nominal short rate becomes only available in 1987).

[2] While the other openness measures are graphed in their original form, in the empirical work below, we often construct moving averages of the openness measures matching the window frames for the convergence measures.

measures, all the openness variables feature a positive trend coefficient, except the TO measure for the 2 long samples. However, the trends are not statistically significantly different from zero.

Table 2 reports summary statistics for the openness measures (Panel A) and their correlations (Panel B). In most cases, the measures are highly positively correlated, with correlations mostly exceeding 0.8. One exception is the correlation between TO and FO in the long sample, which is negative due to the downward trend of trade openness in the mid 1980s. This trend also reduces the correlation with IO for these samples.

We do not use a popular alternative measure of openness, due to Lane and Milesi-Ferreti (1999), which records the ratio of foreign assets and foreign liabilities over GDP. Their gross measure adds up the stocks of direct investment, portfolio equity, debt assets (liabilities) and foreign exchange reserves, thereby covering all securities in IMF's International Investment Position, and divides the aggregate number by annual GDP. However, the measure is very highly correlated with both FO and especially IO. The correlation with the latter, computed as in Table 2, always exceeds 99%. It therefore makes little sense to include the measure in addition to the ones we already analyze.

3 Asset prices

Theory

Generally, we are interested in tracing out the effects of globalization on returns to the two main asset classes, equities and bonds, and their components. Figure 2 provides an overview. To price equities, we need (expected) cash flows and discount rates. The discount rate for stocks can be split up in three components: a (short-term) real rate, a term premium, and an equity premium. For nominal bonds, we only need to consider discount rates, the real rate and the term premium, but we also investigate inflation as it is the most important variable driving time-variation in nominal bond yields (see Ang, Bekaert and Wei (2008) and many others).

How will globalization affect the comovement of these various variables across countries? Let's start with real interest rates. Under real interest rate parity, real interest rates are equalized across countries. However, real interest rate parity requires the strong and somewhat unpalatable assumptions of uncovered interest rate parity, purchasing

power parity and the Fisher hypothesis in both countries to hold. That is, full money market integration does not suffice, as it does not preclude the existence of currency and country risk premiums. Nevertheless, one would expect globalization to contribute to real rate convergence across the world, as open financial markets help equalize real returns to capital invested. While financial market integration should be the major force affecting interest rates, under imperfect integration, trade openness may have important effects. Imagine a closed-economy world, in which real rates reflect expected real growth rates and local precautionary savings motives. Theoretically, the effect of trade openness is not clear. Trade integration may lead to specialization, which should lower output correlations across countries and thus likely imply real rate divergence, but it may also lead to synchronization of business cycles through demand spillover effects.

The effect of openness on business cycle convergence has been studied extensively in the literature, but mostly the focus is on financial openness. In fact, most theoretical models predict that financial market integration leads to business cycle divergence, either through specialization towards the higher return projects as in Obstfeld (1994); or the attraction of capital to positive productivity shocks as in Baxter and Crucini (1995). The empirical evidence is decidedly mixed (compare Kalemli-Ozcan, Papaioannou, and Peydro (2009), who find divergence, with Imbs (2004), who finds convergence). However, unless capital market distortions exist, interest rates may still equalize under full market integration. Comparing short versus long term real interest rates, monetary policy should exert more of an influence on short term interest rates, making convergence more likely to be observed for longer term interest rates. Of course, this is no longer true if there is abundant monetary policy coordination, or if in the limit, as happened in Europe, countries join monetary unions.

A simple perspective on the convergence of nominal interest rates is a Fisherian world, where nominal interest rates equal real interest rates plus inflation expectations (and perhaps inflation risk premiums). We discuss inflation below. An international perspective is the uncovered interest rate parity condition, where nominal interest rates in one country equal the interest rate in another country plus expected exchange rate depreciation. These exchange rate expectations may then be linked to inflation expectations through purchasing power parity. The relationship may not hold because of

the presence of currency risk and country risk premiums. Importantly, open financial markets and free trade need not lead to equalization of interest rates (see also Frankel (1989)), but it should lead to the disappearance of certain country premiums, caused by capital controls. The creation of a monetary union, as happened in the context of the European Union in 1999, obviously must lead to a convergence of nominal interest rates, and it mostly did so within Europe (see Baele et. al. (2004), Jappelli and Pagano (2008)). One may still observe some divergence for long term bond yields, however, simply because of the presence of liquidity premiums in various bond markets.

Generally, inflation is of course an important state variable driving bond returns (although it may also affect equity returns). Globalization may affect the inflation process through a variety of channels. Trade openness generally increases the level of competition in both product and labor markets. Openness means increased tradability and substitutability of products and services across countries; increased contestability of both output and input markets and increased availability of low-cost production in previous command economies, such as China, etc. Rogoff (2003) and Lane (1997) argue that globalization decreases the central bank's incentive to inflate. Chen, Imbs and Scott (2009) and Cox (2007) stress how globalization raises productivity growth, and therefore inflation. On balance, these effects may contribute to inflation convergence across countries (see Chen, Imbs and Scott (2009)). For example, one interesting recent hypothesis is that international trade has made it possible for many countries to import low inflation from China, and withstand the rather strong inflationary forces coming from the recent commodity price shocks. Globalization should make country-specific inflation more sensitive to global excess demand conditions, although this of course also depends on exchange rate movements. Borio and Filardo (2007) show that, especially since the early 1990s, the role of global economic slack in explaining domestic inflation has substantially increased.

Globalization, together with improved central bank institutions and practice, may also have played an important role in the global trend towards lower inflation, witnessed over the last 20 years (see Rogoff (2003)). It is also conceivable that the real shocks buffeting the world economy were simply milder over the last few decades, and that the current crisis will eventually usher in another era of higher inflation. With its lower

level, we have also witnessed a decrease in inflation volatility (part of the so-called "Great Moderation" phenomenon). Table 3 shows the average of the country-specific means and annual volatilities of inflation during three sub-samples: 1980s, 1990s and 2000s. First note that emerging markets have higher inflation and inflation variability than the developed group in all the sub-samples. More importantly, inflation and its variability decrease substantially over time in both groups.

There is in fact a big debate raging in macroeconomics about the causes of the "break" in volatility, which has not settled yet at a time where it is becoming painfully obvious this "Great Moderation" has come to an end. For our purposes, these trends are nonetheless important. The lower level and variability of inflation may affect comovement measures. At first glance, a substantially lower level of inflation may lead to convergence; the decreased variability at the world level, on the other hand, may lead to decreased comovement (see Section 2.6), if it is caused by the lower variability of global inflation shocks.

An important part of the variation in bond returns and, even more so, in equity returns comes from variation in risk premiums. Here, we expect financial market integration to be the main driver behind the convergence of term- and equity premiums across countries. In integrated economies, securities of similar risk should command the same risk premiums and we should likely observe risk premiums converge.

Finally, how should globalization affect the correlation of cash flows across countries? Here the debate on the effects of openness on business cycle convergence is relevant again. Assume for one moment that cash flows are positively correlated with output. Then, the theoretical literature would suggest that financial market integration may lead to business cycle divergence and hence to lower cash flow correlations, through the effects discussed earlier. Recall that trade openness has ambiguous effects on output growth correlations. Now, of course, how output translates into cash flows is an entirely different matter, which may depend on the competitive structure in particular countries. Ammer and Mei (1996), for example, find that cash flow growth rates are more highly correlated across countries than are output growth rates.

Measurement

We would like to split up returns into its main drivers (discount rates, split up over term structure effects and risk premiums, and cash flows), but we want to minimize relying on parametric assumptions in this article, and preferably only use variables we can measure from the data directly.

In the middle of Figure 2, we show real rates and term premiums as major components of the discount rate for both equities and bonds. The real rate plus the real term premium (the difference between the long and short rate), is the real long rate. The remainder of the discount rate is a risk premium. Measuring ex-ante real rates is impossible without a model for expected inflation and inflation risk premiums. We make the simplest possible assumption for expected inflation, namely that the best forecast of future inflation is current (annual) inflation. While we do not believe that inflation is a random walk process in all of our countries, there is some evidence that random walk inflation forecasts are hard to beat for the US (see Atkeson and Ohanian (2001), and Ang, Bekaert and Wei (2007)). Finding more sophisticated inflation forecasts for all of these countries is next to impossible. Our short rates are very short-term, mostly reflecting a three-month maturity; therefore we can safely assume a zero inflation risk premium[3]. Hence, we compute the real short term rate as the difference between the nominal short rate and (current) inflation.

For long term rates, let's consider the following decomposition of the long-term nominal rate, $i_{n,t}$:

$$i_{n,t} = r_{n,t} + \pi^{e}_{n,t} + \varphi_{n,t} \quad (1)$$

where $r_{n,t}$ is the real long rate (ex-ante), $\pi^{e}_{n,t}$ is the average expected inflation over the life of the bond and $\varphi_{n,t}$ is the long-term inflation risk premium.

If inflation is a random walk, the best forecast for inflation over a longer time period is also current inflation. We therefore compute the long-term real rate also as the difference between the long-term nominal rate and current inflation, but here we are on considerably shakier ground. Even for developed countries, most studies seem to agree that inflation risk premiums can be sizable and vary through time (see Bekaert (2009) for

[3] We use continuously compounded rates, expressed in per annum terms.

a survey)[4]. Under these strong random walk and zero inflation risk premium assumptions, the real term premium equals the nominal term premium.

For completeness, we also look at nominal short and long rates and at inflation itself.

Of course, we also investigate the returns themselves, and consider three versions for both equities and bonds: the actual return, the excess return (defined as the return in excess of the nominal short rate), both expressed in dollars, and a hedged excess return. We approximate the latter by investigating local currency excess returns. In addition, we consider a number of equity-related variables. We examine cash flow growth, measured as the year-on-year earnings growth rate: $cf_t = \ln(\overline{EA}_t/\overline{EA}_{t-12})$ where $\overline{EA}_t = EA_t + EA_{t-1} + EA_{t-2}$ and $EA_t = MCAP_t/PE_t$ measured in U.S. dollars. Because there is mostly quarterly reporting on earnings, we first aggregate the reported earnings in the recent 3 months to smooth the series. Using annual growth rates is necessary to control for the strong seasonal patterns in earnings.

We also investigate a valuation ratio, namely the log of the price earnings ratio (PE, henceforth). Valuation ratios reflect both discount rates and growth opportunities, but at least they are real concepts and should not have a currency component.

Table 4 provides summary statistics for the variables of interest in this paper. For each variable, we first compute the time-series mean of the variable for each country, then obtain the cross-sectional mean and standard deviation across either developed countries or emerging markets. Comparing developed and emerging markets, developed markets on average have relatively lower interest rates, and higher returns, higher PE ratios and lower cash flow growth. Standard deviations of these variables are uniformly higher in emerging markets.

[4] One potential procedure to correct for time-varying inflation risk would compute rolling inflation volatility for all of our countries, and then run a panel regression of our current real rates for each country on inflation volatility, with potentially the coefficient depending on emerging versus developed countries. We could then take the current long term real rate minus the pooled regression coefficient times current inflation volatility as the estimate of the true ex-ante real long term rate.

4 Methodology

We seek to answer two simple questions. First, do we observe a pattern of cross-country convergence in returns and their components over time? Second, is this pattern related to openness? We do not take a strong stance on a measure of convergence. Instead, we examine four different measures, each with pros and cons: correlations, global betas, panel country-effect standard deviations and cross-sectional dispersion. We discuss these measures in more detail in separate sections devoted to each.

To detect quasi-permanent movements in convergence/divergence measures, we use trend tests. This may appear strange at first, as it is quite possible that some measures may move to a point where they can no longer converge further. Also, if de jure liberalizations drive changes in the measures, a break analysis around the liberalization dates would appear superior. However, recall that we are interested in the convergence of variables across countries. Consequently, they are affected by liberalizations in all the countries in the sample. Given sufficient cross-sectional and temporal variation in the liberalizations over time, the pattern should look like a slow trend over time, as the globalization process itself, see Figure 1. This is true even if the "break" in one country is sudden and abrupt. Even so, in many countries or regional groups (such as the EU), integration itself has been rather gradual. For instance, Korea relaxed foreign ownership restrictions starting in 1991, in slow increments, to finally become totally open in 2002.

The benchmark model for the trend test is

$$y_\tau = \alpha_0 + \alpha_1 \tau + u_\tau \qquad (2)$$

where y_τ is the variable of interest, and τ is a linear time trend. We use the test developed by Bunzel and Vogelsang (2005), which is robust to I(0) and I(1) error terms and uses a "Daniell kernel" to nonparametrically estimate the error variance needed in the test. Our relatively small sample necessitates the use of a powerful test, and the Bunzel-Vogelsang test has optimal power properties.

In addition, we also directly investigate the link between convergence of various economic variables and our openness variables. To this end, we specify multivariate regressions of the form:

$$CONV_t = \alpha + \beta_1 TO_t + \beta_2 FO_t + \beta_3 IO_t + \gamma Z_t + \varepsilon_t \qquad (3)$$

where $CONV_t$ is the convergence measure and Z_t are control variables we discuss below. Because the error terms are likely serially correlated, we use a Cochrane-Orcutt estimation method, specifying $\varepsilon_t = \rho\ \varepsilon_{t-1} + u_t$ and $u_t \sim IID$. We often also check whether a trend variable survives in such a specification.

Because we have a relatively small sample in the time series dimension and a large set of countries to collect data for, it is impossible to allow for a comprehensive set of control variables Z_t. We use two variables that may ex ante have a significant effect on convergence measures, but may not be directly related to openness. The first is a global business cycle variable, denoted by Cyc_t. To measure the stance of the business cycle, we subtract a moving average of world GDP growth (over the last 5 years) from current GDP growth. However, we only have end-of-year annual GDP growth. To turn this into a monthly variable, Cyc_t is constructed using the weighted average of the annual world business cycle variable $Cyc_{s,a}$ in the current year and last year. For example, in the m^{th} month of year s, $Cyc_t = ((12\text{-}m)/12)\ Cyc_{s-1,a} + (m/12)\ Cyc_{s,a.}$ It is well known that in recessions all asset prices are more variable. If a global factor model has some explanatory power for asset returns, then recessions should lead to financial variables being more correlated across countries because the global factors are more variable (see Boyer, Gibson and Loretan (1999) and Bekaert, Hodrick and Zhang (2009)). We actually find that the global business cycle variable is mildly positively correlated with the openness variables; suggesting we have had slightly fewer incidences of recessions in the later part of the sample, which would spuriously lower comovements.

The second variable is a crisis measure, denoted as $Crisis_t$. When a significant number of countries experience a crisis, this may lead to extreme movements in asset prices. If isolated to a few countries or one region, this could actually decrease the comovement across asset prices. However, if the crises are global in nature, comovements may increase. We use the dummies for banking and currency crises collected by Caprio and Klingebiel (2003) for each country and update the data using the information in Reinhart and Rogoff (2008). We investigated both equally weighted and value weighted (using GDP) averages over time. These two crisis variables show no consistent correlation pattern with the openness measures, being sometimes negatively, sometimes positively correlated, depending on the country group and the period.

The effects of globalization on asset prices have been examined before in a variety of articles, but most articles have focused on one asset price (with equities being the most popular), a particular comovement measure or a particular set of countries. We discuss the extant literature as we go along, but mention a few articles already. Perhaps the most comprehensive literature has used the stock market openings of emerging markets at the end of the eighties and the beginning of the nineties to trace the effects of (a shock to) integration on asset prices, typically using event study-type methodologies. Bekaert and Harvey (2000), Bekaert, Harvey and Lumsdaine (2002), and Kim and Singal (2000) investigate many characteristics of equity market data, including correlations with world market returns. They find that liberalizations increase the correlation with world market returns. Henry (2000) is more typical of the literature focusing primarily on the cost of equity capital, finding, as Bekaert and Harvey (2000) do, that openings decrease the cost of capital. There has also been work on real interest rates, from a variety of perspectives, but mostly focused on developed markets. Jorion (1996) tests real interest parity for the US, Britain and Germany, rejecting the hypothesis for all three. Goldberg, Lothian and Okunev (2003) examine real interest rate differentials for 15 country pairs, finding no significant differences and a narrowing of differentials over time. Gagnon and Unferth (1995), looking at 9 countries, estimate a world interest rate, and show that each country's real rate is very highly correlated with the world interest rate. Breedon, Henry and Williams (1999) investigate long run real rates, including rates from inflation-linked bonds in 7 countries, but fail to find evidence that interest rates are converging towards a single world rate. Phylaktis (1997) investigates comovements of real rates in the Pacific-Basin region. None of these real interest rate studies takes the dynamic perspective of this article linking changes in comovements to changes in actual financial openness.

5 Correlations

The most obvious convergence statistic to investigate is of course the correlation. There is a long tradition in finance of examining the links between globalization and return correlations (see for instance, Longin and Solnik (1995), Bekaert and Harvey (2000), Bekaert, Hodrick and Zhang (2009)). Longin and Solnik (1995) detect an upward trend in correlations across the G7 countries, but Bekaert, Hodrick and Zhang (2009) only find

a significant trend within Europe. Rather than focusing on correlations per se, we investigate a variance ratio of the form (see Ferreira and Gama (2005)):

$$PR_t = ln\left(\frac{var(\frac{1}{N}\sum_i x_{i,s})}{\left(\frac{1}{N}\sum_i STD(x_{i,s})\right)^2}\right) \text{ for } s \in [t-35, t], \text{ for any variable x at time t.} \qquad (4)$$

This statistic has the sum of the variances in both the denominator and numerator as a leading term, but then depends on the cross-product of the standard deviations multiplied with correlations in the numerator and multiplied with 1 in the denominator. Hence, if the correlations were literally one, the log-ratio would be zero; and the lower the correlations the more negative is the ratio. By computing the statistic over rolling three-year intervals, we trace the evolution of correlations over time. Increased correlations lead to increasing ratios. Note that PR_t is a more "efficient" statistic than the average correlation. For N countries, the latter requires the computation of N×(N-1)/2 correlations, whereas the PR-statistic only requires the estimation of N+1 variances.

Tables 5 and 6 contain the results. Table 5 focuses on the trend test. We do not find a single significant trend coefficient. This is easy to understand once we glance at Figure 3, which graphs the (exponentiated) ratios for all the variables. Ratios close to 1 mean perfect correlation. The graphs show that these ratios primarily show cyclical movements. For the interest rate variables in Panel A, the one variable that seems to display a bit of a trend is the term premium, the one variable in our set that is closest to a risk premium. Yet, at the end of the sample, correlations seem to have moved down again. The large discrepancy between the observations from developed countries and for the EU long sample in the nominal rates graph during 1987-1980 is primarily driven by New Zealand, where two recessions during 1985-1991 implied volatile rates. Panel B shows bond and equity returns. The end of the sample shows closely aligned equity returns, but comovements for bond returns decrease. It is possible that this is an artifact of the recent crisis. Cash flow growth and valuation ratios, shown in Panel C, likewise do not show strong trends, but mostly cyclical behavior.

Table 6 shows the results of our main regression. It is conceivable that there is still a link with openness once the cyclical movements are controlled for. For example, the high comovements observed in the beginning of the sample for both short and long rates in Panel A of Figure 3 coincide with the major recession many developed countries

witnessed in the early eighties. If openness increases comovements, we should see positive and significant coefficients. Unfortunately, there is no clear and consistent pattern, neither across different samples, nor across variables (even within a group). The closest we come to this is perhaps with long real rates, where financial and trade openness always have positive coefficients, which are significant at some level in 4 of the 5 country groups we consider. While the comovement of inflation across countries does not seem to have been systematically affected by the openness variables, financial openness continues to have a rather consistent positive effect on nominal rate comovements as well. For returns, there are a number of significant coefficients, but absolutely no consistent patterns in terms of signs. If anything, bond return comovements appear negatively correlated with financial openness. The same lack of consistency plagues the results for cash flow growth and PE ratios.

Note that in Table 5 superscripts indicate whether a trend term has a significant positive coefficient in our main regression. This does happen in a few cases, but there is no clear interpretable pattern.

6 Beta models

The results using correlation as a comovement measure were perhaps a bit disappointing. However, this is not surprising, because correlations have well-known limitations, especially when one is looking for rather low-frequency changes in comovement. The reason is that correlations vary considerably over time, in particular, in response to movements in the volatilities of underlying factors. Consider a simple one factor model for a variable $x_{i,t}$ for country i:

$$x_{i,t} = \beta_i f_t + e_{i,t} \quad (5)$$

Imagine that f_t is the "world factor". An example of such a model would be the World CAPM, where $x_{i,t}$ would be the country's equity (excess) market return and f_t the world (excess) market return. It is easy to show that in such a model the correlation between $x_{i,t}$ and f_t equals

$$\rho_{i,f} = \beta_i \frac{\sigma_f}{\sigma_i} \quad (6)$$

where σ_i is the volatility of the variable $x_{i,t}$ and σ_f the volatility of the factor. Consequently, everything else equal, if the volatility of the factor increases, it increases the correlation between $x_{i,t}$ and the global factor, and, given that the $e_{i,t}$'s are idiosyncratic, increases the correlations among all country variables correlated with f, provided they have positive betas[5]. It is well known that the volatility of well-diversified equity portfolios varies substantially over time without showing significant permanent changes. Macro variables show distinct cyclical variation in volatility, being higher in recessions (see Bekaert and Liu (2004), for consumption growth, for example). Consequently, there is much scope for correlations to show substantial temporary movements that make it hard to detect the possible underlying trends caused by the globalization process. In particular, they may temporarily increase when factor volatilities are temporarily high, a phenomenon we call the volatility bias.

The volatility bias for equity markets is worse in bear markets. Longin and Solnik (1995) and Ang and Bekaert (2002) show that stock markets are unusually highly correlated in bear markets, even beyond what can be attributed to the higher variance of market factors in such market conditions. Consequently, the incidence of bear markets may play a role in measuring changes in correlations. The controls for global recessions and crises should mitigate these biases, but they may not suffice.

Looking at equation (5), financial market and trade integration is most likely to show up in the betas itself. As markets integrate, presumably the dependence on world factors will increase. The literature here is rather voluminous. Articles that have parameterized betas as a function of integration indicators (most frequently measures of trade integration) include Bekaert and Harvey (1997), Chen and Zhang (1997), Fratzscher (2002), Bekaert, Harvey and Ng (2005), Ng (2000) and Baele and Inghelbrecht (2009).

Note that one has to be careful with such an argument, because if the global factor simply aggregates the country-specific variables (which would be the case in a strict application of the World CAPM), the betas have to add up to one, and hence, they cannot increase for all countries. However, the bulk of the articles we mentioned apply variants

[5] See Forbes and Rigobon (2002), Boyer, Gibson and Loretan (1999), Bekaert, Harvey and Ng (2005) and Bekaert, Hodrick and Zhang (2009) for related discussions.

of equation (5) in such a way that these constraints do not apply, for example, by using the U.S. as the global benchmark.

In this article, we estimate two types of beta models. The first model simply allows for time-varying betas using a three-year rolling window and computes rolling variance ratio statistics. The model can be represented as:

$$x_{i,t} = \alpha_i + \beta_i \, x_{glob,t} + \varepsilon_{i,t} \tag{7}$$

where $x_{i,t}$ denotes any variable of interest in country i at time t. We consider two proxies for the global factor, either $x_{glob,t} = \hat{x}^i_{w,t}$ where $\hat{x}^i_{w,t}$ is the real GDP per capita weighted average $x_{j,t}$ over all countries for all the country i except that for Japan, the U.K. and U.S., $\hat{x}^i_{w,t}$ is the weighted average of $x_{j,t}$ excluding its own country; or $x_{glob,t}$ is simply $x_{US,t}$, which is the U.S. variable. The regressions are estimated country-by-country using OLS. As in Bekaert and Harvey (1997), Bekaert, Harvey and Ng (2005) and Baele (2005), we compute variance ratios, that is,

$$VR_{i,t} = \frac{\hat{\beta}^2_{i,t} \mathrm{var}(x_{glob,s})}{\mathrm{var}(x_{i,s})} \text{ for } s \in [t-35, t] \tag{8}$$

These variance ratios measure how much of the total variation in the variable is accounted for by the global factor, and are therefore closely related to the R^2 in the regression. Pukthuanthong and Roll (2009) in fact propose using the R^2 of a multi-factor model to measure market integration. Using an APT model with 10 factors to compute time-varying R^2's, they uncover a marked increase in measured integration for most countries, which is not revealed by simple correlations among country indices.

By computing the variance ratios over rolling three year-intervals, we can trace the evolution of the importance of the global factor over time. As a first test, we consider trend tests for these variance ratios. However, while the trend coefficients are often positive, we fail to find many significant coefficients. One possible reason is that the volatility bias mentioned before implies that cyclical behavior dominates the dynamics of the variance ratios and erodes the power of the trend tests. To check if we still on average see increases in variance ratios over time, Figure 4 graphs the average variance ratios of individual countries over the 5 country groups for all the variables. The global factor is $x_{US,t}$. It is again difficult to see persistent increases with the exception of the short rate and term premium series. The equity return variance ratios also seem to

increase over time, despite being quite volatile. The increase is especially noticeable for emerging markets. At the end of sample, variance ratios do tend to increase more generally but this may reflect the recent crisis. Replacing $x_{US,t}$ with $x_{glob,t}$ yields similar patterns.

Because the time series graphs are very noisy, we present the data in an alternative fashion. Figures 5 and 6 show the average variance ratios in the first and second halves of the sample period. We use 1980-1994 as the first half of sample and 1995-2008 as the second half for the country groups with the long sample (Figure 5); 1990-1999 as the first half of sample and 2000-2008 as the second half for the country groups with the short sample (Figure 6). We depict the average VR for the first half of the sample on the x- and for the second half of the sample on the y-axis. If the country dots are mostly above the 45-degree line, VR's increase in the second half of sample relative to the first half. The results are now much clearer. In the long sample (eighties and early nineties versus the last 14 years), variance ratios among the interest rate variables clearly increase for real and nominal short rates and the term premium. There are very few exceptions, and the term premium variance ratios increase in all countries. For long rates and inflation, we do not observe a quasi general increase in variance ratios. For the return variables, a general increase is apparent for the bond returns, but for equity returns, the results are decidedly mixed, definitely for unhedged returns. While for cash flow growth rates and PE ratios, most variance ratios increase, it is far from a general phenomenon. The results for the short sample in Figure 6 are actually quite similar, with the exception that the increase in variance ratios is less general in nature for the term premium and not visible at all for inflation. These results are somewhat in contrast with Eiling and Gerard (2008), who find that equity variance ratios increase for developed but not for emerging markets. Their methodology is different, however, in that they use high frequency data but also rely on certain strong parametric restrictions to derive their results. The figures using $x_{glob,t}$ instead of $x_{US,t}$ are similar.

We can also directly examine the time-variation in the global beta. Many studies, mostly focusing on equity markets, have observed that betas with respect to global factors increased over time. Baele (2005) and Baele, Ferrando, Hordahl, Krylova, and Monnet (2004) have documented increases in "shock spillovers" with respect to the global

market, and Bekaert and Harvey (2000) actually show directly that stock market liberalizations increase betas.

Our second model attempts to more directly deal with the volatility bias critique and focuses on how openness affects the beta with respect to the global factor. We estimate the following panel factor model:

$$x_{i,t} = \alpha_i + \alpha_{open} Open_{i,t} + \alpha_{cyc} Cyc_t + \alpha_{cri} Crisis_{i,t} + (\beta_i + \gamma_{open} Open_{i,t} + \gamma_{cyc} Cyc_t + \gamma_{cri} Crisis_{i,t}) x_{glob,t} + \varepsilon_{i,t} \quad (9)$$

where $Open_{i,t}$ is either $TO_{i,t}$, $FO_{i,t}$ or $IO_{i,t}$. All the other variables were explained before. The model is estimated using the Cochrane-Orcutt method.

Note that both the constant term for each country and the country's beta with respect to the global factor depend on a country-specific fixed effect, on the global business cycle variable, the country-specific openness measure, and the country-specific crisis indicator. The latter coefficients must be constrained to be the same across countries for identification. The coefficient we are interested in is γ_{open}. We do not focus on level effects in this article. Note that for this regression, it is impossible to let all openness variables enter the regression simultaneously. While the correlation between these variables is imperfect, the interactions with the global factor make regressions with multiple openness measures ill-behaved.

Table 7 reports the results, with Panel A focusing on the world variable as the benchmark and Panel B on the US.

We first focus on the long sample. In Panel A, it is difficult to see very strong and consistent patterns. Over the long sample, financial openness has the most consistent positive and significant effect on global betas. The main exception is the price earnings ratios where the beta is negatively linked to its world counterpart. Using the U.S. variable as the global factor, financial openness receives higher and more significant coefficients, whereas the PE ratios are only weakly negatively linked to financial openness. Whereas FDI has weak and inconsistent effects with the world benchmark, the U.S. beta appears mostly positively associated with FDI, being significant in the majority of cases. The strongest effects of trade openness are on bond returns, where it has led to LOWER not higher betas. The results for the short sample are in fact roughly consistent with coefficient patterns observed for all countries and the full sample. However, for

emerging markets, this is so with much less statistical significance. Here, FDI seems to have a stronger effect on global betas than does financial openness. It is also true, for the short samples, that the U.S. betas with respect to financial openness and FDI yield the stronger results. One interesting conclusion of Table 7 is that the results for interest rates and stocks are quite different. For equity returns and its components (including cash flows), we find financial openness and FDI to mostly have positive effects on global betas. However, this is not true for interest rates (especially short rates) and inflation, where the results are decidedly mixed. Perhaps because the term premium is mostly positively associated with financial openness, bond returns mostly are too, but not always (see for instance, the emerging market sample). This suggests that it really may be quite powerful to try to further decompose equity returns into various components, an issue we return to in the conclusions.

There are a number of possible interpretations of the sometimes weak results, which we discuss more thoroughly in Section 9. Let us just mention two that have been the focus of articles closely related to the ones surveyed in this section. First, regional integration may be stronger than global market integration. Baele (2005) finds this to be true in Europe. Second, the model may be inappropriate along a number of dimensions. In particular, the beta with respect to a global factor could reflect changes in both economic and financial integration, but also many other factors, such as competitive forces, industrial structure, etc. A number of articles attempt to impose more structure by specifying an asset pricing model, linking the second moments to the first moments, and then examining the degree of integration over time (see Bekaert and Harvey (1995); Carrieri, Errunza and Hogan (2007)). These articles also show that the evolution towards more integrated markets is not always a smooth process observed for all countries.

7 Country effect standard deviation

Most of our comovement measures thus far have the disadvantage of requiring a rolling estimation to trace out the effects of globalization. Here, we use a regression model estimated over the full sample that separates the data into global and country-specific components, and then uses the cross-sectional standard deviation of the country effects at each point of time as the measure of interest. Of course, this measure is inversely

correlated with comovement. There are an infinite number of ways to split the data into country-specific and global components, but we restrict ourselves to the simplest possible model with fixed effects[6]:

$$x_{i,t} = \mu + g_t + \alpha_i + e_{i,t} \quad (10)$$

Because many of our variables are quite persistent, we again use the Cochran-Orcutt method, with country-specific autocorrelations, to estimate the model. The country fixed effects and time effects sum to zero, so we can think of $g_t+\mu$ as the global component at each point in time. Gagnon and Unferth (1995) use such a model to estimate the world interest rate using data from 9 countries. The country-specific component is of course $\alpha_i+e_{i,t}$, and it is its cross-sectional variation that we are interested in. We consider two variants:

$$CESD_t = \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(x_{i,t} - (\mu + g_t)\right)^2} \text{ and} \quad (11)$$

$$CESDALT_t = \frac{1}{N}\sum_{i=1}^{N}\left|x_{i,t} - (\mu + g_t)\right| \quad (12)$$

These measures are available at each point in time, and we can consequently perform a trend analysis and multivariate regressions as we did for the PR measure.

Table 8 reports the results for the trend tests on the CESD measure. Convergence would be reflected in negative trend coefficients and we find the trend coefficients to be over-whelmingly negative. Unfortunately, only 7 out of a total of 70 coefficients are significantly different from zero, of which two for the term premium variables and four for bonds returns. One problem, especially for the emerging markets sample, is that crisis periods may cause rather big outliers. For example, the Mexican and South-East Asian crises cause spikes in interest rates in a few countries and extreme observations for equity returns as well that affect the measure. We obtain a very similar picture from CESDALT, so we do not report trend results for that measure.

Table 9 reports the results from regressing the CESD measure on our openness variables while controlling for global business cycles and crises. The significant coefficients are mostly concentrated in the long samples (developed and EU markets) and

[6] For example, Kose, Otrok and Whiteman (2003) and Kose, Otrok and Prasad (2008) employ Bayesian dynamic latent factor models, with world, regional and country-specific factors to study global business cycles.

in the interest rate variables. The most robust result appears to be that increased FDI leads to smaller country effects. Do note that FDI is relatively highly correlated with our financial openness variable. For nominal interest rates, for example, the positive coefficient on IO is likely offset by the bigger negative coefficient on the FO variable. Most of the negative effects we see elsewhere are due to either IO or FO. Nevertheless, many puzzling results remain; for instance, it is unclear why the country-specific variation in PE ratios should increase with trade and financial openness for the emerging market sample.

We also use the panel model to extract the world interest rate process, that is, $g_t+\mu$. Figure 7 first graphs the world interest rate (both the short and long real rates) extracted from the long developed countries sample, and then graphs the European real long interest rate, extracted from the European Union countries (we consider both the long and short sample). The graphs use the country effect standard deviation at each point in time to graph a "cross-sectional" standard error band around the estimates. The "world interest rate" climbs above the 4% level in the mid eighties and stays elevated till the end of 1993. Since then we see a non-smooth decrease in the level of interest rates, decreasing to almost zero in the current crisis. The cross-sectional standard deviation, our measure of convergence, decreases largely with the level of interest rates. The long real rate shows a very similar pattern but stays elevated longer. In the European Union countries, we observe the same pattern, but the monetary integration process and the introduction of the euro in 1999 make the cross-sectional standard deviation decrease to very low levels.

8 Cross-sectional dispersion

The last measure we examine is cross-sectional dispersion:

$$CS_t^2 = \frac{1}{N}\sum_{i=1}^{N}(x_{i,t} - x_{ew,t})^2 \text{ where } x_{ew,t} = \frac{1}{N}\sum_{i=1}^{N} x_{i,t} \qquad (13)$$

This statistic simply measures how dispersed a variable is around its cross-sectional mean at each point in time. The statistic has obvious appeal as we would expect that full market integration could in many instances lead to very low cross-sectional

dispersion, and the statistic can be computed at each point in time, without any sample history.

Table 10 reports the usual trend tests for this measure. As with our previous convergence measure, the signs are overwhelmingly negative; but statistical significance is mostly lacking. We now find 11 statistically significant negative trends, again all concentrated in the interest rate and bond return variables. It is interesting that we find the strongest evidence of convergence in the asset variables that have received considerably less attention in the market integration literature, which has mostly focused on equities. Of course, these findings may simply reflect the limited power of trend tests, and the fact that interest rates and bond returns are less noisy than equity returns.

In Table 11, we report results of a multivariate regression of the cross-sectional dispersion of our economic variables on our openness measures. If the trend towards globalization served to decrease dispersion significantly, we should observe significant negative coefficients on the openness variables. Focusing first on the long developed country sample and the interest rate variables, there seems to have been a significant downward trend in dispersion, mostly associated with increased FDI flows. This is also true for inflation. Not surprisingly, this also translates into the increase in FDI over time being associated with less dispersion in bond returns. However, these coefficients are not significantly different from zero. For equity returns, the coefficients on FDI are negative but insignificant. For the coefficients on trade and financial openness, we find negative coefficients for equity returns, but mixed results for bond returns and the interest rate variables. When we investigate cash flow growth and valuation ratios, we find overall negative coefficients, with the coefficients being most significant for financial openness. These patterns are largely preserved for the EU countries, where we observe more significant coefficients, also associated with financial openness.

Moving to the shorter sample, for emerging markets we also find overall mostly negative coefficients, but statistical significance is more elusive. Equity return dispersion is significantly negatively associated with FDI, but the coefficients on trade and capital market openness are positive, albeit not significant. We now see a few significant positive coefficients, which are hard to explain. For the all countries and EU short

sample, the results look more like the long sample results, but with overall less significance.

Figure 8 graphs the cross-sectional dispersion measures over time. While some downward trending behavior is apparent for all variables, the graphs also show cyclical and extreme behavior, which is mostly driven by crises. For example, the spikes in 1996 for the interest rate variables are mainly driven by Mexico's high interest rates during the Mexican financial crisis. The spikes in nominal and real rates, the term premium and inflation in 1998-1999 are a byproduct of the South-East Asian crisis, whereas the spikes in short rates and the term premium in 1994 are driven by Ireland's high interest rates. Of course, these outliers are partially controlled for by our crisis variable in the regression estimated above, which indeed mostly carries positive coefficients.

One concern with the cross-sectional dispersion measure is that it may be mechanically increasing in "overall volatility," even if that volatility is global in nature. To get more insight in this issue, Appendix B shows that the expected value of the cross-sectional dispersion can be decomposed as follows:

$$E[CS_t^2] = E\left[\frac{1}{N}\sum_{i=1}^{N}\left(x_{i,t} - \bar{x}_t\right)^2\right] = \frac{1}{N}\sum_{i=1}^{N} var\left(x_{i,t}\right) + \overline{CS}^2 - var(\bar{x}_t) \qquad (14)$$

where $\overline{CS}^2 = \frac{1}{N}\sum_{i=1}^{N}(\bar{x}_i - \bar{\bar{x}})^2 =$ the cross-sectional variance applied to country means; $\bar{x}_t$ is the cross-sectional mean at time t. Hence, the cross-sectional dispersion comprises the cross-sectional dispersion of country means, and then pure volatility terms: the difference between average total volatility and the volatility of the cross-sectional mean at time t, which can be viewed as the global factor. Consequently, volatility only increases dispersion to the extent it does not reflect volatility of the global factor, that is, to the extent it is idiosyncratic. While this makes perfect sense, there is some evidence that overall volatility and "global systematic" volatility may be (highly) correlated (see Bekaert, Hodrick and Zhang (2009)). To investigate the effects of a potential volatility bias, we also examine the following statistic:

$$\mathrm{CSA_t} = \ln\left(\frac{\mathrm{CS_t^2}}{\hat{\sigma}^2_{\mathrm{ew,t}}}\right) \qquad (15)$$

where $\hat{\sigma}^2_{ew,t} = \frac{1}{N}\sum_{i=1}^{N} var(x_{i,t})$ computed using the past 12-month's var($x_{i,t}$)

That is, we correct for the average volatility of the variable over the past year. While we would expect this correction to perhaps lead to improved results in terms of trend behavior and associations with openness variables, our results are quite similar to the ones reported for the unadjusted measure, and, in fact, often weaker. To conserve space, we do not report these results.

9 Conclusions

In this article, we examine whether globalization has led to the convergence of asset prices across the world, including equity and bond returns; real and nominal interest rates, term premiums, inflation, cash flow growth rates and price-earnings ratios. While, theoretically, we need not necessarily observe convergence of all components of returns, it was still surprising to see that, with some exceptions, there is little evidence of strong convergence over the last 30 years. The exceptions are telling though. Because comovements show strong cyclical variation, the stronger evidence in favor of an openness effect shows up in the dependence of global betas on openness. Consistent with this evidence, we also find global factors to explain a larger portion of bond and equity returns in the second part of the sample, but this is not consistently true for cash flows.

Much of the existing evidence focuses on equity returns and has used correlations as measure of comovement, with some articles foreshadowing our results. Karoloyi (2003) calls the evidence on trends in correlations linked to stronger real and financial linkages "remarkably weak". Bekaert, Hodrick and Zhang (2009) examine return correlations between developed countries and really only find a significant trend among the European countries, and none at all in the Far East.

We now reflect on possible reasons for this main finding.

i. Sample selection

A possible trivial reason for weak results is sample selection, either the countries we analyze or the sample period we consider, which are both mostly driven by data availability. Looking back at Table 1, while our data set is not super comprehensive, we have rather extensive coverage in terms of countries and our set of countries is regionally

well-diversified. It is quite unlikely that the results are driven by "unlucky" country selection.

A more serious concern is that our sample starts too late. For the developed countries, it is conceivable that trade openness generated most of its effects before 1980. It is hard to imagine financial openness generating large effects then, as it really only began in the 80s for most countries. For emerging markets, capital market liberalizations were concentrated in the late eighties to early nineties. Our sample, while starting in 1990, is somewhat late, as many of our measures require a three year "start-up" period, so that it is possible we may have missed the main liberalization effects.

In Table 12, we investigate the importance of this concern. Unfortunately, our data are quite limited. For the developed countries, we collected data for the 1974-1979 period on interest rates, inflation, the term premium, stock returns, the price earnings ratio, and cash flow growth for 5 countries: Belgium, Canada, France, the UK and the US. For the emerging markets, we collected data for the 1980-1989 period on the short rate and inflation for Malaysia, Mexico, Philippines, South Africa and Thailand. We compute both the PR (inversely related to correlation) and CS (dispersion) statistics for both groups. These are reported for the "early" sample and compared to our full sample in Panel A of the table. For the developed countries, we do find a relatively significant increase in the PR statistic and a decrease in the CS statistic for the interest rate variables, suggesting that some convergence did happen in the 70s. While this is also true for cash flow growth and price earnings ratios, the results are much weaker for equity returns, where the PR statistic does not increase, and the CS statistic decreases slightly. For emerging markets, we find modest increases in PR and significant decreases in CS. However, these statistics only look at the emerging market group by itself, and do not speak about integration with the rest of the world. Therefore, in Panel B, we investigate the cross-sectional dispersion relative to the developed country group mean: we find very significant decreases in dispersion, suggesting important convergence did occur already in the 80s.

Another potential sampling problem is that our sample ends in 2008, which is a rather significant crisis period. We have argued before that crises may lead to temporary higher comovements, which have nothing to do with liberalizations. However, in much

of our analysis, we control for both global recessions (typically associated with higher volatility of asset prices) and for crises. Moreover, we redid our analysis stopping the data in 2005. We investigate whether we find trends in the PR, CESD and CS statistics, but found results similar to the full sample, with almost no significant coefficients, and the significant coefficients concentrated in the same variables that showed significant trends over the full sample.

ii. Regional versus global integration

The last 30 years have also witnessed the emergence of strong regional movements towards economic and financial integration, including free trade arrangements in Northern-America (NAFTA), and Asia (ASEAN), with the most momentous change taking place within the European Union, which established an economic and monetary union with one currency in 1999. It is conceivable that regional integration dominates world integration, that is, we may observe strong within-region convergence, but not so strong integration across regions[7].

There is a substantial literature on European integration (see Baele et al. (2004) and Jappelli and Pagano (2008) for recent surveys), but most of the formal academic literature has focused on equity returns. Baele et al. (2004) document a clear increase in regional and global betas, with the regional increase stronger than the global one. During the period 1973-1986, only about 8% of local return variance was explained by common European shocks, but this proportion increased gradually to about 23% in the period 1999-2003. Baele (2005) also finds a larger increase in regional than in global effects (betas and variance ratios), with "spillover intensities" (betas) increasing most strongly in the second half of the 1980s and the first half of the 1990s. He links these changes to many structural determinants, such as trade integration, equity market development and inflation. Hardouvelis, Malliaropoulos and Priestley (2004) document strong convergence in the cost of equity across different countries in the same sector, but much

[7] Kose, Otrok and Prasad (2008) find convergence of business cycle fluctuations among developed countries and among emerging economies, but nevertheless, finds the relative importance of the global factor to have declined over the last 20 years, suggesting decoupling between developed and emerging economies.

less convergence across different sectors. They list the launch of the single currency as a major factor.

For Asia, Ng (2000) uses a conditional GARCH model to investigate spillovers from Japan and the US to Pacific-Basin markets. She finds evidence of both regional and global spillover effects, but the effects of measures of trade and financial integration are not always significant or of the correct sign. These results are consistent with ours. She also finds that the proportions of the Pacific-Basin market volatility captured by regional and world factors are small.

We already reported some results on regional integration as we distinguish between a wide group of countries and the EU countries in various tables. For example, in Table 10, we report trend tests for the cross-sectional dispersion series, but barely observe more significantly negative coefficients for the EU than for all countries. To further examine regional integration, we change our beta model to a bi-variate model. We look at Europe (both the long and short sample) and Asia (the short sample), considering the US variable as the "global" factor, and the German (Japanese) variable as the regional factor in Europe (Asia). With this specification we can look at changes in global and regional betas and variance ratios over the sample period. Table 13 provides a summary of the results; the top panel focuses on betas, the bottom panel on variance ratios. A first conclusion is that regional betas are larger than global betas in Europe but that this is not necessarily the case in Asia. There are no super clear patterns. Regional betas mostly increase over time, especially for the long Europe sample. However, global betas increase as well, although less frequently. While it appears that often regional betas have increased in relative importance, this is by no means a general conclusion. Moreover, even if betas increase, variance ratios do not necessarily increase. For example, in Asia, global factors mostly account for relatively more of the total variation of the economic variables than regional factors in the later part of the sample. We conclude that regional integration has not led to very clear trends in comovements either.

iii. Importance of other economic factors

Our beta regressions may suffer from an omitted variable problem. There are many factors affecting comovements, and without properly controlling for them, we may fail to

pick up the effects of globalization. Let's first check whether the control variables we did include, had significant impact on global exposures.

a. Recessions and crises

The business cycle and crisis variables are not very significant determinants of our convergence measures. Focusing on dispersion, the coefficient on the business cycle variable is primarily negative, but mostly not significant. The crisis coefficient is mostly positive, especially for equity returns variables, which means regional crises drive up the dispersion of equity returns. It is conceivable that we under-estimate the effect of the crisis variable, because small regional crises could decrease comovement, whereas global crises should increase comovement. We therefore re-ran our analysis including a quadratic term for the crisis variable. The effects of the quadratic term are mostly as expected. For example, applied to cross-sectional dispersion, we find that the quadratic term is often negative indicating that large crises indeed increase comovement (lower dispersion), whereas the linear term is often positive. However, few coefficients are significant so we do not report these results to conserve space. Moreover, the openness coefficients are largely unaffected by the inclusion of this new control variable.

b. Corporate governance

There has also been a voluminous literature that stresses the difference between de jure and de facto segmentation. For instance, Bekaert (1995) argues that indirect barriers to investment (such as poor liquidity, poor corporate governance, political and substantial macroeconomic risks, etc.) may keep institutional investors out of certain emerging markets and prevent effective integration, even though these markets are legally open. Nishiotis (2004) shows how these indirect barriers are more important than direct barriers using a sample of closed-end funds. More recently, Bekaert, Harvey, Lundblad and Siegel (2009) develop a measure of effective equity market segmentation and find that, apart from equity market openness, a measure of the quality of institutions, stock market development and certain global risk variables (proxied for by US credit spreads and the VIX) also matter greatly in explaining the temporal and cross-sectional variation in effective segmentation. Finally, the corporate finance literature has used more and more

international data but almost never even tries to control for the degree of openness. There is an implicit assumption that cross-country differences in corporate governance are of first order importance. This implicit argument was recently made eloquently explicit by Stulz (2005). He argues that a "twin agency problem" of rulers of sovereign states and corporate insiders, pursuing their own interests at the expense of outside investors, limits the beneficial effects of financial globalization. In other words, corporate governance at the firm and country level (political risk) is the main factor driving cross-country differences in returns, not financial openness.

To conduct an informal test of Stulz's theory, we collected data on the political risk ratings of ICRG (for the detailed data source see data appendix Table A-1), which are available for a large panel of countries, and importantly obtained the 12 sub-components comprising the overall rating. From three of these sub-components, Corruption, Law and Order, Bureaucracy Quality, we create an index of the Quality of Institutions, following Bekaert, Harvey and Lundblad (2005). We also investigate the sub-category of Law and Order, as we suspect it will be most highly correlated with the overall quality of corporate governance at the firm level. Figure 9 graphs the three measures averaged over the different country groups over time in three panels. For comparison, we add financial openness to the graphs. While the political measures are averaged over groups of countries, their time-evolution may already surprise. First, they do not necessarily show trending behavior upward. Second, the different political risk measures we employ are not perfectly correlated. In fact, any type of time series correlation between these variables is far from perfect (e.g. the average of time series correlations across countries is relatively low as well), but cross-sectional correlations are typically higher. Third, the correlation between political risk and openness is far from perfect. Consequently, there clearly is sufficiently interesting time series variation in political risk measures to make our test meaningful. We do restrict the analysis to only two country groups: developed long and emerging, because we observe significant variation over time in political risk for these groups. We also only look at the following limited set of variables: the real short rate, the nominal long rate, the term premium, excess bond returns, excess equity returns, cash flow growth, and the PE-ratio.

If political risk is primary, improvements in the index may better capture low-frequency changes in comovements than measures of financial globalization. To test this conjecture, we repeat our beta regressions adding one of the political risk measures as an additional control variable. We use the U.S. variable as the global benchmark. In Table 14, we show the regression using FO as the openness measure, and we only show the political risk and the openness betas.

Note that our government quality/political risk indices increase with improved quality (they are between zero and one). Hence, we confirm the Stulz's hypothesis, if the political risk measures carry positive coefficients and ideally decrease the significance of the openness measures. However, this rarely happens. Over the 42 regressions shown, the political risk measures are only significantly positive in 8 cases and are significantly negative in quite a few other cases. Instead, the financial openness measure is significant in 22 cases of the 42, and is never significantly negative. When political risk plays a role at all, it is, not surprisingly perhaps, in interest rate variables, in the emerging market sample. Results with IO as the openness measure are analogous. These results are reminiscent of the results in Bekaert, Harvey, Lundblad and Siegel (2007), who argue that the literature on the channels of growth also ignores openness in favor of financial development and institutional factors, but that financial openness plays a much more important role than these other factors in aligning growth opportunities with actual growth. Here, we show, as do Bekaert, Harvey, Lundblad and Siegel (2009) with an entirely different methodology, that financial openness is more important than corporate governance and (the lack of) political risk in integrating financial markets.

c. Industry factors

The focus on country return comovements ignores the very different industrial structures different countries may have, which in turn may affect country return correlations. However, following Heston and Rouwenhorst (1994), the standard view was that country factors dominated the variation of firm returns relative to industry factors, and that industrial structure could be safely ignored. Towards the end of the nineties, a number of practitioners (see e.g. Cavaglia, Brightman and Aked (2000)) argued that industry factors had now become more important than country factors, likely because of financial

integration, and could no longer be ignored. Academics such as Campa and Fernandes (2006) link the relative importance of industry and country factors directly to measures of economic and financial international integration and development. Their results suggest that industrial structure may matter too and countries with a more specialized production structure will have more country-specific risk.

Nevertheless, several results in the literature suggest our failure to create industry factors is not critical. First, several studies show that country factors are still more important than industry factors (see Bekaert, Hodrick, and Zhang (2009) and De Roon, Eiling, Hillion and Gerard (2006)). One reason that several studies over-estimate the importance of industry factors is simply sample selection, with their sample periods ending around 2000, the time of huge Tech sector volatility. Brooks and Del Negro (2004) ascribe the relative change of importance of industry versus country factors to the 1998-1999 "stock market bubble." Second, Baele and Ingelbrecht (2009) correct directly for industry misalignment, in a study of stock returns comovements, without finding much of an effect. Finally, Bekaert, Hodrick and Zhang (2009) show that parsimonious risk based models are better at capturing comovements, than are models with multiple country and industry factors.

So far, it does not appear that our results are driven by the omission of relevant factors in our regressions. This need not be entirely surprising. King, Sentana, and Wadhwani (1994) put forward a long list of observable economic factors to explain covariances among stock market returns, but these factors explain very little. This state of affairs may help explain the strong results in Pukthuangton and Roll (2009), who document a marked increase in the degree of integration in equity markets over time. Their measure is the R^2 of an APT model with 10 factors to explain global equity returns. Because the APT simply extracts factors from the return data, it is not limited by the poor explanatory power of observable factors. Their methodology also nicely circumvents the problem that integration may well decrease comovements under certain type of events, e.g. competitive pressure, or supply shocks (e.g. commodity price shocks) that benefit certain countries, but hurt others more swiftly in an integrated market.

iv. Alternative capital control measures

We have applied quite general capital account openness measures, or equity market based measures of openness to money market, bond market and equity market data. However, it is conceivable that capital market restrictions differ across these various markets. Very recently, Schindler (2009) has used IMF data to create a more detailed set of "capital market restrictions" data split up over several markets. This data set provides various sub-indices of de jure restrictions on a [0,1] scale for individual asset categories, such as bond securities, money market instruments, etc. It covers 91 countries from 1995 to 2005. We are particularly interested in the sub-indices "ka" (overall restrictions index), "mm" (average money market restrictions), "bo" (average bond restrictions) and "eq" (average equity restrictions).

In Table 15, we show time series correlations between the Schindler measures, recast as openness measures, and our openness measures. Overall, the correlations are quite high, with the lowest correlation for the bond market restrictions. We therefore replace FO with BO in the regressions for the long real rate, the term premium and bond (excess) returns. The results are reported in Table 16. In the regressions for the PR measure, we only obtain significantly positive coefficients on BO in 3 out of 18 regressions; for the CS measure, we get 4 rejections over 18 regressions. These results are largely analogous to using FO, except that in the regressions for the term premium's dispersion, BO obtains a counterintuitive significant positive coefficient.

v. Incorrect methodology/economic variables

While we find only rather weak evidence of convergence linked to financial openness, Pukthuangton and Roll (2009) are not the only one finding strong convergence in measures of "effective financial integration." Eun and Lee (2008) investigate "distance measures" in returns and volatility and also document rather strong convergence. Yet, it is not clear what the theoretical basis is for their measure to converge. Bekaert, Harvey, Lundblad and Siegel (2007) characterize each country by a vector of industry weights (measured using stock market capitalization weights) and then compute the (logarithmic) difference between a country's PE and the PE for the country's basket of industries at

world multiples. BHLS (2007, 2009) show that under some strong assumptions of real and financial integration, this measure should be close to zero. Yet, their measure confounds economic and financial integration.

We already pointed out that it is not obvious that financial openness and even less so trade openness will lead to convergence of many of the asset prices we examine. However, under most dynamic pricing models, risk premiums should become more highly correlated when markets integrate. This may explain why we often found stronger convergence results for term premiums than for other variables. In what follows, we try to extend this evidence to equity risk premiums.

It is notoriously difficult to estimate risk premiums from asset return data. Here, we make two simple attempts. The first approach relies on a simple pricing model. Let's denote real cash flows by cf_t, the long term real rate by r_t, and the discount rate by δ_t. We formulate the model at the country level, but omit country subscripts for simplicity. Here, $\delta_t = r_t + ep_t$ where ep_t is the equity premium. Now, assume that these three variables follow simple autoregressive processes with normally distributed shocks. Appendix C describes the model in more detail and, following Bekaert and Grenadier (2001) and Bekaert and Harvey (2000), shows how the price earnings ratio can be solved for in the closed form as an exponentiated sum of affine functions of the three state variables just mentioned. After linearizing this expression, we obtain the following expression for the log PE ratio, pe_t:

$$pe_t = \overline{pe} + a \cdot r_t + b \cdot ep_t + c \cdot cf_t \qquad (16)$$

While it is tempting to conclude that we can extract the equity risk premium from this equation, it would require knowledge of all structural coefficients, which we do not have. However, we can substitute out the equity premium using its AR(1) dynamics, obtaining:

$$pe_t = m_1 + a \cdot r_t + c \cdot cf_t + m_2 \cdot pe_{t-1} + m_4 \cdot r_{t-1} + m_6 \cdot cf_{t-1} + \eta_t \qquad (17)$$

Note that the coefficients on r_{t-1} and cf_{t-1} are the structural coefficients from equation (C-5) in Appendix C. In a sense, including the lagged values for the PE ratio, cash flow growth rates and real rates corrects for the omitted equity premium variable. We estimate equation (17) for all countries to identify a and c, which we then use in

equation (16) to obtain an affine function of the equity premium. That is, $afep_t = pe_t - a \cdot r_t - c \cdot cf_t = \overline{pe} + b \cdot ep_t$.

Because we cannot identify the scale of the equity premium with this procedure we must use a scale free measure of comovement, which is the portfolio variance ratio measure (PR). Unfortunately, the results do not improve relative to our old results on equity returns. The trend coefficients are all insignificantly different from zero and mostly have an incorrect negative sign. In the multi-variate regressions, the coefficients on the openness measures are very close to our previous estimates in Table 6. We therefore do not include these results in the paper to conserve space.

As an alternative, we obtain proxies for risk premiums, using predictive regressions on equity returns. Bekaert (1995) and Campbell and Hamao (1992) use similar methods to extract expected equity returns and argue that under a one-factor model, these expected returns should be perfectly correlated under perfect market integration. For each country, we use four local instruments, the log PE ratio, the real short rate, the term spread, and the lagged return. In addition, we add the world PE ratio and allow for interaction with an openness variable (IO) to accommodate time-varying global influences. So, for excess equity returns, the regression is the following for country i:

$$\begin{aligned} er_{i,t+1} = \alpha + a_1\, er_{i,t} + a_2\, pe_{i,t} + a_3\, r_{i,t} + a_4\, tp_{i,t} \\ + a_5\, pe_{w,t} + a_6\, IO_{i,t}\, pe_{w,t} + a_7\, IO_{i,t} + \varepsilon_{i,t+1} \end{aligned} \tag{18}$$

where er is the excess local stock return; pe is the log(PE ratio); r is the real short rate in local currency; tp is the term premium in local currency; pe_w is the world version of pe. The fitted value of this regression is our estimate of the equity risk premium. We estimate a similar regression for excess bond returns with the world term premium replacing the world PE ratio:

$$\begin{aligned} ebr_{i,t+1} = \alpha + a_1\, ebr_{i,t} + a_2\, pe_{i,t} + a_3\, r_{i,t} + a_4\, tp_{i,t} \\ + a_5\, tp_{w,t} + a_6\, IO_{i,t}\, tp_{w,t} + a_7\, IO_{i,t} + \varepsilon_{i,t+1} \end{aligned} \tag{19}$$

Finally, in equity pricing, expected cash flow growth can also be an important determinant of valuation. We estimate an analogous regression for cash flow growth[8], again using the world pe as an instrument.

$$cf_{i,t+1} = \alpha + a_1\, cf_{i,t} + a_2\, pe_{i,t} + a_3\, r_{i,t} + a_4\, tp_{i,t} + a_5\, pe_{w,t} + a_6\, IO_{i,t}\, pe_{w,t} + a_7\, IO_{i,t} + \varepsilon_{i,t+1} \quad (20)$$

Tables 17 and 18 report the trend tests and multi-variate regressions for PR and CS of these projection variables. The trend tests in Table 17 are disappointing as we observe only one significant trend coefficient. Whereas the CS trend coefficients have the correct sign for equity returns, for the other variables and for all variables with the PR measures the signs are often indicating divergence rather than convergence.

Table 18 shows more promising results for the multi-variate regressions. For PR, in the long samples, trade openness (TO) is consistently positively associated with the comovement; whereas in the short samples, FDI shows similar behavior. For CS, in the short samples, financial openness (FO) is negatively associated with the dispersion of equity and bond premiums. In all the five samples for cash flow growth, FO is consistently negatively associated with dispersion. Although the coefficients are not always significant, FDI and FO appear robustly associated with the convergence of equity and bond premiums and expected cash flows.

Note that both approaches suffer from a number of flaws. In particular, the market integration process is likely to change many relationships in the economy, but both our pricing model and predictive relationships are assumed to have time-invariant parameters. While it is conceivable that only the variables (like price earnings ratios) themselves change, dynamic models of integration likely imply that the entire relationship changes (Bekaert, Harvey and Lumsdaine (2002) exploit these changes to "date" the time of integration).

We conclude that overall it is somewhat challenging to document strong effects of globalization on the convergence of asset prices. Consequently, we confirm the findings

[8] Because we smoothed the data and use year on year growth rates, standard errors for these coefficients must take into account a substantial number of Newey-West (1987) lags. However, we are not interested in the estimated coefficients here, only in the projections.

of some early studies of the dynamics of market integration, like Bekaert and Harvey (1995), who argue that integration is a non-smooth process that may actually reverse, and is only weakly linked to de jure openness. That being said, we do find some evidence of a link between openness and the extent global factors matter for local asset prices. In fact, financial openness seems to matter more than other factors which receive more attention in the literature, such as corporate governance. We also found that some interest rate variables and bond returns display less dispersion over time associated with movements in legal globalization. For equity returns, the evidence is stronger when focusing on risk premiums, rather than raw returns. With the current crisis possibly leading to a reversal of the globalization process, our study hopefully provides useful input in assessing how the financial landscape may evolve in the near future.

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Table 1. List of country groups

	Long sample (1980:01 – 2008:12)		Short sample (1990:01 – 2008:12)		
	Developed	EU-old	Emerging	All	EU-new
Country names	Austria Belgium Canada France Germany Netherlands New Zealand Norway Singapore Spain Sweden Switzerland U.K. U.S.	Belgium France Germany Netherlands Spain U.K.	Chile China Indonesia Israel Korea Malaysia Mexico Philippines South Africa Taiwan Thailand	Australia Austria Belgium Canada Chile China Denmark Finland France Germany Greece Hong Kong Indonesia Ireland Israel Italy Japan Korea Malaysia Mexico Netherlands New Zealand Norway Philippines Portugal Singapore South Africa Spain Sweden Switzerland Taiwan Thailand U.K. U.S.	Austria Belgium Denmark Finland France Germany Greece Ireland Italy Netherlands Portugal Spain Sweden U.K.
Number of countries	14	6	11	34	14

Table 2. Summary statistics for the openness measures

Panel A: Basic Statistics

	Mean		Std	
	DV	EM	DV	EM
TO	0.739	0.682	0.717	0.373
FO	0.923	0.616	0.077	0.129
IO	0.823	0.282	0.830	0.169

Panel B: Correlation matrix of the openness measures

	DV long		EU long		EM short		ALL short		EU short	
	TO	FO	TO	FO	TO	FO	TO	FO	TO	FO
FO	-0.094		-0.296		0.887		0.889		0.875	
IO	0.308	0.829	0.090	0.821	0.940	0.915	0.948	0.934	0.928	0.965

Notes:

Panel A shows the mean and standard deviation of each openness measure in the short sample (post-1990) for developed (in the DV columns) and emerging (in the EM columns) markets. We first take the time series mean of each variable in each country; then compute the cross-sectional mean and standard deviation across countries within either the developed or emerging markets group.

Panel B shows the time-series correlations between openness measures averaged within country groups using samples as long as possible for each country group. The trade openness variable is annualized using the moving summation of the monthly imports plus exports divided by annual GDP over the past 12 months.

Table 3. Summary statistics for inflation

	1980s	1990s	2000s
Inflation			
Developed	7.9%	3.3%	2.2%
Emerging		9.3%	3.8%
Inflation volatility			
Developed	3.7%	1.9%	1.0%
Emerging		5.8%	2.3%

Note:
For each sample period in the 1980s, 1990s and 2000s, we first compute the means and standard deviations country by country in the corresponding periods, then take the means over either the developed or emerging countries. All numbers are in annualized percent.

Table 4. Summary statistics for the economic variables

		Mean		Std	
		DV	EM	DV	EM
Interest rate	Real short rate	0.027	0.028	0.013	0.027
	Real long rate	0.038	0.040	0.010	0.022
	Inflation	0.028	0.067	0.013	0.035
	Nominal short rate	0.053	0.090	0.022	0.053
	Nominal long rate	0.064	0.099	0.016	0.045
	Term premium	0.009	0.011	0.008	0.013
Returns	Bond return	0.082	0.072	0.022	0.032
	Excess bond return	0.040	0.035	0.020	0.033
	Excess bond return hedged	0.017	0.012	0.015	0.018
	Equity return	0.090	0.061	0.030	0.061
	Excess equity return	0.046	0.019	0.030	0.061
	Excess equity return hedged	0.030	-0.001	0.033	0.049
Equity valuation	Cash flow growth	0.183	0.275	0.054	0.110
	Log(PE ratio)	2.814	2.735	0.232	0.279

Note:
The table shows the mean and standard deviation of each economic variable in the short sample (post-1990) for developed (DV columns) and emerging (EM columns) markets. We first take the mean of each variable in each country; then compute the cross-sectional mean and standard deviation across countries within either the developed or emerging markets group.

Table 5. Trend tests for portfolio variance ratios (PR)

		Long sample		Short sample		
		Developed	EU-old	Emerging	All	EU-new
Interest rates	Real short rate	0.002	0.001	0.002	0.005	0.0003
		[0.194]	[0.038]	[0.013]	[0.195]	[0.014]
	Real long rate	0.001	0.0003[a]	-0.001	0.0003	-0.00002
		[0.062]	[0.005]	[0.007]	[0.030]	[0.0002]
	Inflation	0.0005	-0.003	0.001	0.004	-0.002
		[0.010]	[0.146]	[0.019]	[0.047]	[0.055]
	Nominal short rate	0.003	0.002	-0.0002	0.004	0.003
		[0.191]	[0.415]	[<.0001]	[0.103]	[0.137]
	Nominal long rate	0.003	0.001	-0.003	-0.001	0.004
		[0.130]	[0.406]	[0.013]	[0.001]	[0.019]
	Term premium	0.006	0.006[a]	0.001	0.003	0.005[a]
		[0.313]	[0.245]	[0.012]	[<.0001]	[0.209]
Returns	Bond return	-0.0001	0.001	--	0.001	0.002
		[0.002]	[<.0001]		[<.0001]	[<.0001]
	Excess bond return	0.00002	0.001	--	0.001	0.002
		[<.0001]	[<.0001]		[<.0001]	[<.0001]
	Excess bond return hedged	0.0001	0.002	--	-0.0001	0.002
		[0.023]	[0.247]		[0.009]	[0.305]
	Equity return	0.0001	0.001	0.003	0.001	0.001
		[0.0001]	[0.121]	[0.083]	[0.019]	[0.022]
	Excess equity return	0.00003	0.001	0.002	0.001	0.001
		[<.0001]	[0.112]	[0.055]	[0.012]	[0.022]
	Excess equity return hedged	0.001	0.003	-0.0003	-0.001	0.0002
		[0.032]	[0.019]	[0.011]	[0.003]	[0.003]
Equity valuation	Cash flow growth	-0.001[a]	-0.001[a]	-0.0030[a]	-0.002	-0.0029
		[0.001]	[0.001]	[0.041]	[0.002]	[0.009]
	Log(PE ratio)	-0.001	-0.001	-0.001	-0.002	0.000
		[0.089]	[0.053]	[<.0001]	[0.0002]	[0.004]

Notes:

We construct equally-weighted portfolio variance ratios using 36-month rolling windows as follows:

$$PR_t = ln\left(\frac{var(\frac{1}{N}\sum_i x_{i,s})}{\left(\frac{1}{N}\sum_i STD(x_{i,s})\right)^2}\right) \text{ for } s \in [t-35, t], \text{ for any variable x at time t.}$$

We show the Bunzel-Vogelsang (2005) trend test coefficients with the t-Dan-J statistic in square brackets; the 5% (1%) critical value for this test is 1.71 (2.46). A bold number means that the trend coefficient is significantly positive at the 5% level.

A superscript "a" next to the trend test coefficients indicates that the trend variable is significantly positive at the 5% level in the Cochrane-Orcutt regression: $PR_t = \alpha + \beta_1 TO_t + \beta_2 FO_t + \beta_3 IO_t + \beta_4 Cyc_t + \beta_5 Crisis_t + \varepsilon_t$ where $\varepsilon_t = \rho \varepsilon_{t-1} + u_t$ and $u_t \sim IID$.

For individual countries, TO is the trade openness measure computed as (Imports + Exports) / GDP summed over past 36 months; FO is the financial openness measure averaged over the past 36 months computed as 1/4 (Official Liberalization dummy + Quinn measure + Edison-Warnock measure + Chinn-Ito measure) where Chinn-Ito measure is normalized to a [0,1] range; IO is the investment openness measure averaged over the past 36 months computed as (FDI Assets + FDI Liabilities) / GDP. We use the simple average of openness measures within

the country groups in the PR regressions. We also control for world business cycle and crisis effects in the openness regression. The monthly variable Cyc_t is constructed using a weighted average of the annual world business cycle variable $Cyc_{s,a}$ in the current year and last year. The annual business cycle variable is computed by subtracting a moving average of world GDP growth (over the last 5 years) from current GDP growth. $Crisis_t$ is the sum of the dummy variable $Crisis_{i,t}$ over all the countries in a particular country group, where $Crisis_{i,t}$ takes a value of 1 when there is a banking/economic crisis in country i at time t and 0 otherwise according to Caprio and Klingebiel (2003) and Reinhart and Rogoff (2008).

The missing values for the emerging markets group's bond return related variables are due to the short history of the emerging markets data. Because of the 36-month window needed to compute the portfolio variance ratios, the sample drops to less than 6 observations.

Table 6. Multi-variate regression of portfolio variance ratios (PR)

		Long sample					
		Developed			EU-old		
		TO	FO	IO	TO	FO	IO
Interest rate	Real short rate	0.57	16.40***	-0.29	0.13	4.77	0.18
	Real long rate	1.36***	22.26***	-1.84**	0.40*	4.32	-0.71*
	Inflation	-0.41	-10.76*	1.32*	0.32	-5.41	-0.26
	Nominal short rate	-1.68***	5.35	2.07**	0.34	9.17***	-0.25
	Nominal long rate	-2.36***	5.20	1.42**	0.04	6.61***	-0.30*
	Term premium	1.90***	-2.70	-0.26	0.14	-3.00	1.25**
Returns	Bond return	0.25	-7.09***	0.47*	0.18***	-1.33	0.29**
	Excess bond return	0.45**	-5.31*	0.25	0.27***	-2.27**	0.34***
	Excess bond return hedged	0.09	0.13	0.23	0.31*	17.09***	-1.33***
	Equity return	-0.32	-2.95	0.24	0.05	4.20**	-0.38*
	Excess equity return	-0.48	-4.03	0.40	-0.03	2.12	-0.17
	Excess equity return hedged	0.15	-4.61*	-0.04	-0.65***	-2.72**	0.58***
Equity valuation	Cash flow growth	1.22**	20.53***	-1.75*	0.16	2.60	-0.35
	Log(PE ratio)	-1.56***	-15.89***	1.61***	-0.62***	-9.39***	0.77**

Table 6. Multi-variate regression of portfolio variance ratios (PR) (continued)

		Short sample								
		Emerging			All			EU-new		
		TO	FO	IO	TO	FO	IO	TO	FO	IO
Interest rate	Real short rate	0.81**	-1.30	-2.85	1.36**	8.21**	-1.85**	-0.41	1.03	0.44
	Real long rate	0.67	12.06**	-5.97**	1.81**	4.20**	-2.62***	3.60***	8.80***	-3.42***
	Inflation	0.57*	-1.61	0.22	1.29	-1.39	-1.03	-0.13	-3.67*	0.17
	Nominal short rate	0.34	5.51***	-7.83***	0.95*	9.83***	-1.41**	1.19**	5.80**	-0.78
	Nominal long rate	-2.34***	2.37	3.63	-2.47***	10.64***	-0.37	-0.68	4.16**	0.42
	Term premium	1.43**	-12.66**	4.80*	1.30**	7.05**	-1.82**	0.58	6.19***	-0.18
Returns	Bond return	--	--	--	0.09	-5.00***	0.80**	0.47**	-0.12	0.25
	Excess bond return	--	--	--	0.35	-8.27***	0.52	0.60**	-0.15	0.21
	Excess bond return hedged	--	--	--	0.15	-0.54	0.28	0.93**	-3.62	0.41
	Equity return	-3.62***	10.65**	6.51**	-1.54**	-2.26*	1.74**	-1.37***	-3.55**	1.15**
	Excess equity return	-3.34***	9.39**	6.12**	-1.58**	-1.99	1.59**	-1.55***	-4.22**	1.31**
	Excess equity return hedged	-1.69**	-1.70	6.22**	-0.89	-0.09	0.31	-1.07**	-1.11	0.39
Equity valuation	Cash flow growth	-0.60	-17.12***	15.18***	0.97	-1.52	-0.60	0.61	3.24	-1.15*
	Log(PE ratio)	-3.46***	16.13**	3.98	-1.23**	-5.23***	1.37*	-0.24	-7.36**	0.688

Notes:

We report the results of the multivariate regression using the Cochrane-Orcutt method: $PR_t = \alpha + \beta_1 TO_t + \beta_2 FO_t + \beta_3 IO_t + \beta_4 Cyc_t + \beta_5 Crisis_t + \varepsilon_t$ where $\varepsilon_t = \rho \varepsilon_{t-1} + u_t$ and $u_t \sim IID$. We report the coefficients on the openness measures with * indicating coefficients significant at the 10% level; ** indicating coefficients significant at the 5% level; *** indicating coefficients significant at the 1% level.

The missing values for the emerging markets group's bond return related variables are due to the short history of the emerging markets data. Because of the 36-month window needed to compute the portfolio variance ratios, the sample drops to less than 6 observations.

For the construction of all other variables, see the notes to Table 5.

Table 7. Multivariate beta models

		Panel A: With respect to the world benchmark					
		Long sample					
		Developed			EU-old		
		TO	FO	IO	TO	FO	IO
Interest rate	Real short rate	0.74*	0.44**	-0.08	1.23**	0.42**	0.09
	Real long rate	0.55	0.13	0.05	0.38	0.45**	0.05
	Inflation	-0.03	-0.05	0.06**	0.20***	0.30***	0.09***
	Nominal short rate	0.02	0.72***	-0.22***	0.03	0.44***	-0.17**
	Nominal long rate	-0.17	0.41***	-0.09**	0.18	0.48***	-0.19***
	Term premium	-0.21	0.44**	0.27***	-0.47	0.89**	0.57***
Returns	Bond return	-0.89**	0.78***	0.03*	-0.65*	0.08	0.03
	Excess bond return	-0.96**	0.71***	0.03	-0.85**	-0.03	0.02
	Excess bond return hedged	1.86***	0.57**	0.18***	-0.28	0.31	0.11**
	Equity return	0.63*	0.17	-0.01	0.13	0.06	-0.04
	Excess equity return	0.56*	0.16	-0.01	0.04	0.05	-0.04
	Excess equity return hedged	0.87**	0.14	0.04	0.40	0.33**	0.11***
Equity valuation	Cash flow growth	0.83*	0.82**	0.24***	0.60	-0.31	0.13**
	Log(PE ratio)	0.26	-0.56**	0.05	-1.45**	-0.76***	0.01

Table 7. Multivariate beta models (continued)

Panel A: With respect to the world benchmark (continued)

		Short sample								
		Emerging			All			EU-new		
		TO	FO	IO	TO	FO	IO	TO	FO	IO
Interest rate	Real short rate	4.01	0.57	2.68**	1.39*	0.51*	-0.25**	3.22**	-3.66***	-0.72***
	Real long rate	3.66*	0.38	0.25	1.05	0.56**	0.09	0.50	0.64*	0.00
	Inflation	-0.09	0.18***	0.83***	0.05	0.19***	0.11***	0.16***	0.22**	0.30***
	Nominal short rate	0.61	-0.15	2.08**	0.35	0.24	-0.12*	1.61**	1.13***	-0.25***
	Nominal long rate	-0.60	-0.27	-0.77	-0.29	-0.17	-0.03	-0.37	0.47**	-0.08*
	Term premium	1.25	-0.43	-0.02	-0.85	0.04	-0.47***	-3.37	1.61*	-0.85***
Returns	Bond return	1.31	-1.12**	2.73***	-0.68	0.27*	0.02	-0.41	0.04	-0.01
	Excess bond return	1.03	-0.92*	2.68***	-0.62	0.30*	0.02	-0.29	0.01	-0.01
	Excess bond return hedged	3.04*	0.36	-0.30	1.78***	0.43**	0.22***	-0.02	1.02***	0.22***
	Equity return	0.59	0.29	0.71**	0.22	0.07	-0.01	1.54**	-0.59**	0.02
	Excess equity return	0.59	0.28	0.71**	0.21	0.07	-0.01	1.48**	-0.58**	0.01
	Excess equity return hedged	0.01	-0.42*	-0.17	0.18	-0.51***	-0.07**	0.72	-0.61**	0.05
Equity valuation	Cash flow growth	-2.51	0.17	2.49***	0.61	0.40*	0.15**	1.29	0.66	0.21**
	Log(PE ratio)	0.68	-0.34	0.30	0.37	-0.37**	0.01	-1.25	-0.40	0.03

Table 7. Multivariate beta models (continued)

		Panel B: With respect to the U.S. benchmark					
		Long sample					
		Developed			EU-old		
		TO	FO	IO	TO	FO	IO
Interest rate	Real short rate	0.74**	0.54***	0.07**	0.92**	0.48***	0.07**
	Real long rate	-0.56*	0.63***	0.10***	-0.39	0.40***	0.02
	Inflation	-0.04	0.10	0.02	0.70**	-0.02	0.03
	Nominal short rate	0.54**	0.52***	0.11**	0.88**	0.36**	0.07
	Nominal long rate	0.01	1.11***	0.24***	0.64**	1.24***	0.15***
	Term premium	0.47	0.59***	0.31***	-0.33	0.65***	0.36***
Returns	Bond return	-4.79***	1.41***	0.29***	-4.73**	1.05*	0.24**
	Excess bond return	-6.71***	1.52***	0.36***	-6.53***	1.14*	0.30***
	Excess bond return hedged	-1.46**	0.89***	0.26***	-0.66	0.67***	0.23***
	Equity return	1.83***	1.29***	0.11***	1.62*	1.20***	0.11**
	Excess equity return	1.71***	1.29***	0.12***	1.42	1.20***	0.12**
	Excess equity return hedged	1.03*	1.22***	0.19***	0.06	1.24***	0.24***
Equity valuation	Cash flow growth	-0.69	1.63**	0.54***	-1.20	2.19**	0.53***
	Log(PE ratio)	-0.58**	-0.20	0.10**	-2.28***	-0.39*	0.05

Table 7. Multivariate beta models (continued)

Panel B: With respect to the U.S. benchmark (continued)

		Short sample								
		Emerging			All			EU-new		
		TO	FO	IO	TO	FO	IO	TO	FO	IO
Interest rate	Real short rate	-1.94	0.54	0.21	-1.02	0.56*	0.06	-0.36	0.98*	0.05
	Real long rate	2.30	0.80*	0.01	0.69	0.77***	0.04	-2.21***	-0.01	-0.09**
	Inflation	-2.26	-0.02	-1.52***	-0.25	0.07	0.01	1.03	-0.03	-0.003
	Nominal short rate	-2.17	0.13	0.67	-0.46	0.44	0.13	0.46	1.59**	0.22**
	Nominal long rate	-0.37	1.06**	0.29	-0.29	1.10***	0.01	-1.09**	1.47***	-0.02
	Term premium	-0.05	-0.12	0.11	1.09	0.31	0.54***	4.15**	3.39***	0.85***
Returns	Bond return	6.37*	-0.28	-3.25*	-0.08	1.67***	0.47***	-0.16	3.31***	0.57***
	Excess bond return	5.64	0.04	-2.21	-0.82	1.98***	0.58***	-0.32	3.75***	0.68***
	Excess bond return hedged	-2.15	-0.35	-0.93	-1.80***	0.43**	0.24***	1.05	1.32***	0.27***
	Equity return	0.16	0.76**	0.96**	1.35**	1.02***	0.09**	3.59***	2.48***	0.20***
	Excess equity return	0.17	0.77**	0.98**	1.31**	1.03***	0.09**	3.58***	2.51***	0.20***
	Excess equity return hedged	0.35	0.36	0.63*	0.98*	0.61***	0.06	1.58*	1.80***	0.16***
Equity valuation	Cash flow growth	-2.98	1.20*	2.88***	-1.15	1.71***	0.31***	-1.78	4.23***	0.27**
	Log(PE ratio)	1.05	-0.24	0.73*	0.64	-0.23	-0.05	0.17	-0.04	-0.083

Notes:

We estimate the following panel factor model: $x_{i,t} = \alpha_i + \alpha_{open} Open_{i,t} + \alpha_{rec} Cyc_t + \alpha_{cri} Crisis_{i,t} + (\gamma_i + \gamma_{open} Open_{i,t} + \gamma_{cyc} Cyc_t + \gamma_{cri} Crisis_{i,t}) x_{glob,t} + \varepsilon_{i,t}$ where $Open_{i,t}$ is either $TO_{i,t}$, $FO_{i,t}$ or $IO_{i,t}$; $x_{glob,t}$ takes two forms, $\hat{x}^i_{w,t}$ or $x_{US,t}$. $Crisis_{i,t}$ is the dummy taking a value of 1 when there is a banking/economic crisis in country i at time t and 0 otherwise according to Caprio and Klingebiel (2003) and Reinhart and Rogoff (2008). Other variables are constructed in the same way as before. The regressions are estimated using the Cochrane-Orcutt method, where $\varepsilon_{i,t} = \rho_i \varepsilon_{i,t-1} + u_{i,t}$ and $u_{i,t} \sim$ IID.

For each country group, we report the γ_{open} coefficients, with * indicating significance at the 10% level; ** indicating significance at the 5% level; *** indicating significance at the 1% level.

For the construction of all other variables, see the notes to Table 5.

Table 8. Trend tests for country effect standard deviation (CESD)

		Long sample		Short sample		
		Developed	EU-old	Emerging	All	EU-new
Interest rates	Real short rate	-0.00003[a]	0.000002	-0.00016[a]	-0.00005	0.00004
		[1.665]	[0.177]	[0.276]	[0.200]	[1.246]
	Real long rate	-0.00001[a]	0.000005	0.00004	0.00002	-0.00002[a]
		[0.991]	[0.347]	[0.081]	[0.072]	[0.029]
	Inflation	-0.00006[a]	-0.00008[a]	-0.00033	-0.00023	-0.00017[a]
		[0.079]	[<.0001]	[0.319]	[0.406]	[<.0001]
	Nominal short rate	0.000001	0.00001	-0.00027[a]	-0.00014	**-0.00009[a]**
		[0.015]	[0.041]	[0.727]	[0.350]	[4.659]
	Nominal long rate	-0.00001[a]	-0.00002[a]	-0.00005[a]	-0.00009[a]	-0.00013[a]
		[0.0005]	[0.260]	[0.319]	[1.037]	[<.0001]
	Term premium	**-0.00004[a]**	-0.00005[a]	-0.00004[a]	-0.00009	**-0.00011**
		[1.933]	[0.004]	[0.316]	[1.436]	[1.803]
Returns	Bond return	-0.00005[a]	**-0.00008[a]**	0.00201	-0.00004[a]	**-0.00012[a]**
		[1.398]	[1.859]	[0.002]	[0.472]	[2.073]
	Excess bond return	-0.00005[a]	-0.00012[a]	0.00152	-0.00002[a]	-0.00013[a]
		[1.106]	[1.615]	[0.0004]	[0.153]	[1.199]
	Excess bond return hedged	-0.00002	**-0.00007[a]**	0.00093	-0.00002	**-0.00014**
		[0.418]	[2.938]	[0.001]	[0.018]	[0.111]
	Equity return	-0.00020[a]	-0.00020[a]	-0.00116	-0.00074	-0.00050
		[0.584]	[0.637]	[0.715]	[0.137]	[0.038]
	Excess equity return	-0.00024[a]	-0.00024[a]	-0.00115	-0.00071	-0.00046
		[0.614]	[0.660]	[0.807]	[0.137]	[0.051]
	Excess equity return hedged	-0.00023[a]	-0.00021[a]	-0.00092	-0.00055	-0.00045
		[0.808]	[0.664]	[0.352]	[0.033]	[0.054]
Equity valuation	Cash flow growth	-0.00001	-0.00017	-0.00126[a]	-0.00070	-0.00090[a]
		[0.028]	[0.128]	[0.172]	[0.232]	[0.357]
	Log(PE ratio)	-0.00028[a]	-0.00024[a]	0.00018	0.00001[a]	-0.00012[a]
		[<.0001]	[<.0001]	[<.0001]	[<.0001]	[<.0001]

Notes:

We construct the equally-weighted country effect standard deviation measure as follows: $CESD_t = \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(x_{i,t} - (\mu + g_t)\right)^2}$ where μ and g_t are from Cochrane-Orcutt estimation of the regression: $x_{i,t} = \mu + g_t + \alpha_i + e_{i,t}$

We show the Bunzel-Vogelsang (2005) trend test coefficients with the t-Dan-J statistic in square brackets; the 5% (1%) critical value for this test is 1.71 (2.46). A bold number means that the trend coefficient is significant at the 5% level.

A superscript "a" next to the trend test coefficients indicates that the trend variable is negatively significant at the 5% level in the Cochrane-Orcutt regression: $CESD_t = \alpha + \beta_1 TO_t + \beta_2 FO_t + \beta_3 IO_t + \gamma t + \beta_4 Cyc_t + \beta_5 Crisis_t + \varepsilon_t$ where $\varepsilon_t = \rho \varepsilon_{t-1} + u_t$ and $u_t \sim IID$.

For the construction of all other variables, see the notes to Table 5.

Table 9. Multi-variate regression of country effect standard deviation (CESD)

		Long sample					
		Developed			EU-old		
		TO	FO	IO	TO	FO	IO
Interest rate	Real short rate	0.003	0.02	-0.01***	-0.01	-0.04***	0.004**
	Real long rate	0.02*	0.02*	-0.004**	0.004	0.01**	-0.0003
	Inflation	0.01	0.01	-0.01**	0.02	-0.06***	-0.003**
	Nominal short rate	0.004	-0.06***	0.01***	-0.01	-0.07***	0.007***
	Nominal long rate	-0.0001	0.01	-0.001	-0.002	-0.003	-0.001***
	Term premium	-0.02	-0.001	-0.01***	-0.03**	0.002	-0.01**
Returns	Bond return	-0.01	0.01	-0.01*	-0.01	0.02	-0.02*
	Excess bond return	0.03	0.019	-0.02*	-0.04	0.06	-0.03*
	Excess bond return hedged	0.09*	0.02	-0.01*	0.03	-0.01	-0.01*
	Equity return	-0.24	-0.17	-0.002	0.15	0.07	-0.03*
	Excess equity return	-0.24	-0.20	-0.003	0.21	0.07	-0.03*
	Excess equity return hedged	-0.17	-0.21	-0.01	0.24	0.11	-0.04**
Equity valuation	Cash flow growth	-0.09	-0.71***	0.07*	-0.07	0.01	-0.01
	Log(PE ratio)	-0.03	0.04	-0.06***	0.03	0.003	-0.04***

Table 9. Multi-variate regression of country effect standard deviation (CESD) (continued)

		Short sample								
		Emerging			All			EU-new		
		TO	FO	IO	TO	FO	IO	TO	FO	IO
Interest rate	Real short rate	0.31**	0.08	-0.054	0.03	0.14	-0.03*	-0.06	-0.19**	0.04***
	Real long rate	0.21*	0.16**	-0.01	0.09	0.14*	-0.02	0.01	-0.02	0.0003
	Inflation	0.05	-0.01	-0.05	-0.02	-0.04	-0.01	-0.004	-0.03	-0.001
	Nominal short rate	0.09	-0.03	-0.02	0.02	0.02	-0.01	-0.06	-0.04	-0.01*
	Nominal long rate	0.07	0.04	0.002	0.04	-0.02	-0.01	-0.005	-0.03	-0.002
	Term premium	0.02	0.02	-0.04*	-0.11*	0.02	-0.02**	-0.12*	-0.05	-0.01
Returns	Bond return	-0.23	0.22	-0.51	-0.24*	0.07	-0.01	0.08	-0.10	-0.01
	Excess bond return	-0.77**	0.77*	0.06	-0.29*	0.15	-0.02	0.09	-0.16	-0.005
	Excess bond return hedged	-0.08	0.08	-0.05	0.09	-0.06	0.001	0.004	-0.07	-0.01
	Equity return	0.46	-0.02	-0.54**	-0.16	-0.10	-0.10	-0.19	-0.79*	0.10
	Excess equity return	0.41	0.00	-0.57**	-0.15	-0.09	-0.11	-0.18	-0.92*	0.12*
	Excess equity return hedged	-0.13	-0.14	-0.32*	-0.26	-0.35	-0.03	-0.48	-1.15**	0.14*
Equity valuation	Cash flow growth	-1.00	0.20	-0.10	-0.79	0.35	-0.09	-0.71**	-0.68	0.02
	Log(PE ratio)	0.39**	0.22***	0.09	0.09	0.02	-0.01	-0.07	-0.19	-0.01

Notes:

We report the results of the multivariate regression using the Cochrane-Orcutt method: $CESD_t = \alpha + \beta_1 TO_t + \beta_2 FO_t + \beta_3 IO_t + \beta_4 Cyc_t + \beta_5 Crisis_t + \varepsilon_t$ where $\varepsilon_t = \rho \varepsilon_{t-1} + u_t$ and $u_t \sim IID$. We report the coefficients on the openness measures with * indicating coefficients significant at the 10% level; ** indicating coefficients significant at the 5% level; *** indicating coefficients significant at the 1% level.

For the construction of all other variables, see the notes to Table 5.

Table 10. Trend tests for cross-sectional dispersion (CS)

		Long sample		Short sample		
		Developed	EU-old	Emerging	All	EU-new
Interest rates	Real short rate	**-0.00006[a]**	-0.00005	-0.00016[a]	-0.00013[a]	**-0.00011**
		[2.953]	[1.438]	[0.209]	[0.429]	[5.746]
	Real long rate	**-0.00006[a]**	-0.00004	-0.00013[a]	-0.00010	-0.00008[a]
		[2.817]	[0.836]	[0.170]	[0.188]	[0.130]
	Inflation	-0.00010[a]	-0.00009[a]	-0.00026[a]	-0.00022[a]	-0.00017[a]
		[0.458]	[0.428]	[0.216]	[0.351]	[<.0001]
	Nominal short rate	-0.00010[a]	**-0.00012[a]**	-0.00028[a]	-0.00025[a]	**-0.00023**
		[0.730]	[1.927]	[0.417]	[1.146]	[3.382]
	Nominal long rate	-0.00008[a]	-0.00009[a]	-0.00020[a]	-0.00016[a]	-0.00018[a]
		[0.0703]	[1.095]	[0.632]	[0.502]	[<.0001]
	Term premium	**-0.00004[a]**	-0.00005[a]	-0.00006[a]	**-0.00008**	**-0.00010**
		[3.385]	[0.897]	[0.400]	[2.367]	[5.355]
Returns	Excess bond return	-0.00005	-0.00015[a]	0.00099	-0.00002[a]	**-0.00025**
		[1.108]	[1.463]	[0.0003]	[0.177]	[1.391]
	Excess bond return hedged	-0.00002	**-0.0001**	0.00080	0.00002	**-0.00012**
		[0.359]	[2.820]	[0.001]	[0.153]	[2.953]
	Excess equity return	-0.00027[a]	-0.00029[a]	-0.00102	-0.00066	-0.00039[a]
		[0.866]	[1.354]	[0.776]	[0.146]	[0.073]
	Excess equity return hedged	-0.00026[a]	-0.00022[a]	-0.00077	-0.00048	-0.00040[a]
		[1.392]	[1.108]	[0.423]	[0.048]	[0.084]
Equity valuation	Cash flow growth	-0.00008	-0.00012	-0.00019[a]	-0.00031	-0.00052[a]
		[0.236]	[0.121]	[0.043]	[0.139]	[1.535]
	Log(PE ratio)	-0.00069[a]	-0.00024[a]	-0.00027[a]	-0.00049[a]	-0.00049[a]
		[0.126]	[0.364]	[<.0001]	[0.000]	[0.254]

Notes:

We construct the equally-weighted cross-sectional dispersion measure by $CS_t^2 = \frac{1}{N}\sum_{i=1}^{N}(x_{i,t} - x_{ew,t})^2$ where $x_{ew,t} = \frac{1}{N}\sum_{i=1}^{N} x_{i,t}$

We show the Bunzel-Vogelsang (2005) trend test coefficients with the t-Dan-J statistic in square brackets; the 5% (1%) critical value for this test is 1.71 (2.46). A bold number means that the trend coefficient is significant at the 5% level.

A superscript "a" next to the trend test coefficients indicates that the trend variable is negatively significant at the 5% level in the Cochrane-Orcutt regression: $CS_t = \alpha + \beta_1 TO_t + \beta_2 FO_t + \beta_3 IO_t + \gamma t + \beta_4 Cyc_t + \beta_5 Crisis_t + \varepsilon_t$ where $\varepsilon_t = \rho \varepsilon_{t-1} + u_t$ and $u_t \sim IID$.

For the construction of all other variables, see the notes to Table 5.

Table 11. Multi-variate regression of cross-sectional dispersion (CS)

		Long sample					
		Developed			EU-old		
		TO	FO	IO	TO	FO	IO
Interest rate	Real short rate	0.002	0.02	-0.02***	-0.01	-0.04**	-0.01*
	Real long rate	0.02	0.01	-0.01***	0.01	-0.02*	-0.002
	Inflation	0.02	0.02	-0.01**	0.01	-0.03**	-0.01***
	Nominal short rate	-0.01	-0.07***	-0.01***	-0.02	-0.10***	-0.01*
	Nominal long rate	-0.01	0.001	-0.01***	-0.002	-0.02**	-0.01***
	Term premium	-0.03*	0.005	-0.01***	-0.03*	0.001	-0.01***
Returns	Excess bond return	0.08	0.001	-0.01	-0.11	0.10	-0.04*
	Excess bond return hedged	0.11*	-0.05	-0.003	0.01	0.04	-0.02**
	Excess equity return	-0.24	-0.15	-0.012	0.24	-0.08	-0.03
	Excess equity return hedged	-0.24	-0.24*	-0.01	0.24	0.02	-0.04**
Equity valuation	Cash flow growth	-0.02	-0.68**	0.07*	-0.06	-0.05	-0.01
	Log(PE ratio)	-0.06	-1.09***	0.02	0.26	-0.37***	0.02

Table 11. Multi-variate regression of cross-sectional dispersion (CS) (continued)

		Short sample								
		Emerging			All			EU-new		
		TO	FO	IO	TO	FO	IO	TO	FO	IO
Interest rate	Real short rate	-0.39***	0.08*	-0.23***	-0.29***	0.01	-0.05***	-0.04	-0.04***	-0.01**
	Real long rate	0.16	0.09	-0.06	0.05	0.02	-0.02	0.01	-0.06***	-0.004
	Inflation	-0.35***	-0.30***	-0.23***	-0.42***	-0.62***	-0.05***	0.02	0.01	-0.01**
	Nominal short rate	-0.36**	-0.16***	-0.07	-0.22**	-0.08*	-0.05***	-0.05	0.04***	-0.05***
	Nominal long rate	0.07	0.04	-0.03	0.04	0.02	-0.02	-0.02	-0.05***	-0.02***
	Term premium	0.03	0.02	-0.05*	-0.09	0.02**	-0.02***	-0.06	0.02**	-0.02***
Returns	Excess bond return	-1.06***	1.20***	0.48	-0.15	-0.01	0.002	0.11	-0.21*	-0.01
	Excess bond return hedged	-0.27	0.15	0.16	0.15*	-0.05**	0.001	-0.01	-0.08**	-0.01*
	Excess equity return	0.37	0.06	-0.59**	-0.33	0.20	-0.13*	-0.60**	-0.22	-0.005
	Excess equity return hedged	-0.39	0.29*	-0.54**	-0.41	0.11	-0.08	-0.68**	-0.26*	0.001
Equity valuation	Cash flow growth	-0.46	0.46	0.14	-0.14	0.22	-0.06	-0.28	0.18	-0.12***
	Log(PE ratio)	0.67	-0.50**	0.18	0.07	-0.23*	-0.03	-0.48**	-0.15	-0.01

Notes:

We report the results of the multivariate regression using the Cochrane-Orcutt method: $CS_t = \alpha + \beta_1 TO_t + \beta_2 FO_t + \beta_3 IO_t + \beta_4 Cyc_t + \beta_5 Crisis_t + \varepsilon_t$ where $\varepsilon_t = \rho \varepsilon_{t-1} + u_t$ and $u_t \sim IID$. We report the coefficients on the openness measures with * indicating coefficients significant at the 10% level; ** indicating coefficients significant at the 5% level; *** indicating coefficients significant at the 1% level.

For the construction of all other variables, see the notes to Table 5.

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Table 12. PR and CS for early samples

			PR		CS	
			Early	Later	Early	Later
Panel A: Average PR and CS within group						
Developed	Interest rate	Real short rate	0.31	0.57	0.029	0.014
		Real long rate	0.49	0.63	0.021	0.011
		Inflation	0.57	0.56	0.033	0.012
		Nominal short rate	0.44	0.64	0.017	0.013
		Nominal long rate	0.41	0.78	0.020	0.007
		Term premium	0.47	0.61	0.015	0.010
	returns	Equity return	0.66	0.62	0.145	0.104
		Excess equity return	0.65	0.63	0.145	0.104
		Excess equity return hedged	0.70	0.69	0.122	0.092
	Equity valuation	Cash flow growth	0.40	0.50	0.171	0.134
		Log(PE ratio)	0.51	0.63	0.218	0.152
Emerging	Interest rate	Real short rate	0.32	0.41	0.143	0.039
		Inflation	0.36	0.48	0.256	0.045
		Nominal short rate	0.46	0.44	0.187	0.057
Panel B: Average CS of emerging w.r.t. the developed group						
Emerging	Interest rate	Real short rate			0.172	0.048
		Inflation			0.300	0.066
		Nominal short rate			0.212	0.082

Notes:

Panel A shows average PR and CS statistics of the early samples for selected variables. The developed countries group includes Belgium, Canada, France, U.K. and U.S. The emerging markets group includes Malaysia, Mexico, Philippines, South Africa and Thailand. The early samples cover 1974-1979 and 1980-1989 for the developed and emerging markets groups respectively. The later samples are exactly the same as we study in previous sections.

Panel B shows the average modified CS of the emerging market group with respect to the developed group. That is, we have $CS_t^2 = \frac{1}{N}\sum_{i=1}^{N}(x_{i,t} - x_{dev,t})^2$. where $x_{dev,t}$ is the simple average of the variable over the developed group.

Table 13. Regional factors in the beta model

Panel A: Average betas

		U.S.benchmark						Regional benchmark					
		Europe long		Europe short		Asia short		Europe long		Europe short		Asia short	
		Early	Later	Early	Later	Early	Later	Early	Later	Early	Later	Early	Later
Interest rate	Real short rate	-0.12	0.12	-0.26	0.26	-0.33	0.17	0.28	0.32	0.49	0.32	-0.20	0.09
	Nominal long rate	0.13	0.02	-0.07	0.02	0.00	0.03	0.40	0.95	0.85	0.92	0.13	-0.25
	Term premium	0.19	0.32	0.17	0.28	0.38	0.27	0.28	0.48	0.77	0.44	0.89	0.39
Return	Excess bond return	-0.02	0.08	--	0.05	--	--	0.87	0.85	--	0.94	--	--
	Excess equity return	0.34	0.24	0.26	0.22	0.79	0.88	0.52	0.57	0.58	0.60	0.28	0.44
Equity valuation	Cash flow growth	-0.25	0.30	-0.11	0.05	-0.62	-0.34	0.32	0.32	0.39	0.32	-0.13	0.19
	Log(PE ratio)	0.44	0.32	0.29	0.29	0.40	0.66	0.30	0.43	0.48	0.48	0.37	0.07

Panel B: Average VRs

Interest rate	Real short rate	0.35	0.23	0.23	0.28	0.17	0.20	0.23	0.12	0.16	0.11	0.25	0.04
	Nominal long rate	0.15	0.04	0.05	0.05	0.14	0.12	0.36	0.71	0.55	0.72	0.12	0.06
	Term premium	0.15	0.32	0.18	0.34	0.19	0.22	0.16	0.26	0.30	0.23	0.13	0.09
Return	Excess bond return	0.04	0.04	--	0.02	--	--	0.76	0.84	--	0.94	--	--
	Excess equity return	0.11	0.11	0.11	0.11	0.14	0.23	0.37	0.47	0.31	0.53	0.11	0.19
Equity valuation	Cash flow growth	0.24	0.23	0.20	0.26	0.23	0.36	0.30	0.20	0.26	0.18	0.09	0.18
	Log(PE ratio)	0.26	0.20	0.21	0.15	0.20	0.15	0.13	0.19	0.15	0.23	0.19	0.11

Notes:

We consider three samples, Europe long sample, Europe short sample and Asia short sample. For the long sample, we construct the model as $x_{i,t} = \alpha_i + \beta_{glob,i}\, x_{glob,t} + \beta_{Europe,i}\, x_{Germany,t} + \varepsilon_{i,t}$ where $x_{glob,t}$ is the U.S. variable; For the short sample, we construct the model as $x_{i,t} = \alpha_i + \beta_{glob,i}\, x_{glob,t} +$

$\beta_{Europe,i}\ x_{Germany,t}\ D_{Europe} + \beta_{Asia,i}\ x_{Japan,t}\ D_{Asia} + \varepsilon_{i,t}$ where D_{Asia} is a dummy variable taking the value of 1 when country i is an Asian country and 0 otherwise, and D_{Europe} is an analogous dummy for European countries. The regressions are estimated by the Cochrane-Orcutt method using a 36-month rolling window.

Panel A shows the $\beta_{glob,i}$ first averaged over the 1st and 2nd half of the sample (for the long sample, the early one is 1980-1994, the later one is 1995-2008; for the short sample, the early one is 1990-1999, the later one is 2000-2008) and then averaged in three sub-groups. Panel B shows the average variance ratios, $VR_{i,t} = \frac{\beta^2_{glob,i} var(x_{glob,s})}{var(x_{i,s})}$ or $VR_{i,t} = \frac{\beta^2_{region,i} var(x_{region,s})}{var(x_{i,s})}$,, in the sub-groups.

Table 14. Multivariate beta models with corporate governance measures

		Gov = Political risk				Gov = Law and Order				Gov = Quality of Institution			
		DV		EM		DV		EM		DV		EM	
		FO	Gov	FO	Gov	FO	Gov	FO	Gov	FO	Gov	FO	Gov
Interest rate	Real short rate	1.09***	-0.17	0.23	4.59***	1.05***	-0.69***	0.42	1.08*	1.03***	-0.29	0.59	1.13
	Nominal long rate	1.42***	-0.57*	0.18	6.11***	1.37***	-0.46***	0.60	1.20**	1.35***	0.01	0.85**	0.88
	Term premium	0.53***	-0.92**	-0.39	3.08***	0.51***	-0.66***	-0.26	1.13**	0.46**	-0.02	-0.02	1.06*
Returns	Excess bond return	0.18	-0.07	0.18	0.59	0.16	-0.23	0.09	0.41	0.17	-0.38	0.10	-0.01
	Excess equity return	1.25***	-0.17	1.00*	2.15*	1.27***	-0.23**	1.04**	0.19	1.26***	-0.45***	1.05**	0.00
Equity valuation	Cash flow growth	1.21***	0.39	-0.09	-1.67*	1.24***	-0.53**	-0.03	-0.85**	1.19***	-0.45	-0.16	-0.56
	Log(PE ratio)	2.96***	-0.26	-0.06	-2.42	2.95***	-0.56	-0.25	-0.54	2.92***	0.06	0.08	-0.08

Notes:

We estimate the following factor model: $x_{i,t} = \alpha_i + \alpha_{open} FO_{i,t} + \alpha_{cyc} Cyc_t + \alpha_{cri} Crisis_{i,t} + \alpha_{gov} Gov_{i,t} + (\gamma_i + \gamma_{open} FO_{i,t} + \gamma_{cyc} Cyc_t + \gamma_{cri} Crisis_{i,t} + \gamma_{gov} Gov_{i,t}) x_{glob,t} + \varepsilon_{i,t}$ where $Gov_{,t}$ is either the Polital Risk index, or Law and Order index from ICRG or the Quality of Institutions index constructed as in Bekaert, Harvey and Lundblad (2005); $x_{glob,t}$ is $x_{US,t}$. $Crisis_{i,t}$ is the dummy taking a value of 1 when there is a banking/economic crisis in country i at time t and 0 otherwise according to Caprio and Klingebiel (2003) and Reinhart and Rogoff (2008). The regressions are estimated using the Cochrane-Orcutt method, where $\varepsilon_{i,t} = \rho_i \varepsilon_{i,t-1} + u_{i,t}$ and $u_{i,t} \sim$ IID.

We use two samples: developed long sample and emerging short sample and report the γ_{gov} and γ_{open} coefficients, with * indicating significance at the 10% level; ** indicating significance at the 5% level; *** indicating significance at the 1% level.

For the construction of all other variables, see the notes to Table 5.

Table 15. Correlations between alternative openness measures

DV long	TO	FO	IO	KA	MM	BO
FO	-0.094	1				
IO	0.308	0.829	1			
KA	0.273	0.333	0.642	1		
MM	0.501	0.531	0.813	0.939	1	
BO	-0.037	0.113	0.397	0.893	0.783	1
EQ	0.344	0.282	0.617	0.841	0.772	0.767
EU long	TO	FO	IO	KA	MM	BO
FO	-0.296	1				
IO	0.090	0.821	1			
KA	0.768	0.770	0.904	1		
MM	0.805	0.827	0.942	0.981	1	
BO	0.314	0.433	0.567	0.836	0.772	1
EQ	0.756	0.685	0.848	0.950	0.900	0.896
EM short	TO	FO	IO	KA	MM	BO
FO	0.887	1				
IO	0.930	0.916	1			
KA	0.880	0.929	0.936	1		
MM	0.790	0.751	0.868	0.907	1	
BO	0.534	0.613	0.696	0.877	0.772	1
EQ	0.820	0.896	0.925	0.964	0.828	0.899
ALL short	TO	FO	IO	KA	MM	BO
FO	0.889	1				
IO	0.948	0.939	1			
KA	0.696	0.810	0.920	1		
MM	0.653	0.721	0.854	0.968	1	
BO	0.309	0.435	0.585	0.888	0.882	1
EQ	0.670	0.785	0.887	0.986	0.946	0.871
EU short	TO	FO	IO	KA	MM	BO
FO	0.875	1				
IO	0.928	0.965	1			
KA	0.500	0.347	0.643	1		
MM	0.642	0.611	0.822	0.921	1	
BO	0.169	0.061	0.362	0.895	0.813	1
EQ	0.575	0.281	0.599	0.893	0.811	0.855

Notes:

We substract ko (overall restrictions index), mm (average money market restrictions), bo (average bond restrictions) and eq (average equity restrictions) in Schindler (2009) from 1 to recast the restrictions measures into the openness measures KA, MM, BO, EQ.

The correlations between these openness measures are calculated first country by country using the common sample period of the two measures; then averaged within specific groups.

Table 16. Multi-variate regressions for PR and CS using Schindler's BO measure instead of FO

		Emerging			All			EU-new		
		TO	BO	IO	TO	BO	IO	TO	BO	IO
PR	Real long rate	5.75***	-9.34***	-23.70***	2.06	-52.80***	4.89**	-0.33	-19.69**	-10.18***
	Nominal long rate	-2.00***	-14.35***	42.86***	-3.68**	24.04*	6.56**	-0.09	-2.35	0.72**
	Term premium	0.70	-0.96	17.69*	2.03**	-4.85	-1.10	-0.32	-11.34**	0.42
	Bond return	--	--	--	0.10	13.28**	-0.16	-0.16*	-0.46	0.07*
	Excess bond return	--	--	--	-0.02	17.84***	-0.37	-0.19*	-0.30	0.08*
	Excess bond return hedged	--	--	--	-0.31	-1.43	-0.58	-0.23**	-0.66	-0.10***
CS	Real long rate	0.12	0.07	-0.18	0.02	0.07	-0.09**	-0.01	0.01	-0.002
	Nominal long rate	0.03	-0.05	0.05	0.02	-0.01	-0.01	-0.02	0.03**	-0.02***
	Term premium	-0.22	0.10***	-0.15***	-0.03	0.16***	-0.06***	-0.04**	0.05***	-0.02***
	Bond return	--	--	--	-0.83***	-0.05	0.16***	-0.24*	-0.14	0.01
	Excess bond return	--	--	--	-0.83***	-0.05	0.16***	-0.24*	-0.14	0.01
	Excess bond return hedged	--	--	--	0.04	0.03	0.0001	-0.02	0.001	-0.01**

Notes:

In the multivariate regression PR_t (CS_t) = $\alpha + \beta_1 TO_t + \beta_2 FO_t + \beta_3 IO_t + \beta_4 Cyc_t + \beta_5 Crisis_t + \varepsilon_t$, we replace FO with BO for long real rate, term premium and bond (excess) returns, for the short sample. We map the restrictions measure "bo" in Schindler (2009) to BO = (1-bo) which represents openness. Because Schindler's data extend only through 2005 and the bond returns data in emerging markets start relatively late, we do not have enough observations for the bond returns regressions for emerging markets.

We report the coefficients on the openness measures with * indicating coefficients significant at the 10% level; ** indicating coefficients significant at the 5% level; *** indicating coefficients significant at the 1% level.

For the construction of all other variables, see the notes to Table 5.

Table 17. Trend tests for PR and CS of equity and bond premiums and expected cash flow growth

		Long sample		Short sample		
		Developed	EU-old	Emerging	All	EU-new
PR	Equity Premium	-0.0010	-0.0009	-0.0021	0.0034	0.0028
		[0.047]	[0.042]	[0.003]	[<.0001]	[<.0001]
	Bond Premium	0.000003	0.0011		-0.0005	0.0033
		[0.0001]	[0.065]		[0.001]	[0.065]
	Cash Flow Growth	-0.0028	-0.0033	-0.0087	-0.0079	-0.0063
		[0.002]	[<.0001]	[0.089]	[0.004]	[0.004]
CS	Equity Premium	-0.0001	-0.00002	-0.0003	-0.0004	-0.0002
		[1.843]	[0.199]	[0.528]	[0.923]	[1.454]
	Bond Premium	0.00004	-0.0001	0.0009	0.0001	**-0.0001**
		[1.105]	[0.400]	[0.092]	[1.464]	[4.486]
	Cash Flow Growth	0.00002	-0.0002	0.0006	0.00001	-0.0004
		[0.045]	[0.075]	[0.035]	[0.002]	[0.460]

Notes:

The bond and equity premiums and expected cash flow growth rates are computed country-by-country using a projection method described in the conclusions.

We show the Bunzel-Vogelsang (2005) trend test coefficients with the t-Dan-J statistic in square brackets; the 5% (1%) critical value for this test is 1.71 (2.46). A bold number means that the trend coefficient is significant at the 5% level.

Table 18. Multi-variate regressions for PR and CS of equity and bond premiums and expected cash flow growth

		Long sample					
		Developed			EU-old		
		TO	FO	IO	TO	FO	IO
PR	Equity Premium	0.48	0.88	-0.374	0.41	-21.67**	1.66**
	Bond Premium	0.09	5.92	-0.437	0.05	9.29*	-0.99*
	Cash Flow Growth	1.33**	23.05***	-2.18**	0.66**	55.29***	-5.68***
CS	Equity Premium	0.41	0.10	-0.04**	0.55*	-0.46**	0.04*
	Bond Premium	0.14**	0.09**	-0.002	0.08	0.19***	-0.02***
	Cash Flow Growth	-0.10	-0.82***	0.10**	-0.18	-0.43	0.04

Table 18. Multi-variate regressions for PR and CS of equity and bond premiums and expected cash flow growth (continued)

		Short sample								
		Emerging			All			EU-new		
		TO	FO	IO	TO	FO	IO	TO	FO	IO
PR	Equity Premium	0.31	-10.25***	6.64***	0.79	-7.91	1.25	1.13	-9.81**	1.39
	Bond Premium	--	--	--	-2.73***	-2.33	2.66**	-2.32***	3.52	0.66
	Cash Flow Growth	-0.55	-13.14***	8.06***	0.87	-27.10**	2.46	1.15	-0.87	-0.50
CS	Equity Premium	0.13	-0.53*	0.41	-0.10	-0.61	0.04	0.04	-1.21***	0.15**
	Bond Premium	-1.27*	-0.31	-0.86	-0.08	-0.12**	0.04***	0.04	-0.01	-0.02*
	Cash Flow Growth	0.06	-0.004	0.57	-0.12	-0.29	0.01	-0.54	-0.43	0.03

Notes:
The bond and equity premiums and expected cash flow growth rates are computed country-by-country using a projection method described in the conclusions.

We report the results of the multivariate regression using the Cochrane-Orcutt method: PR_t (CS_t) = $\alpha + \beta_1 TO_t + \beta_2 FO_t + \beta_3 IO_t + \beta_4 Cyc_t + \beta_5 Crisis_t + \varepsilon_t$ where $\varepsilon_t = \rho \varepsilon_{t-1} + u_t$ and $u_t \sim IID$. We report the coefficients on the openness measures with * indicating coefficients significant at the 10% level; ** indicating coefficients significant at the 5% level; *** indicating coefficients significant at the 1% level.

For the construction of all other variables, see the notes to Table 5.

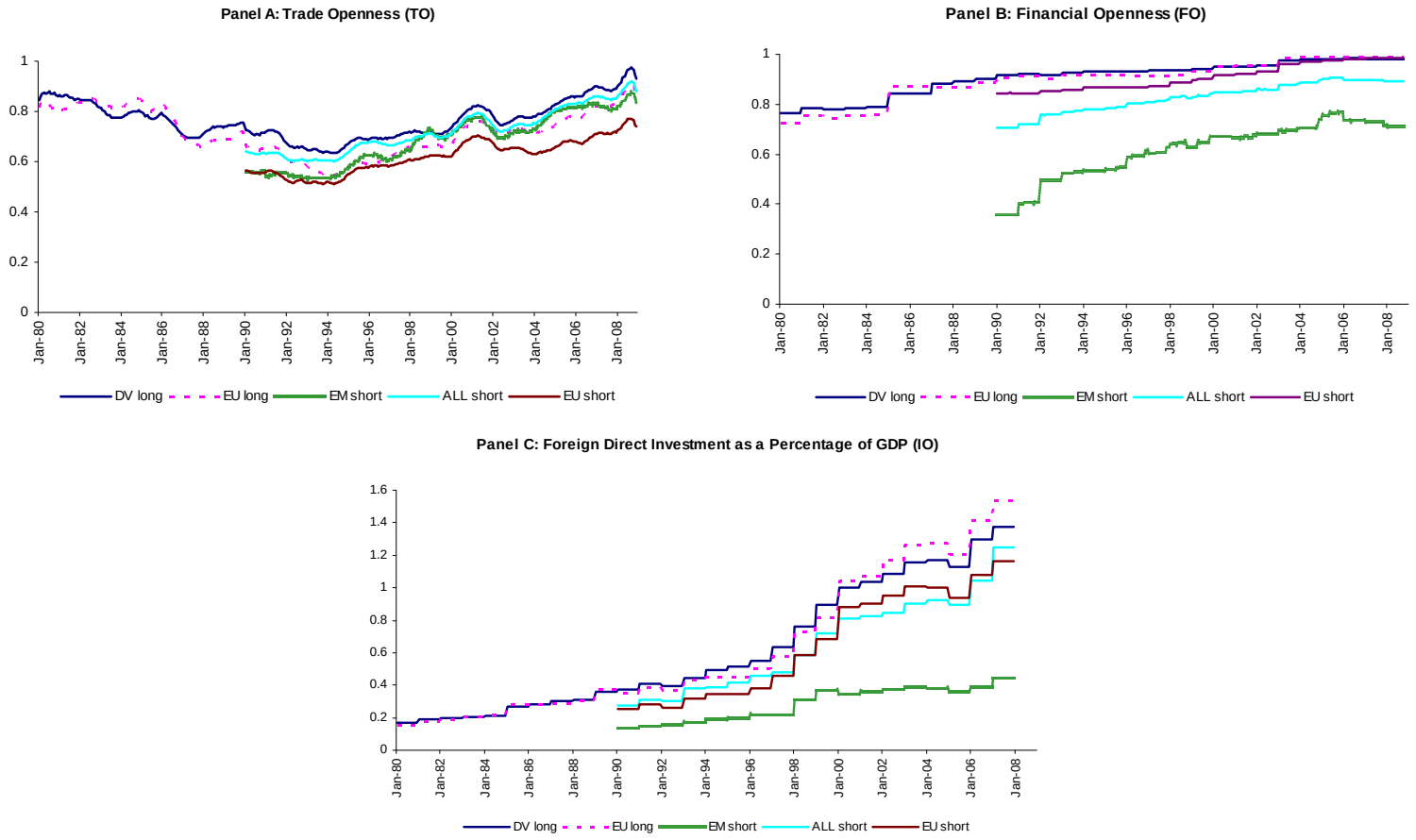

Figure 1. Openness measures

Note:
Graph of cross-sectional average of each openness measure within certain country groups. In Panel A, trade openness measures the monthly imports plus monthly exports divided by annual GDP of the current year and is summed over the last 12 months.

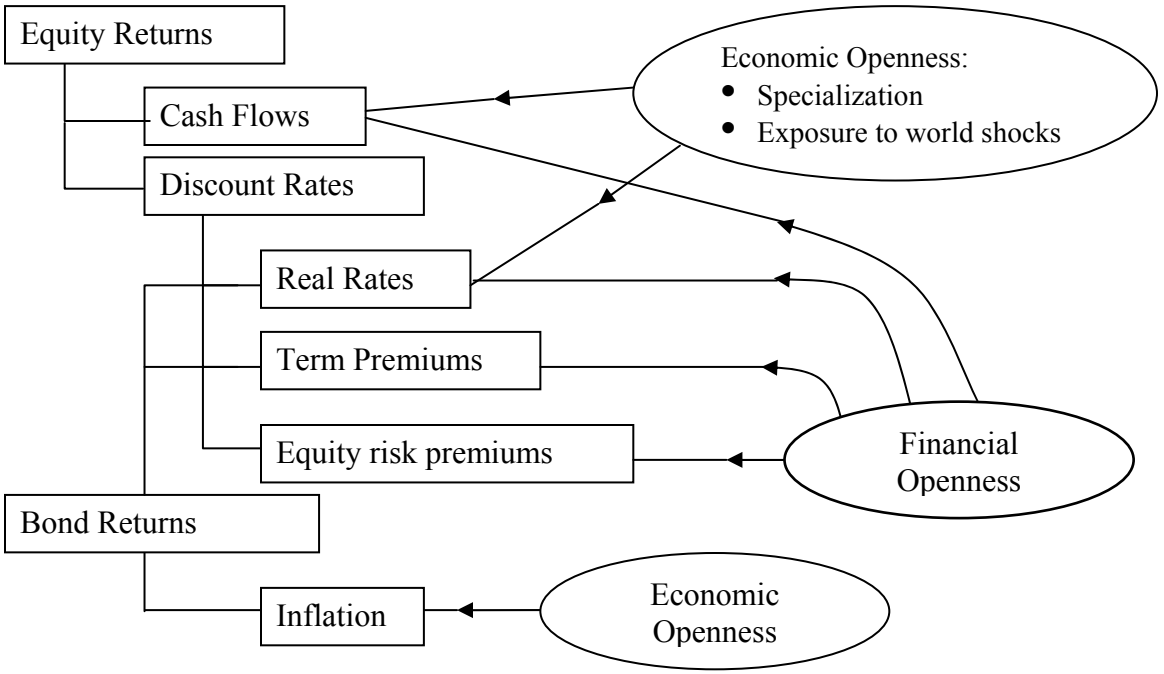

Figure 2. Potential effects of globalization on bond and equity returns, and their components

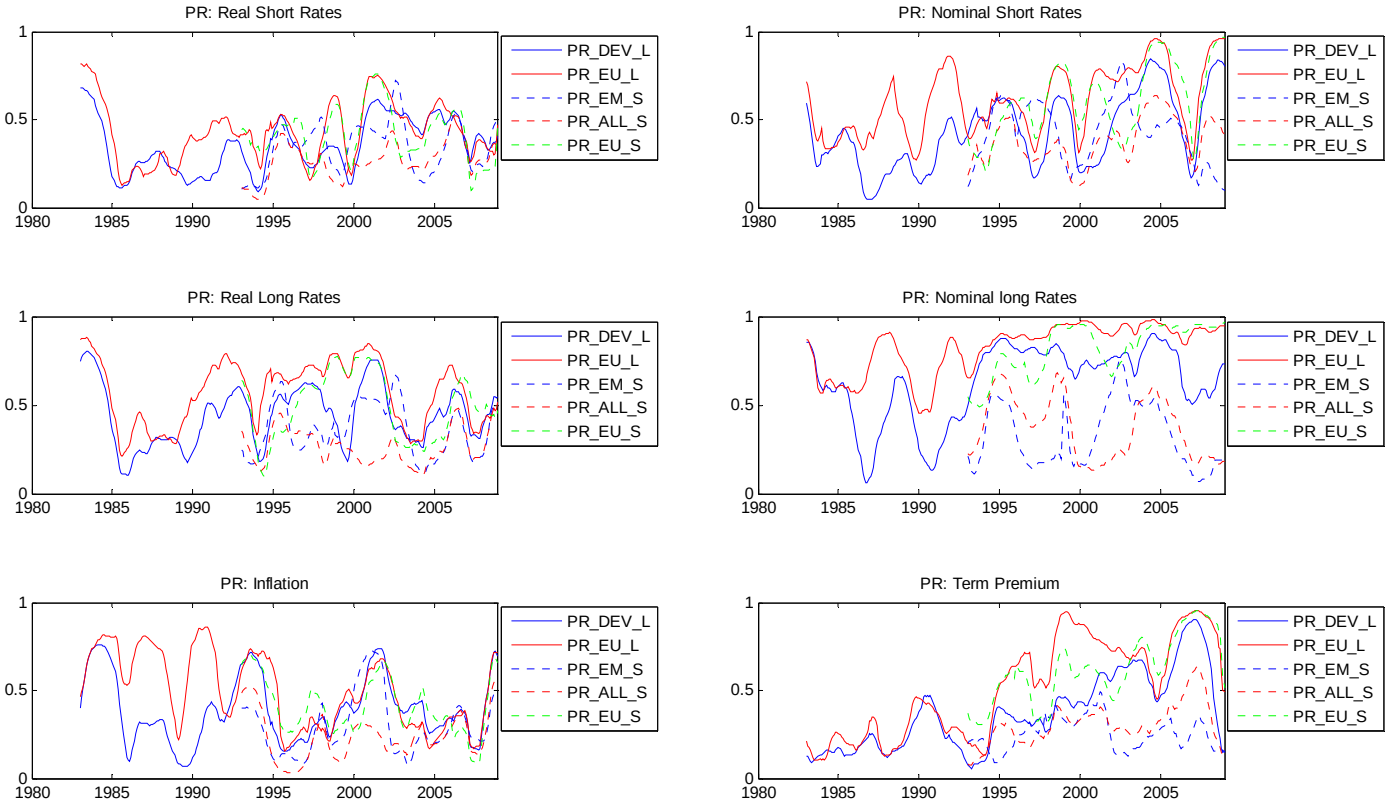

Figure 3-a. Portfolio variance ratios of interest rate variables

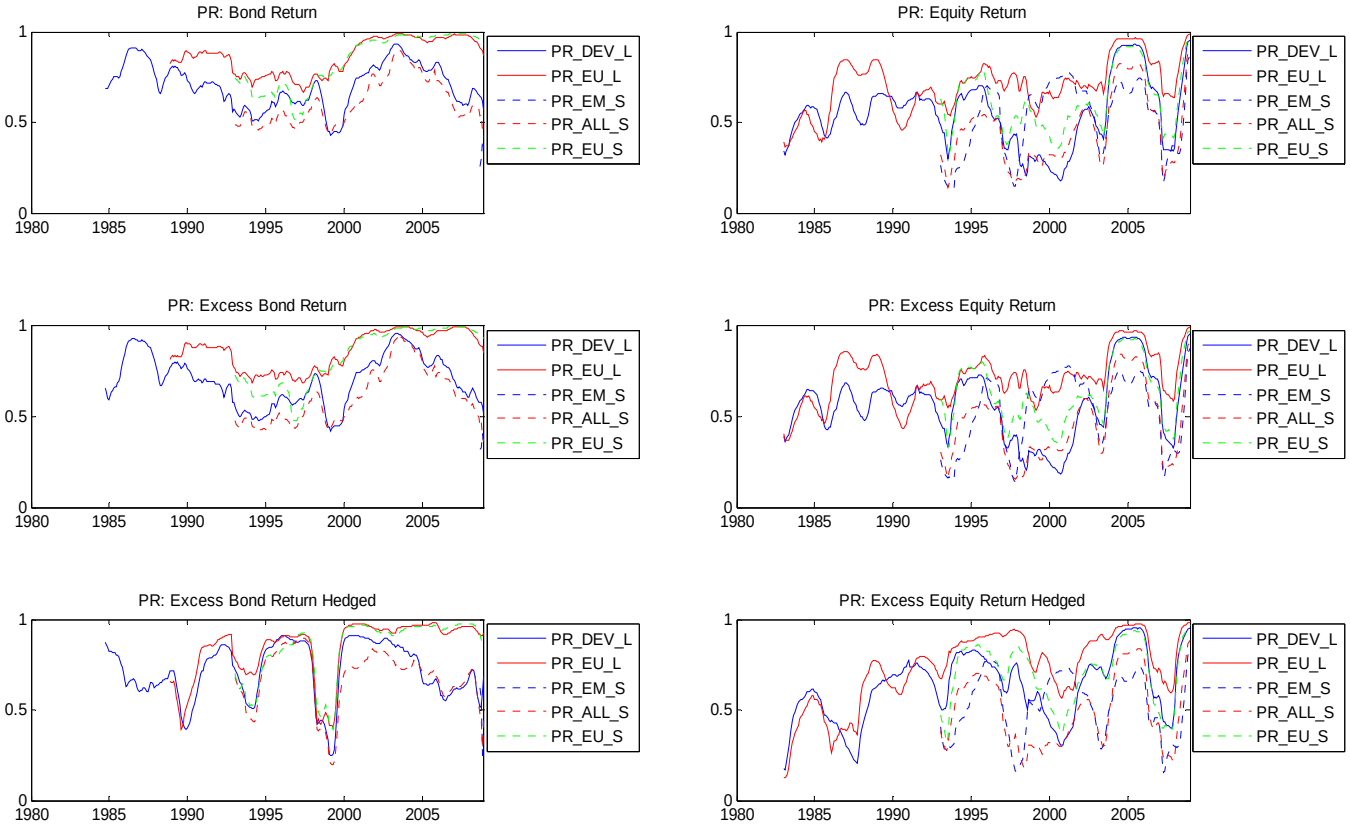

Figure 3-b. Portfolio variance ratios of return variables

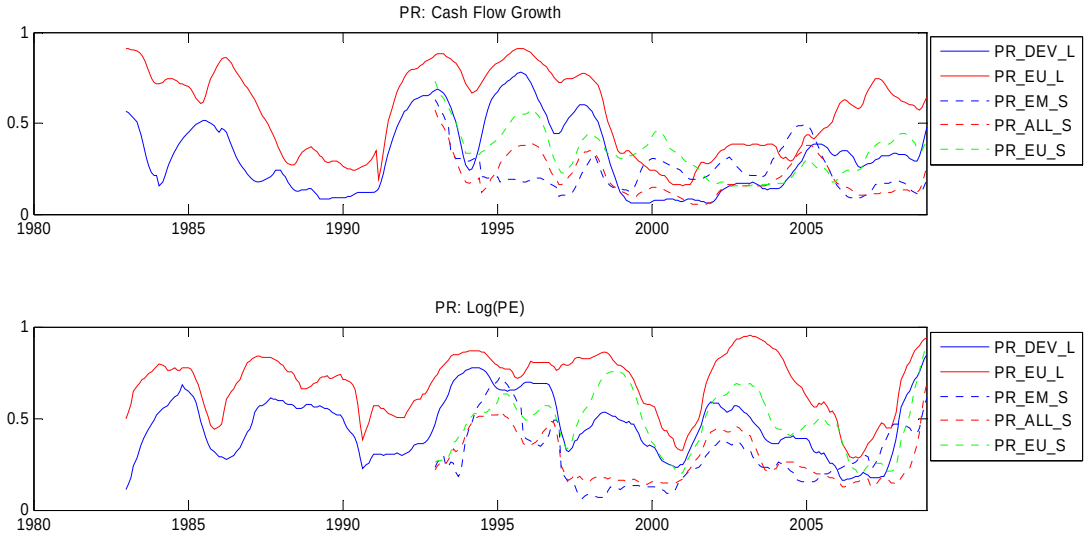

Figure 3-c. Portfolio variance ratios of equity valuation variables

Note:
Each panel shows the times series of a variable for 5 samples, with "_DEV_L" indicating developed long sample; "_EU_L" indicating EU long sample; "_EM_S" indicating emerging short sample; "_ALL_S" indicating all countries short sample; and "_EU_S" indicating EU short sample.

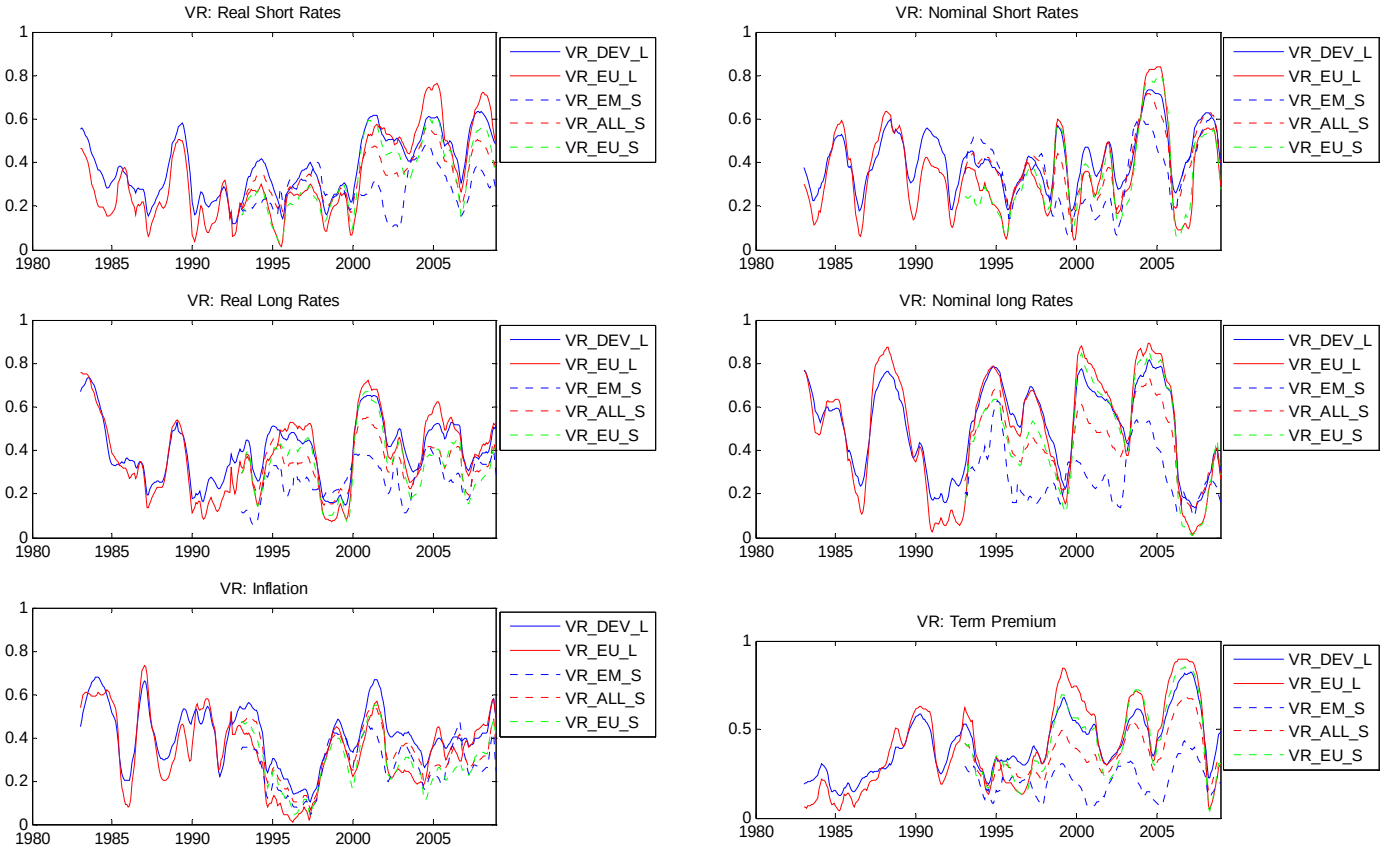

Figure 4-a. Variance ratios of interest rate variables ($x_{glob,t} = x_{US,t}$)

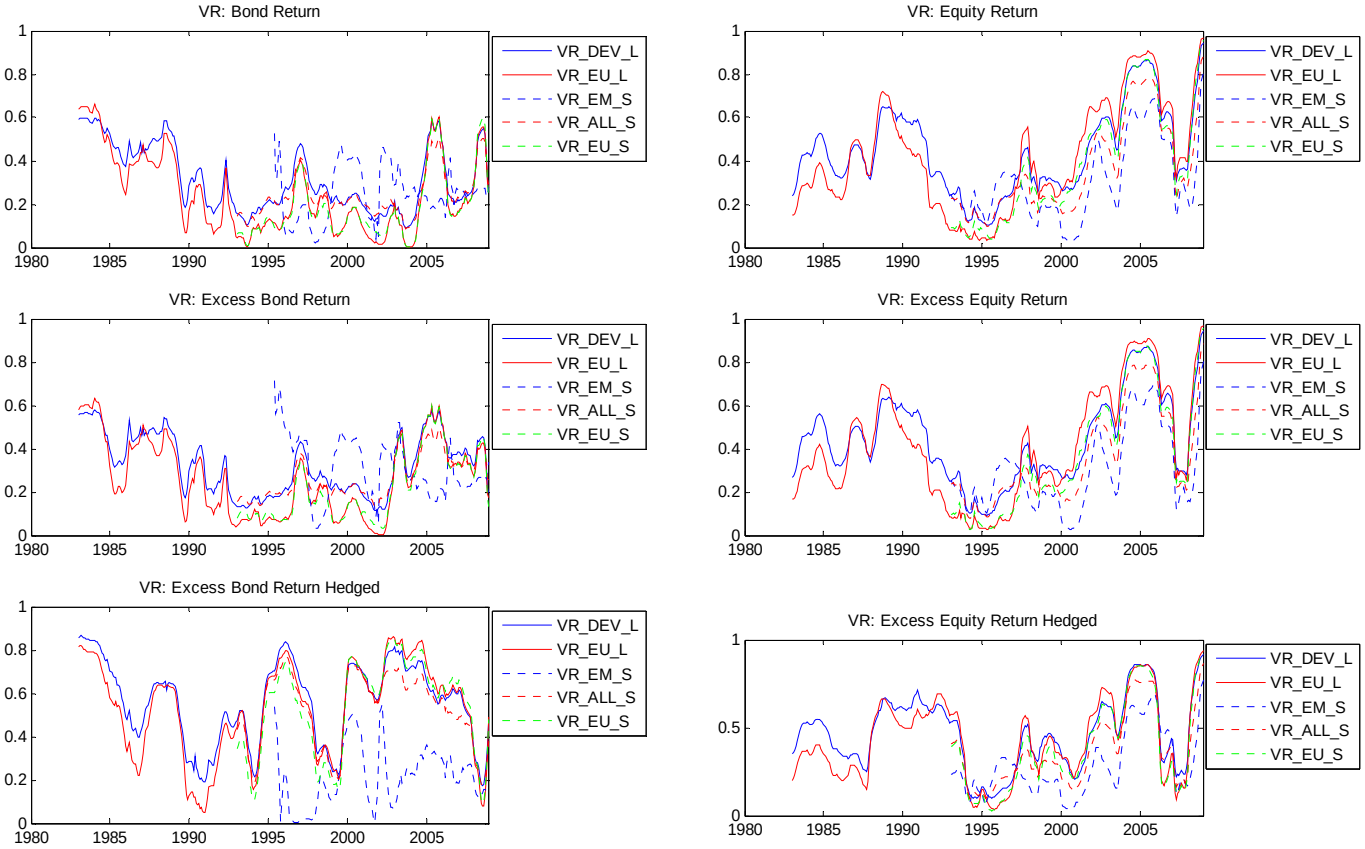

Figure 4-b. Variance ratios of return variables ($x_{glob,t} = x_{US,t}$)

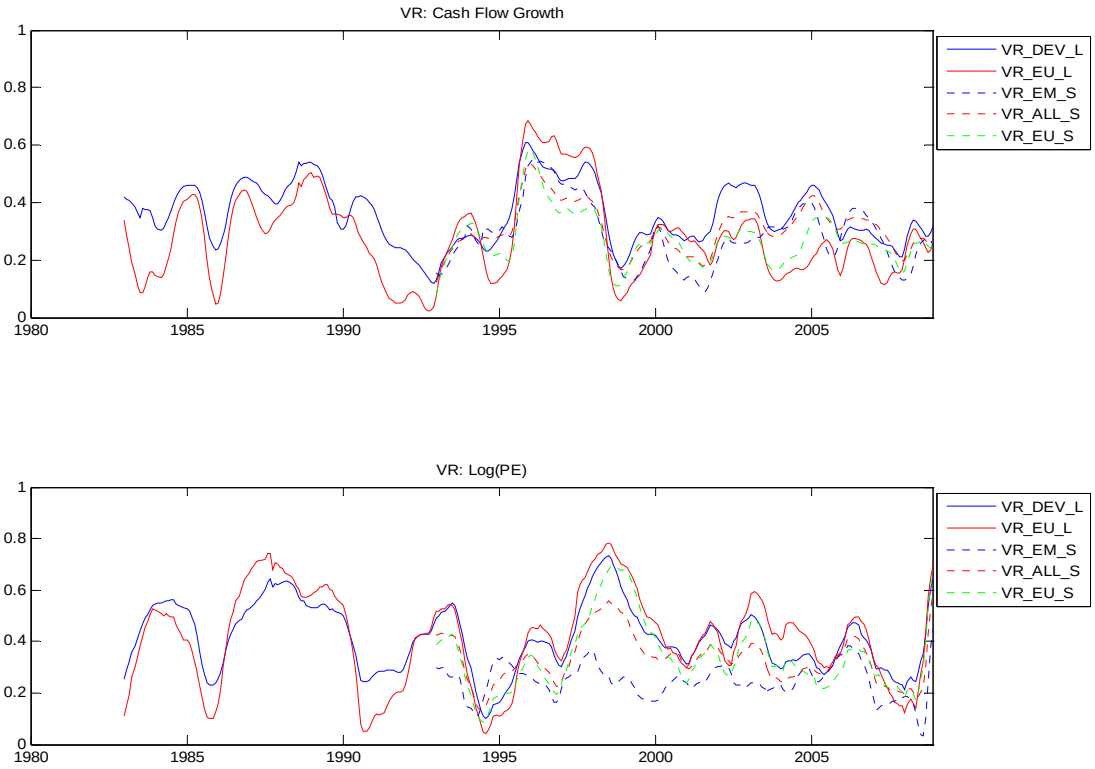

Figure 4-c. Variance ratios of equity valuation variables ($x_{glob,t} = x_{US,t}$)

Note:
Each panel shows the times series of a variable for 5 samples, with "_DEV_L" indicating developed long sample; "_EU_L" indicating EU long sample; "_EM_S" indicating emerging short sample; "_ALL_S" indicating all countries short sample; and "_EU_S" indicating EU short sample.

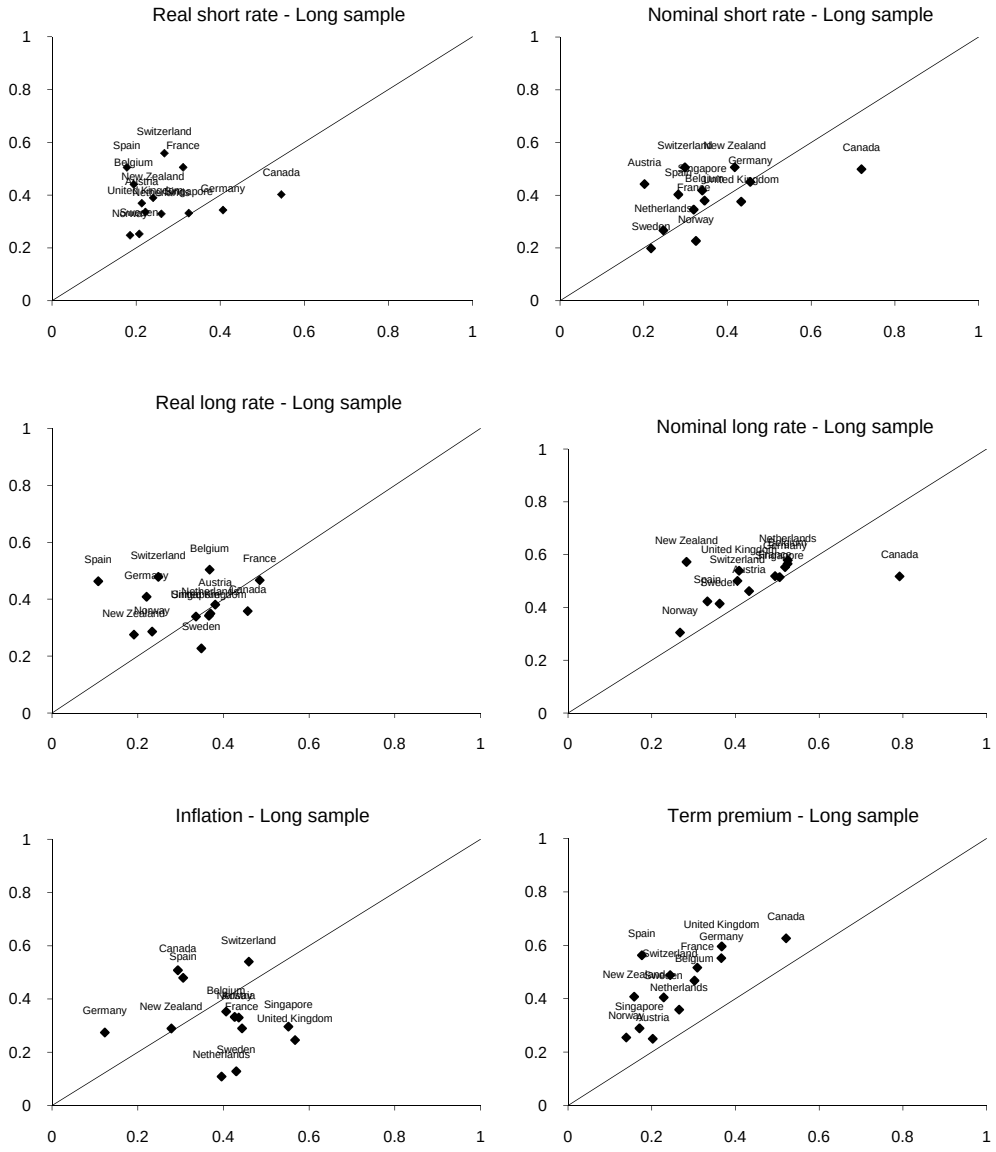

Figure 5-a. Variance ratios of interest rate variables ($x_{glob,t} = x_{US,t}$) splitting the long sample into 2 sub-samples

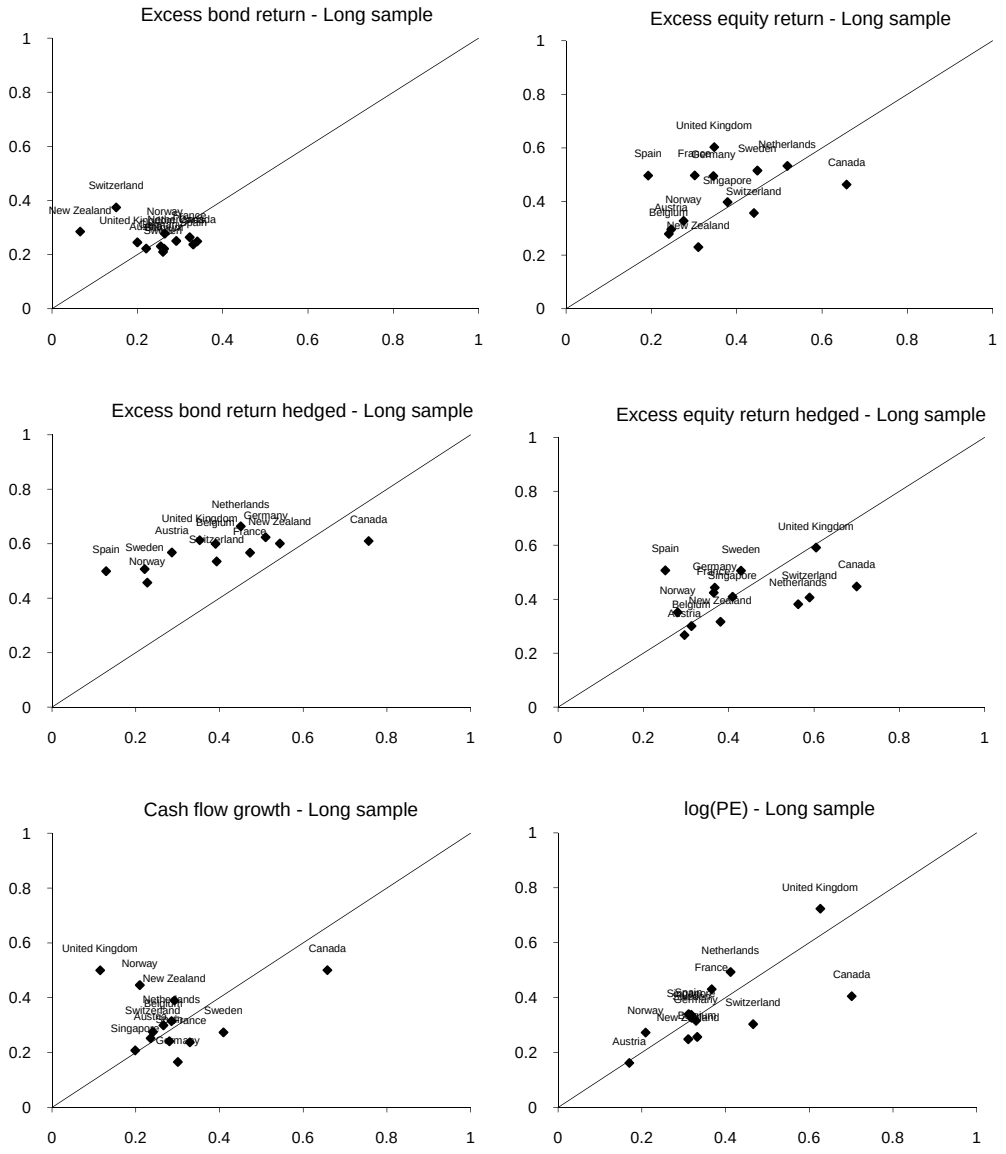

Figure 5-b. Variance ratios of return and equity valuation variables ($x_{glob,t} = x_{US,t}$) splitting the long sample into 2 sub-samples

Note:
The early (x-axis) and later sub-samples (y-axis) for the long sample are 1980-1994 and 1995-2008 respectively.

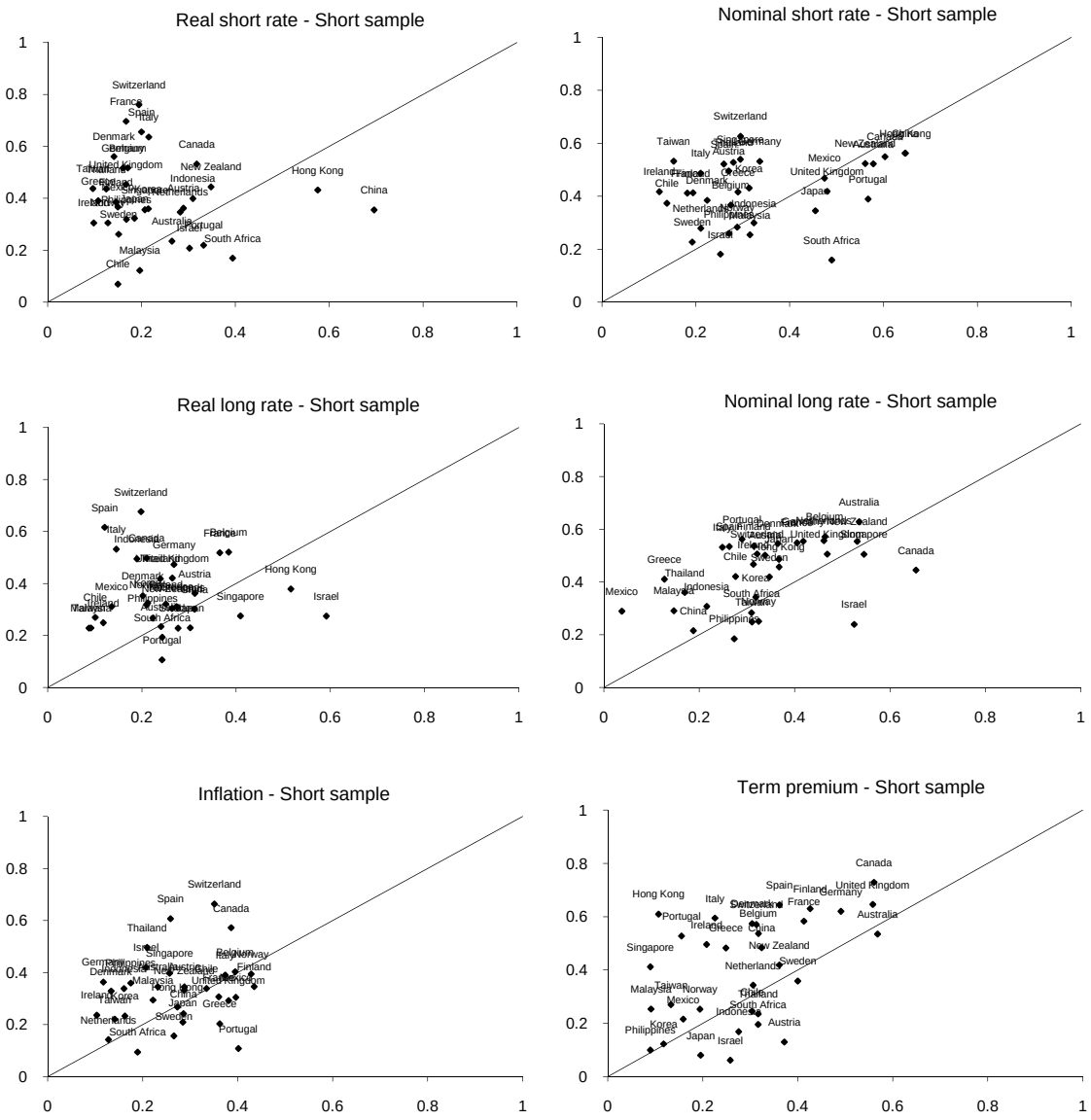

Figure 6-a. Variance ratios of interest rate variables ($x_{glob,t} = x_{US,t}$) splitting the short sample into 2 sub-samples

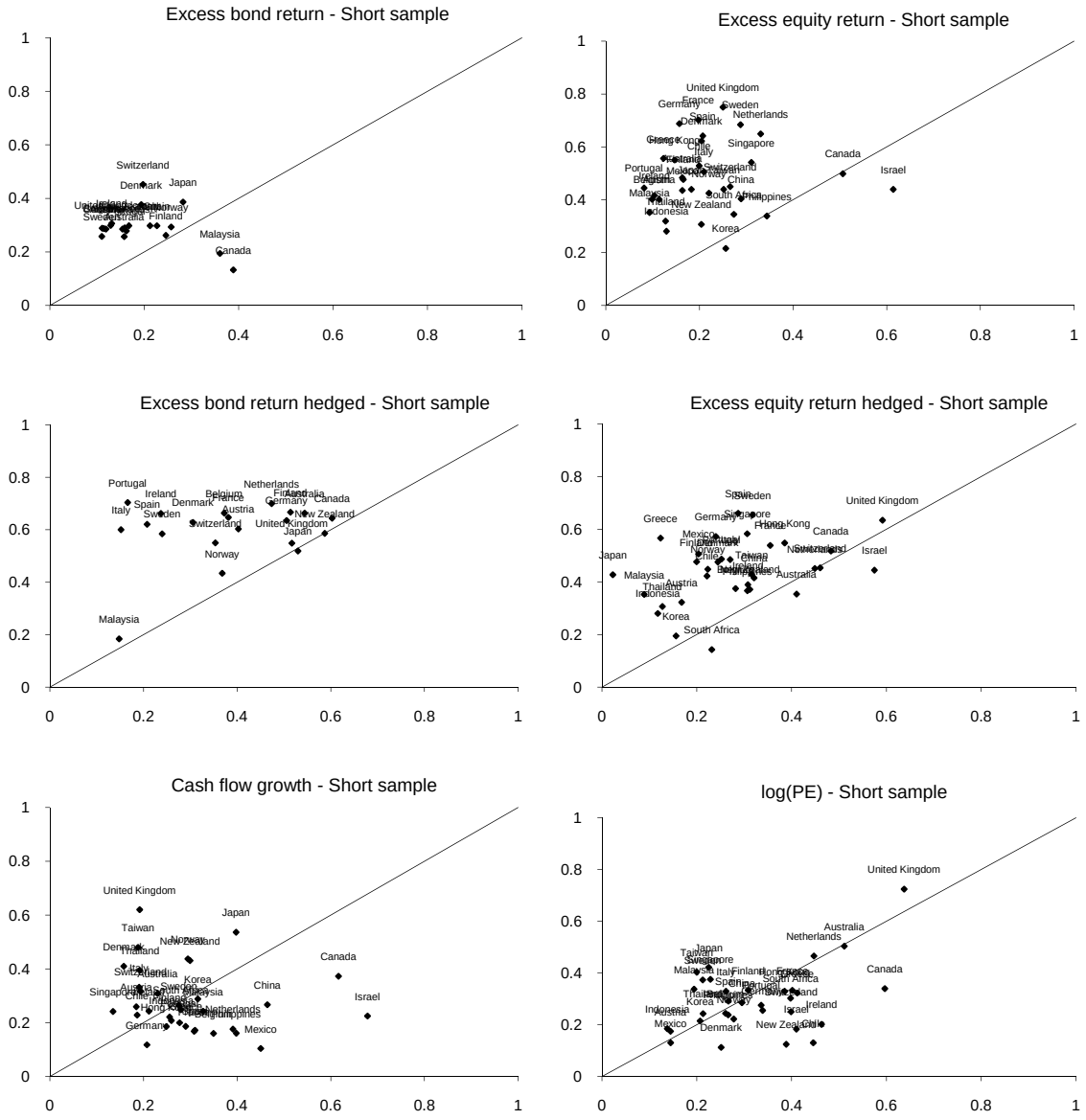

Figure 6-b. Variance ratios of return and equity valuation variables ($x_{glob,t} = x_{US,t}$) splitting the short sample into 2 sub-samples

Note:
The early (x-axis) and later sub-samples (y-axis) for the short sample are 1990-1999 and 2000-2008 respectively.

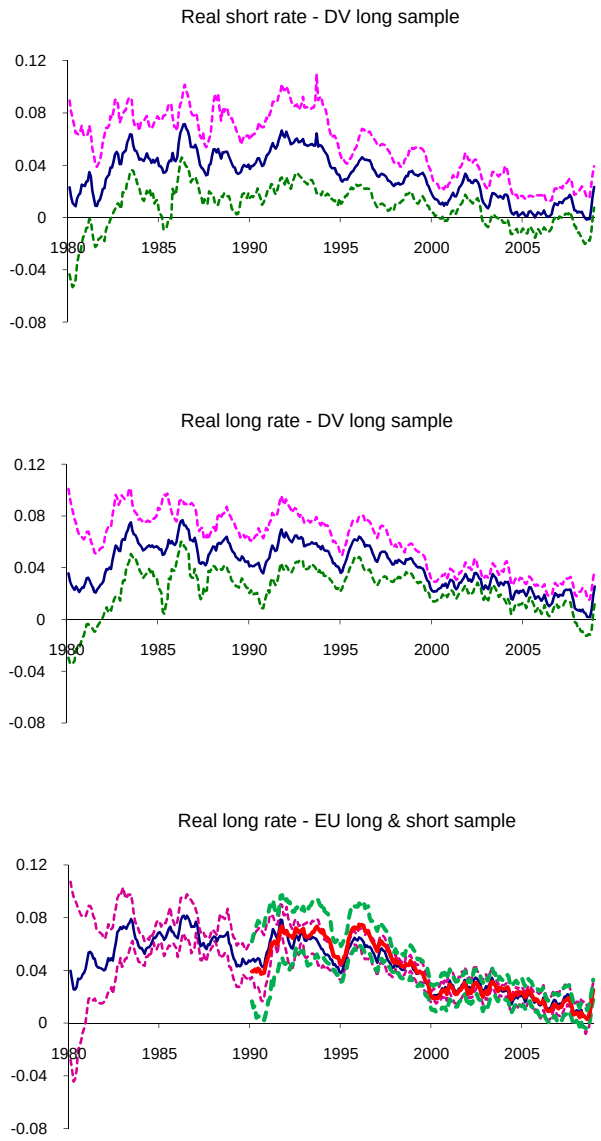

Figure 7: World interest rate with "standard error" bounds for DV and EU sub-samples

Note:

We show the Cochrane-Orcutt estimates of $(\mu+g_t)$ in regressions for different country groups: $x_{i,t} = \mu + g_t + \alpha_i + \varepsilon_{i,t}$ and the upper and lower bound calculated as

$$(\mu + g_t) \pm \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left[(\alpha_i + \varepsilon_{i,t}) - \overline{(\alpha_\iota + \varepsilon_{\iota,t})}\right]^2}$$

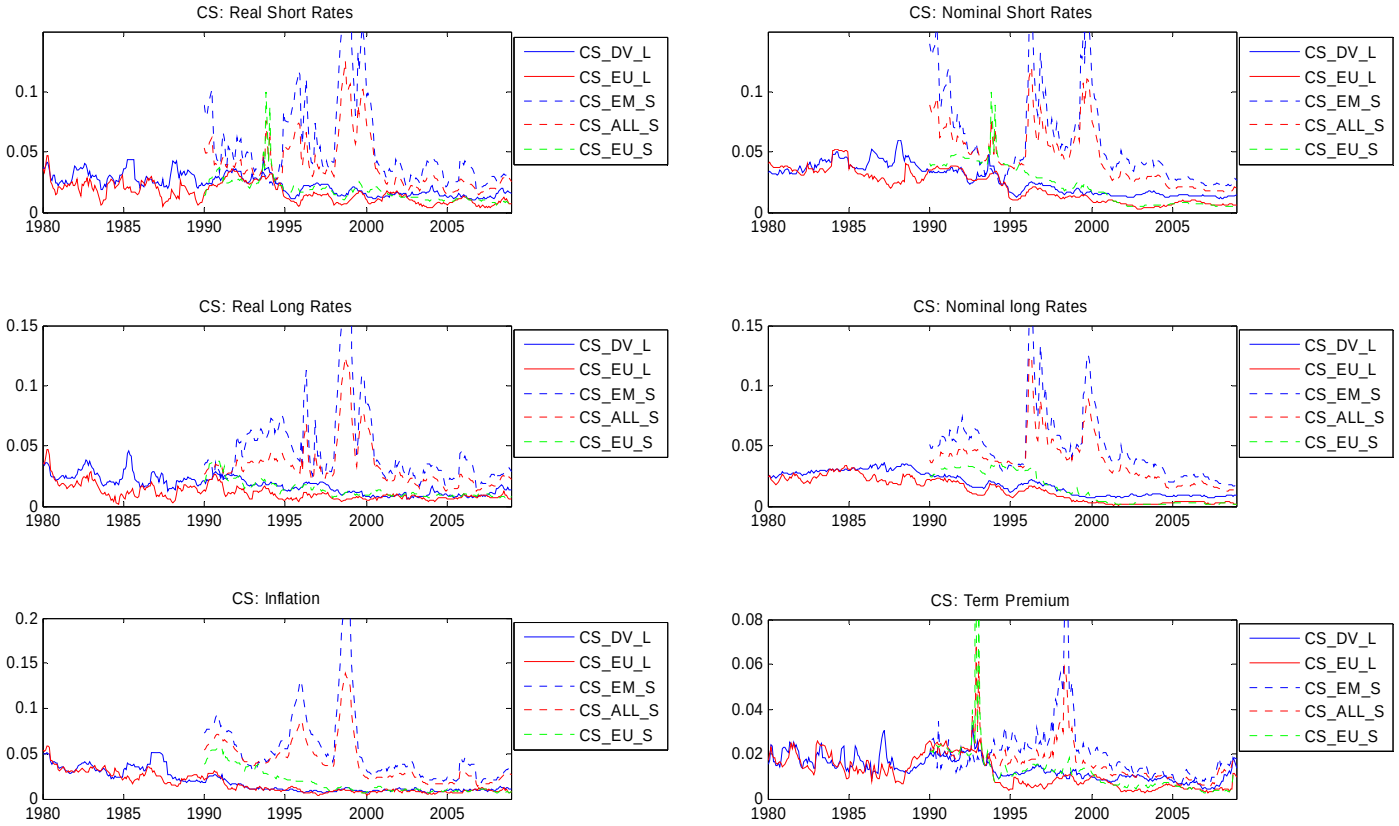

Figure 8-a. Cross-sectional dispersion of interest rate variables

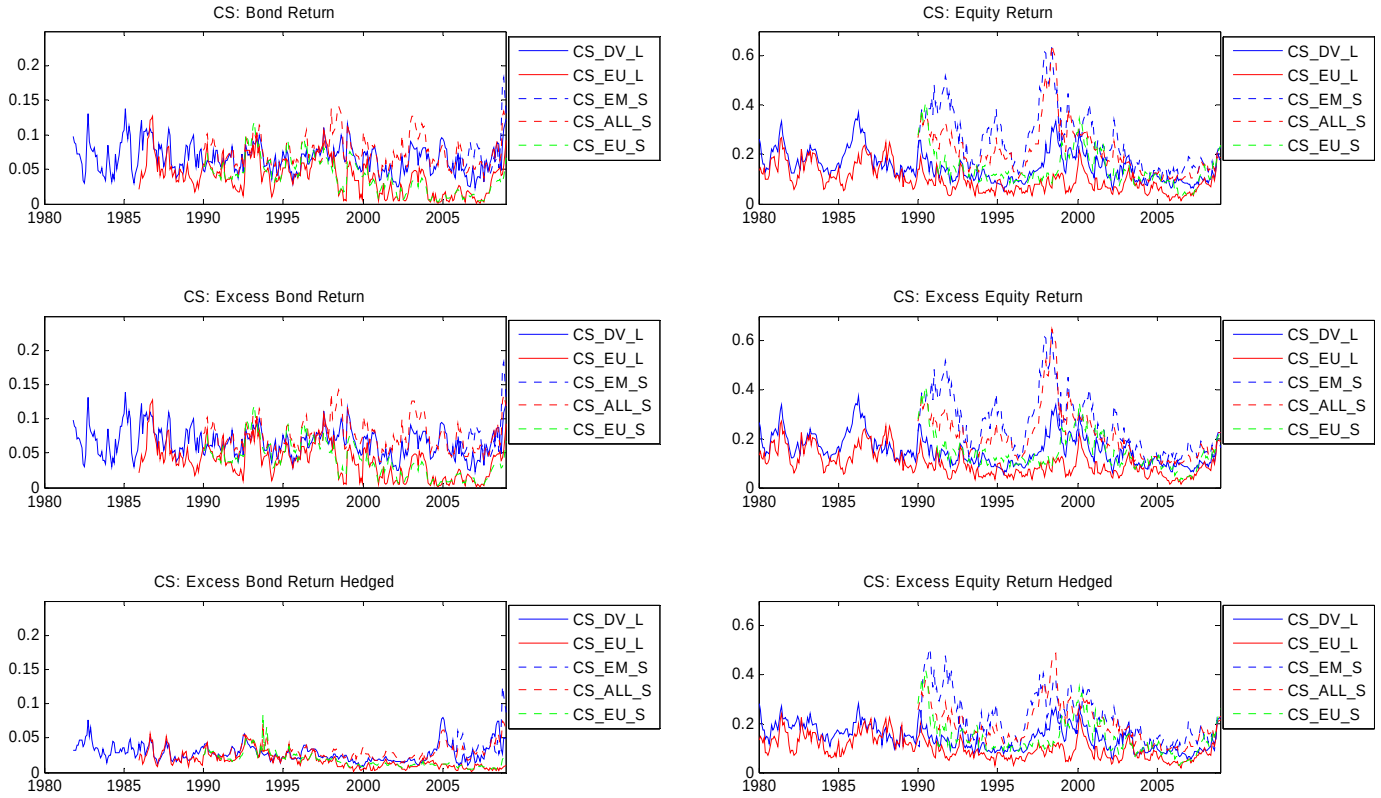

Figure 8-b. Cross-sectional dispersion of return variables

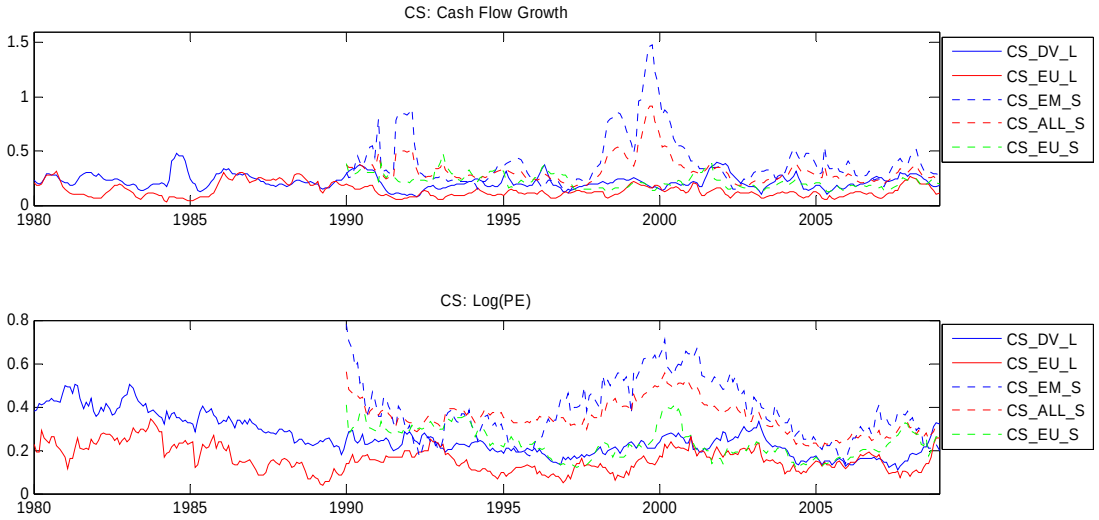

Figure 8-c. Cross-sectional dispersion of equity valuation variables

Note:
Each panel shows the times series of a variable for 5 samples, with "_DEV_L" indicating developed long sample; "_EU_L" indicating EU long sample; "_EM_S" indicating emerging short sample; "_ALL_S" indicating all countries short sample; and "_EU_S" indicating EU short sample.

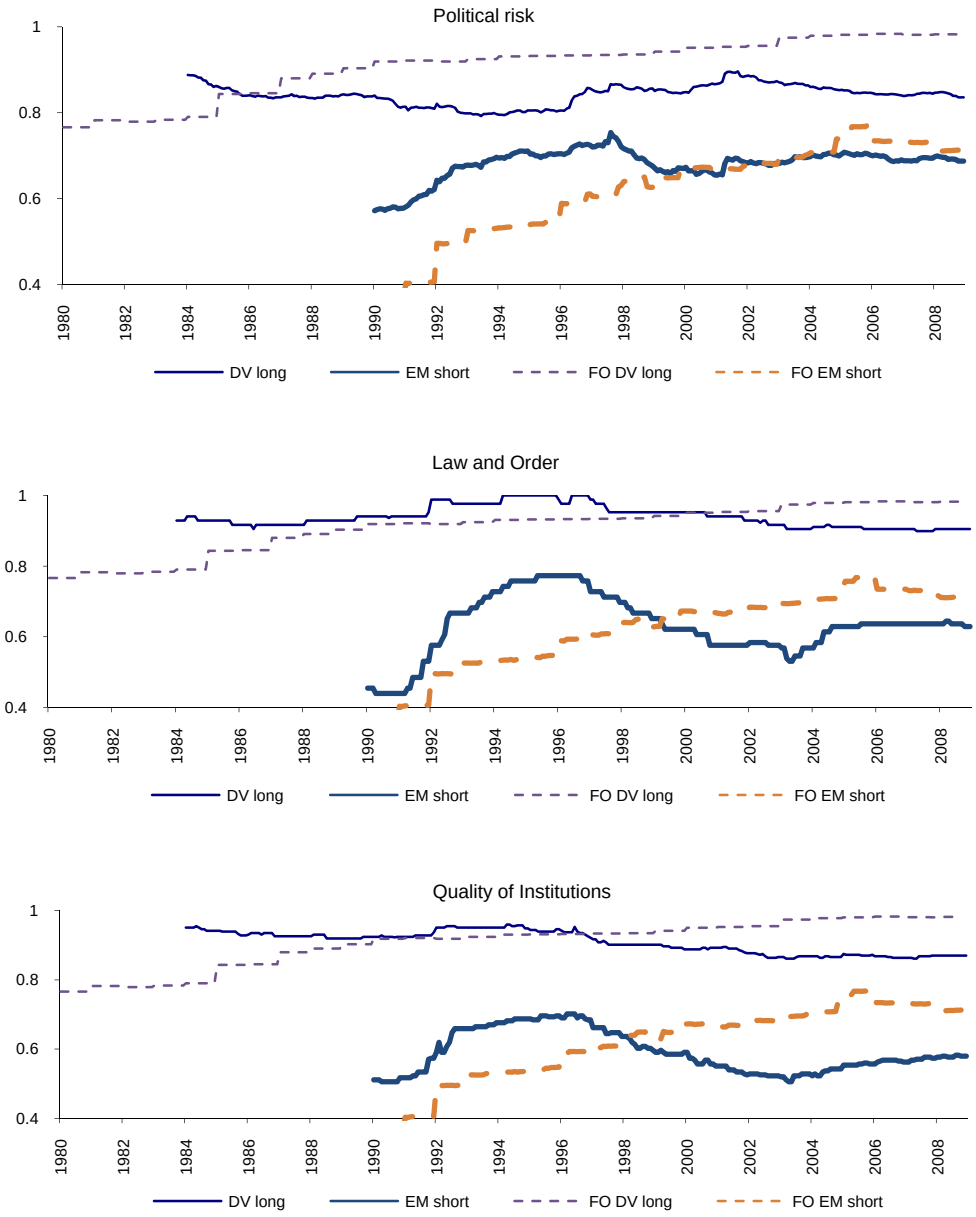

Figure 9. Corporate governance measures

Note:

For display purpose, the graphs of each measure only show two samples, developed long and emerging short, given that EU long and EU short samples typically generate series close to those of developed long sample.

Appendix

A Data appendix

Table A-1. Description of variables
All data are sampled at the monthly frequency except otherwise indicated

	Variable	Description
Interest rate	r_l	Real short term (mostly 3-month) interest rate in local currency: $i_l - \pi$. Source: Treasury bill or equivalent from Datastream and International Financial Statistics
	r_n	Real long term (mostly 10-year) interest rate in local currency: $i_n - \pi$. Source: Treasury bond or equivalent from Datastream and International Financial Statistics
	π	Inflation per annum (Year-on-year CPI change). Source: International Financial Statistics
	i_l	Nominal short term interest rate in local currency. Source: Treasury bill or equivalent from Datastream and International Financial Statistics
	i_n	Nominal long term interest rate in local currency. Source: Treasury bond or equivalent from Datastream and International Financial Statistics
	tp	Term premium in local currency: i_n - i_l. Source: See above
Returns	r_b	Government bond total return (covering all maturities) in USD. Source: Datastream Government Bond indices or Merrill Lynch Emerging Sovereign Indices from Datastream
	er_b	Excess bond return of country j: $r_b^{j,USD} - i_l^{US}$. Source: See above
	er_{hb}	Excess hedged bond return of country j: $r_b^{j,LC} - i_l^{j}$. Source: See above
	r_s	Stock return in USD. Source: MSCI from Datastream
	er_s	Excess equity return of country j: $r_s^{j,USD} - i_l^{US}$. Source: See above
	er_{hs}	Excess hedged equity return of country j: $r_s^{j,LC} - i_l^{j}$. Source: See above
Equity valuation	cf	Cash flow or earnings growth rate $cf_t = \ln(\overline{EA}_t / \overline{EA}_{t-12})$ where $\overline{EA}_t$ = EA_t + EA_{t-1} + EA_{t-2} and EA_t = $MCAP_t$ / PE_t measured in U.S. dollars. Source: MCAP and PE from Datastream
	log(PE)	Log PE ratio using the latest annualized earnings (PEs with negative earnings are set as zero). Source: PE from Datastream

Table A-1. Description of variables (continued)

	Variable	Description
Openness	TO	Trade openness: (Imports + Exports) /GDP. Source: Monthly import and export from Global Insight; annual GDP from Global Insight
	FO	Financial openness: (Official Liberalization dummy + Quinn's measure + Edison Warnock measure + Chinn Ito measure)/4 where Chinn-Ito measure is normalized within a [0,1] range. Source: annual Offical Liberalization from Bekaert and Harvey's (2004) "A Chronology of Important Financial, Economic and Political Events in Emerging Markets"; annual Quinn's capital account openness measure from Quinn and Toyoda (2008); monthly Edison-Warnock measure is constructed from S&P Emerging Market Indices (IFCI/IFCG) from Datastream; annual Chinn-Ito measure from Professor M.D.Chinn's website.
	IO	Investment openness: (FDI Assets + FDI Liabilities)/GDP. Source: International Financial Statistics
Corporate governance	Pol	Political risks index normalized within a [0,1] range. Source: International Country Risk Guide (ICRG)
	Law	Law and Order sub-index normalized within a [0,1] range. Source: International Country Risk Guide (ICRG)
	QualInst	The normalized sum of the Political Risk subcomponents: Corruption, Law and Order and Bureaucratic Quality. Source: International Country Risk Guide (ICRG)

Table A-2. Sample periods by country

	Nominal short term interest rate		Nominal long term interest rate		Inflation		Government bond return		Stock return		PE ratio	
	start	end	start	end	start	end	start	end	start	end	start	end
Australia	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Mar-87	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
Austria	Apr-87	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-85	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
Belgium	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-85	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
Canada	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-85	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
Chile	Jan-94	Dec-08	Jan-94	Dec-08	Jan-80	Dec-08	Jan-05	Dec-08	Jan-88	Dec-08	Jun-89	Dec-08
China	Dec-93	Dec-08	Jan-87	Dec-08	Jan-87	Dec-08	Nov-04	Dec-08	Jan-93	Dec-08	Mar-94	Dec-08
Denmark	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-85	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
Finland	Jun-92	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-89	Dec-08	Jan-88	Dec-08	Mar-88	Dec-08
France	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-85	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
Germany	Jan-80	Dec-08	Jan-80	Dec-08	Jan-92	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
Greece	Jan-83	Dec-08	May-86	Dec-08	Jan-80	Dec-08	Apr-99	Dec-08	Jan-88	Dec-08	Dec-89	Dec-08
Hong Kong	Dec-93	Dec-08	Nov-96	Dec-08	Oct-81	Dec-08	Jan-05	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
Indonesia	Jan-89	Dec-08	Jan-89	Dec-08	Jan-80	Dec-08	Jan-05	Dec-08	Jan-88	Dec-08	Jan-91	Dec-08
Ireland	Jan-80	Dec-08	Mar-81	Dec-08	Jan-80	Dec-08	Jan-85	Dec-08	Jan-88	Dec-08	Jan-80	Dec-08
Israel	Jan-86	Oct-08	Dec-94	Dec-08	Jan-80	Dec-08	-	-	Jan-93	Dec-08	Dec-92	Dec-08
Italy	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-89	Dec-08	Jan-80	Dec-08	Jan-86	Dec-08
Japan	Nov-94	Nov-08	Jan-80	Nov-08	Jan-80	Nov-08	Jan-89	Dec-08	Jan-88	Dec-08	Jan-80	Dec-08
Korea	Mar-91	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-05	Dec-08	Jan-88	Dec-08	Dec-87	Dec-08
Malaysia	Jan-80	Dec-08	Jan-81	Dec-08	Jan-80	Dec-08	Jan-94	Dec-08	Jan-88	Dec-08	Jan-86	Dec-08
Mexico	Jan-80	Dec-08	Jan-95	Dec-08	Jan-80	Dec-08	Jan-02	Dec-08	Jan-88	Dec-08	Jun-90	Dec-08
Netherlands	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
New Zealand	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-89	Dec-08	Jan-88	Dec-08	Jan-88	Dec-08
Norway	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-89	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
Philippines	Jan-80	Dec-08	Feb-87	Dec-08	Jan-80	Dec-08	Jan-05	Dec-08	Jan-88	Dec-08	Sep-87	Dec-08
Portugal	Feb-95	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-93	Dec-08	Jan-88	Dec-08	Jan-90	Dec-08
Singapore	Jan-80	Dec-08	May-87	Dec-08	Jan-80	Dec-08	Jan-00	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
South Africa	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Sep-00	Dec-08	Jan-93	Dec-08	Jan-80	Dec-08
Spain	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-99	Dec-08	Jan-80	Dec-08	Feb-87	Dec-08
Sweden	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-85	Dec-08	Jan-80	Dec-08	Jan-82	Dec-08
Switzerland	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Dec-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
Taiwan	Feb-82	Dec-08	Apr-89	Dec-08	Jan-80	Dec-08	Jul-00	Dec-08	Jan-88	Dec-08	Apr-88	Dec-08
Thailand	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Feb-05	Dec-08	Jan-88	Dec-08	Jan-87	Dec-08
U.K.	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08
U.S.	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08	Jan-80	Dec-08

Table A-3. Summary statistics for the convergence measures

	Panel A:	Portfolio variance ratio				Variance ratio (w.r.t. world level)				Variance ratio (w.r.t. U.S. level)			
		Mean		Std		Mean		Std		Mean		Std	
		DV	EM	DV	EM	DV	EM	DV	EM	DV	EM	DV	EM
Interest rate	Real short rate	-1.219	-1.204	0.492	0.543	0.313	0.320	0.120	0.111	0.298	0.279	0.148	0.107
	Real long rate	-0.942	-1.097	0.358	0.423	0.385	0.420	0.148	0.140	0.242	0.215	0.160	0.102
	Inflation	-1.100	-1.402	0.438	0.587	0.378	0.377	0.184	0.212	0.188	0.160	0.118	0.077
	Nominal short rate	-0.843	-1.015	0.445	0.498	0.376	0.453	0.141	0.096	0.361	0.298	0.161	0.093
	Nominal long rate	-0.502	-1.212	0.420	0.636	0.540	0.568	0.135	0.091	0.347	0.268	0.098	0.067
	Term premium	-0.880	-1.453	0.473	0.380	0.506	0.565	0.145	0.118	0.420	0.408	0.130	0.100
Returns	Bond return	-0.441	-1.133	0.218	0.191	0.781	0.924	0.271	0.030	0.125	0.201	0.090	0.057
	Excess bond return	-0.457	-1.060	0.248	0.107	0.781	0.932	0.269	0.031	0.109	0.168	0.094	0.048
	Excess bond return hedged	-0.352	-0.850	0.272	0.418	0.818	0.933	0.224	0.041	0.378	0.516	0.110	0.054
	Equity return	-0.801	-0.756	0.502	0.461	0.579	0.611	0.152	0.156	0.353	0.359	0.130	0.137
	Excess equity return	-0.788	-0.745	0.509	0.460	0.588	0.619	0.154	0.156	0.348	0.352	0.127	0.135
	Excess equity return hedged	-0.530	-0.707	0.362	0.391	0.664	0.685	0.169	0.163	0.400	0.398	0.122	0.123
Equity valuation	Cash flow growth	-1.602	-1.480	0.770	0.472	0.292	0.375	0.153	0.131	0.218	0.218	0.057	0.067
	Log(PE ratio)	-1.004	-1.359	0.376	0.592	0.430	0.455	0.136	0.148	0.305	0.302	0.139	0.150

Table A-3. Summary statistics for the convergence measures (continued)

	Panel B:	Country effect standard deviation				Alt. country effect standard deviation			
		Mean		Std		Mean		Std	
		DV	EM	DV	EM	DV	EM	DV	EM
Interest rate	Real short rate	0.039	0.063	0.007	0.034	0.034	0.048	0.007	0.021
	Real long rate	0.041	0.067	0.002	0.029	0.037	0.055	0.001	0.021
	Inflation	0.034	0.088	0.012	0.036	0.028	0.067	0.008	0.016
	Nominal short rate	0.062	0.112	0.008	0.028	0.057	0.094	0.007	0.014
	Nominal long rate	0.067	0.110	0.009	0.018	0.063	0.097	0.007	0.006
	Term premium	0.016	0.023	0.011	0.012	0.013	0.018	0.009	0.008
Returns	Bond return	0.103	0.101	0.014	0.031	0.090	0.086	0.011	0.029
	Excess bond return	0.077	0.082	0.017	0.030	0.063	0.070	0.014	0.028
	Excess bond return hedged	0.032	0.054	0.014	0.020	0.025	0.043	0.010	0.012
	Equity return	0.179	0.266	0.065	0.126	0.141	0.218	0.047	0.110
	Excess equity return	0.163	0.259	0.066	0.126	0.125	0.213	0.048	0.108
	Excess equity return hedged	0.152	0.225	0.063	0.100	0.116	0.186	0.043	0.088
Equity valuation	Cash flow growth	0.293	0.504	0.061	0.254	0.224	0.380	0.042	0.182
	Log(PE ratio)	2.697	2.572	0.041	0.055	2.679	2.540	0.039	0.044

Table A-3. Summary statistics for the convergence measures (continued)

	Panel C:	Cross-sectional dispersion				Adjusted cross-sectional dispersion			
		Mean		Std		Mean		Std	
		DV	EM	DV	EM	DV	EM	DV	EM
Interest rate	Real short rate	0.022	0.054	0.010	0.037	1.746	1.053	0.637	0.807
	Real long rate	0.018	0.047	0.006	0.035	1.682	1.173	0.517	0.973
	Inflation	0.019	0.054	0.010	0.039	2.202	1.776	0.737	0.964
	Nominal short rate	0.026	0.057	0.013	0.036	2.765	2.280	0.748	0.877
	Nominal long rate	0.019	0.048	0.010	0.028	2.752	2.702	0.659	0.906
	Term premium	0.013	0.020	0.008	0.012	1.517	1.434	0.873	0.792
Returns	Bond return	0.065	0.074	0.020	0.030	-0.013	0.650	0.644	0.519
	Excess bond return	0.065	0.074	0.020	0.030	0.002	0.628	0.650	0.545
	Excess bond return hedged	0.026	0.043	0.012	0.022	-0.096	0.471	1.137	0.705
	Equity return	0.157	0.254	0.066	0.121	0.450	0.331	0.761	0.784
	Excess equity return	0.157	0.254	0.066	0.121	0.447	0.329	0.766	0.783
	Excess equity return hedged	0.148	0.217	0.062	0.094	0.320	0.256	0.783	0.700
Equity valuation	Cash flow growth	0.230	0.402	0.056	0.240	0.872	0.837	0.484	0.835
	Log(PE ratio)	0.305	0.380	0.065	0.138	1.916	1.551	0.497	0.694

Note:
In Panel A through C, we report the mean and standard deviation of various comovement measures for the economic variables in the short sample (post-1990) for developed (DV columns) and emerging (EM columns) markets. With the exception of the variance ratios in Panel A, we only have one time series for either the developed or emerging markets group, so the mean and standard deviation represent time series properties. For variance ratio, we first take the mean of each variables in each country, then compute the cross-sectional mean and standard deviation across the countries within each group.

B Decomposition of cross-sectional dispersion

Consider the sequence of the cross-sectional dispersion as:

$$CS_t^2 = \frac{1}{N}\sum_{i=1}^{N}(x_t^i - \bar{x}_t)^2 \tag{B-1}$$

This statistic can be decomposed as follows:

$$CS_t^2 = \frac{1}{N}\sum_{i=1}^{N}\left[\left(x_t^i - \bar{x}^i\right) + \left(\bar{x}^i - \bar{x}_t\right)\right]^2$$

$$= \frac{1}{N}\sum_{i=1}^{N}\left(x_t^i - \bar{x}^i\right)^2 + \frac{1}{N}\sum_{i=1}^{N}\left(\bar{x}^i - \bar{x}_t\right)^2 + 2\frac{1}{N}\sum_{i=1}^{N}\left(x_t^i - \bar{x}^i\right)\left(\bar{x}^i - \bar{x}_t\right) \tag{B-2}$$

$$= \quad A \quad + \quad B \quad + \quad C$$

Taking time series expectations, it follows that $E[CS_t^2] = E[A] + E[B] + E[C]$ where

$$E[A] = \frac{1}{N}\sum_{i=1}^{N}\sigma_i^2 = \frac{1}{N}\sum_{i=1}^{N} var(x_t^i) \tag{B-3}$$

$$E[C] = 2\frac{1}{T}\sum_{t=1}^{T}\frac{1}{N}\sum_{i=1}^{N}(x_t^i - \bar{x}^i)\,\bar{x}^i - 2\frac{1}{T}\sum_{t=1}^{T}\frac{1}{N}\sum_{i=1}^{N}(x_t^i - \bar{x}^i)\,\bar{x}_t$$

$$= 2\frac{1}{N}\sum_{i=1}^{N}\bar{x}^i\frac{1}{T}\sum_{t=1}^{T}(x_t^i - \bar{x}^i) - 2\frac{1}{T}\sum_{t=1}^{T}\bar{x}_t\frac{1}{N}\sum_{i=1}^{N}(x_t^i - \bar{x}^i)$$

$$= 0 - 2\frac{1}{T}\sum_{t=1}^{T}\bar{x}_t(\bar{x}_t - \bar{\bar{x}})$$

$$= 2var(\bar{x}_t) \tag{B-4}$$

$$E[B] = E\left[\frac{1}{N}\sum_{i=1}^{N}\left(\bar{x}^i - \bar{x}_t\right)^2\right]$$

$$= E\left[\frac{1}{N}\sum_{i=1}^{N}\left(\bar{x}^i - \bar{\bar{x}}\right)^2 + \frac{1}{N}\sum_{i=1}^{N}(\bar{\bar{x}} - \bar{x}_t)^2 + 2\frac{1}{N}\sum_{i=1}^{N}\left(\bar{x}^i - \bar{\bar{x}}\right)(\bar{\bar{x}} - \bar{x}_t)\right]$$

$$= E\left[\frac{1}{N}\sum_{i=1}^{N}\left(\bar{x}^i - \bar{\bar{x}}\right)^2 + \sum_{i=1}^{N}(\bar{\bar{x}} - \bar{x}_t)^2\right]$$

$$= \overline{CS}^2 + E[(\bar{\bar{x}} - \bar{x}_t)^2] \tag{B-5}$$

where $\overline{CS}^2 = \frac{1}{N}\sum_{i=1}^{N}\left(\bar{x}_t^i - \bar{\bar{x}}\right)^2$ is the cross-sectional variance applied to country means. This imples

$$E[B] = \overline{CS}^2 + var(\bar{x}_t) \tag{B-6}$$

Hence, collecting terms, we find:

$$E[CS_t^2] = \frac{1}{N}\sum_{i=1}^{N} var(x_t^i) + \overline{CS}^2 - var(\bar{x}_t) \quad \text{(B-7)}$$

C Identifying equity risk premium using an affine model

We assume an AR(1) equation system of the real long term interest rate, equity premium and cash flow growth rate:

$$\begin{cases} r_t = \mu_t + \varphi_r \cdot r_t + \varepsilon_{r,t} \\ ep_t = \mu_{ep} + \varphi_{ep} \cdot ep_{t-1} + \varepsilon_{ep,t} + v \cdot \varepsilon_{r,t} \\ cf_t = \mu_{cf} + \varphi_{cf}.cf_{t-1} + \varepsilon_{cf,t} \end{cases} \quad \text{(C-1)}$$

where r is the real long term interest rate, ep is the equity premium, cf is the cash flow real growth rate, $\varepsilon_{r,t} \sim N(0,\sigma_r^2)$, $\varepsilon_{ep,t} \sim N(0,\sigma_{ep}^2)$, $\varepsilon_{cf,t} \sim N(0,\sigma_{cf}^2)$, and the 3 error terms are uncorrelated.

In addition, we assume

$$\delta_t \equiv r_t + ep_t \quad \text{(C-2)}$$

Using system (C-1) and equation (C-2), we linearize the expression of PE ratio

$$PE_t = \frac{V_t}{EA_t} = E_t\left[\sum_{k=1}^{\infty} e^{-\sum_{l=0}^{k-1}\delta_{t+l}} EA_{t+k}\right] / EA_t \quad \text{(C-3)}$$

From equation (C-3), we derive an identity:

$$pe_t = \overline{pe} + a \cdot r_t + b \cdot ep_t + c \cdot cf_t \quad \text{(C-4)}$$

where pe_t is $\log(PE_t)$.

Replacing ep in system (C-1) using equation (C-4), the system becomes

$$\begin{cases} r_t = \mu_t + \varphi_r.r_t + \varepsilon_{r,t} \\ pe_t = m_1 + m_2 pe_{t-1} + m_3 r_t + m_4 r_{t-1} + m_5 cf_t + m_6 cf_{t-1} + \eta_{pe,t} \\ cf_t = \mu_{cf} + \varphi_{cf}.cf_{t-1} + \varepsilon_{cf,t} \end{cases} \quad \text{(C-5)}$$

Then all the coefficients in system (C-5) are identified. Moreover, m_3 and m_5 here correspond to a and c in (C-4) respectively. Therefore, a and c can be estimated.

Note that we cannot identify b and hence only get an affine function of the equity premium:

$$afep_t = pe_t - \hat{a} \cdot r_t - \hat{c} \cdot cf_t \quad \text{(C-6)}$$

For each country, we estimate a and c using an unrestricted OLS regression of the second equation in (C-5) and construct the time series of the affine function of the equity premium $afep_t$. Because afep is not the equity premium itself, we cannot use convergence measures that depend on scale.