International Financial Market Integration,

Capital Flows and Quantitative Easing in the U.S.

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Abstract

We examine the impact of three rounds of quantitative easing (QE1, QE2 and QE3) in the U.S. on financial market integration and capital flows across 31 countries. We find that market integration levels significantly increase during QE1 and QE2 but decrease during QE3 with the exception of emerging countries. Using 3SLS estimations of three simultaneous-equations regressions, we find that the market integration level is positively (negatively) related to capital flows for emerging (developed) countries during non-QE period. The tendency of such relations to weaken or disappear during the QEs depends on the asset class considered and level of economic development.

Keyword: *Quantitative Easing; Financial Market Integration; Capital Flows; Emerging Markets*

JEL Classification: E52, E58, F21, F36, G15

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ABSTRACT: We examine the impact of three rounds of quantitative easing (QE1, QE2 and QE3) in the U.S. on financial market integration and capital flows across 31 countries. We find that market integration levels significantly increase during QE1 and QE2 but decrease during QE3 with the exception of emerging countries. Using 3SLS estimations of three simultaneous-equations regressions, we find that the market integration level is positively (negatively) related to capital flows for emerging (developed) countries during non-QE period. The tendency of such relations to weaken or disappear during the QEs depends on the asset class considered and level of economic development.

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1. INTRODUCTION

In response to the recent financial crisis and to bring the U.S. economy out of the recent recession, the U.S. Fed initiated an unconventional monetary policy, Q*uantitative Easing* or QE for short, in late November 2008. The first QE round began with the purchase of about $600 billion of mortgage-backed securities (MBS) by the Fed to inject liquidity and credit into financial markets. Although this alleviated the impact of the subprime crisis on the banking sector it did not boost economic growth because the banks did not re-inject this additional credit and liquidity into other economic sectors (Benmelech and Bergman, 2012). During the second QE round (November 2010 to June 2011), the Fed bought about $600 billion of treasury securities to stimulate demand and reduce the unemployment rate. To further assist liquidity and the economy, the third QE round consisting of a new $40 billion per month, open-ended bond purchasing program of agency MBS was announced in September 2012.[1]

[1] Respective sources for details about each QE round are:
http://www.federalreserve.gov/newsevents/press/monetary/20081125b.htm;

While these purchases were confined to the U.S., recent studies show that the QEs also generated profound impacts on non-U.S. economies through a portfolio-balancing channel (Bernanke, 2012; Gagnon *et al*., 2011; Joyce *et al.*, 2011a; Hamilton and Wu, 2012; Neely, 2015), signaling channel (Bernanke, 2012; Bauer and Neely, 2014; Krishnamurthy and Vissing-Jorgensen, 2011), liquidity premium channel (Gagnon *et al.* 2011; Joyce *et al.* 2011a; Krishnamurthy and Vissing-Jørgensen, 2011) and/or a confidence channel (Joyce *et al*., 2011b). Also, the increased monetary base in the U.S. during the QE periods significantly affected international capital flows (Fratzscher *et al.*, 2013; Lim and Mohapatra, 2016) and foreign exchange risk (Kryzanowski, Zhang and Zhong, 2016a); two important determinants of cross-country market integration. Nevertheless, little is known about how unconventional monetary policies affect international market integration and its relation with international capital flows.

In this paper, we examine the influence of QEs on international market integration, capital flows and currency hedging performance across 31 countries, including both emerging markets (henceforth, EM) and developed markets (henceforth, DM) during the 2003-2014 period. Empirically, we find that the average international integration level from the perspective of a U.S. investor significantly increases (decreases) during QE1 and QE2 (QE3) for both the bond and stock markets with the exception of the EM bond markets. Using a system of simultaneous equations of market integration, capital flows and currency hedging performance, we find that market integration (INTEGR) is significantly and negatively (positively) related with capital flows scaled by domestic GDP (CAP/GDP) during the non-QE period for both bond and stock markets of the

http://money.cnn.com/2010/11/03/news/economy/fed_decision/index.htm; and http://www.federalreserve.gov/newsevents/press/monetary/20121024a.htm

DM (EM) countries. Furthermore, such relations between INTEGR and CAP/GDP tended to disappear or weaken during the QE periods.

We first examine the changes of INTEGR measured using the approach of Pukthuanthong and Roll (2009) during the three QE periods.[2] Compared to the non-QE period, we document that average market integration significantly increases during QE1 and QE2 for the bond and stock markets of All, DM and EM countries, and significantly decreases during QE3 except for the significant increase for the bond market of the EM countries. The percentage changes based on the elasticities at the mean are considerably higher during QE1 and QE2 for the EM countries (about 12.81% and 16.84%) versus the DM countries (2.53% and 3.80%).[3]

Since international financial market integration, capital flows and currency hedging performance are determined simultaneously (Evans and Hnatkovska, 2014; Reinhardt *et al.*, 2013; Caporale *et al.*, 2015; Brooks *et al.*, 2004), we formulate a three-equation system to capture the simultaneous effects between capital flows (CAP/GDP) and integration (INTEGR) while allowing hedging performance (δSHARPE) to depend on both CAP/GDP and INTEGR. The coefficients of this system are estimated using a standard three-stage least squares procedure. For international bond markets, we find that INTEGR as the dependent variable is significantly and negatively (positively) related with the CAP/GDP during the non-QE period for the DM (EM) countries. Such relations tend to disappear for the DM countries and weaken for the EM countries during the QE periods. In particular, the significantly negative relation for the DM countries remains only during

[2] This integration measure is also applied by Berge *et al.* (2011), Berger and Pukthuanthong (2012) and Christiansen (2014).
[3] The average of the integration levels in bond (stock) markets in DM and EM countries are 79% and 57% (74% and 62%)(see Panel B of Table 3), respectively. The incremental percentage is equal to the estimated coefficient of a QE dummy divided by the corresponding mean of the integration level. For example, it is equal to 16.84% (i.e., 7.3%/57%) for the EM bond markets during QE1.

QE2, while the significantly positive relations for the EM countries become significantly less positive during the QE periods. The magnitude of the elasticity at the mean of CAP/GDP for the EM countries is much bigger than that for the DM countries. For international stock markets, we document a similar negative (positive) relation between INTEGR as the dependent variable and CAP/GDP during the non-QE period for the DM (EM) countries. Such relations generally tend to disappear for both the DM and EM countries during the QE periods. In contrast to the bond markets, the magnitude of the elasticity of CAP/GDP for the DM countries is much bigger than that for the EM countries.

We perform robustness checks by restricting the simultaneous equations to have only QE-conditioned intercepts or QE-conditioned coefficients of the dependent-as-independent variables. We confirm that the significant and negative (positive) relations between bond or equity INTEGR as the dependent variable and debt (or equity) CAP/GDP as an independent variable for the DM (EM) countries during the non-QE period are robust for both restricted models.

To the best of our knowledge, our paper is the first one to examine the influence of an unconventional monetary policy on the evolution of international bond and stock market integration and on the relation between international market integration and capital flows in the DM and EM countries. As such, it contributes to the on-going debate on international market integration and on capital flows. For example, Evan and Hnatkovska (2014) develop a theoretical model to study how greater financial market integration affects the behavior of international capital flows. Sutherland (1996) shows that market integration reduces the frictions that inhibit asset trade. Reinhardt et al. (2010) provide evidence that the financial openness at various stages of economic development affects capital flows. However, none of these works consider the impact of unconventional monetary policy. Our paper is also related to the emerging strand of literature that examines the effects of the QE rounds on various economic indicators such as economic growth, employment and inflation (e.g., Thornton, 2010; Fuhrer and Olivei, 2011; Bernanke, 2012; Chung *et al*., 2012) and financial indicators, including the long-term interest rate (e.g., Gagnon *et al*., 2011; Krishnamurthy and Vissing-Jorgensen, 2011), Treasury supply and bond yields (e.g., Hamilton and Wu, 2012; Wright, 2012; D'Amico and King, 2013; Greenwood and Vayanos, 2014), market liquidity (Christensen and Gillan, 2014) and cross-financial-market correlations (Kryzanowski, Zhang and Zhong, 2016b).

Our findings have implications for public monetary policy and for private and public sector participants in financial markets. As noted above, the QEs tend to have different impacts on capital flows and the level of market integration, which in turn, tend to have different effects on the benefits and uncertainties associated with hedging financial asset risk in international markets for sovereign borrowers, public and private pension funds and other financial asset managers. In addition, these unintended consequences can be expected to have implications for the international activities of the corporate sector including investment in real assets.

The rest of the paper is organized as follows: Section 2 describes the sample and data. Section 3 describes the methodology used to calculate the integration measure. Section 4 reports the empirical results. Section 5 presents robustness checks with restricted simultaneous equations and Section 6 concludes. The definitions of the variables are reported in Appendix A.

2. SAMPLE AND DATA

The stock and bond indices are collected from those included in the Morgan Stanley Capital International (MSCI) index, the J.P. Morgan (JPM) Global Bond Broad Indices (GBI Broad) and the JPM Government Bond Index - Emerging Markets Broad (GBI-EM Broad) Indices. We match all countries from the JPM GBI Broad and GBI-EM Broad Indices with those from the MSCI

Equity Indices. After removing the countries with missing observations, our sample covers 19 developed markets (DM) and 12 emerging markets (EM)[4] over the time period from September 2003 to November 2014.

We use weekly total returns denominated in local currencies for all stock and bond indices. The bond indices for the DM and EM countries are those included in the GBI Broad index and the GBI-EM Broad index, respectively.[5] For the four countries included in both bond indices, we use the JPM GBI Broad index for Hungary, Poland, and South Africa, and the JPM GBI-EM Broad index for Mexico to maximize the time coverage available for analysis.

We obtain the spot and forward currency prices on Friday from Datastream and Bloomberg. The U.S. nominal T-bill rates at a weekly frequency on Friday are from French's data library.[6] The WM Reuters Spot and one-month forward U.S. dollar currency prices are the arithmetic means of their closing bids and offers at 4 p.m. U.K. time provided by the WM Company. Missing forward rates are collected from Bloomberg. Since our sample includes 11 countries using the European euro, there are only 20 different currency-denominated forward contracts. Three time dummies, QE1, QE2 and QE3, which are equal to one if the date falls into their respective time periods and zero otherwise, are used to identify each QE round.

We follow Evans and Hnatkovska (2014) and collect the portfolio flow data from the Balance of Payment database complied by the IMF. As a subcategory of the financial accounts, portfolio investments consist of assets and liabilities, both of which include equity and debt securities. We

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[4] The classification of countries as being developed or emerging is based on the categorization used for the MSCI Equity Indices.
[5] The former includes bonds with maturities of 3-5 years (JPM, 2013) and the latter includes government bonds with maturities of at least 13 months.
[6] We thank Kenneth R. French for making the data available on his website. The weekly T-bill rate over four weeks that is compounded to a 1-month T-bill rate is obtained from Ibbotson and Associates, Inc.

calculate the net equity (debt) flows as the difference between their respective inflows and outflows. All flows are measured in USD and scaled by each country's GDP collected from the World DataBank.[7]

3. METHODOLOGY

3. 1 Measuring Integration

Following Pukthuanthong and Roll (2009) and Christiansen (2014) and using the latter's notation,[8] we measure integration as the adjusted R-square obtained from the following OLS regression:

$$r_{i,\tau,t} = \beta_{i,\tau,0} + \beta_{i,\tau,1,t} PF_{i,\tau,1,t} + ... + \beta_{i,\tau,K,t} PF_{i,\tau,K,t} + \varepsilon_{i,\tau,t} \qquad (1)$$

Where $r_{i,\tau,t}$ is the bond or stock return for week *t* for country *i* in year τ, and $PF_{i,\tau,k,t}$ is the return for a country-level bond or stock index *k* (k = 1…K) based on the K main principal components. $R_{i*,\tau-1}$ is defined as the weekly return matrix for all countries other than country *i* for year $\tau - 1$, and its principal components have factor loadings of $\alpha_{i*,\tau-1}$. The bond or stock index returns excluding the country under estimation represented by *i** are given by $PF_{i,\tau,K,t} = R_{i*,\tau} * \alpha_{i*,k,\tau-1}$, where $R_{i*,\tau}$ are the returns in the current year and $\alpha_{i*,k,\tau-1}$ are the factor loadings for the previous year.

The local total return indexes for bonds and stocks in a country are converted into U.S. dollars to mitigate exchange rate noise (Pukthuanthong and Roll, 2009). To account for at least 80% of

[7] Capital flow data are available for 27 countries since portfolio investment data for Colombia, India, Mexico and Singapore are not in the Balance of Payment dataset of the IMF.
[8] Pukthuanthong and Roll (2009) argue that simple correlations not only fail theoretically but they also provide an "imperfect and biased downward empirical depiction of actual market integration".

the cumulative eigenvalues, we extract the first six principal components for bond indexes and eight for stock indexes.[9]

3.2. Integration Time Trend

As in Pukthuanthong and Roll (2009) and Christiansen (2014), we report the level of integration (adjusted R-squares) on an annual basis based on equation (1) for the country-level bond and stock indexes (Tables 1 and 2, respectively). For example, the integration levels for 2005 are 0.75 and 0.40 for the Australian bond and stock markets, respectively. We find that most of the EU bond markets are highly integrated at the beginning and end of the sample years and are lower in 2010 and 2012. The values of integration for the EU bond markets are similar to those reported by Christiansen (2014) and are much higher than those for the DM countries in Asia or North America. The emerging bond markets exhibit greater cross-sectional and time-series variations. The changes in integration levels are more similar for the EM versus the DM countries. On average, the integration levels increase and then decrease over the time period studied. Also the emerging bond markets in the EU show higher levels of integration than those in Asia, South Africa, and South America. Based on a comparison of Table 2 with Table 1, we observe that the average integration level for stock markets is lower than that for bond markets, especially for the European countries. In Table 2, the integration levels are higher for the EU stock markets compared to those for the other developed countries. The integration levels for the emerging stock markets are more dispersed than those for the developed stock markets.

[Please place Tables 1 and 2 about here.]

[9] Although the choice of 80% is arbitrary, Pukthuanthong and Roll (2009) use 90% and Christiansen (2014) uses 70%. The explanatory power of the principal components for the bond and stock market indexes are reported in the online appendix that is available upon request.

To rigorously examine the trend of the integration level around and during the QE periods, we run rolling window regressions of equation (1) with a 52-week window width. We extract the first matrix of principal components from an initial 52-week period and then extract the subsequent matrices of principal components by advancing the window by a week by adding the new week and dropping the most distant week until the end of the observations is reached. We calculate the adjusted R-square values using the two matrices of principal components based on equation (1) to obtain a series of weekly integration estimates. This not only provides for a robustness test for the yearly integration results but also meets the requirement of a sufficiently large sample size for the principal component analysis.

Panel A of Table 3 reports the integration level estimates for the various country-level bond and stock markets based on the regression of the adjusted R-square values on a constant and a time trend. Of the 31 country-level bond markets, 27 show a strong time trend. The integration levels have significantly decreased (increased) for most of the bond markets in the DM (EM) countries. The trend for the developed country-level bond markets is significantly decreasing for the EU countries (Italy and Portugal) and significantly increasing for North America (e.g., Canada and the U.S.).[10] Consistent with the findings of Christiansen (2014), the trend in integration levels for the emerging bond markets in the EU is mixed, increasing significantly in the Czech Republic and Greece but decreasing significantly in Hungary and Poland. The emerging markets in Asia, South America and South Africa (with the exception of Thailand) show a significant increase in the integration level of their bond markets.

[Please place Table 3 about here.]

[10] The trend in the EU country bond markets may be due to increasing frictions embodied in legal or technical barriers, differential tax treatments, or different investment habits (Wessel, 2003).

The time trends of the integration levels differ for the stock markets. The integration levels for most of the DM countries significantly increase. For example, the stock markets in the EU countries become more integrated, consistent with the findings of Pukthuanthong and Roll (2009). The stock markets in the EM countries show mixed evidence with about an equal proportion of countries showing increases and decreases in the integration levels of their stock markets.

We also construct equally- and GDP-weighted integration indexes (Looi Kee *et al.*, 2009; Wolf, 2000) using the integration estimates for each country in each sample (i.e., All, DM, and EM countries) for the stock and bond market, respectively.[11] Panels A and B of Figure 1 plot these indexes for the bond and stock markets for the All, DM, and EM countries, respectively. The weekly time trends for the DM and EM countries are similar to those reported in Berger *et al.* (2011). We observe from Figure 1 that both the bond and the stock markets are highly integrated during the QE1 and QE2 periods and are less so during the QE3 period. Since QE1 and QE2 were launched after much of the financial turmoil and QE3 was implemented during a rather stable economic environment, this finding may indicate that market integration increased, on average, during bear markets and decreased during bull markets, consistent with the findings of Pukthuanthong and Roll (2009).

[Please place Figure 1 about here.]

Panel B of Table 3 reports the summary statistics for All, DM, and EM countries. The mean (median) equal-weighted R^2 for the bond markets are in general greater than the corresponding values for their GDP-weighted counterparts. The equally- (GDP-) weighted integration index for the bond (stock) market in the DM countries is higher than its counterpart for the EM countries.

[11] The annual GDP from 2005 to 2014 obtained from the World Bank website are converted to a weekly frequency as in Aslanidis and Christiansen (2012).

4. EMPIRICAL TESTS

4.1 Formal Test of the Level of Market Integration During and Around the QE Periods

To test the hypothesis that the level of bond and stock country-level market integration is different during QE1 and QE2 from that during QE3, we run regressions of the level of integration (equal- or GDP-weighted adjusted-R^2) for All, DM, and EM countries, respectively, on the time dummies QE1, QE2, and QE3. Based on the results reported in Panel A of Table 4, we find that the mean of the integration levels of the country-level bond and stock markets during the QE1 and QE2 periods compared to the non-QE periods are significantly higher for the All, DM and EM country samples. In contrast, the mean integration levels of the country-level bond markets during the QE3 period compared to the non-QE period are significantly lower for the All and DM country samples and significantly higher for the EM country sample. With one exception, we obtain the same results based on the country-level equity markets. The mean integration levels of the country-level stock markets during the QE3 period compared to the non-QE period is now significantly lower for the EM sample of countries.

[Please place Table 4 about here.]

In Panel B of Table 4, we report the results of tests of the equally-weighted integration differences between each pair of QE periods for the country-level bond and stock markets.[12] The integration level is significantly different between QE1 and QE2, QE2 and QE3, and QE1 and QE3 across All, DM, and EM countries for country-level bond and stock markets, except that the integration level is not significantly different between QE1 and QE2 for country-level bond markets for the DM and EM samples of countries.

[12] GDP-Weighted Integrations for bond or stock markets are available from the authors in a separate appendix.

4.2 Simultaneous Equation Regression Results with QE-conditioning of Intercept and Slope Coefficients

Evans and Hnatkovska (2014) find that financial market integration of international debt and equity markets affects international capital flows and financial returns (price of risk). Reinhardt *et al*. (2013) argue that financial openness (integration) affects international capital flows. Thus, the relation between capital flows and financial integration is bi-directional. For a sample of seven countries, Caporale *et al.* (2015) find that exchange rate uncertainty impacts net equity flows, and has a primarily negative impact on net bond flows. Brooks *et al.* (2004) argue that exchange rate movements are more sensitive to equity portfolio flows than current account transactions. When investors allocate their assets internationally, their portfolios of foreign-currency denominated bonds or stocks are exposed to the uncertainty of exchange rate movements which affect capital flows. When currency risk is hedged, portfolio performance is affected by capital flows and affects capital flows. Thus, these results imply that the relations between market integration, capital flows and currency hedging performance are likely to be determined simultaneously.

Most recent studies find that the capital flows during the U.S. quantitative easing program exhibit different trends. For example, Fratzscher *et al.* (2013) report that during the QE1 period equity and bond investors moved capital from emerging markets and other developed countries to the U.S., but during the QE2 period the portfolio rebalancing was in the opposite direction so capital flowed into the emerging markets. Lim and Mohapatra (2016) find that QE programs had a greater effect on (especially bond) portfolio flows than the FDI and thus that monetary easing tends to promote financial flows. This provides the motivation to examine the simultaneous effects among financial market integration, capital flows and hedging performance under the three U.S.

monetary easing programs. We do so by estimating the following simultaneous system of three equations:[13]

$$\begin{aligned} INTEGR &= \alpha_0 + \alpha_1 QE_1 + \alpha_2 QE_2 + \alpha_3 QE_3 + \alpha_4 CAP/GDP + \alpha_5 CAP/GDP * QE_1 \\ &+ \alpha_6 CAP/GDP * QE_2 + \alpha_7 CAP/GDP * QE_3 + \varepsilon_1 \end{aligned} \tag{2}$$

$$\begin{aligned} CAP/GDP &= \beta_0 + \beta_1 QE_1 + \beta_2 QE_2 + \beta_3 QE_3 + \beta_4 INTEGR + \beta_5 \delta SHARPE \\ &+ \beta_6 INTEGR * QE_1 + \beta_7 INTEGR * QE_2 + \beta_8 INTEGR * QE_3 + \beta_9 \delta SHARPE * QE_1 \\ &+ \beta_{10} \delta SHARPE * QE_2 + \beta_{11} \delta SHARPE * QE_3 + \beta_{12} X_1 + \varepsilon_2 \end{aligned} \tag{3}$$

$$\begin{aligned} \delta SHARPE &= \gamma_0 + \gamma_1 QE_1 + \gamma_2 QE_2 + \gamma_3 QE_3 + \gamma_4 INTEGR + \gamma_5 CAP/GDP \\ &+ \gamma_6 INTEGR * QE_1 + \gamma_7 INTEGR * QE_2 + \gamma_8 INTEGR * QE_3 + \gamma_9 CAP/GDP * QE_1 \\ &+ \gamma_{10} CAP/GDP * QE_2 + \gamma_{11} CAP/GDP * QE_3 + \gamma_{12} X_2 + \varepsilon_3 \end{aligned} \tag{4}$$

where INTEGR is the bond or stock market integration based on the methodology of Pukthuanthong and Roll (2009); CAP/GDP represents net portfolio bond or stock flows, defined as the ratio of net debt (or equity) capital flows to GDP,[14] and δSHARPE is the difference of the Sharpe ratios of the hedged and unhedged bond (or stock) portfolios investing in All, DM or EM countries.

The exogenous variables in X_1 = {Pop, Trade} are the exogenous variables determining capital flows as in Reinhardt *et al.* (2013); and X_2 = {Term, Credit, EXMKT, SMB, HML, LIQ, VIX, INF, M2, GDP, PUI} are the control variables that may affect the Sharpe ratio. No exogenous variables are added that affect market integration. Based on the discussion above, δSHARPE is included in equation (4) because it depends upon exchange rate movements which are associated with capital flows. Detailed variable descriptions are provided in Appendix A. In the interests of

[13] Four countries (Colombia, India, Mexico and Singapore) are excluded from these tests due to data not being available for net equity (debt) capital flows as noted earlier.
[14] We use the CAP/GDP as a decimal and not its % equivalent to be consistent with the Sharpe ratio which also is in decimal.

parsimony, only the coefficient estimates for the dependent-as-independent variables are reported in all subsequent tables.[15]

This system of equations allows hedging performance to depend on market integration and capital flows while capturing the simultaneous effects between capital flows and market integration. The systems are estimated using a standard three-stage least squares procedure. The hedging strategies are based on a rolling-window approach with a window width of W = 52 weeks as was used previously to obtain the weekly integration estimates. Under an optimal and fully hedging strategy, we calculate a rolling Sharpe ratio given by $\widehat{SR}_t = (\hat{u}_t - r_f)/\hat{\sigma}_t$, where $\widehat{SR}_t$ denotes the Sharpe ratio at time t; $\hat{u}_t$ and $\hat{\sigma}_t$ denote the mean and standard deviation of the realized weekly returns of a portfolio within a window, respectively; and r_f denotes the risk-free rate.

[Please place Table 5 about here.]

Table 5 reports the simultaneous relations among bond market integration, the ratio of capital flows to GDP, and differential bond hedging performance differentiated by QE periods. Among the independent variables in this system of equations, INTEGR, CAP/GDP, and δSHARPE are endogenous and all the other variables are exogenous.[16] To examine the economic significance of any relation between an independent variable (e.g. CAP/GDP) and a dependent variable (e.g., INTEGR), we calculate the elasticity at the mean by multiplying the estimated coefficient of the independent variable by its mean value and then dividing this product by the mean value of the dependent variable.[17]

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[15] They are reported in the online appendix that is available upon request.
[16] *Reg3* develops instrumented values for all endogenous variables in a 3SLS estimation to produce consistent estimates and uses "generalized least squares (GLS) to account for the correlation structure in the disturbances across the equations" in the system (StataCorp., 2013 reg3 manual, p. 5).
[17] The change from the mean for the dependent variable from a 1% change from the mean of the independent variable is obtained by multiplying the mean of the dependent variable by this elasticity at the mean.

Based on Panel A of Table 5, market integration (INTEGR) as the dependent variable is negatively (positively) and significantly related with the ratio of capital flows to GDP (CAP/GDP) during the non-QE period for the DM (EM) countries for both hedging strategies. The magnitude of the elasticity of CAP/GDP for the EM countries is much bigger than that for the DM countries. A change of 1% of the mean of -0.001073 for CAP/GDP for the DM countries is associated with a 0.006% change in the mean of 0.786884 for INTEGR (0.006 is the elasticity at the mean). In contrast, a change of 1% of the mean of -0.000965 for CAP/GDP for the EM countries is associated with -0.021% change in the mean of 0.566453 for INTEGR. Although this significantly positive relation remains for the EM countries during each QE period, the positive relation is significantly less positive. In contrast, the significantly negative relation only remains for the DM countries during QE2. Thus, the relation between bond market integration and the ratio of capital flows to GDP is weakened during the QE periods.

Based on Panel B of Table 5, the ratio of capital flows to GDP (CAP/GDP) as the dependent variable is positively and significantly related with market integration (INTEGR) for the DM and EM countries during the non-QE period, with the exception of the optimal hedged bond portfolio of DM countries where it is insignificantly negative. The relation becomes significantly negative for the fully hedged bond portfolio of DM countries during QE2 and is insignificant for all other hedged bond portfolios of DM countries during the QE periods. It remains positive during the QE periods for the hedged bond portfolios of EM countries but becomes insignificant during QE2 for the optimal hedged bond portfolio of EM countries. While the ratio of capital flows to GDP as the dependent variable is positively related with differential hedging performance (δSHARPE) during the non-QE period, this relation is only significant for the optimal hedged bond portfolio of DM countries. The relations change materially during the QE periods. They remain positive for both types of hedged bond portfolios of EM countries and become significant except for the optimal hedged bond portfolio of EM countries in QE2. The relations remain significant and positive for the optimal hedged bond portfolios of DM countries during each QE and become negative for the fully hedged bond portfolios of DM countries during each QE although only the relation during QE3 is significant.

Based on Panel C of Table 5, differential hedging performance (δSHARPE) during the non-QE period is significantly and negatively related with bond market integration (INTEGR), except for the optimal hedged bond portfolio of DM countries where the relation is significantly positive. With one exception, the relation between differential hedging performance and market integration becomes significantly negative during each QE period. During the non-QE period, differential hedging performance is significantly and positively related with net capital flows to GDP. The one exception is their significantly negative relation for the fully hedged bond portfolio of DM countries. While the significantly positive relations remain during the QE periods for the portfolios of EM countries, the relations change during the QE periods for the portfolios of DM countries. While the positive and significant relation for the optimal hedged bond portfolio of EM countries remains during each QE period, the negative relations for the fully hedged bond portfolios of DM countries only remain significant during QE3. Although the magnitudes of the estimated coefficients for both INTEGR and CAP/GDP for the optimal hedged bond portfolios during the non-QE period are relatively large, we find that the economic significance is much higher for INTEGR than for CAP/GDP. Using the optimal hedged bond portfolios of the EM countries to illustrate these differences and holding everything else constant, we find that a change of 1% of the mean of -0.000965 for CAP/GDP is associated with only a -0.23% change in the mean of 0.457707for δSHARPE (-0.23 is the elasticity at the mean). In contrast, a change of 1% of

INTEGR's mean of 0.566453 is associated with a change of -11.95% in δSHARPE's mean of 0.457707 (-11.95 is the elasticity at the mean).

We now summarize the results for the international bond markets. We find that market integration as the dependent variable is significantly and negatively (positively) related with the ratio of debt capital flows to GDP during the non-QE period for the DM (EM) countries. The magnitude of the elasticity of CAP/GDP for the EM countries is much bigger than that for the DM countries. However, the significantly negative relations for the DM countries remain only during QE2. In contrast, the significantly positive relations for the EM countries become significantly less positive for the EM countries. Thus, the relation between market integration and the ratio of debt capital flows to GDP tended to disappear for the DM countries and weaken for the EM countries during the QE periods.

[Please place Table 6 about here.]

Table 6 reports the simultaneous relations among stock market integration, the ratio of equity capital flows to GDP, and differential hedging performance of stock portfolios differentiated by QE periods. Based on Panel A, and like the bond markets, we find that market integration as the dependent variable is significantly and negatively (positively) related with the ratio of debt capital flows to GDP for the DM (EM) countries during the non-QE period for both hedging strategies. The elasticity of CAP/GDP for the DM countries is much bigger than that for the EM countries. A change of 1% of the mean of -0.002427 for CAP/GDP for the DM countries is associated with a 0.038% change in the mean of 0.738595 for INTEGR (0.038 is the elasticity at the mean). In contrast, a change of 1% of the mean of 0.000480 for CAP/GDP for the EM countries is associated with a 0.006% change in the mean of 0.622553 for INTEGR. While the relation for the DM countries remains negative during the QEs, the relation only remains significant during QE1 for the optimal hedged stock portfolio and during QE1 and QE3 for the fully hedged portfolios of stocks. The relation for the EM countries remains positive and significant only during QE3 for both hedging strategies.

Based on Panel B of Table 6, and unlike the bond markets, we find that the ratio of capital flows to GDP as the dependent variable is negatively and significantly related with market integration for the DM countries during the non-QE period for both hedging strategies. The relation remains negative in all cases but becomes insignificant during QE2 and QE3 for the optimal hedged stock portfolio and during QE3 for the fully hedged stock portfolio. While the relation is positive for the EM countries during the non-QE period, the relation is only significant for the fully hedged stock portfolio but becomes insignificant in QE1 and QE3.[18]

Unlike the bond markets, we find that the ratio of equity capital flows to GDP as the dependent variable is positively and significantly related with differential hedging performance during the non-QE period for both hedged stock portfolios of EM countries, and becomes insignificant during the QE periods. While the relation between the ratio of equity capital flows to GDP and differential hedging performance is significant (negative) during the non-QE period only for the optimal hedged stock portfolio of DM countries, this relation becomes significantly negative during QE1.

Based on Panel C of Table 6, and as was the case for the bond markets, we find mixed results when differential hedging performance is the dependent variable. During the non-QE period, differential hedging performance is positively (negatively) related with market integration for the DM (EM) countries, although only the positive relations are significant. During the QE periods, differential hedging performance is no longer positively and significantly related with market

[18] Based on the untabulated results, equity CAP/GDP is significantly and positively related with the population and trade variables for the EM countries only.

integration for the DM countries. In fact, the relation becomes significantly negative during QE1 for both hedging strategies for the DM countries.

During the non-QE period, differential hedging performance is significantly and positively (negatively) related with net equity capital flows to GDP for the DM (EM) countries for both types of hedged stock portfolios. The relation for the DM countries becomes insignificantly negative in QE1, significantly negative in QE2 and remains significantly positive in QE3 for the optimal portfolios. The relation for the EM countries remains significantly negative in QE1 and becomes insignificantly positive and negative in QE2 and QE3, respectively, for the optimal hedged stock portfolios, and remains significantly negative only in QE3 for the fully hedged stock portfolios.

We now end this section with a summary of the results for the international equity markets. As was the case for the bond markets, market integration as the dependent variable is significantly and negatively (positively) related with the ratio of capital flows to GDP during the non-QE period for the DM (EM) countries. In contrast to the bond markets, the magnitude of the elasticity of CAP/GDP for the DM countries is much bigger than that for the EM countries. However, the significantly negative relations for the DM countries remain only during QE1 for the optimal hedged stock portfolios and during QE1 and QE3 for the fully hedged stock portfolios. In contrast, the significant positive relations for the EM countries become significantly less positive for the optimally hedged stock portfolios and more positive for the full hedged stock portfolios. Hence, the relation between stock market integration and the ratio of equity capital flows to GDP generally tends to disappear for the DM and EM countries during the QE periods.

5. TESTS OF ROBUSTNESS

In this section, we conduct two tests of robustness that involve less general models where only the intercepts or only the coefficients of the dependent variables when they are included as independent variables (the dependent-as-independent variables) are allowed to change during each QE period. In the interest of parsimony, we only tabulate the estimates of the intercepts and the coefficients of the dependent-as-independent variables (i.e., INTEGR, CAP/GDP and δSHARPE) for these less general formulations of equations (2)-(4) and compare these estimates with those reported earlier for the full model. The general conclusion from these comparisons is that there are many changes in the direction and/or significance of the relations when either of the two less general models are used to draw inferences. In other words, the inferences based on the two less general models are most likely less robust. However, the relations between bond or equity market integration as the dependent variable and the ratio of debt (or equity) capital flows to GDP as an independent variable for the DM (EM) countries are significant and negative (positive) during the non-QE periods for the general and less general models.

5.1 Simultaneous Equation Regression Results with QE-conditioned Intercepts

In our first test of robustness, we only remove the QE dummies from INTEGR, CAP/GDP, and δSHARPE and leave everything else unchanged in equations (2)-(4). The abridged results for this less general model 1 are reported in Table 7 for the bond portfolios.

[Please place Table 7 about here.]

We now compare these less general model 1 results for the estimated coefficients of each dependent-as-independent variable to those reported earlier in Table 7 although the estimated coefficient for each dependent-as-independent variable is for the non-QE period in the general model and for the whole period in this less general model 1. Based on Panel A in both tables, we find that the negative coefficients and their significance for CAP/GDP at the 0.01 level remain for this less general model 1. Based on Panel B in both tables, we find that the signs of the estimated coefficients for INTEGR remain for this less general model 1 but such is not the case for δSHARPE. More of the δSHARPE coefficient estimates are significant using this less general model 1. Based on Panel C in both tables, we find that while all the coefficient estimates for INTEGR remain significant, they become positive values for fully hedged portfolios of bond indexes for the DM and EM countries. We observe even less similar results for the coefficient estimates for CAP/GDP. The significantly positive estimates for the optimal hedged bond portfolios for DM and EM countries only remain significant for the EM countries and the significantly negative and positive estimates for the fully hedged bond portfolios for DM and EM countries become insignificantly positive and significantly negative, respectively.

Table 7 also reports the abridged results for the less general model 1 for the stock portfolios. We now compare these results to the abridged full model results reported earlier in Table 6. Based on Panel A in both tables, we find that the negative coefficients and their significance for CAP/GDP at the 0.01 level remain for this less general model 1. Based on Panel B in both tables, most of the coefficients for INTEGR are significant and negative for the less general model 1. Similarly most of the coefficients for δSHARPE are significant based on the less general model 1. Based on Panel C in both tables, while all the coefficient estimates for INTEGR remain significant for the less general model 1, they become negative for the fully hedged portfolios of stock indexes for the DM and EM countries. In contrast, the coefficients of CAP/GDP for the less general model 1 are similar to those for the full model.

5.2 Simultaneous Equation Regression Results with QE-Conditioning of only the Coefficients of the Dependent-as-independent Variables

In our second test of robustness, we only remove the standalone QE dummies and leave everything else unchanged in equations (2)-(4). The abridged results for this less general model 2 are reported in Table 8 for the portfolios of country bond indexes.[19]

[Please Insert Table 8 about here]

We now compare the less general model 2 results reported in Table 8 with those reported earlier in Table 5 for the general model. Based on Panel A in both tables, we find that the relations between bond market integration (i.e., INTEGR) as the dependent variable and the ratio of debt capital flows to GDP (i.e., CAP/GDP) as an independent variable for the DM (EM) countries are significant and negative (positive) during the non-QE period for both models. The relations between these two variables are significant and negative for the portfolios of DM countries for the QE periods for the less general model 2 although only the QE2 estimates for the general model are significant (and negative). In contrast, the relations between these two variables are positive and significant for the portfolios of EM countries for the QE periods for the general model and only significant (and positive) for QE3 for the less general model 2.

Based on Panel B in both tables, we find that the relations between CAP/GDP as the dependent variable and INTEGR as an independent variable for the bond portfolios of DM and EM countries are significant and positive during the non-QE period for both models. The only exception is the insignificantly negative coefficient estimate for the optimal hedged bond portfolio of DM countries for the general model. While all of the coefficient estimates for INTEGR are significant and positive during the QE periods for the less general model 2, the coefficient estimates for INTEGR are generally insignificant or significantly negative for the general model.

[19] The complete tables are available from the authors in a separate appendix.

Based on Panel C in both tables, we find that the relations between δSHARPE as the dependent variable and INTEGR as an independent variable for the bond portfolios of DM and EM countries are negative and significant during the non-QE period using the less general model 2 which was the case using the general model with one exception (the significantly positive coefficient for the optimal hedged bond portfolio of DM countries). All of the coefficient estimates are now significantly negative during the QE periods using the less general model 2 while such was not the case for two of the 12 estimates using the general model.[20] While the coefficient estimates of CAP/GDP are positive and significant for the portfolios of EM countries using either model during the non-QE period, they are significant and positive (negative) for the optimal hedged bond portfolios of DM countries using the general model (less general model 2).

Table 8 also reports the less general model 2 for stocks when only the coefficients of the dependent-as-independent variables are allowed to differ for the QE periods. We compare the abridged results reported in Table 8 with those for the full model reported earlier in Table 6. Based on Panel A in both tables, we find that the relations between stock market integration (i.e., INTEGR) as the dependent variable and the ratio of equity capital flows to GDP (i.e., CAP/GDP) as an independent variable for the DM (EM) countries are significant and negative (positive) during the non-QE period for both models. This is similar to the same comparison for bonds discussed earlier. The relations between these two variables for the stock portfolios of DM countries is significantly negative during QE1 (not significant for the optimal hedged stock portfolio), is (not) significantly negative during QE2 based on the less general model 2 (general

[20] They are the significantly positive coefficient estimate for the optimal hedged portfolio of DM countries and the insignificantly negative coefficient estimate for the fully hedged portfolio of DM countries.

model), and is significantly and positively (negatively) during QE3 based on the less general model 2 (general model only for the optimal hedged stock portfolio).

Based on Panel B in both tables, we find that the relations between CAP/GDP as the dependent variable and INTEGR as an independent variable that are significant (with one exception) and negative (positive) for the stock portfolios of DM (EM) countries during the non-QE period from the full model are only significant (and positive) for the fully hedged stock portfolio for the EM countries using the less general model 2. While 25% (3 out of 12) of the coefficients for INTEGR are only significant at conventional levels during the QEs for both models, their significances do not coincide for the two models.

Based on Panel C in both tables, we find that the relations between δSHARPE as the dependent variable and INTEGR as an independent variable during the non-QE period for the two models are significant with the same signs only for the fully hedged stock portfolio of EM countries. There is a low level of agreement in the signs of the INTEGR estimates and their significance at conventional levels across the two models during the QE periods.

6. CONCLUSION

In this paper, we investigate the influence of the three rounds of quantitative easing launched by the U.S. Federal Reserve on international financial market integration and capital flows. We find that the means of market integration for bond and stock markets of all countries significantly increase during the first and the second QE rounds but decrease during the third QE round (except for the stock market in emerging countries). Taking advantage of a system of three simultaneous equations to capture the joint determination of market integration, capital flows and currency hedging performance, we find a significant and negative (positive) relation between market integration as the dependent variable and the capital flows scaled by domestic GDP for both bond and stock markets of the DM (EM) countries during the non-QE period. These relations weaken or disappear for both bond and stock markets for the full sample of countries during the QE period.

Our paper is the first empirical analysis providing evidence on the impacts of unconventional monetary policy on international market integration and capital flows. It complements previous studies on the determinants of international market integration and enriches the emerging literature on the impacts of quantitative easing on international economies. Our findings shed light on the importance of the spillover impact of a domestic unconventional monetary policy on international market integration and capital flows, and suggest that our work subsequently could be extended to an examination of the effect of monetary policy shocks on international market integration and capital flows.

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Appendix A: Variable definitions

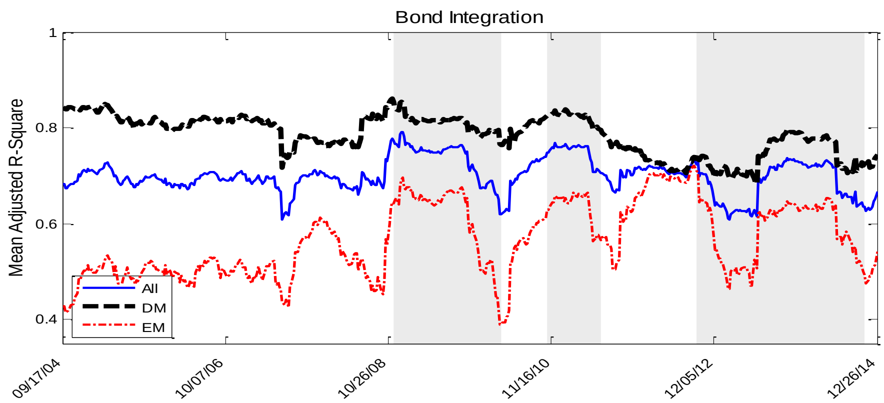
This table defines all the dependent and time dummy variables, and the control variables.

Variable	Definition and Sources
Main Dependent-Independent Variables	
INTEGR	Financial bond or stock market integration. Calculation based on Pukthuanthong and Roll (2009).
CAP/GDP	The net capital flow for equities (and for debt) is scaled by GDP as in Evans and Hnatkovska (2014) but left in decimal. These series are collected from the IMF and World Bank Dataset.
δSHARPE	Difference of Sharpe ratios between the weekly optimal (fully) hedged and not hedged portfolios of bonds, and of stocks
Quantitative Easing Dummies	
QE1, QE2, and QE3	To control for the different effects of the three QEs. QE1, QE2, and QE3 correspond to the three round of QEs. Each dummy variable takes the value of one for the time period during which the Fed undertook QE1 (or QE2 or QE3) and zero otherwise.
Bond Market	
Term	Term spread, the difference between the yields of a 10-year and a three-month Treasury-bill. Data source: Datastream
Credit	Credit spread, the difference between yields on Moody's Baa corporate bond yield and Aaa corporate bond yield. Data source: Datastream
Equity Market	
EX_MKT	The excess return on the market. EX_MKT includes all NYSE, AMEX, and NASDAQ firms. Data source: Kenneth R. French's data library
SMB	The average return on the three small portfolios minus the average return on the three big portfolios. Data source: Kenneth R. French's data library
HML	The average return on the two value portfolios minus the average return on the two growth portfolios. Data source: Kenneth R. French's data library
LIQ	Levels of aggregate liquidity factor of Pastor and Stambaugh (2003). Data source: Pastor's website
Other Macro Variables	
Residual VIX, VIXrate	The residual VIX obtaining by regressing VIXrate, percentage change of the VIX index, on the market excess returns, EX_MKT, because the VIX index is highly correlated with EX_MKT as shown in Table 9. Data source: Chicago Board Options Exchange (CBOE)
INF	Inflation rate, percentage change in CPI for All Urban Consumers: All Items. Data source: US Bureau of Labor Statistics
M2	Percentage change of seasonally adjusted monthly M2 money stock. Data source: Board of Governors of the Federal Reserve System (U.S.)
GDPRate	Seasonally adjusted quarterly real gross domestic product growth rate. Data source: U.S. Bureau of Economic Analysis
PUI	An index of economic policy constructed from: 1) newspaper coverage of policy-related economic uncertainty; 2) the number of federal tax code provisions; and 3) disagreement among economic forecasts. Scaled by 0.01. Data source: website at: http://www.policyuncertainty.com/us_historical.html
Pop	Population growth rate are collected from World Bank Dataset
Trade	Trade openness, the sum of imports and exports of goods and services scaled by GDP. Data source: World Bank Dataset

Figure 1. Weekly level of international market integration for country-level bond and stock indexes

Panels A and B depict the weekly level of market integration before QE1 (September 2003 to October 2008), QE1 (November 2008 to March 2010), QE2 (November 2010 to June 2011), and QE3 (September 2012 to October 2014) for the 31 countries (19 DM and 12 EM) for bond indexes in the upper panel and stock indexes in the lower panel. The adjusted R-square is obtained from equation (1), which measures market integration.

Panel A: Bond integration levels



Panel B: Stock integration levels

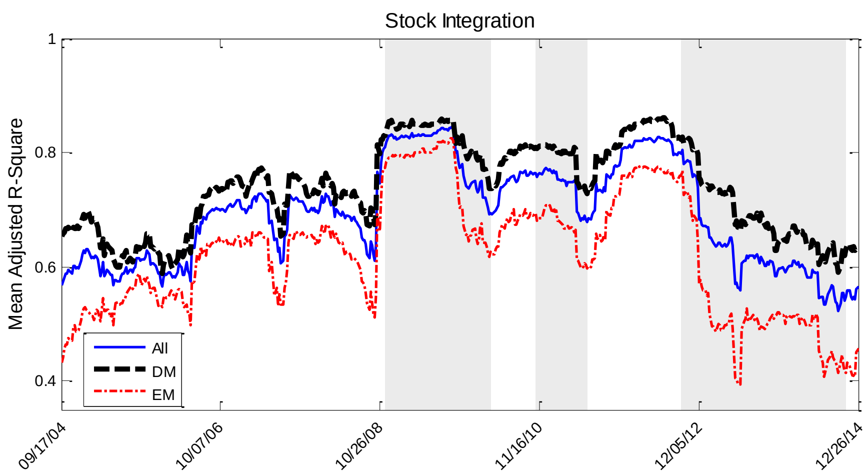


Table 1. Annual level of bond integration

This table presents the adjusted R-square values for the international bond country-level indexes annually for each country. The 31 countries are the developed countries of Australia (AU), 11 developed markets from Eurozone [Austria (AT), Belgium (BE), Finland (FI), France (FR), Germany (DE), Ireland (IE), Italy (IT), Netherlands (NL), Portugal (PT), and Spain (ES)], Canada (CA), Denmark (DK), Japan (JP), New Zealand (NZ), Singapore (SG), Sweden (SE), United Kingdom (UK), and the United States (US), and the developing countries of Brazil (BR), Chile (CL), Colombia (CO), Czech Republic (CZ), Greece (GR), Hungary (HU), India (IN), Mexico (MX), Poland (PL), South Africa (ZA), South Korea (SR), and Thailand (TH).

year	Australia	Austria	Belgium	Finland	France	Germany	Ireland	Italy	Netherlands	Portugal	Spain	Canada	Denmark	Japan	New Zealand	Singapore
2005	0.75	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.34	0.99	0.43	0.57	0.57
2006	0.63	0.99	0.99	0.99	0.99	0.99	0.97	0.99	0.99	0.99	0.99	0.39	0.99	0.73	0.18	0.63
2007	0.76	0.93	0.93	0.15	0.93	0.93	0.89	0.93	0.93	0.93	0.93	0.17	0.93	0.69	0.54	0.24
2008	0.85	0.99	0.99	0.97	0.99	0.99	0.96	0.99	0.99	0.99	0.98	0.71	0.98	0.63	0.83	0.60
2009	0.68	0.98	0.98	0.98	0.98	0.97	0.92	0.96	0.98	0.97	0.98	0.45	0.96	0.22	0.66	0.60
2010	0.80	0.89	0.91	0.87	0.88	0.86	0.82	0.94	0.86	0.79	0.96	0.67	0.86	0.40	0.56	0.79
2011	0.77	0.95	0.87	0.95	0.97	0.92	0.61	0.88	0.96	0.62	0.86	0.70	0.89	0.20	0.56	0.80
2012	0.59	0.93	0.88	0.94	0.94	0.92	0.79	0.84	0.94	0.25	0.80	0.44	0.92	0.13	0.52	0.72
2013	0.67	0.98	0.97	0.98	0.98	0.97	0.93	0.83	0.98	0.47	0.86	0.59	0.96	0.32	0.60	0.54
2014	0.60	0.95	0.95	0.95	0.94	0.94	0.95	0.89	0.95	0.56	0.89	0.44	0.94	0.39	0.55	0.75

year	Sweden	United Kingdom	United States	Brazil	Chile	Colombia	Czech Republic	Greece	Hungary	India	Mexico	Poland	South Africa	South Korea	Thailand
2005	0.86	0.63	0.06	0.36	0.44	0.25	0.83	0.99	0.65	0.13	0.29	0.54	0.55	0.37	0.43
2006	0.86	0.83	0.28	0.28	0.15	0.47	0.83	0.99	0.68	0.16	0.37	0.82	0.39	0.35	0.21
2007	0.77	0.47	0.54	0.63	0.37	0.67	0.65	0.93	0.82	0.42	0.52	0.78	0.48	0.46	-0.04
2008	0.73	0.62	0.14	0.76	0.62	0.41	0.77	0.96	0.80	0.16	0.82	0.84	0.63	0.53	0.00
2009	0.68	0.33	0.24	0.56	0.01	0.26	0.78	0.90	0.69	0.21	0.33	0.62	0.42	0.29	0.49
2010	0.80	0.41	0.42	0.60	0.31	0.54	0.82	0.44	0.84	0.71	0.59	0.93	0.77	0.56	0.15
2011	0.70	0.43	0.34	0.77	0.64	0.30	0.76	0.48	0.72	0.60	0.74	0.80	0.69	0.69	0.46
2012	0.53	0.53	0.30	0.26	0.63	0.32	0.84	0.42	0.70	0.22	0.55	0.89	0.41	0.32	0.40
2013	0.73	0.61	0.38	0.69	0.53	0.77	0.70	0.94	0.67	0.33	0.77	0.81	0.58	0.22	0.35
2014	0.57	0.51	0.48	0.44	0.30	0.38	0.85	0.94	0.52	0.12	0.56	0.70	0.57	0.10	0.13

Table 2. Annual level of stock integration

This table presents the adjusted R-square values for the international stock country-level indexes annually for each country. The 31 countries are the developed countries of Australia (AU), 11 developed markets from Eurozone [Austria (AT), Belgium (BE), Finland (FI), France (FR), Germany (DE), Ireland (IE), Italy (IT), Netherlands (NL), Portugal (PT), and Spain (ES)], Canada (CA), Denmark (DK), Japan (JP), New Zealand (NZ), Singapore (SG), Sweden (SE), United Kingdom (UK), and the United States (US), and the developing countries of Brazil (BR), Chile (CL), Colombia (CO), Czech Republic (CZ), Greece (GR), Hungary (HU), India (IN), Mexico (MX), Poland (PL), South Africa (ZA), South Korea (SR), and Thailand (TH).

year	Australia	Austria	Belgium	Finland	France	Germany	Ireland	Italy	Netherlands	Portugal	Spain	Canada	Denmark	Japan	New Zealand	Singapore
2005	0.40	0.66	0.72	0.45	0.86	0.70	0.34	0.76	0.70	0.51	0.69	0.57	0.49	0.23	0.32	0.10
2006	0.56	0.84	0.86	0.61	0.86	0.86	0.73	0.85	0.78	0.57	0.80	0.53	0.74	0.60	0.06	0.63
2007	0.80	0.78	0.79	0.64	0.91	0.88	0.59	0.80	0.81	0.54	0.58	0.64	0.76	0.45	0.64	0.66
2008	0.88	0.82	0.69	0.69	0.92	0.95	0.52	0.89	0.88	0.75	0.87	0.84	0.90	0.62	0.79	0.82
2009	0.79	0.80	0.84	0.76	0.95	0.91	0.48	0.92	0.92	0.79	0.91	0.85	0.75	0.40	0.60	0.64
2010	0.84	0.79	0.88	0.73	0.95	0.92	0.60	0.90	0.92	0.81	0.83	0.84	0.80	0.49	0.69	0.72
2011	0.87	0.88	0.83	0.86	0.97	0.89	0.88	0.95	0.93	0.84	0.89	0.86	0.74	0.40	0.49	0.84
2012	0.61	0.87	0.74	0.75	0.95	0.90	0.61	0.92	0.86	0.53	0.77	0.77	0.49	0.46	0.46	0.69
2013	0.58	0.71	0.67	0.53	0.91	0.79	0.52	0.79	0.86	0.65	0.76	0.59	0.46	0.18	0.34	0.61
2014	0.30	0.67	0.71	0.77	0.87	0.77	0.59	0.80	0.75	0.61	0.76	0.70	0.56	0.20	0.10	0.27

year	Sweden	United Kingdom	United States	Brazil	Chile	Colombia	Czech Republic	Greece	Hungary	India	Mexico	Poland	South Africa	South Korea	Thailand
2005	0.77	0.73	0.66	0.60	0.32	0.11	0.51	0.60	0.50	0.30	0.66	0.58	0.68	0.46	-0.01
2006	0.80	0.84	0.66	0.74	0.70	0.47	0.69	0.51	0.76	0.29	0.69	0.79	0.58	0.49	0.38
2007	0.75	0.91	0.65	0.84	0.49	0.48	0.63	0.68	0.64	0.44	0.73	0.61	0.75	0.76	0.26
2008	0.87	0.92	0.76	0.88	0.52	0.63	0.87	0.74	0.78	0.50	0.87	0.82	0.81	0.62	0.45
2009	0.80	0.87	0.82	0.70	0.49	0.49	0.62	0.68	0.74	0.55	0.74	0.61	0.85	0.53	0.48
2010	0.84	0.86	0.84	0.81	0.51	0.51	0.73	0.60	0.81	0.77	0.81	0.82	0.75	0.82	0.18
2011	0.92	0.91	0.75	0.90	0.73	0.49	0.70	0.55	0.72	0.70	0.86	0.87	0.79	0.77	0.65
2012	0.82	0.89	0.81	0.69	0.66	0.26	0.58	0.30	0.64	0.37	0.63	0.83	0.44	0.51	0.44
2013	0.76	0.80	0.53	0.64	0.46	0.43	0.37	0.30	0.18	0.37	0.50	0.41	0.64	0.22	0.49
2014	0.56	0.74	0.60	0.34	0.53	0.61	0.09	0.60	0.18	0.45	0.48	0.40	0.62	0.42	0.21

Table 3. Time trend and summary statistics for market integration

This table reports the coefficient of the time trend in a regression of the adjusted R-square values on a constant and a time trend (Panel A) and summary statistics for the equal- and GDP-weighted averages of the country-level integration estimates for bond and stock markets across All, DM and EM countries (Panel B). The sample consists of 537 observations. The coefficients (*Coeff*) are multiplied by 10,000 in Panel A.

Panel A: Time trend of market integration

DM Countries	Bond Markets		Stock Markets		**EM Countries**	Bond Markets		Stock Markets	
	Coeff	*t-stat*	*Coeff*	*t-stat*		*Coeff*	*t-stat*	*Coeff*	*t-stat*
Australia	-0.57	-2.16	-0.54	-1.43	Brazil	4.61	10.30	0.17	0.57
Eurozone					Chile	4.53	10.40	0.86	2.55
Austria	-0.89	-27.32	0.98	4.22	Colombia	5.12	12.98	0.92	2.21
Belgium	-1.59	-17.85	-1.88	-8.88	Czech Republic	-0.30	-1.82	-3.02	-6.92
Finland	1.79	3.19	4.58	16.74	Greece	-5.18	-13.51	0.22	0.66
France	-0.86	-33.67	1.22	11.71	Hungary	2.72	10.41	-3.55	-8.48
Germany	-1.32	-25.83	0.15	0.96	India	6.66	15.01	3.41	8.65
Ireland	-3.52	-18.00	2.07	5.39	Mexico	6.73	16.64	-2.13	-5.85
Italy	-3.45	-41.55	1.26	6.10	Poland	2.88	13.39	-1.39	-3.94
Netherlands	-0.94	-30.26	1.72	10.60	South Africa	2.10	7.42	-0.43	-1.18
Portugal	-11.30	-37.53	3.16	9.81	South Korea	0.91	1.97	-1.40	-3.38
Spain	-3.76	-35.50	0.28	1.33	Thailand	-0.04	-0.08	1.09	2.78
Canada	4.88	10.60	2.08	5.94					
Denmark	-1.37	-21.58	-1.26	-3.73					
Japan	-7.99	-20.56	-4.00	-10.90					
New Zealand	-0.24	-0.65	2.27	4.19					
Singapore	3.55	10.11	3.13	9.01					
Sweden	-5.66	-26.08	0.74	3.21					
UK	-3.99	-11.68	1.10	5.78					
US	2.87	6.09	-0.05	-0.18					

Panel B: Summary statistics for market integration

	Equal-weighted						GDP-weighted					
	Bond Markets			Stock Markets			Bond Markets			Stock Markets		
Summary Statistics	All	DM	EM	All	DM	EM	All	DM	EM	All	DM	EM
Mean	0.70	0.79	0.57	0.69	0.74	0.62	0.57	0.48	0.08	0.72	0.61	0.10
Median	0.70	0.80	0.56	0.70	0.74	0.64	0.56	0.49	0.09	0.73	0.62	0.10
Std. dev.	0.04	0.04	0.08	0.09	0.08	0.11	0.07	0.07	0.02	0.08	0.06	0.02
25^{th} Pctl.	0.68	0.76	0.50	0.61	0.67	0.52	0.52	0.43	0.06	0.65	0.57	0.09
75^{th} Pctl.	0.72	0.82	0.64	0.76	0.81	0.69	0.62	0.53	0.10	0.79	0.66	0.12

Table 4. Regression models to examine the means of the country-level integration estimates during the QE periods and their differences for bond and stock markets across All, DM and EM countries

This table reports the results of tests examining the hypothesis that the level of bond country-level market integration is different during the QE periods from the non-QE period given by the constant across All, DM, and EM countries. Results for tests of the null hypothesis of no differences in the level of integration between two periods is reported in Panel B. Statistical significance at the 10%, 5%, and 1% levels is denoted by *, **, and ***, respectively. Number of observations is 537.

Panel A: Mean integration

	Bond Markets			Stock Markets		
	All	DM	EM	All	DM	EM
QE1	0.040***	0.020***	0.073***	0.115***	0.103***	0.135***
	(10.09)	(4.49)	(7.92)	(12.74)	(12.06)	(12.77)
QE2	0.056***	0.030***	0.096***	0.056***	0.063***	0.045***
	(10.33)	(5.08)	(7.74)	(4.61)	(5.50)	(3.18)
QE3	-0.012***	-0.049***	0.047***	-0.066***	-0.040***	-0.107***
	(-3.49)	(-13.11)	(6.04)	(-8.65)	(-5.59)	(-11.98)
Constant	0.694***	0.792***	0.540***	0.686***	0.728***	0.621***
	(402.68)	(415.76)	(135.99)	(176.30)	(198.54)	(136.44)
adj. R^2	0.302	0.334	0.179	0.372	0.309	0.429

Panel B: Hypothesis test

		Bond Markets			Stock Markets		
H_0	Statistic	All	DM	EM	All	DM	EM
QE1 vs.	F(1, 533)	5.99**	2.26	2.57	17.40***	8.84***	29.44***
QE2	Prob > F	0.01	0.13	0.11	0.00	0.00	0.00
QE1 vs.	F(1, 533)	126.91***	180.10***	5.98**	299.32***	210.01***	390.13***
QE3	Prob > F	0.00	0.00	0.01	0.00	0.00	0.00
QE2 vs.	F(1, 533)	131.99***	148.42***	13.22***	84.57***	68.19***	95.89***
QE3	Prob > F	0.00	0.00	0.00	0.00	0.00	0.00

Table 5. Simultaneous equation regression results for bond indexes for the full model

This table reports the regression results for the system of equations consisting of equations (2), (3) and (4) for All, DM and EM countries. The dependent (endogenous) variables are market integration (INTEGR), the ratio of debt capital flows to GDP (CAP/GDP), and the differential Sharpe ratio (δSHARPE) for optimal and fully hedged bond portfolios for each sample of countries, and all the other variables whose results remain untabulated are exogenous. The four countries without CAP/GDP data are excluded from the tests. Definitions of all variables are in Appendix A. CAP/GDP, INTEGR, Pop and Trade are for the countries in each sample.

	Optimal Hedged			Fully Hedged		
	All	DM	EM	All	DM	EM
Panel A: Bond market integration (INTEGR) as the dependent variable						
Constant	0.695***	0.795***	0.548***	0.695***	0.796***	0.548***
	(416.60)	(366.00)	(143.49)	(416.82)	(368.23)	(143.62)
QE1	0.059***	0.013*	0.119***	0.059***	0.009	0.131***
	(9.80)	(1.71)	(10.10)	(9.77)	(1.17)	(11.51)
QE2	0.043***	-0.001	0.098***	0.046***	0.008	0.099***
	(3.41)	(-0.11)	(7.57)	(3.70)	(0.62)	(7.73)
QE3	-0.022***	-0.056***	0.032***	-0.022***	-0.055***	0.030***
	(-5.95)	(-12.10)	(4.23)	(-6.16)	(-11.95)	(3.97)
CAP/GDP	1.760***	-4.388***	12.379***	1.749***	-4.749***	12.797***
	(4.22)	(-8.71)	(14.84)	(4.25)	(-9.65)	(15.66)
CAP/GDP *QE1	0.795	4.068***	-3.048*	0.789	4.005***	-1.329
	(1.08)	(4.91)	(-1.90)	(1.08)	(4.70)	(-0.88)
CAP/GDP *QE2	-3.156**	2.120**	-6.865**	-2.762**	3.244***	-6.692**
	(-2.29)	(2.15)	(-2.22)	(-2.02)	(3.23)	(-2.31)
CAP/GDP *QE3	1.794**	5.396***	-7.164***	2.097***	5.478***	-6.288***
	(2.31)	(6.75)	(-5.38)	(2.72)	(6.85)	(-4.95)
CAP/GDP + CAP/GDP *QE1	2.555***	-0.320	9.331***	2.538***	-0.745	11.468***
	(4.25)	(-0.48)	(6.85)	(4.21)	(-1.07)	(9.11)
CAP/GDP + CAP/GDP *QE2	-1.396	-2.268***	5.515*	-1.012	-1.505*	6.104**
	(-1.06)	(-2.67)	(1.85)	(-0.77)	(-1.71)	(2.20)
CAP/GDP + CAP/GDP *QE3	3.554***	1.008	5.216***	3.846***	0.729	6.508***
	(5.39)	(1.64)	(5.06)	(5.86)	(1.14)	(6.75)
Panel B: Ratio of debt capital flows to GDP (CAP/GDP) as the dependent variable						
Constant	-0.110***	0.023	-0.024***	-0.096***	-0.172***	-0.029***
	(-3.62)	(0.42)	(-2.63)	(-3.16)	(-4.05)	(-3.72)
QE1	0.008	0.008	-0.016	0.019	0.027	-0.014
	(0.28)	(0.15)	(-1.06)	(0.63)	(0.58)	(-1.14)
QE2	0.042	-0.111	0.002	0.103**	0.283***	-0.004
	(0.84)	(-0.97)	(0.08)	(2.27)	(2.89)	(-0.23)
QE3	0.026	-0.098**	-0.022*	0.042	0.116***	-0.021*
	(0.91)	(-2.18)	(-1.72)	(1.56)	(3.67)	(-1.94)
INTEGR	0.124***	-0.078	0.053***	0.122***	0.120***	0.061***
	(3.18)	(-1.52)	(2.78)	(3.16)	(3.26)	(3.92)
δSHARPE	0.003	0.014*	0.002	-0.373	0.039	0.011
	(1.35)	(1.87)	(1.17)	(-0.84)	(0.13)	(0.09)
INTEGR*QE1	-0.024	-0.018	0.005	-0.045	-0.041	0.002
	(-0.54)	(-0.28)	(0.20)	(-1.05)	(-0.71)	(0.08)
INTEGR*QE2	-0.076	0.137	-0.011	-0.165***	-0.377***	-0.005
	(-1.09)	(0.97)	(-0.35)	(-2.58)	(-3.09)	(-0.17)
INTEGR*QE3	-0.041	0.113*	0.019	-0.062	-0.149***	0.019
	(-1.02)	(1.87)	(0.95)	(-1.58)	(-3.53)	(1.18)
δSHARPE*QE1	-0.003	0.004	0.005**	1.279***	-0.136	0.347**
	(-1.03)	(0.47)	(2.33)	(2.60)	(-0.41)	(2.41)

δSHARPE*QE2	0.000	0.002	0.001	-0.357	-0.813	0.628**
	(0.04)	(0.23)	(0.21)	(-0.31)	(-0.88)	(1.97)
δSHARPE*QE3	-0.001	0.005	0.007***	0.021	-1.209***	0.474***
	(-0.40)	(0.63)	(3.13)	(0.04)	(-3.31)	(3.43)
INTEGR + INTEGR*QE1	0.100***	-0.096	0.058***	0.077***	0.080	0.063***
	(5.97)	(-1.59)	(5.27)	(5.25)	(1.51)	(7.07)
INTEGR + INTEGR*QE2	0.048	0.059	0.042	-0.043	-0.257**	0.056***
	(0.83)	(0.42)	(1.61)	(-0.84)	(-2.14)	(2.62)
INTEGR + INTEGR*QE3	0.083***	0.034	0.072***	0.060***	-0.029	0.080***
	(6.59)	(1.31)	(8.44)	(-5.64)	(-1.45)	(10.72)
δSHARPE + δSHARPE*QE1	0.000	0.018***	0.007***	0.906***	-0.097	0.358***
	(0.36)	(5.61)	(5.94)	(3.79)	(-0.55)	(3.75)
δSHARPE + δSHARPE*QE2	0.003*	0.016***	0.003	-0.730	-0.774	0.639**
	(1.66)	(5.32)	0.73	(-0.69)	(-0.88)	(2.08)
δSHARPE + δSHARPE*QE3	0.002***	0.019***	0.009***	-0.352	-1.170***	0.485***
	(3.39)	(12.27)	(7.61)	(-1.24)	(-5.58)	(7.67)
Panel C: Differential Sharpe ratio (δSHARPE) for international bond portfolios as the dependent variable						
Constant	-21.342***	-6.312***	5.270***	0.058***	0.058***	0.056***
	(-3.14)	(-4.08)	(5.10)	(3.28)	(3.15)	(3.79)
QE1	9.822	1.814	-2.100*	-0.034**	-0.033	-0.016
	(1.47)	(0.74)	(-1.85)	(-1.97)	(-1.06)	(-0.97)
QE2	28.849***	16.495***	-2.483	-0.008	0.090*	-0.014
	(3.42)	(3.96)	(-1.40)	(-0.36)	(1.80)	(-0.60)
QE3	25.082***	8.857***	-1.372	-0.032*	-0.015	0.012
	(3.59)	(6.74)	(-1.24)	(-1.78)	(-0.92)	(0.76)
INTEGR	32.628***	8.224***	-9.655***	-0.083***	-0.074***	-0.093***
	(3.31)	(4.34)	(-4.86)	(-3.27)	(-3.26)	(-3.28)
CAP/GDP	-62.198***	62.213**	110.071***	0.067	-0.529*	0.900**
	(-3.06)	(2.48)	(4.15)	(1.23)	(-1.80)	(2.40)
INTEGR*QE1	-14.004	-1.896	5.545***	0.051**	0.037	0.052*
	(-1.47)	(-0.64)	(2.91)	(2.04)	(0.95)	(1.94)
INTEGR*QE2	-42.197***	-21.144***	4.637	0.012	-0.118*	0.028
	(-3.52)	(-4.15)	(1.57)	(0.38)	(-1.92)	(0.68)
INTEGR*QE3	-35.612***	-10.899***	3.903*	0.051*	0.022	-0.002
	(-3.53)	(-6.77)	(1.92)	(1.94)	(1.13)	(-0.07)
CAP/GDP *QE1	105.390***	-23.356	-44.729	-0.013	0.412	0.033
	(3.48)	(-0.90)	(-1.25)	(-0.16)	(1.34)	(0.06)
CAP/GDP *QE2	122.883***	-44.452**	-75.720**	-0.100	0.363	-0.186
	(2.93)	(-1.99)	(-2.31)	(-0.83)	(1.36)	(-0.38)
CAP/GDP *QE3	93.649***	-20.929	-39.818	0.119	0.340	0.107
	(3.57)	(-0.89)	(-1.50)	(1.62)	(1.22)	(0.29)
INTEGR + INTEGR*QE1	18.624***	6.328**	-4.110***	-0.032***	-0.037	-0.041***
	(6.68)	(2.43)	(-4.88)	(-4.16)	(-1.13)	(-3.52)
INTEGR + INTEGR*QE2	-9.569	-12.920**	-5.018**	-0.071***	-0.192***	-0.065**
	(-1.38)	(-2.44)	(-2.11)	(-3.60)	(-3.02)	(-2.05)
INTEGR + INTEGR*QE3	-2.984*	-2.675**	-5.752***	-0.032***	-0.052***	-0.095***
	(-1.69)	(-2.17)	(-7.93)	(-6.52)	(-3.54)	(-9.8)
CAP/GDP + CAP/GDP *QE1	43.192**	38.856***	65.342***	0.054	-0.117	0.933***
	(2.18)	(7.13)	(4.91)	(0.95)	(-1.35)	(4.54)
CAP/GDP + CAP/GDP *QE2	60.684	17.760**	34.351*	-0.032	-0.165	0.714**
	(1.54)	(2.11)	(1.81)	(-0.29)	(-1.38)	(2.46)
CAP/GDP + CAP/GDP *QE3	31.450*	41.283***	70.253***	0.186***	-0.188**	1.007***
	(1.67)	(7.45)	(11.12)	(3.43)	(-2.34)	(10.03)

Table 6. Simultaneous equation regression results for stock indexes for the full model

This table reports the regression results for the system of equations consisting of equations (2), (3) and (4) for All, DM and EM countries. The dependent (endogenous) variables are stock market integration (INTEGR), the ratio of equity capital flows to GDP (CAP/GDP), and the differential Sharpe ratio (δSHARPE) for optimal and fully hedged stock portfolios for each sample of countries, and all the other variables whose results remain untabulated are exogenous. The four countries without CAP/GDP data are excluded from the tests. Definitions of all variables are in Appendix A. CAP/GDP, INTEGR, Pop and Trade are for the countries in each sample.

	Optimal Hedged			Fully Hedged		
	All	DM	EM	All	DM	EM
Panel A: Stock market integration (INTEGR) as the dependent variable						
Constant	0.667***	0.704***	0.621***	0.668***	0.703***	0.621***
	(161.38)	(171.54)	(130.93)	(162.52)	(174.43)	(131.04)
QE1	0.139***	0.126***	0.139***	0.138***	0.127***	0.138***
	(15.86)	(15.11)	(12.01)	(15.85)	(15.41)	(11.98)
QE2	0.049**	0.054**	0.045***	0.053**	0.065***	0.045***
	(2.26)	(2.35)	(2.86)	(2.48)	(2.86)	(2.92)
QE3	-0.053***	-0.021***	-0.108***	-0.055***	-0.025***	-0.109***
	(-6.49)	(-2.70)	(-12.29)	(-6.76)	(-3.22)	(-12.37)
CAP/GDP	-17.978***	-11.547***	7.889***	-17.706***	-12.181***	7.745***
	(-11.51)	(-11.65)	(2.81)	(-11.61)	(-12.98)	(2.75)
CAP/GDP *QE1	2.374	6.793***	-11.134*	2.868	7.243***	-10.501
	(0.51)	(2.81)	(-1.74)	(0.61)	(3.04)	(-1.64)
CAP/GDP *QE2	11.661**	6.083*	-9.166	12.512***	8.305**	-8.181
	(2.50)	(1.67)	(-1.21)	(2.72)	(2.34)	(-1.08)
CAP/GDP *QE3	15.276***	10.250***	-0.464	14.326***	9.427***	1.158
	(6.89)	(7.19)	(-0.09)	(6.61)	(6.96)	(0.23)
CAP/GDP + CAP/GDP *QE1	-15.604***	-4.754**	-3.245	-14.838***	-4.938**	-2.756
	(-3.55)	(-2.16)	(-0.56)	(-3.35)	(-2.27)	(-0.48)
CAP/GDP + CAP/GDP *QE2	-6.317	-5.464	-1.277	-5.194	-3.876	-0.436
	(1.43)	(-1.56)	(-0.18)	(-1.19)	(-1.13)	(-0.06)
CAP/GDP + CAP/GDP *QE3	-2.072*	-1.298	7.424*	-3.380**	-2.754***	8.093**
	(-1.74)	(-1.29)	(1.76)	(-2.22)	(-2.88)	(2.12)
Panel B: Ratio of equity capital flows to GDP (CAP/GDP) as the dependent variable						
Constant	0.012*	0.053***	-0.053***	-0.005	0.028**	-0.055***
	(1.86)	(4.44)	(-10.18)	(-0.52)	(2.00)	(-9.72)
QE1	0.017	0.028	0.005	0.012	0.026	0.014***
	(1.48)	(1.21)	(0.74)	(1.00)	(1.14)	(2.63)
QE2	-0.048**	-0.009	-0.017	0.011	0.016	-0.011
	(-2.14)	(-0.32)	(-1.00)	(0.67)	(0.59)	(-1.05)
QE3	-0.010	-0.031**	0.001	-0.019**	-0.037***	0.009**
	(-1.39)	(-2.40)	(0.27)	(-2.33)	(-2.65)	(2.27)
INTEGR	-0.017*	-0.047***	0.001	-0.025**	-0.052***	0.011**
	(-1.92)	(-3.30)	(0.09)	(-2.55)	(-3.26)	(2.31)
δSHARPE	-0.000	-0.008**	0.010***	0.434**	0.158	0.227***
	(-0.16)	(-1.99)	(4.40)	(2.25)	(0.94)	(3.79)
INTEGR*QE1	-0.017	-0.027	-0.004	-0.008	-0.022	-0.018**
	(-1.09)	(-0.91)	(-0.35)	(-0.48)	(-0.75)	(-2.26)
INTEGR*QE2	0.063**	0.009	0.024	-0.016	-0.020	0.014
	(2.09)	(0.27)	(0.91)	(-0.73)	(-0.59)	(0.89)
INTEGR*QE3	0.015	0.040**	0.002	0.025**	0.045***	-0.009
	(1.59)	(2.46)	(0.27)	(2.38)	(2.60)	(-1.63)
δSHARPE*QE1	-0.000	0.002	-0.010***	-1.739***	-1.507***	-0.171*
	(-0.12)	(0.37)	(-3.68)	(-4.11)	(-4.10)	(-1.68)

δSHARPE*QE2	-0.005**	0.005	-0.011**	0.577	0.630*	-0.316*
	(-2.26)	(0.53)	(-2.54)	(1.35)	(1.90)	(-1.65)
δSHARPE*QE3	-0.000	0.010**	-0.012***	0.047	0.478**	-0.271***
	(-0.37)	(2.27)	(-4.48)	(0.18)	(1.99)	(-3.61)
INTEGR + INTEGR*QE1	-0.034***	-0.074***	-0.003	-0.033***	-0.074***	-0.006
	(-3.80)	(-3.54)	(-0.54)	(-3.61)	(-3.95)	(-1.52)
INTEGR + INTEGR*QE2	0.046	-0.038	0.024	-0.041**	-0.072***	0.025*
	(1.53)	(-1.34)	(0.99)	(-2.30)	(-2.64)	(1.77)
INTEGR + INTEGR*QE3	-0.002	-0.007	0.003	0.000	-0.007	0.002
	(-0.43)	(-0.91)	(0.76)	(0.11)	(-1.02)	(0.76)
δSHARPE + δSHARPE*QE1	-0.0003	-0.006**	0.000	-1.305***	-1.349**	0.056
	(-0.61)	(-2.27)	(0.45)	(-3.52)	(-4.30)	(0.64)
δSHARPE + δSHARPE*QE2	-0.005***	-0.003	-0.000	1.011***	0.787***	-0.089
	(-2.67)	(-0.42)	(-0.04)	(2.80)	(2.75)	(-0.52)
δSHARPE + δSHARPE*QE3	-0.001**	0.002	-0.001	0.481***	0.635***	-0.044
	(-2.22)	(1.22)	(-1.16)	(3.31)	(5.20)	(-0.98)
Panel C: Differential Sharpe ratio (δSHARPE) of international stock portfolios as the dependent variable						
Constant	0.908	-0.772***	-0.185	-0.031***	-0.021***	-0.001
	(1.24)	(-2.58)	(-0.78)	(-7.34)	(-4.19)	(-0.11)
QE1	2.047	4.789***	2.050***	0.031**	0.056***	0.013
	(1.05)	(4.26)	(2.73)	(2.57)	(2.90)	(0.83)
QE2	-11.540***	-1.000	-3.621***	0.004	-0.025	-0.037
	(-4.06)	(-0.75)	(-2.70)	(0.20)	(-1.08)	(-1.32)
QE3	-2.272**	0.210	0.739**	0.031***	0.027***	0.013*
	(-2.31)	(0.44)	(1.99)	(5.32)	(3.39)	(1.65)
INTEGR	-1.619*	0.676*	-0.344	0.039***	0.023***	-0.002
	(-1.68)	(1.74)	(-0.86)	(6.91)	(3.49)	(-0.28)
CAP/GDP	87.719	43.179***	-160.555***	3.382***	1.932***	-3.483***
	(1.43)	(4.06)	(-5.68)	(10.22)	(11.33)	(-6.00)
INTEGR*QE1	-3.491	-6.483***	-3.111***	-0.060***	-0.087***	-0.019
	(-1.31)	(-4.59)	(-3.09)	(-3.71)	(-3.58)	(-0.90)
INTEGR*QE2	14.608***	0.606	5.438***	-0.016	0.026	0.054
	(3.73)	(0.36)	(2.70)	(-0.63)	(0.85)	(1.27)
INTEGR*QE3	3.377**	-0.289	-1.401**	-0.047***	-0.037***	-0.015
	(2.21)	(-0.43)	(-2.16)	(-5.09)	(-3.25)	(-1.09)
CAP/GDP *QE1	-123.851	-62.771***	46.058	-2.874***	-1.626***	2.449***
	(-1.47)	(-4.01)	(1.26)	(-5.63)	(-6.14)	(3.44)
CAP/GDP *QE2	-191.643*	-84.661***	182.119***	-3.633***	-1.696***	3.177***
	(-1.93)	(-3.62)	(3.53)	(-6.53)	(-4.40)	(3.31)
CAP/GDP *QE3	-116.511**	-32.289***	120.534***	-2.024***	-1.052***	0.866
	(-2.06)	(-2.91)	(3.59)	(-6.66)	(-5.93)	(1.39)
INTEGR + INTEGR*QE1	-5.110**	-5.807***	-3.456***	-0.021	-0.064***	-0.021
	(-2.18)	(-4.34)	(-3.42)	(-1.41)	(-2.74)	(-1.02)
INTEGR + INTEGR*QE2	12.989***	1.282	5.094**	0.024	0.049*	0.052
	(3.48)	(0.77)	(2.56)	(1.00)	(1.66)	(1.23)
INTEGR + INTEGR*QE3	1.758	0.388	-1.745***	-0.007	-0.014	-0.017
	(1.59)	(0.77)	(-3.34)	(-1.03)	(-1.56)	(-1.53)
CAP/GDP + CAP/GDP *QE1	-36.132	-19.592	-114.497***	0.508	0.305	-1.034
	(-0.55)	(-1.41)	(-2.66)	(1.31)	(1.33)	(-1.27)
CAP/GDP + CAP/GDP *QE2	-103.924*	-41.483**	21.564	-0.251	0.236	-0.306
	(-1.88)	(-2.28)	(0.55)	(-0.78)	(0.78)	(-0.44)
CAP/GDP + CAP/GDP *QE3	-28.792	10.890**	-40.022	1.358***	0.880***	-2.617***
	(-1.46)	(2.07)	(-1.62)	(13.07)	(10.8)	(-6.49)

Table 7. Simultaneous equation regression results with QE conditioning of intercepts only

This table reports partial regression results for the system of equations with QE-conditioning of intercepts only for DM and EM countries. The dependent (endogenous) variables are bond (or stock) market integration (INTEGR), the ratio of debt (or equity) flows to GDP (CAP/GDP), and the differential Sharpe ratio (δSHARPE) for optimal and fully hedged portfolios for each sample of countries, and all the other variables whose results remain untabulated are exogenous. Tests exclude the four countries without CAP/GDP data about balance of payment from the IMF. Definitions of all variables are in Appendix A.

	Bonds				Stocks			
	Optimal Hedged		Fully Hedged		Optimal Hedged		Fully Hedged	
Variable	DM	EM	DM	EM	DM	EM	DM	EM
Panel A: Bond (or stock) market integration (INTEGR) as the dependent variable								
QE1	-0.013**	0.131***	-0.011*	0.138***	0.125***	0.128***	0.131***	0.128***
	(-2.18)	(12.85)	(-1.85)	(14.29)	(13.61)	(12.52)	(13.98)	(12.39)
QE2	-0.014*	0.110***	-0.012	0.111***	0.020	0.054***	0.010	0.059***
	(-1.75)	(8.73)	(-1.41)	(8.92)	(1.56)	(3.79)	(0.79)	(4.10)
QE3	-0.042***	0.024***	-0.042***	0.021***	-0.057***	-0.108***	-0.061***	-0.108***
	(-9.90)	(2.95)	(-10.01)	(2.69)	(-7.48)	(-12.52)	(-7.76)	(-12.37)
CAP/GDP	-3.379***	11.481***	-3.170***	12.760***	-11.407***	8.152***	-14.009***	10.990***
	(-8.49)	(13.99)	(-7.87)	(24.12)	(-11.93)	(3.34)	(-19.86)	(4.52)
Panel B: Ratio of debt (or equity) flows to GDP (CAP/GDP) as the dependent variable								
QE1	-0.006***	-0.011***	-0.007***	-0.011***	0.007***	0.003***	0.011***	-0.001***
	(-5.20)	(-9.44)	(-6.13)	(-13.56)	(3.64)	(3.06)	(11.21)	(-2.64)
QE2	-0.010	-0.007***	-0.022***	-0.009***	-0.001	-0.002***	0.000	-0.002***
	(-0.82)	(-4.43)	(-8.55)	(-8.68)	(-0.89)	(-4.04)	(0.12)	(-5.32)
QE3	-0.007*	-0.005***	-0.003***	-0.002**	-0.003**	-0.000	-0.006***	0.004***
	(-1.87)	(-3.09)	(-2.73)	(-2.08)	(-2.24)	(-0.16)	(-7.99)	(6.38)
INTEGR	0.032	0.071***	0.155***	0.077***	-0.061***	-0.009*	-0.072***	0.012***
	(0.50)	(9.23)	(3.76)	(20.11)	(-5.70)	(-1.82)	(-12.56)	(5.19)
δSHARPE	0.009	0.003**	0.596***	-0.079*	-0.007*	0.004***	0.219***	-0.206***
	(1.07)	(2.14)	(3.82)	(-1.65)	(-1.65)	(2.62)	(3.26)	(-6.17)
Panel C: Differential Sharpe ratio (δSHARPE) for international bond (or stock) portfolios as the dependent variable								
QE1	1.254	1.897***	0.031	-0.025***	-0.504***	-0.389***	-0.015***	0.001
	(0.44)	(8.38)	(0.53)	(-7.92)	(-5.33)	(-5.09)	(-6.78)	(0.53)
QE2	0.484	1.070***	0.028	-0.030***	-0.121*	-0.267***	0.007***	-0.003
	(0.19)	(4.64)	(0.55)	(-9.50)	(-1.92)	(-3.06)	(4.72)	(-1.51)
QE3	1.915**	1.009***	0.044***	0.004***	0.111***	0.132**	0.004***	0.003**
	(2.43)	(10.81)	(2.67)	(2.89)	(2.84)	(2.06)	(4.13)	(2.13)
INTEGR	36.805**	-14.988***	0.912**	0.250***	1.115***	1.112**	-0.024***	-0.024***
	(2.08)	(-6.64)	(2.53)	(9.13)	(3.13)	(2.53)	(-3.08)	(-2.79)
CAP/GDP	180.555	157.336***	4.279	-3.327***	30.311***	-124.194***	1.834***	-2.617***
	(0.95)	(6.15)	(1.11)	(-10.47)	(3.22)	(-5.50)	(8.61)	(-5.39)

Table 8. Simultaneous equation regression results with QE conditioning of coefficients of dependent-as-independent variables only

This table reports partial regression results for the system of equations with QE-conditioning of coefficients of dependent-as-independent variables only for DM and EM countries. The dependent (endogenous) variables are bond (or stock) market integration (INTEGR), the ratio of debt (or equity) flows to GDP (CAP/GDP), and the differential Sharpe ratio (δSHARPE) for optimal and fully hedged portfolios for each sample of countries, and all the other variables whose results remain untabulated are exogenous. Tests exclude the four countries without CAP/GDP data about balance of payment from the IMF. Definitions of all variables are in Appendix A.

Variable	Optimal Hedged - Bonds		Fully Hedged - Bonds		Optimal Hedged - Stocks		Fully Hedged - Stocks	
	DM	EM	DM	EM	DM	EM	DM	EM
Panel A: Bond (or stock) market integration (INTEGR) as the dependent variable								
CAP/GDP	-3.775***	12.273***	-3.641***	12.544***	-6.029***	14.995***	-7.879***	13.895***
	(-6.72)	(13.57)	(-6.49)	(14.23)	(-5.32)	(3.98)	(-7.07)	(3.72)
CAP/GDP +	-2.093***	1.259	-1.826***	1.956	-3.360	36.571***	-5.518**	37.047***
CAP/GDP*QE1	(-4.36)	(1.19)	(-3.79)	(1.93)	(-1.26)	(5.34)	(-2.09)	(5.48)
CAP/GDP +	-2.618***	1.145	-2.458***	0.180	-8.498**	-13.704	-9.237***	-11.470
CAP/GDP*QE2	(-5.14)	(0.44)	(-4.81)	(0.07)	(-4.39)	(-1.64)	(-4.78)	(-1.40)
CAP/GDP +	-2.426***	7.348***	-2.136***	6.862***	5.735***	-1.930	3.774***	3.37
CAP/GDP*QE3	(-3.69)	(7.64)	(-3.24)	(7.28)	(5.24)	(-0.34)	(3.48)	(0.62)
Panel B: Ratio of debt (or equity) flows to GDP (CAP/GDP) as the dependent variable								
INTEGR	0.114***	0.114***	0.252***	0.126***	0.005	-0.004	-0.009	0.006***
	(3.13)	(14.08)	(6.14)	(16.17)	(0.67)	(-1.24)	(-1.26)	(2.85)
δSHARPE	0.016**	0.001	-0.254	-0.093	-0.016***	0.010***	0.491**	0.172***
	(2.15)	(0.59)	(-0.61)	(-0.76)	(-3.24)	(3.86)	(2.40)	(2.93)
INTEGR +	0.117***	0.090***	0.244***	0.101***	0.002	0.000	-0.006	0.008***
INTEGR*QE1	(3.27)	(14.06)	(5.94)	(16.32)	(0.34)	(0.12)	(-0.96)	(4.66)
INTEGR +	0.090***	0.107***	0.216***	0.117***	0.000	-0.006**	-0.011	0.004
INTEGR*QE2	(2.68)	(13.88)	(5.55)	(16.56)	(0.03)	(-1.94)	(-1.55)	(1.66)
INTEGR +	0.116***	0.107***	0.262***	0.118***	0.008	-0.002	-0.013	0.010***
INTEGR*QE3	(3.30)	(13.97)	(6.47)	(16.01)	(0.86)	(-0.39)	(-1.55)	(3.84)
δSHARPE +	-0.008**	0.006***	-0.502**	0.291***	-0.003	0.000	-0.459	0.070
δSHARPE*QE1	(-2.17)	(5.93)	(-2.35)	(3.06)	(-1.17)	(0.13)	(1.37)	(0.82)
δSHARPE +	-0.002	0.003	0.263	0.773***	-0.008	0.004**	0.827***	0.027
δSHARPE*QE2	(-0.71)	0.95	(0.29)	(2.58)	(-0.93)	(1.92)	(3.20)	(0.26)
δSHARPE +	0.002	0.008***	-1.246***	0.539***	0.000	-0.002	0.736***	0.051
δSHARPE*QE3	(1.13)	(5.48)	(-4.52)	(7.58)	(-0.04)	(-1.22)	(6.84)	(0.96)
Panel C: Differential Sharpe ratio (δSHARPE) for international bond (or stock) portfolios as the dependent variable								
INTEGR	-19.577***	-16.520***	-0.050**	-0.253***	-0.486	-0.875**	0.007	-0.023***
	(-6.68)	(-11.07)	(-2.45)	(-12.95)	(-1.42)	(-2.12)	(1.08)	(-2.87)
CAP/GDP	-158.807***	185.105***	-0.384	2.743***	17.085*	-142.598***	1.684***	-3.401***
	(-3.63)	(9.32)	(-1.34)	(10.10)	(1.93)	(-5.16)	(10.74)	(-6.11)
INTEGR +	-20.423***	-14.105***	-0.0548**	-0.220***	-0.893***	-1.203***	-0.005	-0.023***
INTEGR*QE1	(-6.39)	(-10.03)	(-2.49)	(-11.77)	(-2.72)	(-3.08)	(-0.86)	(-3.01)
INTEGR +	-21.659***	-15.781***	-0.0582***	-0.241***	-1.031***	-0.880**	0.003	-0.023***
INTEGR*QE2	(-6.90)	(-12.25)	(-2.69)	(-14.20)	(-3.09)	(-2.25)	(0.49)	(-3.03)
INTEGR +	-20.336***	-14.871***	-0.0436**	-0.229***	-0.513	-1.095***	0.007	-0.019***
INTEGR*QE3	(-6.20)	(-11.09)	(-1.92)	(-13.04)	(-1.49)	(-2.32)	(1.19)	(-2.05)
CAP/GDP +	-10.359	106.331***	-0.119	1.398***	-22.827*	-90.952**	0.392*	-1.688**
CAP/GDP*QE1	(-0.74)	(9.39)	(-1.50)	(6.53)	(-1.74)	(-2.43)	(1.84)	(-2.38)
CAP/GDP +	-64.512***	64.611***	-0.117	0.762**	-43.786***	15.781	0.471*	-0.453
CAP/GDP*QE2	(-3.57)	(3.00)	(-1.12)	(1.82)	(-2.64)	(0.42)	(1.71)	(-0.67)
CAP/GDP +	-8.594	112.635***	-0.165**	1.568***	6.861	-33.061***	0.832***	-2.214***
CAP/GDP*QE3	-0.63	(15.00)	(-2.24)	(10.61)	(1.46)	(-1.39)	(11.41)	(-5.50)