



Seminar Paper

EE459 Seminar in International Trade Theory and Policy

Capital flows to emerging market economies: a study of unconventional  
monetary policy and unconventional monetary policy normalization

By

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Presented to

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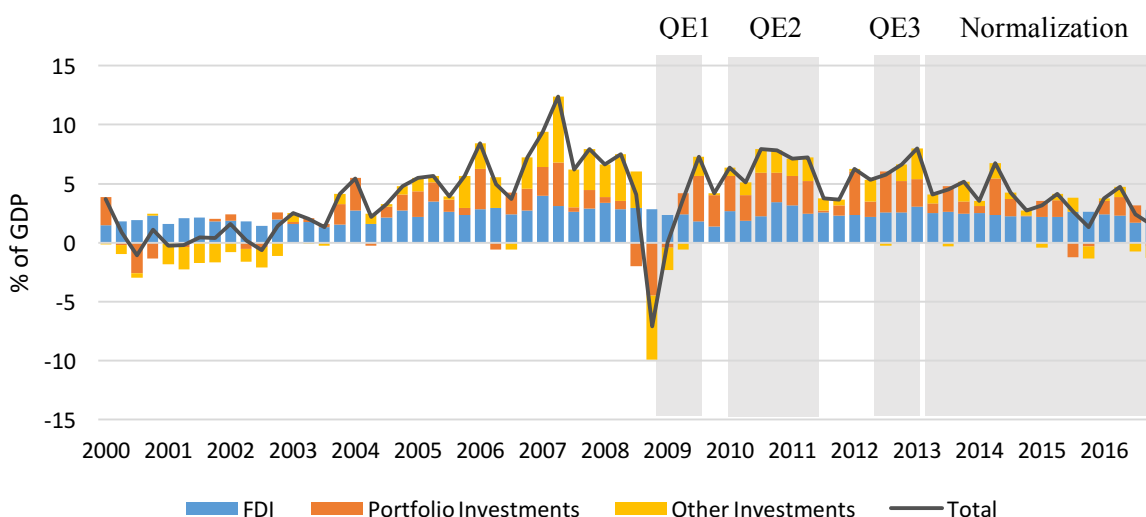
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## Introduction

The recent data demonstrates the immediate surge in capital flows to Emerging Market Economies (EMEs) after the occurrence of Global financial crisis in 2008 (Clark, Converse, Coulibaly, and Kamin 2016). This incident complies with the aggressive unconventional monetary policy imposed by many advanced economies central bank with intention to relieve the crisis and boost economy. Concerns are raised again when Advanced Economies (AEs) begin to normalize their balance sheet reflecting less world's liquidity. Consequently, it hypothetically generates adverse impact on capital flows. There is approximately 50 percent drop in bond and equity issuances, and syndicated bank loans which then enforce modification pressure on currencies, asset prices, and foreign exchange reserves of many countries (Burns, Kida, Lim, Mohapatra, and Stocker, 2014).

**Figure 1: Net private capital Inflows<sup>1</sup> (percent of GDP)**



Emerging Market Economies generally refers to countries who partially have characteristics of developed market, experience rapid growth and industrialization but still have low to middle per capita income. Particularly, EMEs tends to provides higher return on investment with supportive EMEs environment as well as more risks have to be concerned (Blair, 2017). Higher growths of EMEs coupled with higher interest rates pull funds in while lowering interest rate in AEs tends to push funds out of AEs (Huefner, 2013). This paper aims to

<sup>1</sup> Net private capital flow of 14 EMEs is weighted by percentage share of the world calculated from GDP based on purchasing power parity (PPP). Data for PPP are available from IMF World Economic Outlook Database.

discuss about the effects of 2 policies 1) U.S. unconventional monetary policy(QE), and 2) U.S. unconventional monetary policy normalization(QE tapering) on net private capital flows to Emerging Market Economies whether how these 2 policies have given the consequences on capital flows to EMEs after global financial crisis.

Theoretically, financial liberalization yields the advantages to all countries since it promotes the efficient funds allocation from the surplus spending unit to deficit spending unit which consequently increases domestic productivity and economic growth which implies the advantages (Ahmed, and Zlate, 2014). In fact, due to this circumstance, funds mostly come in the form of large and volatile flows with the purpose of short term speculation on yield spread. This could consequently create economic fluctuation and negative effect on economic growth to recipient countries (Carp, 2014). Also, sudden stop and financial crisis (subsequent problems) more frequently occur among developing economies with more severe negative macroeconomic impact (Reis, 2005). Therefore, policy makers are challenged with the appropriate policy responses as well as balancing the real effect of policies imposed across inflows and outflows.

To summarize, this paper is mainly subjected to the following questions:

1. Is there any sensitivity change of main determinants of capital flows to EMEs in post global financial crisis period?
2. Is there an asymmetric effect on capital inflows and outflows of EMEs due to Fed's unconventional policy and policy normalization?
3. Do these associations vary across net capital flows compositions?

The analysis is through the using of these methods as followed:

1. Structural break test to see how the determinants sensitivity have changed after the financial crisis
2. Analyzing the asymmetrical impact through the size of coefficient of unconventional monetary policy dummy
3. Decomposing capital flows into sub-dependent variables.

## Literature Review

There are several studies examining the the real effect of capital inflows in EMEs. Igan, Kutan, and Mirzaei(2016) found that private capital inflows were associated with higher output growth during the pre-crisis years differently across industries. Along with the study on inflows by Bosworth, Collins and Reinhart (1999) saying that flows can raise growth rates through the incrementing domestic saving whereby increasing the rate of capital accumulation.

Fratzsher (2011), Ahmed and Zlate (2014) discover the structural change in sensitivity of flow determinants but the conclusions are contrast. Fratzher (2011) found the change in risk pricing after crisis. In pre-crisis period, increase in risk pushed flows out of AE and pulled in EMEs while after crisis, the relationship switched. This alternatively confirms a flight-to-safety phenomenon raising during financial crisis. Ahmed and Zlate (2014) argue that investors are less sensitive to risk; in other word, becoming less risk aversion after crisis. This implies search for higher yield behavior.

Many literatures try to explain the surge in capital flows to EMEs after the global financial crisis. Some may view this situation through push and pull factors effects while some view it as a result of U.S policy. In general literature, since global rate is unobservable, estimating EMEs yield spread will use, instead, U.S. interest rate as a proxy of global interest rate (Bahadir, and Lastrapes, 2015). Therefore, the majority of studies bundle EMEs as one region; for example, Ahmed and Zlate (2014), Burns, Kida, Lim Mohapatra, and Stocker(2014), Nier, Sedik, Mondino(2014). However, Reinhart and Montiel(2001) argue that portfolio flows to Latin America are more influenced by U.S. interest rate whereas Asia appears to be subjected to Japanese interest rate instead. Turning to the flows determinants, Suttle, Huefner, and Koepke(2013) concludes that EMEs real GDP growth and risk aversion are the key predictors of capital inflows which equally share the importance. However, lowering interest rate in AEs fails to explain capital flows but they are alternatively successful in using measure of liquidity as a proxy of impact of monetary policy to explain the surge in capital inflows in EMEs. Clark, Converse, Coulibaly, and Kamin's model(2016) found contrast results on the effect of global risk indicators in which it plays no role to the surge of capital flows and relatively low role in recent slowdown. The policy rate differential and tightening U.S. monetary policy variables show statistically insignificant, but consistent sign and acceptable magnitude. In contrast, diminishing growth differential become the main determinant of flows slowdown instead. Bekaert, Hoerova

and Duca(2013) found that VIX index, a popular measurement of risk aversion, have co-movement with the U.S. monetary policy where expansionary policy tends to decrease future risk aversion showing in lower VIX. In contrast, high current VIX is shown to loosen monetary policy in medium-term future. In turns, Nier, Sedik, and Mondino(2016) study further about how different levels of VIX associate with the prominent effect of VIX as a key determinant of capital flows to EMEs. The research shows that when VIX is low, marginal change of VIX does not show much significant effect while other pull factors such as growth differential become the dominant one, vice versa.

Dahlhaus and Vasishtha(2014) use VAR model to analyze the U.S. policy normalization shock on several variables. They find that shock that significantly decreases flows determinants varies across countries but the impact on capital flows itself is still economically small. Hungary, South Africa, Malaysia, and Thailand tend to get the highest impact since these countries initially get larger fund inflows before 2013.

Fratzscher(2011) and Burns, Kida, Lim Mohapatra, and Stocker(2014) similarly break down net flows into sub-dependent variables, but conclude in different aspects. Fratzscher(2011) indicates the significant equity outflows of both AEs and EMEs as a result of crisis but bonds are adversely induced to AEs. Also, bonds flows are much sensitive to risk. Burns, Kida, Lim Mohapatra, and Stocker(2014) suggests that portfolio flow is the most sensitive to external factors, mainly measured by monetary conditions in AEs, whereas FDI is the least sensitive.

Koepke(2015) study on a diverge aspect of capital flows to EMEs by relating the Fed policy Expectations to portfolio flows. The result shows an asymmetric impact of shifts in monetary policy expectation. In post-crisis period(2010-2013), the effect of a shift to tightening is twice higher than the effect of a shift to expansionary.

Structural change varies across the way of estimation along with the role of determinants on capital flows that are still lagged in the existing literatures create the main research gap that there are more approaches to be found. Since most literature tends to focus on the significance of each flow determinants as well as the relationship between the capital flows and monetary policy are found on only one leg; therefore, the asymmetric size of policy impact on the net total capital flow is still being ignored. Moreover, deeper look in each composition is included to determine whether channels are affected from policy the most.

## Data and Methodology

It is quite common in the literature of capital flows to emerging economies to use panel data models. Hence, to answer questions, panel regression model can be properly estimated through quarterly data of 14 emerging market countries covering Asia, Europe, Africa, and South America over the period 2000 -2016. Source of data is reported in Appendix.

### I. Baseline model with structural break test

$$CF_{it} = \alpha_0 + \beta_1 X_{it} + \beta_2 VIX_t + (\gamma_0 + \gamma_1 X_{it} + \gamma_2 VIX_t) PCRS_t + v_i + \varepsilon_{it}$$

$$\text{where } X_{it} = \begin{bmatrix} rGDP_{it} - rGDP_t^{AE} \\ r_{it} - r_t^{US} \\ REER_{i,t-1} \\ Rating_{it} \end{bmatrix} \quad \text{and} \quad v_i = \sum_{i=1}^{n-1} \alpha_i D_i$$

The dependent variable ( $CF_{it}$ ) represents capital flows as a share of GDP of country  $i$  at time  $t$ . Capital flow is defined as gross inflows less gross outflows representing portfolio flows (mainly from equity and debt securities investment) plus other investments (principally composed by interbank loan and transfer) which taken from the liability side of financial accounts in Balance of Payment. FDI is excluded due to the fact that it is relatively stable (Ahmed and Zlate 2014) and likely depends on country specific factors such as infrastructure, market size, factor cost structure, and degree of willingness to accept FDI (Demirhan and Masca 2008). Matrix  $X$  indicates the controlled variables that are likely to influence the capital flows referring to previous literatures. This includes real GDP growth differential between country  $i$  and G-4<sup>2</sup>, interest rate differential between country  $i$  and US<sup>3</sup> (using overnight interbank rate and effective fed fund rate), real effective exchange rate measured as percentage from the same quarter a year ago, current account balance as a share of GDP, and country's credit rating score<sup>4</sup>. VIX index<sup>5</sup> is used to measure market uncertainty and

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<sup>2</sup> G-4 countries are used to represent the group of advanced economies (Ahmed and Zlate 2014).

<sup>3</sup> In empirical work, US interest rate is generally referred to a proxy of global interest rate.

<sup>4</sup> Country's credit rating score is calculated based on Fitch Ratings by ranking AAA as 1 up to D as 10.

<sup>5</sup> VIX measures the implied volatility of S&P 500 index options which calculated and published by the Chicago Board Options Exchange (CBOE).

investor risk appetite. Higher value of VIX indicates higher risk aversion of investors. Also,  $v_i$  refers to country-specific components. To examine the sensitivity change in flow determinants, we introduce the post-crisis dummy variable in both intercept and slope dummies specifying as 1 in period after quarter 3 of 2009.

## II. Extended Model with unconventional monetary policy variables

$$CF_{it} = \alpha_0 + \beta_1 X_{it} + \beta_2 VIX_t + (\gamma_0 + \gamma_1 X_{it} + \gamma_2 VIX_t) PCRS_t + USMP_t + v_i + \varepsilon_{it}$$

where  $USMP_t = \begin{bmatrix} QE1 \\ QE2 \\ QE3 \\ QET1 \end{bmatrix}$

qe1 dummy variable equal to 1 for the entire duration of QE1 policy

qe2 dummy variable equal to 1 for the entire duration of QE2 policy

qe3 dummy variable equal to 1 for the entire duration of QE3 policy

qet1 dummy variable equal to 1 for the entire after actual announcement of phase I tapering

Reaching zero percent of policy rate still cannot solve the crisis together with sluggish economic recoveries, unconventional monetary policy, simply called as quantitative easing(QE), is introduced by many AEs central banks with intention to ease credit market as well as boost economy. Recently, U.S. began to use monetary policy normalization in order to allow them to conduct policy and bring fed fund rate to its normal path as it was before the beginning of financial crisis. Referring to U.S, there are four quantitative easing dummies are included in the baseline model, three dummies indicates three phase of QE expansion and one dummy indicates the first phase of QE normalization. The periods corresponding to dummies are implementing period of U.S unconventional monetary policy<sup>6</sup>. Coefficients of expanding QE episodes are

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<sup>6</sup> The dummy period is mainly based on the period of U.S. unconventional monetary policies implementation with the assumption that most of advanced economy central banks implement policy closed to each other.

expected to be positive inferring that unconventional monetary policy push capital flows to EMEs while coefficient of QE tapering is expected to be negative implying reverse effect.

Note that QE dummies in this model mainly refers the liquidity channel of quantitative easing transmission based on the model of Khatiwada (2017).

### III. Decomposition of capital flows

$$PORT_{it} = \alpha_0 + \beta_1 X_{it} + \beta_2 VIX_t + (\gamma_0 + \gamma_1 X_{it} + \gamma_2 VIX_t) PCRS_t + v_i + \varepsilon_{it}$$

$$BOND_{it} = \alpha_0 + \beta_1 X_{it} + \beta_2 VIX_t + (\gamma_0 + \gamma_1 X_{it} + \gamma_2 VIX_t) PCRS_t + v_i + \varepsilon_{it}$$

$$EQUITY_{it} = \alpha_0 + \beta_1 X_{it} + \beta_2 VIX_t + (\gamma_0 + \gamma_1 X_{it} + \gamma_2 VIX_t) PCRS_t + v_i + \varepsilon_{it}$$

$$OTHER_{it} = \alpha_0 + \beta_1 X_{it} + \beta_2 VIX_t + (\gamma_0 + \gamma_1 X_{it} + \gamma_2 VIX_t) PCRS_t + v_i + \varepsilon_{it}$$

where  $X_{it} = \begin{bmatrix} rGDP_{it} - rGDP_t^{AE} \\ r_{it} - r_t^{US} \\ REER_{i,t-1} \\ Rating_{it} \end{bmatrix}$  and  $v_i = \sum_{i=1}^{n-1} \alpha_i D_i$

For the purpose of deeper look in policy channels, the dependent variable is decomposed into sub-dependent variables where portfolio investment are decomposed into bonds and equity, and other flows refers to bank loans. This is mainly to see more which financial flows composition has the most sensitive to internal and external drivers (called as push and pull factors). In addition, it will help explaining the specific channel of flows resulting from policies. (see Table 2, Appendix for more details on decomposition)

## Results

### I. Capital flow determinants sensitivity change after crisis

Referring to table 4, main determinants are found consistent with literature such that real GDP growth differential, VIX and current account balance shows economically significant with correct sign while the size of coefficients is altered according to different model specification. Surprisingly, this model reports interest rate differential a contradict sign from literatures; for

example, Clark, Converse, Coulibaly, and Kamin (2016) found statistically insignificant positive relationship. Looking at **Figure 4: Relationship between interest rate differential and capital flows** in Appendix, capital flows tends to go along inversely with interest rate differentials; however, after combining with several important factors, some literatures may conclude the positive relationship. Thus, this relationship is ambiguously explained by this model.

Recall from Structural Break Test, the interaction terms are jointly different from zero which means that, in general, there will be a sensitivity change of capital flow determinant after crisis. Ahmed and Zlate (2014) concisely found the sensitivity changes of flows to interest rate differentials—increases in post-crisis period implying the inducement of higher rates to investors. The model, in another way around, shows that VIX index has less coefficient in after crisis period referring that investors seem to have less sensitive to risk, in other words, daring to invest in riskier place. It also alternatively intimates the search for higher yield behavior of investors.

Note that even though the Hausman test suggest to use Fixed Effect model, it tends to diminish the significance of country rating score. In general, country rating varies across country and region while less likely vary across time, so the effect will be fully captured by fixed effect component in the model. As many literatures mentioned this problem such as Ahmed and Zlate (2014), they report several estimation techniques to avoid the ignorance of this issue. In this case, three estimation techniques are reported (see **Table 4: Structural Break Test** in Appendix)

## **II. Effect of Unconventional Monetary Policy**

Adding four more QE dummy variables does not deviate the results on controlled variables much showing the robustness of the model. Two estimation techniques are reported—Fixed effect, and Random effect. Along with the previous literatures, the conduction of unconventional monetary policy has statistically impacted the capital flows to emerging markets. As shown in **Table 6: Extended model with QE variables** in Appendix, QE1, QE2 and normalization policy are economically significant. However, the magnitudes of coefficient contradict to literature that there will be diminishing effect of QE when new QE is used since the asset purchase in QE2 is in smaller scale than QE1 (Burns, Kida, Lim, Mohapatra, and Stocker, 2014). In this case, QE2 shows stronger impact on capital flows which is reasonable to alternatively interpret that QE1 is done with the attention to calm down market right after crisis

but later QE is done to boost domestic economy. With Fed's intention to keep low interest rate, investors seem to search for higher yield in EMEs during the second phase of policy instead. QE3 is insignificantly affect capital flows due to the fact that yield spread is relatively stable and investor get used to the situation. QE tapering comes with expected sign in which it pulls funds out of the countries. Comparing the coefficient of expansion QE and tapering QE, it seems to have asymmetric effect of these policies. The coefficient QE tapering is relatively lower than QE expansion variable. Though the effect of expansion QE; resulting the flows surge, still overcomes the recent retrenchment in capital flows, it just only phase one of normalization policy. Second phase of normalization policy is still in issue not only for U.S. Federal reserve, but along with other advanced economies like England and Japan. Thus, it is possible that capital outflows may overcome the inflows.

### **III. Decomposition of capital flows**

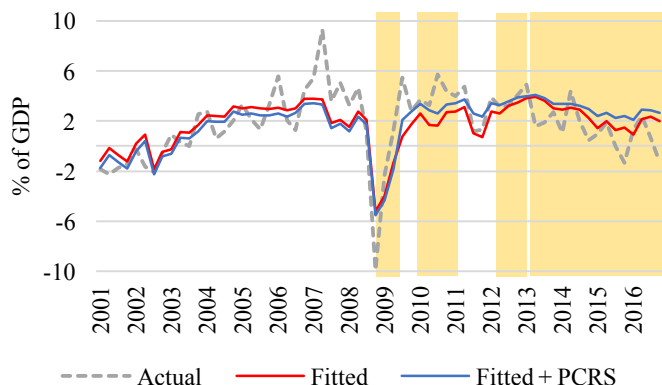
Seeing in **Table 7: Decomposition of capital flows** in Appendix, the significance of flows determinants varies across compositions. Growth differential and country credit rating relate with confidential investment through the ability to pay back initial investment, especially for debt-related instruments which is mainly subjected to default risk. Thus, bond flows and other investment flows (composition of bank loans) are reported statistically significant in real GDP growth differential and country credit rating<sup>7</sup>. Conversely, equity is purely subjected to level of risk appetite such increase in risk aversion is associated with a decline in equity flows. Likewise, interest rate differential shows negative sign, but statistically significant only other investment. QE policy operates through overall portfolio flows more than other flows which found inconsistent with literature (Burns, Kida, Lim, Mohapatra, and Stocker, 2014). All portfolio flows compositions—bonds and equity, are found associated with QE1, where equity shows a bit greater impacts, while QE2 shows irrelevant. This is somehow consistent with literature. However, Khatiwada (2017) contrarily sees QE2 association with equity inflows. Similarly to aggregate capital flows, none of composition is likely to be affected by QE3. Normalization policy is clearly transmitted through the channel of portfolio flows, particularly bond flows channel. Meanwhile, since the significance of each episodes of unconventional

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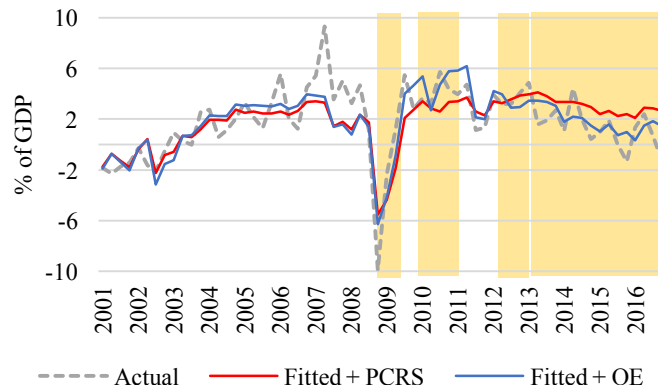
<sup>7</sup> Country credit rating is considered through random effect model (column (8) and (10) in Table 7: Decomposition of capital flows in Appendix; otherwise, fixed effect model diminishes the importance of this variable.

policy effect varies across compositions, it is difficult to compare the magnitudes among them. In sum, each episodes of policy finds distinct way to go.

**Figure 5: Prediction comparison (post crisis dummy)**



**Figure 6: Prediction comparison (QE dummy variable)**



#### IV. Comparison of fitted values

Seeing that the predicted value of model with post-crisis dummy variable is well-explained the actual capital flows, especially period after the crisis—the underestimated and overestimated values are partially corrected. This assertively suggests the sensitivity change of capital flows main determinants. Also, the effect of U.S. unconventional monetary policy is affirmed by the fitted value of model with QE dummy variable, especially the period where policies are implemented. Nevertheless, in the part of normalization policy, the prediction is still lagged behind due to some limitations; a room for further improvement.

#### Limitations

Right now not everyone agrees entirely on which countries are emerging markets. For example, IMF and Morgan Stanley classifies 23 countries as emerging markets, while S&P and Russell classify 21 countries as emerging markets. Due to the unavailable of data, only 14 EMEs are collected from different region such that capital flows may be captured by region’s specific events such as oil price shock in Latin America during 2014-2015, debt crisis in Europe, etc. For further study, breaking down into sub-regions should be concerned. Beside, model specifications are not able to fully capture the whole capital flows which deviates my results from literature such as the mismatch between the expected sign and actual sign. This result is also subjected to

the lack of capital flows determinants data; only limited set of controlled variables are included. Lastly, the underlying assumption may not be thoroughly right in the real situation—QE variables are generated based on the period of policy implementation of US only with the assumption that many advanced economies imposed policy simultaneously and the model captures only the effect of US policy through the interest differential between EMEs money market rate and effective fed fund rate. It is under the assumption that U.S interest rate is a proxy of global interest rate.

## **Policy recommendations**

There are two main issues occur as a result of Fed unconventional policy. Firstly, the money comes in form of large and volatile flows with the purpose of short term speculation on yield spread which the impact of volatile capital flows on financial stability can complicate the conduct of domestic monetary policy. However, the more focused issue is on the normalization policy of advanced economies—the more capital out flows are predicted when second phase of normalization policy began. The country with financial instability will face with more severe effect of outflows which may leads to sudden stop or financial crisis in the end. Hence, policy makers are challenged with appropriate policy response, smoothing the adjustments and, balancing between the real effect of policies and long term cost.

I recommend 4 policies which ranked based on the difficulty of implementation and subsequent cost. Starting with the easiest and least cost, signaling through conference statement or speech of central bank will help calm down and restore market confidence. Secondly, raising interest rate through a conventional monetary policy can keep a relatively high interest rate to make country more attractive in the eye of searching for yield investors. Thirdly, the conduct of domestic reformation by investing in infrastructure, or increasing government transparency will create a more stable image for a country. Since real GDP growth differential, from the model, is one of the main determinants of capital flows, boosting policy is anticipated to gradually lure fund flows. Lastly, capital control, which is the most effective policy, can immediately stop the capital outflows but comes with the highest long term costs such that investors may lose confident about the country. In case, investor may not be interested in investing in country that has used capital controls as if any circumstances occur, capital control is expected to be used

again they aren't allowed to move the funds. Thus, policymakers have to carefully balance the effect of stopping short-term outflows and long-term inflows.

## **Conclusions**

The issue has been rising when many advanced-economy central banks begin to size down their balance sheet which complies with the retrenchment of capital flows to Emerging Market Economies. This research aims to tackle the argument about the effect of unconventional monetary policy conducted by many advanced economies in the period right after the global financial crisis in 2008. Along with the supporting debates to be discussed, further studies about the asymmetric effect of policy and transmission channels among capital flows compositions are also included. The evidence shows that the growth differential, VIX index, and current account balance are statistically consistent in line with existing literatures. However, interest rate differential is unclear to be concluded. VIX is used to alternatively imply the behavioral change of investors in post-crisis period; the decreased in coefficients assert the searching for higher yield of global investors. In this case, several estimation techniques are collectively reported due to the fact that Fixed Effect model diminishes the importance of country credit rating. The results support the effect of first two episodes of U.S unconventional monetary policy and policy normalization to capital inflows to Emerging Market Economies. The surge in capital flows can be captured by expansion policy while the slow down is due to tapering policy. The effect is shown to be asymmetric where expansion tends to overcome slow down effect. Not all controlled variables are founded statistically consistent among each types of flows composition. Debt-related instruments tends to depend on real GDP differential and country credit rating score which refer to confirmedly pay back initial investment and default risk. Meanwhile, the magnitudes of policy effect varies across flows compositions such that it is ambiguous to conclude the asymmetric size among compositions.

As long as the next chapter of normalization policy is anticipated to be done, the more capital flows are expected to gone. As mentioned the challenges, four policies are recommended to overcome the capital flows retrenchment as well as increases countries' attractiveness. Market signaling, raising interest rates, domestic reformation, and temporary capital controls are specified based on difficulty of implementation and associated costs.

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## Appendix

### Part I: Variable list for panel data model

**Table 1: Baseline variables summary**

| Variable            | Unit           | Description  | Expected impact |
|---------------------|----------------|--|-----------------|
| CF                  | percent of GDP | Net capital flow less FDI in liability taken from financial account, Balance of payments<br>Source: IMF IFS  | NA              |
| Growth differential | percent        | Real GDP growth differential of country i with U.S.; measured as a percentage change from the same quarter a year ago<br>Source: IMF IFS                 | +               |
| Rate differential   | percent        | Short-term interest differential with U.S.; using overnight interbank rate for EMEs and effective fed fund rate for U.S.<br>Source: IMF IFS, FRED        | +               |
| IREER               | percent        | Real effective exchange rate; measured as a percentage change from the same quarter a year ago (higher value indicates real appreciation)<br>Source: BIS | +               |
| CA                  | percent of GDP | Current account balance<br>Source: IMF IFS   | +/-             |
| Rating              | Unit           | Credit rating score (1 for AAA and 10 for D)<br>Source: Fitch Rating Inc.  | -               |
| VIX                 | percent        | Chicago Board Options Exchange Market Volatility Index (higher value indicates higher risk aversion)<br>Source: FRED                                     | -               |

**Table 2: Decomposition of capital flows**

| Variable | Unit           | Description  | Expected impact |
|----------|----------------|--|-----------------|
| Port     | percent of GDP | Portfolio flow in liability taken from financial account, Balance of payments<br>Source: IMF IFS                               | NA              |
| Bond     | percent of GDP | Bond flow, a component of portfolio flows, in liability taken from financial account, Balance of payments<br>Source: IMF IFS   | NA              |
| Equity   | percent of GDP | Equity flow, a component of portfolio flows, in liability taken from financial account, Balance of payments<br>Source: IMF IFS | NA              |
| Other    | percent of GDP | Other investment flow in liability taken from financial account, Balance of payments<br>Source: IMF IFS                        | NA              |

**Table 3: U.S. monetary policy dummy variables summary**

| Variable | Description  | Expected impact |
|----------|--|-----------------|
| qe1      | dummy variable equal to 1 for the entire duration of QE1 policy (2008Q4 – 2010Q1)                        | +               |
| qe2      | dummy variable equal to 1 for the entire duration of QE2 policy (2010Q3 – 2011Q1)                        | +               |
| qe3      | dummy variable equal to 1 for the entire duration of QE3 policy (2012Q3 – 2013Q4)                        | +               |
| qet1     | dummy variable equal to 1 for the entire after actual announcement of phase I tapering (2013Q4 – 2016Q3) | -               |

**Country List for panel data model**

|           |             |              |
|-----------|-------------|--------------|
| Argentina | South Korea | Russia       |
| Brazil    | Malaysia    | South Africa |
| Chile     | Mexico      | Thailand     |
| Colombia  | Philippines | Turkey       |
| Indonesia | Poland      |              |

**Table 4: Statistical summary**

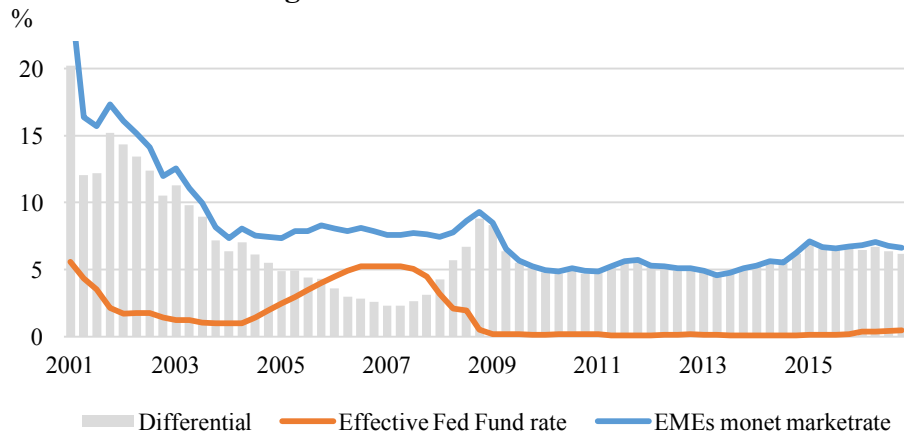
| VARIABLES | (1)<br>N | (2)<br>mean | (3)<br>SD | (4)<br>min | (5)<br>max |
|-----------|----------|-------------|-----------|------------|------------|
| CF        | 896      | 1.931       | 5.233     | -35.95     | 22.80      |
| Port      | 896      | 1.365       | 3.556     | -26.27     | 22.80      |
| Equity    | 896      | 0.384       | 1.583     | -11.73     | 10.07      |
| Bond      | 896      | 0.885       | 2.647     | -21.19     | 15.48      |
| Other     | 896      | 0.567       | 3.406     | -20.96     | 16.44      |
| gdp       | 896      | 2.401       | 3.040     | -17.10     | 15.06      |
| rate      | 896      | 5.778       | 9.158     | -3.913     | 169.1      |
| ca        | 896      | 0.634       | 5.001     | -12.01     | 19.83      |
| reer      | 896      | 48.14       | 1,955     | -3,022     | 58,267     |
| rating    | 896      | 4.415       | 2.791     | 1          | 66         |
| vix       | 896      | 20.20       | 8.235     | 11.03      | 58.60      |
| qe1       | 896      | 0.0938      | 0.292     | 0          | 1          |
| qe2       | 896      | 0.0625      | 0.242     | 0          | 1          |
| qe3       | 896      | 0.0938      | 0.292     | 0          | 1          |
| qet       | 896      | 0.188       | 0.391     | 0          | 1          |

**Table 5: Correlation between controlled variables**

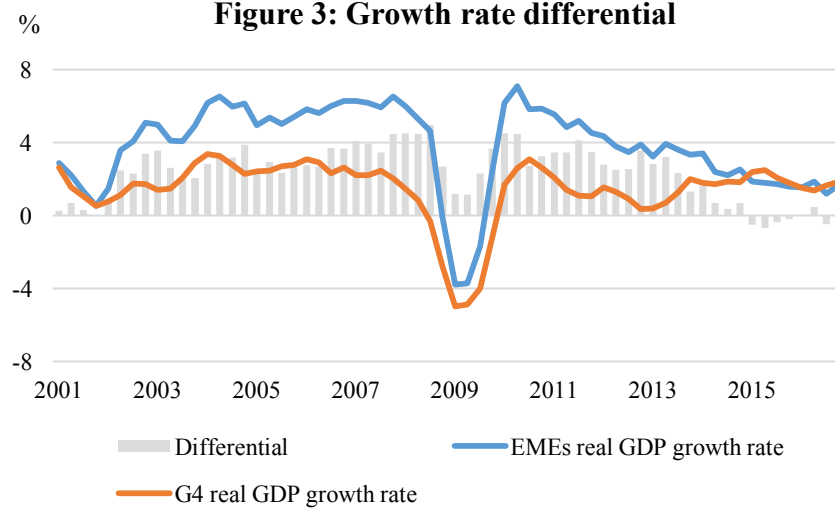
|        | CF      | gdp     | rate    | ca      | reer    | rating | vix    |
|--------|---------|---------|---------|---------|---------|--------|--------|
| CF     | 1.000   |         |         |         |         |        |        |
| gdp    | 0.2282  | 1.0000  |         |         |         |        |        |
| rate   | -0.1913 | -0.3413 | 1.0000  |         |         |        |        |
| ca     | -0.2374 | 0.0386  | -0.1281 | 1.0000  |         |        |        |
| reer   | -0.0282 | -0.0049 | -0.0181 | 0.0282  | 1.0000  |        |        |
| rating | -0.1335 | 0.0078  | 0.3305  | -0.0236 | -0.0351 | 1.0000 |        |
| vix    | -0.3171 | 0.0079  | 0.1482  | 0.0426  | -0.0241 | 0.0203 | 1.0000 |

## Part II: Stylized Facts

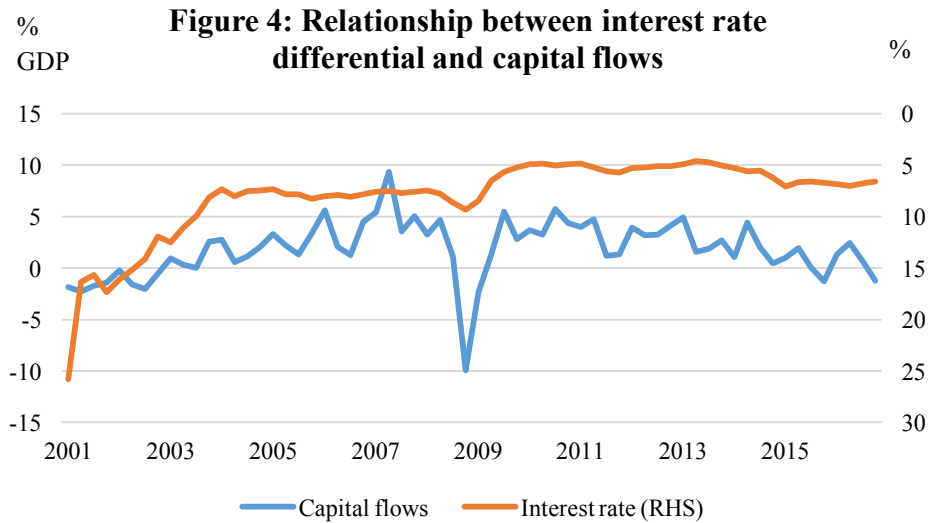
**Figure 2: Interest rate differential**



**Figure 3: Growth rate differential**



**Figure 4: Relationship between interest rate differential and capital flows**



### Part III: Results

**Table 5: Structural Break test**

| VARIABLES      | (1)<br>OLS                 | (2)<br>FE               | (3)<br>RE               | (4)<br>OLS              | (5)<br>FE               | (6)<br>RE               |
|----------------|----------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| gdp            | 0.375***<br>(0.0584)       | 0.381***<br>(0.0575)    | 0.378***<br>(0.0560)    | 0.420***<br>(0.0741)    | 0.384***<br>(0.0750)    | 0.420***<br>(0.0741)    |
| rate           | -0.0384**<br>(0.0183)      | -0.0407*<br>(0.0213)    | -0.0424**<br>(0.0204)   | -0.0354*<br>(0.0202)    | -0.0446**<br>(0.0222)   | -0.0354*<br>(0.0202)    |
| vix            | -0.189***<br>(0.0268)      | -0.188***<br>(0.0187)   | -0.188***<br>(0.0188)   | -0.219***<br>(0.0210)   | -0.219***<br>(0.0206)   | -0.219***<br>(0.0210)   |
| ca             | -0.255***<br>(0.0481)      | -0.300***<br>(0.0475)   | -0.270***<br>(0.0377)   | -0.255***<br>(0.0396)   | -0.277***<br>(0.0538)   | -0.255***<br>(0.0396)   |
| reer           | -8.74e-05***<br>(1.04e-05) | -8.97e-05<br>(7.79e-05) | -8.83e-05<br>(7.80e-05) | -8.46e-05<br>(7.78e-05) | -9.58e-05<br>(7.67e-05) | -8.46e-05<br>(7.78e-05) |
| rating         | -0.213*<br>(0.117)         | -0.0324<br>(0.0745)     | -0.131**<br>(0.0661)    | -0.206***<br>(0.0650)   | -0.0269<br>(0.0735)     | -0.206***<br>(0.0650)   |
| pcrsrgdp       |                            |                         |                         | -0.142<br>(0.116)       | -0.0639<br>(0.117)      | -0.142<br>(0.116)       |
| pcrsrate       |                            |                         |                         | 0.0838<br>(0.0773)      | 0.116<br>(0.0863)       | 0.0838<br>(0.0773)      |
| pcrsvix        |                            |                         |                         | 0.265***<br>(0.0526)    | 0.253***<br>(0.0521)    | 0.265***<br>(0.0526)    |
| pcrsca         |                            |                         |                         | 0.0255<br>(0.0649)      | 0.0544<br>(0.0664)      | 0.0255<br>(0.0649)      |
| pcrsreer       |                            |                         |                         | 0.000310<br>(0.00105)   | -7.58e-05<br>(0.00104)  | 0.000310<br>(0.00105)   |
| pcrsrating     |                            |                         |                         | -0.129<br>(0.165)       | 0.255<br>(0.192)        | -0.129<br>(0.165)       |
| pcrs           |                            |                         |                         | -3.687***<br>(1.170)    | -5.401***<br>(1.206)    | -3.687***<br>(1.170)    |
| Constant       | 6.174***<br>(0.693)        | 5.397***<br>(0.521)     | 5.827***<br>(0.532)     | 6.279***<br>(0.622)     | 5.635***<br>(0.637)     | 6.279***<br>(0.622)     |
| Observations   | 896                        | 896                     | 896                     | 896                     | 896                     | 896                     |
| R-squared      | 0.231                      | 0.214                   | 0.2125                  | 0.262                   | 0.253                   | 0.2410                  |
| No. of country | 14                         | 14                      | 14                      | 14                      | 14                      | 14                      |

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 6: Extended model with QE variables**

| VARIABLES      | Fixed Effect            |                         |                         |                         |                         | Random Effect           |                         |                         |                         |                         |
|----------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|                | (1)<br>QE 1             | (2)<br>QE 2             | (3)<br>QE 3             | (4)<br>QET              | (5)<br>All QEs          | (6)<br>QE 1             | (7)<br>QE 2             | (8)<br>QE 3             | (9)<br>QET              | (10)<br>All QEs         |
| gdp            | 0.384***<br>(0.0746)    | 0.383***<br>(0.0742)    | 0.384***<br>(0.0750)    | 0.379***<br>(0.0744)    | 0.379***<br>(0.0735)    | 0.420***<br>(0.0738)    | 0.420***<br>(0.0734)    | 0.420***<br>(0.0742)    | 0.420***<br>(0.0735)    | 0.420***<br>(0.0727)    |
| rate           | -0.0367*<br>(0.0223)    | -0.0453**<br>(0.0220)   | -0.0447**<br>(0.0223)   | -0.0480**<br>(0.0221)   | -0.0391*<br>(0.0220)    | -0.0307<br>(0.0202)     | -0.0354*<br>(0.0200)    | -0.0354*<br>(0.0202)    | -0.0354*<br>(0.0200)    | -0.0307<br>(0.0199)     |
| vix            | -0.260***<br>(0.0246)   | -0.219***<br>(0.0204)   | -0.219***<br>(0.0206)   | -0.218***<br>(0.0204)   | -0.261***<br>(0.0249)   | -0.259***<br>(0.0248)   | -0.219***<br>(0.0208)   | -0.219***<br>(0.0210)   | -0.219***<br>(0.0208)   | -0.259***<br>(0.0252)   |
| ca             | -0.293***<br>(0.0538)   | -0.278***<br>(0.0532)   | -0.277***<br>(0.0538)   | -0.274***<br>(0.0533)   | -0.294***<br>(0.0530)   | -0.256***<br>(0.0394)   | -0.255***<br>(0.0392)   | -0.255***<br>(0.0396)   | -0.255***<br>(0.0392)   | -0.256***<br>(0.0388)   |
| reer           | -9.47e-05<br>(7.63e-05) | -9.53e-05<br>(7.59e-05) | -9.59e-05<br>(7.67e-05) | -9.59e-05<br>(7.60e-05) | -9.40e-05<br>(7.51e-05) | -8.47e-05<br>(7.75e-05) | -8.46e-05<br>(7.71e-05) | -8.46e-05<br>(7.79e-05) | -8.46e-05<br>(7.71e-05) | -8.47e-05<br>(7.63e-05) |
| rating         | -0.0237<br>(0.0732)     | -0.0292<br>(0.0728)     | -0.0270<br>(0.0736)     | -0.0308<br>(0.0729)     | -0.0285<br>(0.0721)     | -0.206***<br>(0.0647)   | -0.206***<br>(0.0643)   | -0.206***<br>(0.0650)   | -0.206***<br>(0.0644)   | -0.206***<br>(0.0637)   |
| pcrsrgdp       | -0.0874<br>(0.117)      | -0.103<br>(0.116)       | -0.0666<br>(0.119)      | -0.192<br>(0.120)       | -0.208*<br>(0.119)      | -0.159<br>(0.116)       | -0.178<br>(0.115)       | -0.145<br>(0.118)       | -0.265**<br>(0.119)     | -0.275**<br>(0.118)     |
| pcrsrate       | 0.102<br>(0.0861)       | 0.124<br>(0.0855)       | 0.116<br>(0.0864)       | 0.121<br>(0.0856)       | 0.112<br>(0.0848)       | 0.0774<br>(0.0770)      | 0.0861<br>(0.0765)      | 0.0834<br>(0.0774)      | 0.0747<br>(0.0766)      | 0.0742<br>(0.0758)      |
| pcrsvix        | 0.264***<br>(0.0519)    | 0.236***<br>(0.0517)    | 0.256***<br>(0.0559)    | 0.173***<br>(0.0554)    | 0.149*<br>(0.0809)      | 0.272***<br>(0.0524)    | 0.246***<br>(0.0523)    | 0.268***<br>(0.0565)    | 0.180***<br>(0.0561)    | 0.146*<br>(0.0823)      |
| pcrsca         | 0.0356<br>(0.0663)      | 0.0533<br>(0.0657)      | 0.0550<br>(0.0666)      | 0.0652<br>(0.0658)      | 0.0374<br>(0.0655)      | 0.0127<br>(0.0647)      | 0.0242<br>(0.0642)      | 0.0261<br>(0.0650)      | 0.0325<br>(0.0643)      | 0.0128<br>(0.0638)      |
| pcrsreer       | -0.000100<br>(0.00103)  | -0.000237<br>(0.00103)  | -8.35e-05<br>(0.00104)  | 3.82e-05<br>(0.00103)   | -4.91e-05<br>(0.00103)  | 0.000280<br>(0.00105)   | 0.000146<br>(0.00104)   | 0.000299<br>(0.00105)   | 0.000402<br>(0.00104)   | 0.000331<br>(0.00105)   |
| pcrsrating     | 0.253<br>(0.191)        | 0.232<br>(0.190)        | 0.255<br>(0.192)        | 0.230<br>(0.190)        | 0.211<br>(0.188)        | -0.137<br>(0.165)       | -0.141<br>(0.164)       | -0.128<br>(0.165)       | -0.132<br>(0.164)       | -0.154<br>(0.162)       |
| pcrs           | -5.648***<br>(1.203)    | -5.305***<br>(1.194)    | -5.459***<br>(1.287)    | -2.702**<br>(1.371)     | -2.537<br>(2.175)       | -3.876***<br>(1.167)    | -3.600***<br>(1.159)    | -3.771***<br>(1.256)    | -0.925<br>(1.342)       | -0.517<br>(2.182)       |
| qe1            | 1.914***<br>(0.626)     |                         |                         |                         | 1.965***<br>(0.677)     | 1.892***<br>(0.633)     |                         |                         |                         | 1.906***<br>(0.685)     |
| qe2            |                         | 2.744***<br>(0.640)     |                         |                         | 2.256***<br>(0.840)     |                         | 2.788***<br>(0.654)     |                         |                         | 2.205**<br>(0.858)      |
| qe3            |                         |                         | 0.0779<br>(0.600)       |                         | -0.820<br>(0.998)       |                         |                         | 0.113<br>(0.609)        |                         | -0.923<br>(1.021)       |
| qet            |                         |                         |                         | -2.160***<br>(0.538)    | -1.943**<br>(0.929)     |                         |                         |                         | -2.216***<br>(0.542)    | -2.085**<br>(0.944)     |
| Constant       | 6.323***<br>(0.673)     | 5.654***<br>(0.631)     | 5.635***<br>(0.638)     | 5.674***<br>(0.632)     | 6.388***<br>(0.670)     | 6.956***<br>(0.659)     | 6.279***<br>(0.616)     | 6.279***<br>(0.622)     | 6.279***<br>(0.616)     | 6.961***<br>(0.657)     |
| Observations   | 896                     | 896                     | 896                     | 896                     | 896                     | 896                     | 896                     | 896                     | 896                     | 896                     |
| R-squared      | 0.261                   | 0.269                   | 0.253                   | 0.267                   | 0.286                   | 0.2485                  | 0.2567                  | 0.2410                  | 0.2550                  | 0.2741                  |
| No. of country | 14                      | 14                      | 14                      | 14                      | 14                      | 14                      | 14                      | 14                      | 14                      | 14                      |

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 7: Decomposition of capital flows**

| VARIABLES      | Fixed Effect            |                         |                         |                         |                         | Random Effect           |                         |                         |                         |                         |
|----------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|                | (1)<br>CF               | (2)<br>Port             | (3)<br>Equity           | (4)<br>Bond             | (5)<br>Other            | (6)<br>CF               | (7)<br>Port             | (8)<br>Equity           | (9)<br>Bond             | (10)<br>Other           |
| gdp            | 0.379***<br>(0.0735)    | 0.0460<br>(0.0538)      | -0.0280<br>(0.0250)     | 0.0716*<br>(0.0405)     | 0.333***<br>(0.0503)    | 0.420***<br>(0.0727)    | 0.0426<br>(0.0530)      | -0.0280<br>(0.0248)     | 0.0700*<br>(0.0403)     | 0.367***<br>(0.0501)    |
| rate           | -0.0391*<br>(0.0220)    | -0.00779<br>(0.0161)    | -0.00246<br>(0.00747)   | -0.00494<br>(0.0121)    | -0.0313**<br>(0.0150)   | -0.0307<br>(0.0199)     | -0.0173<br>(0.0146)     | -0.00289<br>(0.00722)   | -0.0106<br>(0.0114)     | -0.0183<br>(0.0139)     |
| vix            | -0.261***<br>(0.0249)   | -0.151***<br>(0.0182)   | -0.0694***<br>(0.00847) | -0.0830***<br>(0.0137)  | -0.109***<br>(0.0170)   | -0.259***<br>(0.0252)   | -0.148***<br>(0.0183)   | -0.0694***<br>(0.00841) | -0.0816***<br>(0.0138)  | -0.111***<br>(0.0172)   |
| ca             | -0.294***<br>(0.0530)   | -0.115***<br>(0.0388)   | -0.0226<br>(0.0180)     | -0.0520*<br>(0.0292)    | -0.179***<br>(0.0363)   | -0.256***<br>(0.0388)   | -0.109***<br>(0.0289)   | -0.0251<br>(0.0162)     | -0.0678***<br>(0.0238)  | -0.154***<br>(0.0280)   |
| lrreer         | -9.40e-05<br>(7.51e-05) | -5.89e-05<br>(5.50e-05) | -1.10e-05<br>(2.55e-05) | -5.29e-05<br>(4.14e-05) | -3.51e-05<br>(5.14e-05) | -8.47e-05<br>(7.63e-05) | -5.56e-05<br>(5.55e-05) | -1.07e-05<br>(2.54e-05) | -4.68e-05<br>(4.18e-05) | -2.94e-05<br>(5.23e-05) |
| rating         | -0.0285<br>(0.0721)     | 0.00569<br>(0.0528)     | 0.0154<br>(0.0245)      | -0.00625<br>(0.0397)    | -0.0342<br>(0.0493)     | -0.206***<br>(0.0637)   | -0.0872*<br>(0.0467)    | 0.0126<br>(0.0233)      | -0.0728**<br>(0.0364)   | -0.101**<br>(0.0445)    |
| pcrsrgdp       | -0.208*<br>(0.119)      | -0.00479<br>(0.0870)    | 0.0355<br>(0.0404)      | -0.0490<br>(0.0655)     | -0.203**<br>(0.0813)    | -0.275**<br>(0.118)     | 0.0185<br>(0.0858)      | 0.0309<br>(0.0400)      | -0.0446<br>(0.0652)     | -0.273***<br>(0.0811)   |
| pcrsrate       | 0.112<br>(0.0848)       | 0.209***<br>(0.0620)    | 0.0392<br>(0.0288)      | 0.149***<br>(0.0467)    | -0.0975*<br>(0.0580)    | 0.0742<br>(0.0758)      | 0.162***<br>(0.0558)    | 0.0387<br>(0.0278)      | 0.111**<br>(0.0437)     | -0.0818<br>(0.0533)     |
| pcrsvix        | 0.149*<br>(0.0809)      | 0.0195<br>(0.0592)      | 0.0426<br>(0.0275)      | 0.0281<br>(0.0446)      | 0.130**<br>(0.0553)     | 0.146*<br>(0.0823)      | 0.0154<br>(0.0598)      | 0.0428<br>(0.0274)      | 0.0284<br>(0.0450)      | 0.130**<br>(0.0563)     |
| pcrsca         | 0.0374<br>(0.0655)      | -0.00227<br>(0.0479)    | -0.0340<br>(0.0223)     | -0.0778**<br>(0.0361)   | 0.0396<br>(0.0448)      | 0.0128<br>(0.0638)      | 0.00592<br>(0.0466)     | -0.0327<br>(0.0219)     | -0.0683*<br>(0.0355)    | 0.0165<br>(0.0441)      |
| pcrslrreer     | -4.91e-05<br>(0.00103)  | 9.93e-05<br>(0.000757)  | -0.000360<br>(0.000352) | 0.000347<br>(0.000571)  | -0.000148<br>(0.000708) | 0.000331<br>(0.00105)   | 0.000137<br>(0.000761)  | -0.000352<br>(0.000350) | 0.000327<br>(0.000574)  | 9.58e-05<br>(0.000717)  |
| pcrsrating     | 0.211<br>(0.188)        | -0.265*<br>(0.138)      | -0.170***<br>(0.0639)   | -0.00860<br>(0.104)     | 0.476***<br>(0.129)     | -0.154<br>(0.162)       | -0.412***<br>(0.119)    | -0.174***<br>(0.0606)   | -0.124<br>(0.0940)      | 0.293**<br>(0.114)      |
| pcrs           | -2.537<br>(2.175)       | 1.126<br>(1.592)        | -0.444<br>(0.739)       | -0.0175<br>(1.200)      | -3.664**<br>(1.489)     | -0.517<br>(2.182)       | 1.957<br>(1.587)        | -0.420<br>(0.733)       | 0.571<br>(1.197)        | -2.715*<br>(1.496)      |
| qe1            | 1.965***<br>(0.677)     | 1.833***<br>(0.495)     | 1.007***<br>(0.230)     | 0.905**<br>(0.373)      | 0.132<br>(0.463)        | 1.906***<br>(0.685)     | 1.746***<br>(0.498)     | 1.008***<br>(0.229)     | 0.880**<br>(0.375)      | 0.151<br>(0.469)        |
| qe2            | 2.256***<br>(0.840)     | 1.178*<br>(0.615)       | 0.103<br>(0.285)        | 0.579<br>(0.463)        | 1.078*<br>(0.575)       | 2.205**<br>(0.858)      | 1.139*<br>(0.623)       | 0.102<br>(0.285)        | 0.566<br>(0.468)        | 1.071*<br>(0.587)       |
| qe3            | -0.820<br>(0.998)       | -0.788<br>(0.731)       | -0.199<br>(0.339)       | -0.435<br>(0.551)       | -0.0326<br>(0.683)      | -0.923<br>(0.741)       | -0.821<br>(0.741)       | -0.203<br>(0.339)       | -0.456<br>(0.557)       | -0.0850<br>(0.698)      |
| qet            | -1.943**<br>(0.929)     | -2.045***<br>(0.680)    | -0.347<br>(0.316)       | -1.044**<br>(0.512)     | 0.102<br>(0.636)        | -2.085**<br>(0.944)     | -1.990***<br>(0.686)    | -0.358<br>(0.315)       | -1.009*<br>(0.516)      | -0.0598<br>(0.646)      |
| Constant       | 6.388***<br>(0.670)     | 3.952***<br>(0.490)     | 1.836***<br>(0.228)     | 2.073***<br>(0.369)     | 2.436***<br>(0.458)     | 6.961***<br>(0.657)     | 4.373***<br>(0.481)     | 1.854***<br>(0.248)     | 2.414***<br>(0.373)     | 2.559***<br>(0.456)     |
| Observations   | 896                     | 896                     | 896                     | 896                     | 896                     | 896                     | 896                     | 896                     | 896                     | 896                     |
| R-squared      | 0.286                   | 0.179                   | 0.098                   | 0.150                   | 0.215                   | 0.2741                  | 0.1700                  | 0.0980                  | 0.1410                  | 0.2096                  |
| No. of country | 14                      | 14                      | 14                      | 14                      | 14                      | 14                      | 14                      | 14                      | 14                      | 14                      |

Standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1