# Unconventional Monetary Policy, Global Liquidity Circulation, and Inflation Divergence around the World

**Taeyoon Sung**[*]
Yonsei University, School of Economics

**Jong-Hee Kim**[**]
Chonbuk National University, Department of Economics

**February 2015**

## Abstract

In the aftermath of the global financial crisis and the European fiscal crisis, the central banks in advanced economies have adopted unconventional monetary policy such as quantitative easing, in addition to the conventional policy of low interest rates. Although the expansionary monetary policy is usually expected to put pressure toward inflation, the unconventional monetary policy did not boost inflation in advanced economies which are exposed to the continued deflation risk. However, the increase of global liquidity in terms of key international currencies, driven by the unconventional monetary policy, has made some emerging economies move toward inflation and unstable capital market. This means that we could observe the global divergence of inflation between advanced and emerging economies. The inflation divergence also appears in the intragroup of emerging economies. The emerging economies, which can be featured by capital flow control or current account surplus, turn out to have little inflation pressure. We suggest that the global divergence of inflation is related to liquidity circulation velocity both domestically and internationally. In particular, capital control or current account turn out to play a role in determining the velocity of global liquidity circulation.

Key words: unconventional monetary policy; global liquidity circulation; inflation

JEL Classification: E5; F3

[*] Corresponding Author. Yonsei University, School of Economics, 50 Yonsei-ro, Seoul 120-749, Korea. E-mail: tsung@yonsei.ac.kr; Tel: +82-2-2123-5494.
[**] Chonbuk National University, Department of Economics, 567 Baekje-daero, Jeonju-si, Jeonbuk-do 561-756, Korea. E-mail: jonghk5@jbnu.ac.kr; Tel: +82-63-270-3007.

## I. Background

After the global financial crisis, zero-interest rates and Quantitative Easing (QE) policies are actively pursued by major developed countries. In response to the financial crisis, the major developed countries, such as the U.S. and Japan, continued to decrease their interest rates that they have been maintaining practically zero-interest rates since early 2009; also, with limited room for additional nominal interest rate reduction, many central banks are now pursuing Quantitative Easing in order to continue their expansionary policies.

Such policy to increase the liquidity is spreading throughout many developed countries. The European Central Bank (ECB) decreased their interest rate by 25bp in July 2012, while the Bank of England announced additional quantitative easing to inject additional 50 billion pounds. Japan also reduced their interest rate again to around 0% from their existing 0.1% in October 2012. Moreover, Japan also sought an unlimited quantitative easing with their "Abenomics" policy since January 2013 in order to overcome deflation and to achieve the inflation rate around 2%.

This unconventional monetary policy by central banks is utilized to directly inject liquidity in the market by buying their assets, when their attempts to boost the economy with interest rate reduction fell short (IMF, 2013).

More specifically, the U.S. is now implementing such unconventional monetary policy for additional expansionary measures, as their interest rate reached 0% after the global financial crisis. When the interest rate is zero and the economy is facing the danger of deflation, conventional monetary policy measure of interest rate adjustment cannot achieve liquidity expansion, so that the unconventional monetary policy is necessary. It is well known that the U.S. had begun to decrease their federal benchmark rate in September 2007 to reach around 0.25% in December 2008, while implementing three separate quantitative easing measures along with it.

Still, there are continued debates regarding the effect of unconventional monetary policy, especially the issue of inflation. The massive quantitative easing policy in major developed

countries indeed brought economic growth in them, but also increased inflation pressure in the developing countries (Baumeister, Benati, 2012).

Such issue arises because the developing countries with relatively better economic condition shows sign of inflation, while the developed countries is suffering from the dampening economy and possible deflation after the global financial crisis (Bayoumi and Bui, 2011). In other words, there exists a global inflation divergence, where the danger of inflation in the developing countries and the danger of deflation in the developed countries appear at the same time (Chen, Mancini-Griffoli and Sahay, 2014; Bowman, Londono and Saprza, 2014).

This paper specifically focuses on this situation of divergence and attempts to estimate the effect of spreading unconventional monetary policy in the developed nations on both developed and developing countries. This paper tries to investigate the following three questions in relation of divergence, capital movement and inflation: firstly, what is the reason behind the not-increasing price levels in developed countries even with quantitative easing policies? Secondly, does the quantitative easing policy in the developed nations induce inflation in the developing countries through capital movement? Lastly, why there appears inflation divergence among the developing nations from the quantitative easing policies in the developed countries?

With these questions, we believe we can also make significant analysis on inflation divergence between the divergence in the developing nations, as well as the developed and the developing nations.

## II. Literature Review

There have been number of research on the effect of unconventional monetary policy of the developed nations on the developing economies.

The massive quantitative easing policies in the large developed economies can strongly influence the quantitative easing policies of both other developed and developing economies

(Bauer and Neely, 2012). It is because the extensive QE policies can stimulate growth in the developed economies but can also increase the inflation pressure in the developing economies (Baumeister and Benati, 2012) and they can also bring inflation even in the developed nations themselves (Kapetanios et al., 2012). Moreover, the unconventional monetary policy in the developed economies have significant effect in the real economy of the developing nations (Fratzscher, LoDuca and Straub, 2012; DePooter, Robitaille and Zdinak, 2014), and more importantly, can increase the asset prices in the countries (Eichengree and Gupta, 2014).

The QE policies in the major developed nations can lead to excess liquidity in the global market (IMF, 2012), then to possibly cause increasing raw material prices and inflation. Although the QE measures are implemented against the deflation pressure, such excess liquidity may be driven to the developing nations to increase the price instability and become potential risk for inflation in the developed nations as well.

The super-low interest rates and the massive liquidity injection are the most well-known characteristics of the unconventional monetary policy; still, the unconventional monetary policy should be reasonable enough, as the policy goal is to promote economic recovery without inflation (Ostry, Ghosh and Chamon, 2012). Nevertheless, the risk of inflation exists, as extensive deficit fiscal policy and monetary expansion cannot steer away from inflation. Then, the issue lies in injecting liquidity enough to not causing the inflation. Inflation would be unavoidable if the excess liquidity from the QE policies from the U.S., EU, Japan and England does not go in to virtuous cycle of the financial market.

While the developed economies leads them to suffer from greater recession and deflation pressure, the developing economies experience relatively better economic condition to show signs of inflation (Bayoumi and Bui, 2011). In other words, there exists global inflation divergence with inflation risk in in the developing nations and deflation risk in the developed nations. The signs of inflation in the developing nations are generally shown in foods and raw materials and it is rather prominent from the total demand perspective; on the other hand, the developed nations still face the debt deflation along with the deleveraging pressure in the households. Some crisis economies in Europe, especially, carries heavy burden of government deleveraging pressure due to their enormous public debt (Chen, Filardo, He, and

Zhu, 2012; Neely, 2012).

In addition, the unconventional monetary policy in the developed economies affects the developing economies through capital movement. Byrne and Fiess (2011) show the interest rate reduction in the U.S. as part of their unconventional monetary policy accelerated the capital inflows to the developing economies, while Fratscher, LoDuca and Straub (2011) also show the net inflow to the developing economies have increased from the unconventional monetary policy in the U.S.

As mentioned earlier, the foreign capital inflow to the developing economies induced by QE increases the asset price and causes financial instability (Ehrmann, Fratzscher and Rigobon, 2011; Suttle, Huefner and Koepke, 2013). Such capital inflow is rather a short-term investment seeking the interest rate differences; and the risk of sudden capital reversal in the foreign exchange and financial markets of the developing nation is very high (Sung, Park, and Park, 2014).

Yet, the effect of these capital inflows can vary according to the economic conditions in each developing country, and nations with better established regulatory and policy system against the foreign capital movement can effectively control the effect in the real economy. Fria and Mauro (2004) argue that the effect of foreign capital inflow in the real economy of the nation relies on its regulatory features. Also, Wei (2000) and Han and Wei (2014) demonstrate that the effect of foreign capital movement and international monetary shocks varies by the degree of financial development.

Above studies together show that the unconventional monetary policies in the developed nations not only affect their own economies, but also affect the developing economies by capital movement increasing the asset price and inflation pressure. Nevertheless, the inflation pressure from the unconventional monetary policy is not so distinguishable in the developed economies themselves, and some developing economies do not show clear relationship among the unconventional monetary policy, capital movement and inflation. We can deduct that there exists inflation divergence among the emerging nations, as well as between the developed and the developing nations.

This paper then, tries to empirically verify the existence of the inflation divergence and study the cause of such divergence by investigating the relationships among the unconventional monetary policy, capital movement and inflation.

## III. Empirical Results

### Data

This paper focuses on the effect of unconventional monetary policy in the developed nations on the price levels of developing nations via capital movement. In other words, we verify the reason behind the inflation diversification among the developing economies caused by the unconventional monetary policy. For such analysis, this paper utilizes the data of five advanced economies of Germany, Japan, United Kingdom, the U.S., and EU, and eleven developing nations of Argentina, Brazil, India, Indonesia, Mexico, South Africa, Thailand, China, Korea, Malaysia and Singapore. The data period spans in 30 quarters between the first quarter of 2007 and the second quarter of 2014.

The main variables in this analysis are: economic growth rate, PPI, monetary base (H), M2, interest rate, capital balance, current account and capital movement. All data are seasonally adjusted and they are collected from OECD.Statextracts of OECD, Eurostat of the European Commission, and e-Library Data of IMF. Table 1 reports the summary statistics.

The economic growth rate in the emerging economies is higher than the advanced economies. We have measured both PPI and CPI in order to investigate the price increase from the same period of the year before; and we find the inflation rate is about three times higher in the emerging economies than in the advanced economies. The monetary base (H) and M2 is higher in the advanced economies, while the interest rate is higher in the emerging economies. Lastly, the capital balance in relation to GDP shows surplus in the advanced economies and deficit in the emerging economies. Table 2 reports the estimation result of average inflation in all 16 nations.

The (average quarterly) inflation in the developed economies is about 0.50%, while the emerging economies show 1.42% of inflation rate, which is about 1% higher than the advanced counterparts. Except for a few emerging economies of China, Korea, Malaysia and Singapore, most of the emerging economies show inflation rate in average is higher than 1%.

**Impact of Unconventional Monetary Policy on Advanced Economies**

Then, how does the unconventional monetary policy in the developed nations affect the inflation of each group? For this estimation, this paper utilizes the U.S. 10-year nominal government bond yields (hereafter, 10-year yields) as a proxy for the unconventional monetary policy in the advanced economies. This long-term interest rate reflects the macroeconomic effect of the monetary policy and it is frequently used as proxy for the unconventional monetary policy in the developed countries (Turner, 2014). Figure 1 displays the trends of the 10-year yields and inflation.

The inflation trend in the advanced economies is lower and more stable than it is in the emerging economies. The figure shows the decreasing 10-year yields after 2009, when the unconventional monetary policies in the advanced economies unfolded. However, the figure also shows that the unconventional monetary policy does not cause the price levels in the advanced economies to increase—rather, the emerging economies' price levels are increasing. Along with other previous studies, we can assume that the unconventional monetary policy in the developed nations cause inflation in the emerging economies through capital movement.

Then, why does the unconventional monetary policy does not affect much their own price levels? This paper attempts to find the answer for this question from the effect of unconventional monetary policy on the monetary base (H) and M2. Table 3 reports the estimation result of changes in inflation, money multiplier (M2/H), monetary base (H), and M2 of five advanced economies.

As it was estimated above, the average inflation of the developed economies is 0.5% in the period between the first quarter of 2007 and the second quarter of 2014. The monetary base

increased about 5% but M2 increased 3.19%. Figure 2 displays the trends of the above estimated variables.

The left figure compares the trends among the 10-year bond yields, money multiplier and inflation. After 2009, when the unconventional monetary policy began to be fully implemented, the 10-year yields decreases while the money multiplier also decreases; accordingly, the inflation follows the similar patterns. The unconventional monetary policy in the advanced economies does not cause inflation in their own country.

Why is it so? The figure in right helps us to find the reason by showing inflation and changes in monetary base (H) and M2. The monetary base shows increasing trend after the global financial crisis, while M2 stays relatively stable or rather decreases. We can then conclude that the unconventional monetary policy increases their own monetary base, but does not affect much in M2. The money multiplier follows similar trend as it does not increase much, and consequently, the inflation in the advanced economies stays unchanged or even decreases. Table 4 reports the correlation among the above variables. As we have seen previously, the unconventional monetary policy and inflation ($\pi$) does not have specific correlation. If inflation is caused by the unconventional monetary policy, the correlation between the two variables should have been negative, but the result shows statistically insignificant positive correlation.

Next, this paper attempts to estimate the effect of unconventional monetary policy in the advanced economies in the emerging economies. The aim is to find whether the liquidity from the unconventional monetary policy flows into the emerging economies through capital movement and causes inflation in them.

We first need to find whether the unconventional monetary policy induces capital outflows from the advanced economies. As a proxy for capital movement, this paper utilizes the outflows or inflows of portfolio investment and other investment as a share of GDP, following Frazscher (2012). Portfolio investment includes portfolio investment, equity securities, liabilities, debt securities and liabilities, while other investment includes foreign direct investment in reporting economy (inflows) (Smithy and Valderramaz, 2008). The data

for capital flows are collected from the International Financial Statistics (IFS) of IMF.

Table 5 reports the capital mobility in the advanced economies during the sample period.

The average capital inflows and outflows of the advanced economies are similar in all countries, which is 1.53% in the share of GDP. We can also see that Germany and Japan has relatively higher capital outflow compared to inflows.

Figure 3 below is the trends of capital movement in advanced countries, in the share of GDP.

With unconventional monetary policy, the developed economies experience higher capital outflows than the inflows, especially in 2012 and 2013. The average capital movement was similar in both inflows and outflows, but the capital outflows greatly increases when the unconventional monetary policy is widely implemented. We can deduce that the unconventional monetary policy caused capital inflows to emerging economies.

In order to establish more concrete relationship between unconventional monetary policy and capital outflows in the advanced economies, we formulate the regression as below.

$$C\_O_{it} = \alpha_0 + \alpha_1 Yield_t + \alpha_2 X_{it} + \varepsilon_{it} \quad (1)$$

Here, $C\_O_{it}$ represents the capital outflows of country i in share of GDP at time t. $Yield_t$ represents unconventional monetary policy, which is the 10-year nominal government bond yields at time t. $X$ is the control variable that uses the rate of increase of monetary base (H) and M2, economic growth rate ($\Delta y$), and the interest rate difference with the target country ($i - i^{us}$), where the U.S. market interest rate is utilized.

If there occurs capital outflows in the advanced economy, the estimated coefficient of $\alpha_1$ should be negative, since the reduced interest rate from the QE caused capital outflows. Table 6 reports the regression result.

The column (1) uses the rate of increase of money multiplier as a control variable for the relationship between the unconventional monetary policy and capital outflows; on the other hand, the column (2) utilizes the rate of increases of monetary base (H) and M2 instead of money multiplier. Both columns report statistically significant negative relationship between the 10-year yields and capital outflows, which indicate the capital outflows from the advanced economies increase as the unconventional monetary policy manifests. The column (3) considers interaction between the money supply variables and unconventional monetary policy, which also reports significantly negative relationship. However, the interaction between the money supply variables and the unconventional monetary policy does not seem to play a major role in capital outflows. We can observe weak increase of capital outflows from the interaction between M2 and unconventional monetary policy.

With this regression analysis, we can confirm that there occur capital outflows from the advanced economies when they implement unconventional monetary policy.

**Impact of Unconventional Monetary Policy on Emerging Markets**

Then, how does the unconventional monetary policy in the developed economies affect the emerging economies? To answer this question, we estimate the effect of capital outflows induced by unconventional monetary policy on the economy of the emerging nations, focusing on inflation.

It is necessary to take account that the effect of unconventional monetary policy on emerging markets can vary by their original price levels. As we have already seen from Table 2, most developing economies, except for China, Korea, Malaysia and Singapore, the average quarterly inflation rate was over 1%. We would have more significant interpretation by categorize the emerging economies into relatively high inflation countries and relatively low inflation countries when estimating the effect of unconventional monetary policy.

From Table 2, this paper divides emerging countries with average quarterly inflation rate over 1% to “high inflation economies” and nations with average inflation rate below 1% to “low inflation economies.“ From this guideline, seven countries of Argentina, Brazil, India,

Indonesia, Mexico, South Africa and Thailand from South America and Southeast Asia are categorized in “high-inflation economies,” while four countries of China, Korea, Malaysia and Singapore are put into “low-inflation economies.”

Figure 4 shows inflation trends of both high inflation economies and low inflation economies.

When we compare the trends after 2009, when the unconventional monetary policy began to be implemented in full-scale, the low-inflation countries have decreasing or negative inflation, but the high-inflation countries show steadily increasing trend. Therefore, if capital inflows caused by unconventional monetary policy did affect inflation rate of emerging economies, the degree of effect may vary by their individual price levels. Table 7 reports the degree of capital inflows to each emerging nations.

The high-inflation economies have average of 0.8% of capital inflows in share of GDP, which is higher than the average of 0.5% in the low-inflation economies. The difference between capital inflows and outflows appears starker among the low-inflation economies, but this estimation is an average throughout the whole period that we may earn different interpretation if we look at the trends of capital mobility displayed in Figure 5.

The figure in the left side shows the trend of capital mobility in high-inflation countries. Compared to relatively stable capital outflow trends, the capital inflows show very sharp fluctuations. Also, the capital inflows greatly exceed the outflows after 2009. On the contrary, both inflows and outflows in the low-inflation countries display very similar trends and their volatility after 2009 does not change much as well.

Then, how does such capital inflow to emerging economies affect their inflation? We first estimate the correlation between capital inflows and inflation in Table 8.

There exists positive correlation between capital inflows and inflation in both groups; moreover, the correlation is stronger in the low-inflation countries. Then the question is whether such capital inflow brings price levels higher in these emerging markets and the degree of inflation would be stronger in the low-inflation countries.

To answer such question, we set up the following regression.

$$\pi_{it} = \beta_0 + \beta_1 Yield\_d_t + \beta_2 C\_I_{it} + \beta_3 X_{it} + \mu_{it} \quad (2)$$

Here, $\pi_{it}$ is the inflation of country i at time t. $Yield\_d_t$ is a dummy variable for the unconventional monetary policy and takes value of 1 when the U.S. 10-year nominal government bond yields decreases compared to the previous period. Therefore, it is a dummy variable for the interest rate reduction. $C\_I_{it}$ is capital inflow in share of GDP of country i at time t. Lastly, $X$ is a control variable that is same as it was in the regression (1), with additional capital balance in share of GDP included. We hypothesize that the estimated $\beta_2$ will be positive if the capital flows into the emerging economy indeed increase the price level. Table 9 reports the result of regression (2).

The columns (4) and (5) display the estimated results of high-inflation countries and capital inflows do increase the price levels of these countries. Also, we can see such trend is stronger with the unconventional monetary policy in the advanced economies from column (5), ((a) x (b)). The columns (6) and (7) are the estimated results of low-inflation countries. The price levels in low-inflation countries also increase with capital inflows, but it is relatively weaker than it is in the high-inflation countries. Additionally, the degree of inflation caused by capital inflows together with the stronger unconventional monetary policy is also weaker than it is in the high-inflation countries, as shown in column (7), ((a) x (b)).

In summary, the unconventional monetary policy in the advanced economies does not play much role in inflation of the developed countries, but induces heavy capital inflows to emerging economies. The capital inflows then cause inflation in these countries and the inflation occurs stronger in the seven countries in South America and Southeast Asia, while it is relatively weak in four countries of China, Korea, Malaysia and Singapore.

**Factors of the Different Impact of Unconventional Monetary Policy on Inflation on Emerging Markets**

The next question is, then, what factors cause different effect of unconventional monetary policy on the emerging markets? This paper puts focus on the difference in current account balance, the degree of currency devaluation and capital control. We hypothesize that inflation of countries with large current account surplus, greater currency devaluation and stricter capital control will likely to be less affected by the unconventional monetary policy in the advanced economies, because it is difficult for such countries to experience massive capital inflows. We now investigate these conjectures. Firstly, Table 10 reports the current account balance of emerging economies in share of GDP.

The high-inflation countries show average of -0.46% current account balance in share of GDP, which is deficit; on the contrary, the low-inflation countries have an average of 10.29% surplus.

Figure 6 shows the trends of current account balance in emerging markets in share of GDP throughout the whole period.

The high-inflation countries consistently show current account deficit after 2009, and such deficit increases after 2012. Then, can current account surplus regulate the capital inflows that may affect inflation rate? Below is the regression to verify the statement.

$$C\_I_{it} = \gamma_0 + \gamma_1 CA_{it} + \gamma_2 X_{it} + \nu_{it} \quad (3)$$

Again, $C\_I_{it}$ is capital inflow of country i at time t, in share of GDP, while $CA_{it}$ is current account balance in share of GDP. We assume that the estimated coefficient of $\gamma_1$ would be negative if the current account surplus can indeed regulate capital inflows. Table 11 reports the estimation results of regression (3).

The column (8) is the estimation result for all 11 emerging economies. The current account surplus does decrease the capital inflows, but this is caused by the four low-inflation countries. As we can see in the column (9), the high-inflation countries do not show any

possibility for the current account surplus to moderate the capital inflows. Still, the results in column (10) show promising signs for the current account surplus reducing capital inflow and we can expect the emerging countries with large current account surplus can regulate the capital inflows from the unconventional modernity policy to decrease the effect in its inflation rate.

We now turn our attention to currency devaluation. The loss of value of currency of any country with respect to foreign currencies such as the U.S. Dollars is called currency depreciation. In simple words, it is an increase of the exchange rate due to demand and supply of currency. The change in rate of U.S. Dollar against local currency is taken as proxy for currency depreciation. Therefore, currency depreciation is calculated by taking the first difference of U.S. Dollar exchange rate (Fratzscher, 2012). Table 12 estimates he currency devaluation.

The high-inflation countries show even tendency of appreciation, with -0.82% of average currency devaluation rate during the sample period. In contrast, the low-inflation countries have about 0.42% of currency devaluation rate. Figure 7 below display the trends of currency depreciation rates in the emerging nations.

While the low-inflation countries tend to depreciate throughout the period, the high-inflation countries show tendency of appreciating and their currency value continuously appreciated especially after 2011.

Then, can tendency to depreciate moderate the capital inflows? We set up the following regression in order to verify it.

$$C\_I_{it} = \gamma_0^{'} + \gamma_1^{'} Dep_{it} + \gamma_2^{'} X_{it} + \nu_{it} \qquad (3)'$$

The regression (3)' takes the similar form as the regression (3) and takes the currency depreciation rates ($Dep$) as an explanatory variable. If the rate of currency devaluation can regulate the capital inflows to the country, the estimated coefficient of $\gamma_1^{'}$ should be negative.

Table 13 reports the regression result of (3)'.

The columns (11) and (12) are the estimation results of all eleven emerging countries and the high-inflation countries, respectively. The currency depreciation and capital inflows have negative relationship, but are not statistically significant. On the other hand, the column (13) shows that the low-inflation countries can reduce capital inflows through depreciation. We can conclude that the emerging countries with relatively devalued currency may reduce the effect of capital inflows on price levels caused by the unconventional monetary policy.

Lastly, we estimate the effect of capital control. It is difficult to establish proper proxy for capital control. Previous literature generally utilizes financial openness indices, such as Miniane Index (Miniane, 2006), Schindler Index (Schindler, 2009) and Chinn-Ito Index (Chinn and Ito, 2008). However, using such indices in this paper poses some obstacles, especially when the most recent data of Chinn-Ito Index only offers us data until 2012. Thus, we decide to follow Ahmed and Zlate (2013) and to utilize the weight of financial transaction tax in GDP as proxy for capital control. The higher the ratio degree of financial transaction tax to GDP, the stricter the capital control would be. We retrieved data of financial transaction tax from World Bank. Such data is all annually available, so we take an average of these data in order to use them quarterly frequency. Table 14 reports the ratio of financial transaction tax to GDP.

During the sample period, the average weights of financial transaction tax to GDP are similar in both high-inflation and low-inflation countries between 1.28~1.29%. Argentina from the high-inflation group and China from the low-inflation group has the ratio of financial transaction tax over 2%. Figure 8 below display the trends of financial transaction tax weight in GDP.

The overall trends are similar in both groups. The weight of financial transaction tax to GDP slowly increases after 2009, when the unconventional monetary policy of the advanced economies is implemented. We can infer that the developing economies' interest in capital control indeed grew in response to the developed nations. Also, in the more recent period, the tax weight to GDP in the low-inflation countries is dramatically increasing.

Then, what is the effect of capital control policy in the emerging economies in capital inflow? With similar ratio of financial transaction tax to GDP in both inflation groups, how can those ratios have different effect on capital inflows? For this question, we establish the below regression equation.

$$C\_I_{it} = \gamma_0'' + \gamma_1'' Tax_{it} + \gamma_2'' X_{it} + \nu_{it} \qquad (3)''$$

The regression equation (3)" takes similar form as above equations (3) and (3)', but takes financial transaction weight in GDP as a control variable. If capital control policy of the emerging economies can effectively regulate the capital inflows, the estimated coefficient of $\gamma_1'$ would be negative. Table 15 reports the estimation result.

The columns (14) and (15) are the estimated results of all eleven emerging countries and those seven high-inflation countries. The weight of financial transaction tax in comparison to GDP and capital inflows have negative relationship, but it is not statistically significant. The column (16) is the estimation result of the four low-inflation countries. The financial transaction tax and capital inflows show statistically significant negative relationship in this case. Therefore, emerging countries with relatively low inflation rates will be able to reduce the effect of capital inflows on their price levels caused by the unconventional monetary policy of the advanced economies.

## IV. Concluding Remarks

This paper focuses on the effect of recent unconventional monetary policy implemented by the major advanced economies, especially on the effect of capital mobility induced from such policy on both developed and emerging economies' price levels. As more recent studies report, our interest lies in polarizing phenomena of inflation between the developed and the emerging economies induced by the unconventional monetary policy. In addition, we attempt to verify the inflation diversification among the developing nations, where the price level

changes differently by countries.

We take the data of five advanced economies-Germany, Japan, UK, United States and EU- and eleven emerging economies-Argentina, Brazil, India, Indonesia, Mexico, South Africa, Thailand, China, Korea, Malaysia and Singapore-from the total of 30 quarters between the first quarter of 2007 and the second quarter of 2014, in order to analyze the relationship among the unconventional monetary policy, capital mobility and inflation. Furthermore, we categorize the emerging economies to the high-inflation countries (Argentina, Brazil, India, Indonesia, Mexico, South Africa and Thailand) and to the low-inflation countries (China, Korea, Malaysia and Singapore) by their average inflation rates, to see how the effect of unconventional monetary policy of the developed economies differs.

The empirical evidence from the above analysis offers us the following conclusions. Firstly, the unconventional monetary policy of the advanced countries increases the monetary base (H) of their own, but does not affect M2. The money multiplier does not increase much, and consequently, the inflation rate in the developed countries remains steady or even decreases. Moreover, the expansion of unconventional monetary policy in the advanced economies increases capital outflows.

Secondly, the expanding unconventional monetary policy in the developed nations causes more capital inflows to the emerging economies, which lead the price levels in the developing economies to further rise. However, such increase in price levels varies by the economic conditions of each country. Among the eleven emerging countries, the inflation rates in seven countries of Argentina, Brazil, India, Indonesia, Mexico, South Africa and Thailand from South America and Southeast Asia are affected greatly by the capital inflows, while China, Korea Malaysia and Singapore are rather unaffected.

Thirdly, the emerging economies with large current account surplus or capital control can reduce the effect of capital inflows on inflation from the unconventional monetary policy. Thus, such countries can also regulate the effect of capital inflows further by capital control measures of financial transaction tax.

With above three results, this paper concludes as follows. The spreading unconventional monetary policy in the advanced economies is polarizing the inflation in developed and emerging nations—the advanced countries are facing the possible deflation, while the developing countries are bearing heavier inflation pressure. The inflation is also polarizing among the emerging economies, that South American and Southeast Asian emerging countries have high risk of inflation while Northeast Asian countries such as China and Korea, with few Southeast Asian countries may experience deflation. The emerging countries can reduce the inflation possibilities from capital inflows from the unconventional monetary policy when they have larger current account surplus or capital control.

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**Figure 1: Trends of unconventional monetary policy and inflation (%)**

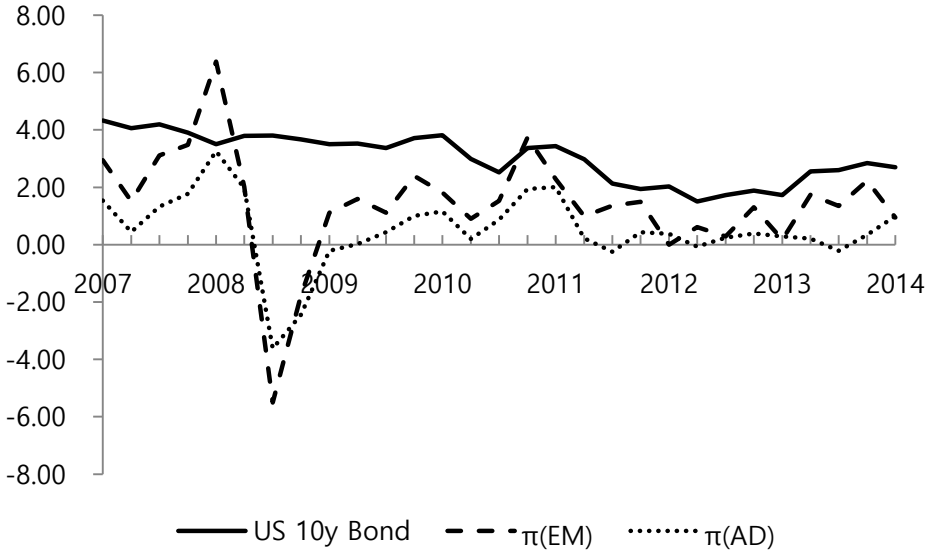


**Figure 2: Trends of money velocity in advanced countries**

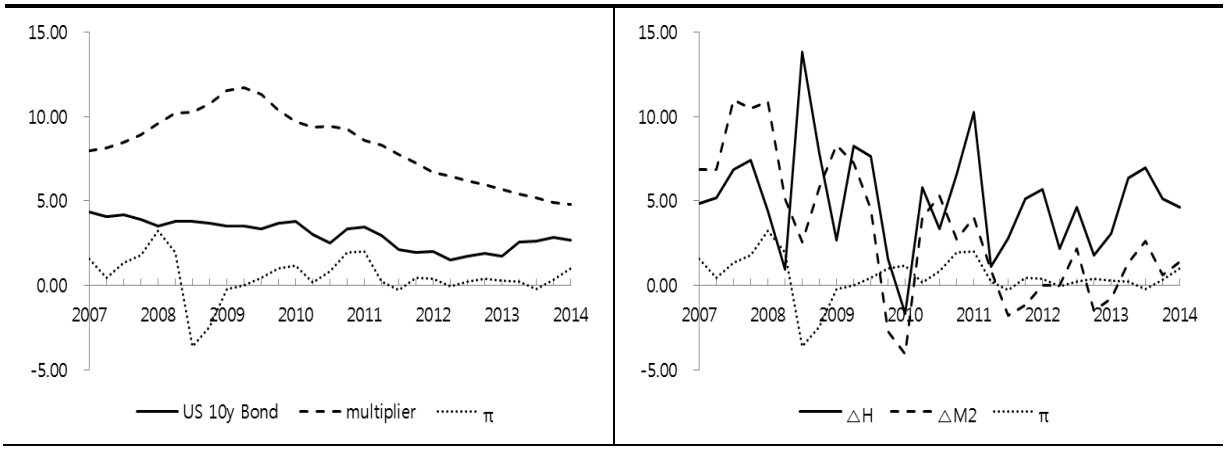


**Figure 3: Trends of capital mobility in advanced countries (%)**

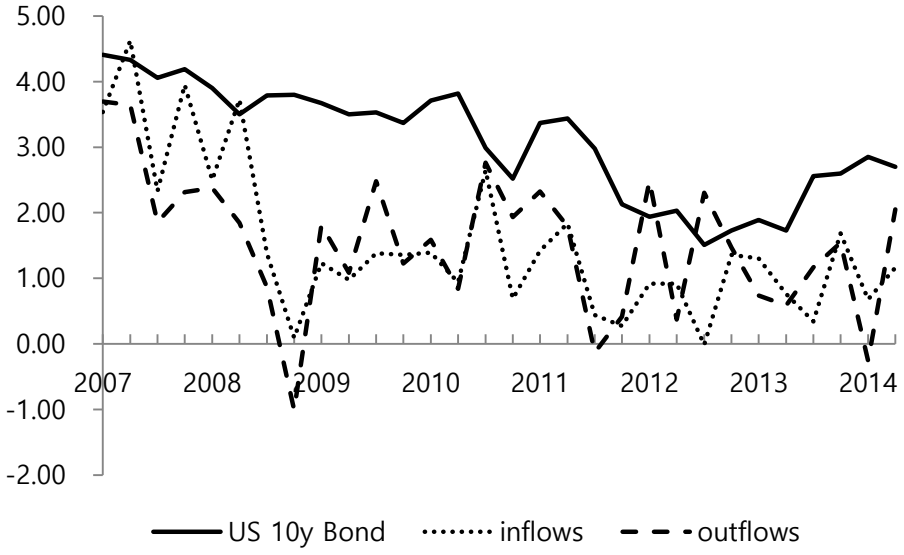


**Figure 4: Trends inflation in emerging markets (%)**

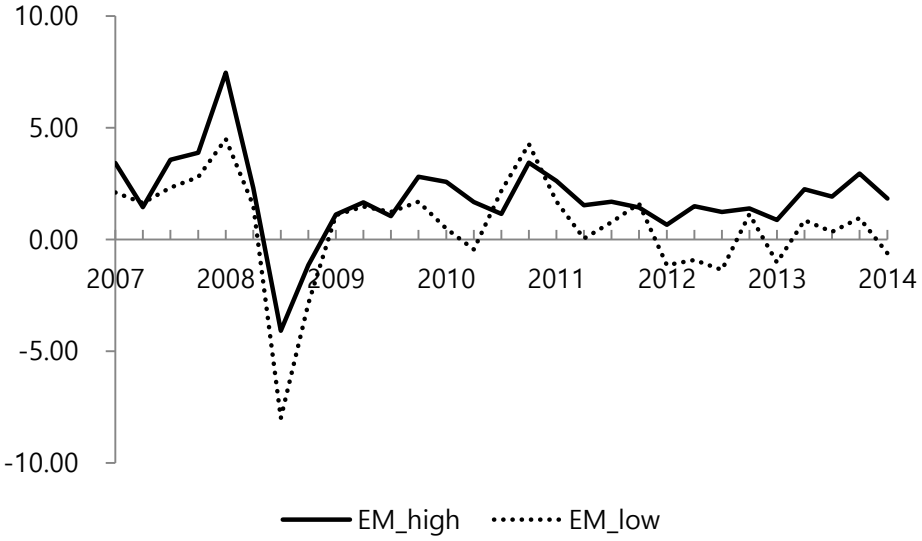


**Figure 5: Trends of capital mobility in emerging markets (%)**

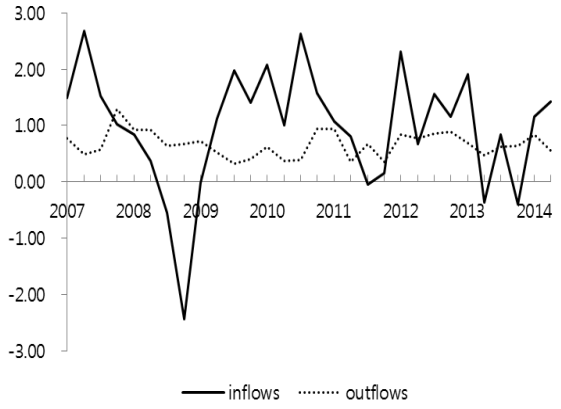
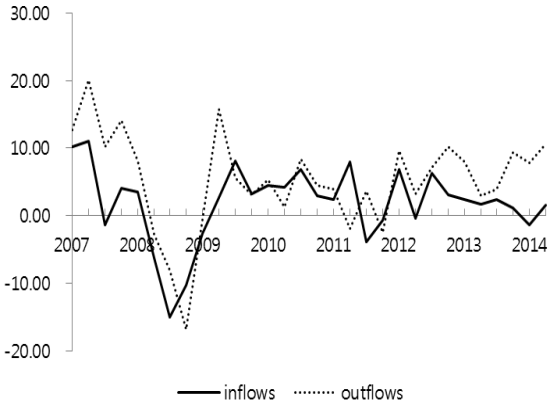
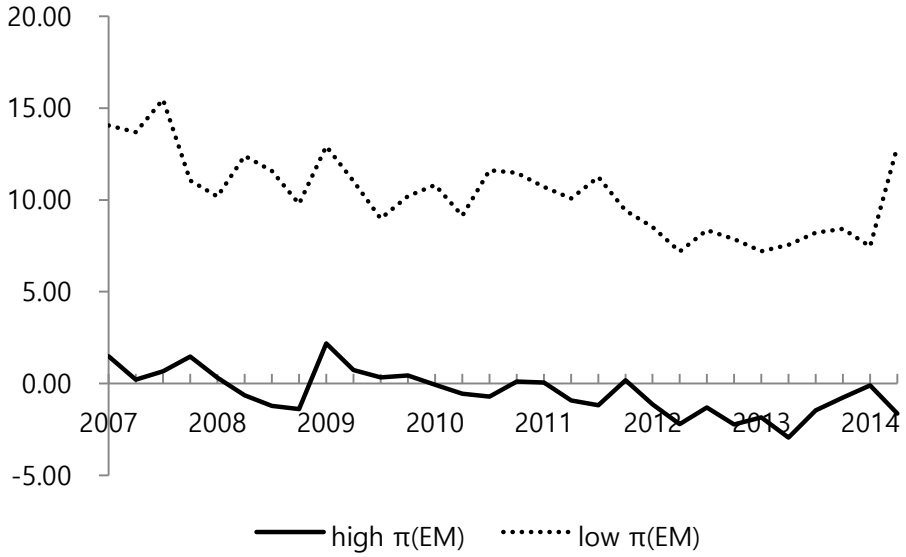
| high inflation countries | low inflation countries |
|---|---|
|  |  |

**Figure 6: Trends of current account balance in emerging markets (%)**




Notes: GDP ratio.

**Figure 7: Trends of currency depreciation in emerging markets (%)**

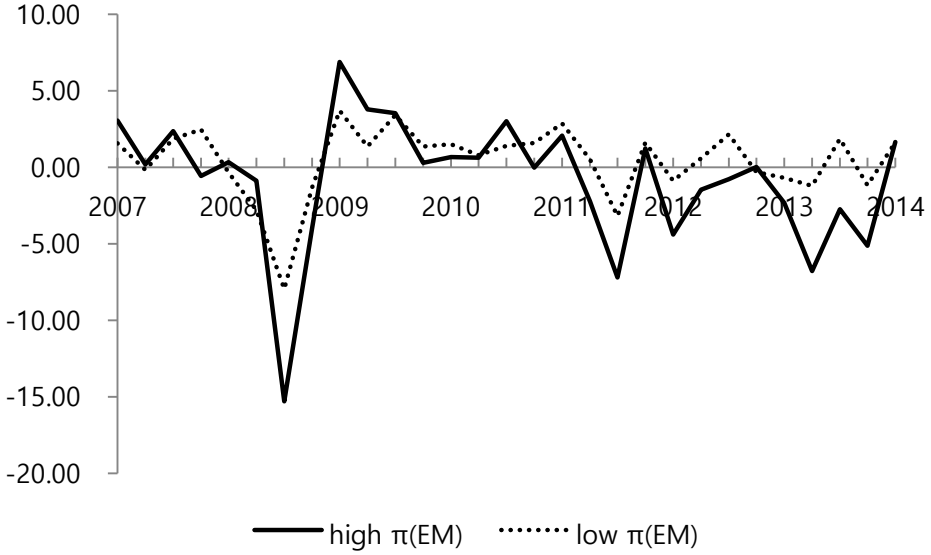
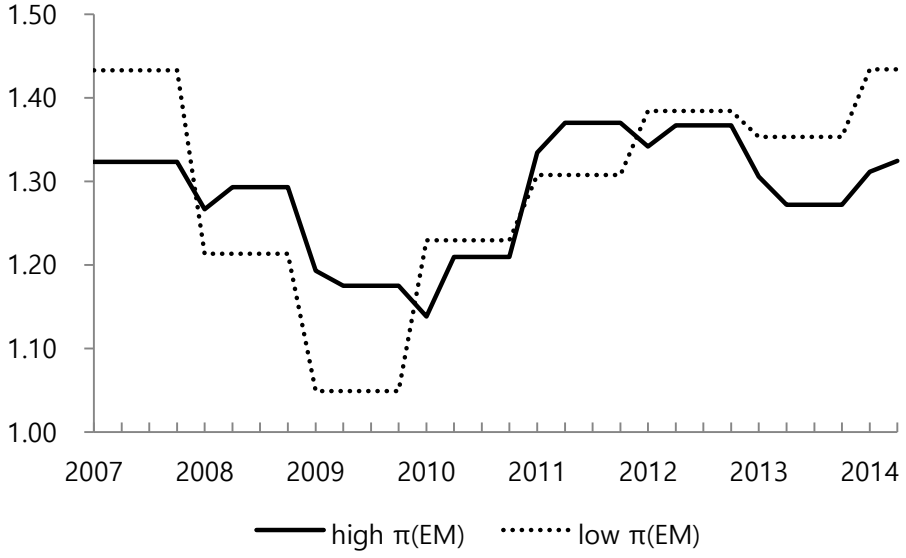


**Figure 8: Trends of capital control in emerging markets (%)**




Notes: GDP ratio.

**Table 1: Summary statistics**

| | 5 Advanced countries | | | 11 Emerging markets | | |
|---|---|---|---|---|---|---|
| variables | Obs. | Ave. | Std. | Obs. | Ave. | Std. |
| $\Delta y$ | 145 | 0.53 | 1.06 | 319 | 2.13 | 6.92 |
| $\pi$ (PPI) | 145 | 0.50 | 1.70 | 330 | 1.42 | 2.97 |
| $\pi$ (CPI) | 145 | 0.45 | 0.75 | 319 | 1.43 | 2.69 |
| H (log) | 150 | 14.28 | 0.52 | 330 | 11.23 | 1.17 |
| M2 (log) | 150 | 16.11 | 0.76 | 330 | 12.95 | 1.30 |
| Interest rate | 150 | 1.13 | 1.66 | 330 | 5.66 | 3.83 |
| Capital account(GDP) | 147 | 0.02 | 0.04 | 286 | -0.90 | 4.05 |

Notes: 2007: 1Q – 2014: 2Q. Ave. stands for average, Std. stands for standard deviation. Average quarterly growth rate over previous year. Euro stands for the average from 18 euro countries.

**Table 2: Average inflation (%)**

| Advanced countries | | Emerging markets | |
|---|---|---|---|
| countries | inflation | countries | inflation |
| Germany | 0.32 | Argentina | 3.68 |
| Japan | 0.22 | Brazil | 1.62 |
| UK | 0.68 | China | 0.77 |
| United States | 0.81 | India | 1.67 |
| Euro | 0.48 | Indonesia | 2.23 |
| | | Korea | 0.66 |
| | | Malaysia | 0.72 |
| | | Mexico | 1.04 |
| | | Singapore | 0.37 |
| | | South Africa | 1.76 |
| | | Thailand | 1.04 |
| Average | 0.50 | Average | 1.42 |

Notes: 2007: 1Q – 2014: 2Q. Average quarterly growth rate over previous year. Euro stands for the average from 18 euro countries.

**Table 3: Money velocity in advanced countries (%)**

| countries | Π | ∆multiplier | ∆H | ∆M2 |
|---|---|---|---|---|
| Average | 0.50 | 8.27 | 5.00 | 3.19 |
| Germany | 0.32 | 17.05 | 11.46 | 11.07 |
| Japan | 0.22 | 9.94 | 4.04 | 1.15 |
| UK | 0.68 | 1.85 | 1.23 | 0.75 |
| United States | 0.81 | 5.09 | 6.42 | 1.60 |
| Euro | 0.48 | 7.40 | 1.88 | 1.36 |

Notes: 2007: 1Q – 2014: 2Q. Euro stands for the average from 18 euro countries.

**Table 4: Correlation among variables**

| variables | π | US 10y Bond | ∆multiplier | ∆H |
|---|---|---|---|---|
| US 10y Bond | 0.116<br>(0.162) | | | |
| ∆multiplier | -0.084<br>(0.311) | 0.188<br>(0.020)** | | |
| ∆H | -0.386<br>(0.000)*** | 0.076<br>(0.361) | 0.208<br>(0.012)*** | |
| ∆M2 | -0.039<br>(0.636) | 0.283<br>(0.000)*** | 0.427<br>(0.000)*** | 0.324<br>(0.000)*** |

Notes: p-values are given in parentheses. * significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent.

**Table 5: Capital mobility in advanced countries (%)**

| countries | capital inflows | capital outflows |
|---|---|---|
| Average | 1.53 | 1.54 |
| Germany | 1.12 | 1.88 |
| Japan | 0.60 | 1.30 |
| UK | 2.78 | 1.92 |
| United States | 1.42 | 1.01 |
| Euro | 1.75 | 1.56 |

Notes: GDP ratio.

**Table 6: The relationship between unconventional monetary policy and capital outflows in advanced countries**

| Dep. V. | $C\_O_{it}$ (capital outflows, GDP ratio) | | |
|---|---|---|---|
| method | (1) | (2) | (3) |
| (a) $\Delta US\_10y_t$ (unconventional policy) | -0.154 (0.068)** | -0.159 (0.068)** | -0.158 (0.069)** |
| $\Delta multiplier_{it}$ (M2/base money) | -0.042 (0.038) | | |
| $\Delta H_{it}$ (base money) | | 0.019 (0.015) | 0.019 (0.015)* |
| (b) $\Delta M2_{it}$ | | 0.009 (0.021) | 0.002 (0.021) |
| (c) $\Delta y_{it}$ | -0.074 (0.197) | -0.063 (0.197) | -0.059 (0.198) |
| $(i - i^{us})_{it}$ (interest rate gap) | 0.232 (0.183)* | 0.254 (0.184)* | 0.235 (0.185) |
| | *Interaction term* | | |
| (a) x (b) | | | 0.001 (0.001) |
| (a) x (c) | | | -0.002 (0.002)* |
| C | 2.149 (0.800)** | 1.270 (0.662)** | 1.219 (0.627)** |
| Panel Obs. | 144 | 144 | 144 |
| R-squared | 0.397 | 0.402 | 0.413 |

Notes: Panel OLS (fixed effect). The country dummies and quarter dummies are included in regression but not reported. Standard errors are given in parentheses. * significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent.

**Table 7: Capital mobility in emerging markets (%)**

| high inflation countries | | | low inflation countries | | |
|---|---|---|---|---|---|
| countries | capital inflows | capital outflows | countries | capital inflows | capital outflows |
| Argentina | 0.79 | 0.70 | China | 0.53 | 0.03 |
| Brazil | 1.74 | 0.66 | Korea | 1.96 | 1.11 |
| India | 1.03 | 0.93 | Malaysia | 4.14 | 2.87 |
| Indonesia | 1.68 | 0.91 | Singapore | 0.97 | 14.76 |
| Mexico | 0.78 | 0.25 | | | |
| South Africa | 0.60 | 0.10 | | | |
| Thailand | 0.83 | 1.23 | | | |
| Average | 0.96 | 0.67 | Average | 2.03 | 5.30 |

Notes: GDP ratio

**Table 8: Correlation among variables**

| | high inflation countries | | | low inflation countries | | |
|---|---|---|---|---|---|---|
| variables | π | inflows(GDP) | ∆H | π | inflows(GDP) | ∆H |
| inflows (GDP) | 0.155 (0.027)** | | | 0.313 (0.001)*** | | |
| ∆H | 0.110 (0.116) | 0.271 (0.000)*** | | 0.267 (0.003)*** | 0.140 (0.157) | |
| ∆M2 | 0.007 (0.912) | 0.244 (0.000)*** | 0.755 (0.000)*** | 0.305 (0.000)*** | 0.248 (0.011)*** | 0.570 (0.000)*** |

Notes: p-values are given in parentheses. * significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent.

**Table 9: The relationship between inflation and capital inflows in emerging markets**

| Dep. V. | $\pi_{it}$ (inflation) | | | |
|---|---|---|---|---|
| classification | high inflation EMs | | low inflation EMs | |
| method | (4) | (5) | (6) | (7) |
| (a) unconventional policy dummy | 0.491<br>(1.260) | 0.235<br>(1.252) | -1.903<br>(1.401)* | -1.975<br>(1.389)* |
| (b) $C\_I_{it-1}$ (capital inflows) | 0.184<br>(0.121)* | 0.178<br>(0.119)* | 0.054<br>(0.026)** | 0.059<br>(0.026)** |
| $\Delta H_{it}$ (base money) | 0.052<br>(0.030)* | 0.052<br>(0.029)* | -0.036<br>(0.040) | -0.039<br>(0.040) |
| $\Delta M2_{it}$ | -0.149<br>(0.043)** | -0.149<br>(0.043)** | -0.093<br>(0.082) | -0.111<br>(0.083)* |
| $\Delta y_{it}$ | -0.053<br>(0.038)* | -0.069<br>(0.039)* | 0.016<br>(0.063) | 0.017<br>(0.062) |
| $(i - i^{us})_{it}$ (interest rate gap) | 0.054<br>(0.100) | 0.040<br>(0.099) | -0.466<br>(0.288)* | -0.542<br>(0.291)* |
| $KA_{it}$ (capital account, GDP ratio) | -0.880<br>(0.452)** | -0.896<br>(0.447)** | 0.106<br>(0.061)* | 0.105<br>(0.060)* |
| | *Interaction term* | | | |
| (a) x (b) | | 0.322<br>(0.156)** | | 0.054<br>(0.038)* |
| C | 3.740<br>(1.436)*** | 3.982<br>(1.425)*** | 3.890<br>(1.672)** | |
| Panel Obs. | 187 | 187 | 91 | |
| R-squared | 0.542 | 0.555 | 0.789 | |

Notes: Panel OLS (fixed effect). The country dummies and quarter dummies are included in regression but not reported. Standard errors are given in parentheses. * significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent.

**Table 10: Current account balance in emerging markets (%)**

| high inflation countries | | low inflation countries | |
|---|---|---|---|
| countries | CA(GDP) | countries | CA(GDP) |
| Argentina | 0.14 | China | 4.85 |
| Brazil | -2.04 | Korea | 2.97 |
| India | -2.57 | Malaysia | 13.48 |
| Indonesia | -0.29 | Singapore | 19.90 |
| Mexico | -0.33 | | |
| South Africa | -1.21 | | |
| Thailand | 2.96 | | |
| Average | -0.46 | Average | 10.29 |

**Table 11: The impact of current account surplus on capital inflows in emerging markets**

| Dep. V. | $C\_I_{it}$ (capital inflows, GDP ratio) | | |
|---|---|---|---|
| classification | EMs | high inflation EMs | low inflation EMs |
| method | (8) | (9) | (10) |
| $CA_{it}$ (current account, GDP ratio) | -0.464<br>(0.098)*** | -0.033<br>(0.059) | -0.514<br>(0.201)*** |
| $\Delta H_{it}$ (base money) | 0.011<br>(0.044) | 0.034<br>(0.019)* | 0.011<br>(0.183) |
| $\Delta M2_{it}$ | 0.096<br>(0.075)* | 0.001<br>(0.028) | 0.572<br>(0.370)* |
| $\Delta y_{it}$ | 0.041<br>(0.063) | 0.076<br>(0.025)*** | -0.276<br>(0.283) |
| $(i - i^{us})_{it}$ (interest rate gap) | 0.280<br>(0.178)* | 0.040<br>(0.065) | 1.669<br>(1.307) |
| $KA_{it}$ (capital account, GDP ratio) | 0.006<br>(0.158) | -0.222<br>(0.296) | -0.223<br>(0.276) |
| C | -3.638<br>(2.524)* | -0.548<br>(0.976) | -4.299<br>(1.847)* |
| Panel Obs. | 297 | 187 | 92 |
| R-squared | 0.371 | 0.511 | 0.655 |

Notes: Panel OLS (fixed effect). The country dummies and quarter dummies are included in regression but not reported. Standard errors are given in parentheses. * significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent.

**Table 12: Currency depreciation in emerging markets (%)**

| high inflation countries | | low inflation countries | |
|---|---|---|---|
| countries | depreciation rate | countries | depreciation rate |
| Argentina | -3.14 | China | 0.80 |
| Brazil | 0.10 | Korea | -0.15 |
| India | -0.94 | Malaysia | 0.30 |
| Indonesia | -0.71 | Singapore | 0.72 |
| Mexico | -0.41 | | |
| South Africa | -1.03 | | |
| Thailand | 0.34 | | |
| Average | -0.82 | Average | 0.42 |

**Table 13: The impact of currency depreciation on capital inflows in emerging markets**

| Dep. V. | $C\_I_{it}$ (capital inflows, GDP ratio) | | |
|---|---|---|---|
| classification | EMs | high inflation EMs | low inflation EMs |
| method | (11) | (12) | (13) |
| $Dep_{it}$ (currency depreciation) | -0.041<br>(0.124) | -0.017<br>(0.047) | -0.937<br>(0.659)* |
| $\Delta H_{it}$ (base money) | 0.002<br>(0.046) | 0.034<br>(0.019)* | 0.045<br>(0.192) |
| $\Delta M2_{it}$ | 0.119<br>(0.091)* | 0.007<br>(0.033) | 1.259<br>(0.642)** |
| $\Delta y_{it}$ | 0.037<br>(0.071) | 0.078<br>(0.026)*** | -0.326<br>(0.295) |
| $(i - i^{us})_{it}$ (interest rate gap) | 0.414<br>(0.184)** | 0.042<br>(0.065) | 2.997<br>(1.258)*** |
| $KA_{it}$ (capital account, GDP ratio) | -0.015<br>(0.166) | -0.215<br>(0.298) | -0.254<br>(0.287) |
| C | -4.840<br>(2.655)* | -0.583<br>(0.986) | -2.644<br>(6.062) |
| Panel Obs. | 279 | 187 | 92 |
| R-squared | 0.311 | 0.510 | 0.627 |

Notes: Panel OLS (fixed effect). The country dummies and quarter dummies are included in regression but not reported. Standard errors are given in parentheses. * significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent.

**Table 14: Capital control in emerging markets (%)**

| high inflation countries | | low inflation countries | |
|---|---|---|---|
| countries | financial transaction tax | countries | financial transaction tax |
| Argentina | 2.40 | China | 2.34 |
| Brazil | 0.88 | Korea | 2.03 |
| India | 1.18 | Malaysia | 0.36 |
| Indonesia | 0.37 | Singapore | 0.39 |
| Mexico | 1.70 | | |
| South Africa | 1.61 | | |
| Thailand | 0.87 | | |
| Average | 1.29 | Average | 1.28 |

Notes: GDP ratio.

**Table 15: The impact of capital control on capital inflows in emerging markets**

| Dep. V. | $C\_I_{it}$ (capital inflows, GDP ratio) | | |
|---|---|---|---|
| classification | EMs | high inflation EMs | low inflation EMs |
| method | (14) | (15) | (16) |
| $Tax_{it}$ (financial transaction tax, GDP ratio) | -0.881<br>(1.200) | -0.226<br>(0.467) | -5.926<br>(4.297)* |
| $\Delta H_{it}$ (base money) | 0.003<br>(0.046) | 0.035<br>(0.020)* | -0.028<br>(0.192) |
| $\Delta M2_{it}$ | 0.103<br>(0.078)* | 0.001<br>(0.028) | 0.552<br>(0.385)* |
| $\Delta y_{it}$ | 0.027<br>(0.066) | 0.075<br>(0.025)*** | -0.285<br>(0.295) |
| $(i - i^{us})_{it}$ (interest rate gap) | 0.443<br>(0.187)*** | 0.049<br>(0.066) | 3.448<br>(1.313)*** |
| $KA_{it}$ (capital account, GDP ratio) | -0.014<br>(0.166) | -0.250<br>(0.300) | -0.283<br>(0.286) |
| C | -2.851<br>(3.652) | -0.035<br>(1.416) | -2.654<br>(2.232) |
| Panel Obs. | 279 | 187 | 92 |
| R-squared | 0.313 | 0.511 | 0.627 |

Notes: Panel OLS (fixed effect). The country dummies and quarter dummies are included in regression but not reported. Standard errors are given in parentheses. * significant at 10 per cent, ** significant at 5 per cent, *** significant at 1 per cent.