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**Low Interest Rate Policy and the Use of
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Low Interest Rate Policy and the Use of Reserve Requirements in Emerging Markets

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Abstract

The paper attempts to shed light on the link between monetary policy in large economies with international currencies (the United States and the euro area) and the use of reserve requirements in emerging markets. Using reserve requirement data for 28 emerging markets from 1998 to 2012 we provide evidence that emerging markets tend to raise reserve requirements and repress financial markets to curb speculative capital inflows when interest rates in the major economies decline. Our finding suggests that the current low interest rate policies of the major economies may have collateral effects on emerging markets by triggering financially repressive policies.

Keywords: Reserve Requirements, Financial Repression, Emerging Markets.

JEL Classification: E52, E58.

1. Introduction

The bursting of the dot-com bubble at the turn of the millennium and the current Great Recession have been followed by substantial interest rate cuts in major advanced economies to stabilize financial markets and step-up domestic growth. But in our integrated international monetary system such insular monetary policies of economies with major funding and reserve currencies, in particular of the United States and the euro area, are likely to have an impact on other smaller economies that hold these currencies or use them in transactions (Portes 2012).

In this paper we attempt to shed light on the link between monetary policy in large economies with international currencies and the use of (low remunerated or unremunerated) reserve requirements in emerging markets. Using reserve requirement data for 28 emerging markets from 1998 to 2012 we provide evidence that emerging markets tend to raise reserve requirement ratios and repress financial markets when

interest rates in large economies decline to shield against volatile short-term capital inflows or to lean against inflationary pressure.

We argue that (i) emerging markets have incentives to follow the interest rate policy of their respective funding and reserve currencies to lean against appreciation pressure when major economies cut interest rates. To curb speculative capital inflows when international interest rates decline and to regain some monetary control when inflation rises (ii) we argue that emerging market central banks have incentives to opt for repressive measures such as reserve requirements (that are remunerated below market interest rates). Not surprisingly, Reinhart et al. (2011) find that an increasing number of emerging markets reintroduced repressive measures and raised reserve requirements since the panic of 2008.

The paper contributes to the growing body of literature that addresses the impact of low or falling world interest rates on emerging market economies. Borio and Disyatat (2011) link the low world interest rates of the 2000s to gross financial flows, emerging market credit booms and global imbalances. McKinnon (2011) stresses that the current expansionary US monetary policy triggers carry trades and asset market bubbles in emerging markets. Brana et al. (2012) provide empirical evidence for the relationship between global liquidity and output and prices in emerging markets. White (2012) outlines several possible unintended consequences of the recent fall of US interest rates toward the zero-bound, including substantial risks for emerging market economies.

While these papers concentrate on macroeconomic consequences, we focus on the policy feedback. We find that interest rate cuts in the large economies go along with financially repressive policies in emerging markets. Our empirical analysis suggests that the current low world interest rate environment may be incompatible with financial globalization (Steil 2007). By triggering financial disintegration it is likely that the current low interest rate environment puts a drag on financial development in emerging markets (Rajan and Zingales 2003).

The remainder of the paper is as follows. In section 2 we review the incentives emerging markets face to follow the monetary policy of large economies with internationally used currencies. Section 3 provides the rationale for the use of

reserve requirements in emerging markets. In section 4 we empirically explore the link between interest rate cuts in the major economies and the use of (low or unremunerated) reserve requirements in emerging markets. Section 5 summarizes and concludes.

2. Monetary Policy Dependence in Emerging Markets

The US Federal Reserve (Fed) and the European Central Bank (ECB) pursue insular monetary policies. They focus on domestic goals such as inflation, financial stability and growth. But the Fed and ECB also provide the international monetary system with important reserve currencies, namely the dollar and the euro. Therefore, it is likely that the rather insular monetary policies of the Fed and ECB affect other economies that hold dollar or euro reserves or use these currencies in transactions (Portes 2012).

The incompatibility of pegged exchange rates, international capital mobility and national monetary policy autonomy is a basic postulate of open economy macroeconomics (impossible trinity). Based on the postulate, emerging markets that peg their currencies to the dollar or euro import the monetary policy of the anchor unless they impose capital controls. Thus, if emerging markets face incentives to directly or indirectly stabilize the exchange rate, they are likely to follow the anchor currency's monetary policy.

Calvo and Reinhart (2002) show that most emerging markets are subject to *fear of floating*. Most emerging market central banks - at least softly - peg currencies in one way or another. Appreciation pressure and large exchange rate swings or volatility seem to make independence costly. A rapid appreciation of the nominal exchange rate can endanger growth, go along with a loss in export shares and potentially contribute to unemployment. Building on the paper, e.g. McKinnon and Schnabl (2004) argue that the prospects of macroeconomic stability, the inability to lend long-term in domestic currency (original sin) and the fact that most trade is invoiced in US dollars provided important rationales for the return to exchange rate pegging in East Asia in the aftermath of the East Asian crisis.

In principle, emerging markets with flexible exchange rates such as Poland or Chile should have full autonomy in monetary policy making even given free capital flows. Their central banks can target a domestic nominal anchor such as inflation. If, however, the economies that provide the international monetary system with reserve currencies cut interest rates and depreciate the currencies, there are incentives for most emerging markets to follow the monetary policy of the large economies even if exchange rates are not pegged:

Given that most emerging market trade is invoiced in US dollar, an expansionary US monetary policy brings about relative price movements even if the US is not a major trading partner. A strong depreciation of the dollar with respect to the domestic currency is tantamount to a large exogenous shocks to the terms of trade (Goldberg and Tille 2009). Therefore, emerging market central banks have an incentive to (unilaterally) coordinate policy with the US Fed and prevent such shocks.

Further, flexible exchange rates may pose the problem of *destabilizing speculation* if appreciation expectations become self-enforcing. This was perceived to be a major problem of flexible exchange rates during the inter-war period (Eichengreen 2008). McKinnon (2011) argues that such one-way bets on appreciation are the likely trigger of overinvestment in emerging market asset markets. Importing the anchor's interest rate policy kills off some speculative capital inflows and prevents appreciation expectations even without foreign exchange interventions.

Loeffler et al. (2010) show that emerging market central banks that introduced inflation targeting (e.g. Colombia, Chile, Poland and Czech Republic) can come under pressure if they still hold on to large stocks of foreign reserves. Such central banks (that operate under surplus liquidity) may be forced to stem against the appreciation of the domestic currency against the former reserve currency. Otherwise, currency appreciation devalues accumulated foreign reserves and deteriorates the central banks' capital bases. Additionally, falling international interest rates can depress the yield on foreign reserves and reduce the seigniorage income.

The prospect of central bank losses can have an impact on the central bank policies as central banks fear to have to deal with the losses themselves in the

future. Permanent central bank losses would burden fiscal policy makers when central banks have to be recapitalized. This could undermine the independence of central banks or prevent them from adhering to policy goals (Stella and Lonnberg 2008). To circumvent losses emerging market central banks with floating exchange rates may follow the interest rate policy of the large, former anchor, economy instead of targeting inflation (even if they do not intervene in the foreign exchange market anymore) when the fall in foreign interest rates poses a threat to the central banks' capital bases (Loeffler et al. 2010).

Empirically e.g. Edwards (2012) provides evidence for the transmission of changes in Fed policy rates to a sample of emerging markets in the 2000s, a period in which US policy rates were relatively low. His sample includes Brazil, Chile, Colombia, Mexico, Indonesia, the Philippines and Korea, which are all countries with more or less flexible exchange rates. He finds that those countries were not able to isolate their economies from interest rate shocks in the major funding economy.

3. The Use of Reserve Requirements in Emerging Markets

As long as the monetary policy of the anchor is in the interest of policy makers in emerging markets, they may be willing to give up some monetary autonomy. No policy conflict arises. But since the 1990s interest rates in the US and euro area have continuously fallen. The downward-trend in US and euro area interest rates and the resulting global excess liquidity are often argued to have contributed to inflationary pressure in emerging markets (Borio and Disyatat 2011, Brana et al. 2012, McKinnon 2011).

The expansionary monetary policies of the major advanced economies put emerging markets in a policy trap. Facing capital inflows or inflationary pressure they may want to regain some monetary control that they have given up. Thus, falling international interest rates provide an incentive for the use of repressive measures such as capital controls "to limit or redirect capital account transactions" (Neely 1999). Kose et al. (2010) distinguish between direct and indirect controls. Direct controls limit or prohibit capital flows (transaction volumes, license requirements

etc.). Indirect controls such as reserve requirements make inflows costly. We shall only focus on the use of low or unremunerated reserve requirements.¹

Recent research suggests that countercyclical capital flow restrictions may be desirable. Reserve requirements may stabilize emerging market economies as they protect from appreciation pressure and the vulnerability from rapid depreciation shocks (Edwards and Rigobon 2009, Stiglitz 2000). Forbes et al. (2012) show for Brazil that already the signal of raising reserve requirements has had a large impact in preventing speculative capital inflows by depressing expectations. Since the Great Recession, especially researchers that are connected to the International Monetary Fund (IMF) highlight the usefulness of capital controls - and reserve requirements in particular - in promoting financial stability (Korinek 2011, Lim et al. 2011, Jeanne 2012, Ostry et al. 2011, 2012).²

In advanced economies such capital controls were widely used during the Bretton Woods period (Werner 1976, Eichengreen 2008). For instance the Deutsche Bundesbank made use of a complicated system of reserve requirements to tame capital inflows and control money growth.³ Today they are abandoned. Capital accounts are widely open. But many emerging market economies never fully dismantled capital controls and still use reserve requirements as a policy tool.

Low (or un-) remunerated reserve requirements can curb capital inflows through their impact on bank interest rates (Reinhart and Reinhart 1999). By absorbing liquidity from the banking sector by brute force, reserve requirements increase marginal funding costs of banks and drive a wedge between banks' lending and deposit rates. When a central bank does not care about financial distortions the asymmetric impact of reserve requirements on bank interest rates provides an additional policy tool to target monetary stability. Whereas lower deposit rates discourage capital inflows, higher lending rates dampen the credit cycle.⁴

¹China for instance builds up a tight wall against capital flows and directly limits inflows (Klein 2012, Jeanne 2012) and at the same time actively uses low remunerated reserve requirements.

²Also e.g. the Bank of International Settlements (BIS) has set up a Committee on the Global Financial System (2012) to intensify research efforts on the transmission and efficiency of macroprudential tools including reserve requirements.

³See e.g. von Hagen (1999) on the importance of reserve requirements in Deutsche Bundesbank policy.

⁴For instance, in the 1990s "Chile's system of unremunerated reserve requirements was equivalent

4. Foreign Interest Rates and Financial Repression

Previous literature provides some descriptive evidence that points to a link between the use of reserve requirements and world funding conditions. For instance Klein (2012) argues that a number of emerging market countries made use of reserve requirements to shield against capital flows following the bursting of the dot-com bubble. During this period, it may be argued, that low world interest rates contributed to credit booms in and substantial portfolio shifts toward fast-growing emerging markets (Borio and Disyatat 2011).

While Jara et al. (2009) find that reserve requirements in many Latin American countries were reduced in 2008 to free up liquidity in response to the withdrawal of capital from emerging markets, there is evidence that "countries have taken one or more steps to control the flow of foreign capital into their economies" since 2008 (Reinhart et al. 2011). To this end, e.g. McKinnon (2011) argues that US interest rate cuts towards zero unintentionally triggered volatile short-term capital flows to emerging markets. As a consequence, countries such as Turkey and Brazil are argued to have lowered interest rates and raised reserve requirements to curb speculative capital inflows and kill off inflationary pressure (Klein 2012, Jeanne 2012, Reinhart et al. 2011).

To empirically address the link between monetary policy in large advanced economies and the use of reserve requirements in emerging markets we collected detailed reserve requirement data for a panel of 28 Eastern European, East Asian and Latin American central banks.⁵ The (weighted) reserve requirement ratios were collected from central bank websites, annual reports, documents on banking regulations, press releases and the surveys on bank regulation and supervision from the World Bank.⁶

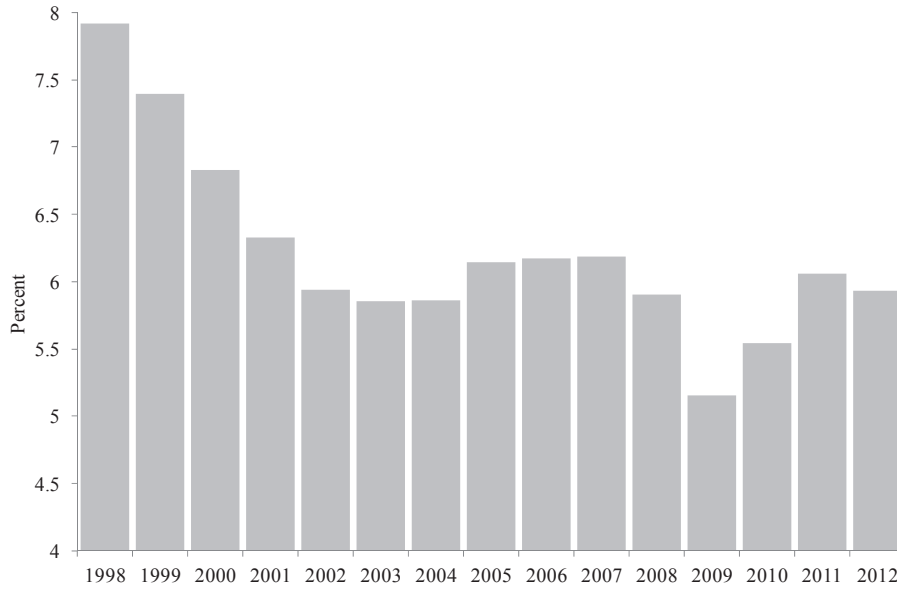
Figure 1 plots the average of the reserve requirement ratios for our sample of 28

to a tax on capital inflows" (Edwards and Rigobon 2009).

⁵The sample includes 12 Eastern European countries (Albania, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania, Slovakia and Slovenia), 10 Asian economies (China, Indonesia, Korea, Malaysia, the Philippines, Russia, Singapore, Taiwan, Thailand and Turkey) and 5 Latin American countries (Bolivia, Brazil, Chile, Colombia and Peru).

⁶For a description of the survey database see Barth et al. (2001).

Figure 1: Average Reserve Requirement Ratio of 28 Countries (geometric mean)



Data Source: Websites, press releases and reports from central banks, World Bank Survey on Banking Regulation, IMF: IFS. Note: In case of a differentiated reserve requirement system, the reserve requirement ratio is calculated either as average of the legal reserve requirement ratios or as the effective ratio that is equal to allocated required reserves of banks to the central bank relative to total deposits of the banking sector.

countries. We see that reserve requirement ratios are an actively used policy tool. The ratios fell until 2002 and increased from 2003 to 2007. Reserve requirement ratios dropped dramatically following the panic of 2008. But after 2008 they have been increased again.

In our empirical analysis we test whether emerging market central banks tend to use reserve requirements⁷ to stem against future inflation and to prevent overheating due to substantial capital flows. We are particularly interested to see whether reserve requirements are raised when foreign interest rates fall. In line with our argumentation, reserve requirements may help curb speculative capital inflows and lean against inflation when raising the interest rate is hardly possible (due to the capital inflow and currency appreciation problem). Therefore, we analyze a monetary policy rule using reserve requirements as policy tools instead of interest rates.

To identify the described policy feedback in emerging markets with respect to interest rate cuts in advanced economies we estimate the following reaction function

⁷Most emerging market central banks remunerate reserve requirements at a significantly lower rate than the market rate if at all.

for our panel of 28 emerging markets:

$$(1) \quad R_{i,t} = \alpha_0 + \alpha_1 if_{i,t} + \alpha_2 X_{i,t} + \alpha_3 \mu_i + \epsilon_{i,t},$$

where R is the reserve requirement ratio rr or (alternatively) the reserve requirement tax $rr(i - i_R)$ for every country i . The reserve tax represents the opportunity cost of holding required reserves at the central bank. To calculate the reserve tax we multiply the reserve requirement ratio with the difference between the market interest rate i and the remuneration rate of the required reserves i_R . If the remuneration rate for required reserves equals the market interest rates, the reserve tax is zero. While the reserve requirement ratio accounts for the general use of non-market based monetary policy operations, the reserve tax signals the de-facto repression of the banking system. In our context, the reserve tax only rises if the increase of the reserve requirement ratio (following a fall in foreign interest rates) outweighs the drop of the domestic policy rate (which reduces the market rate - remuneration rate gap).

In eq. (1) $if_{i,t}$ is our variable of interest and represents the relevant foreign interest rate: either the US or the euro area interest rate. We use the ECB policy rate in the reaction functions for the central banks of Emerging Europe because the euro is their main reserve and funding currency. For Russia, Turkey, the East Asian and Latin American emerging markets we use the Fed policy rate in the reaction function because the dollar is their main funding and reserve currency. $X_{i,t}$ is the vector of variables usually included in emerging market monetary policy reaction functions. We use future inflation to account for expected inflationary pressure, the growth rate and exchange rate changes to the US dollar (for all Asian and Latin American countries) or the euro (for the countries of Emerging Europe). The data is taken from the IMF's International Financial Statistics and World Economic Outlook.

We begin our analysis by estimating the reaction functions using a panel model with country fixed-effects to account for country specific unobserved heterogeneity. Table 1 captures the estimation results. We first regress the absolute year-over-year change in reserve requirement ratios on our independent variables. Column 1 in Table 1 shows that a fall in the relevant foreign interest rates is associated with an

increase in the reserve requirement ratios with respect to the previous year. We also find a positive and significant coefficient on growth. Emerging market central banks seem to increase reserve requirements when growth picks up.

Second, we use the absolute year-over-year change of the reserve tax as policy tool. Column 2 in Table 1 shows that the respective foreign interest rates have an impact on the change in the reserve tax. When foreign interest rates fall, the reserve tax increases relative to the previous year. The policy feedback is highly significant. Using the reserve tax also the coefficient on future inflation turns out positive and significant, while the other variables seem to have no impact on the use of the reserve tax.

It is noteworthy that the impact of foreign interest rates on the change in reserve requirements is larger than on the reserve tax. The coefficient on foreign interest rates in column 1 is higher than in column 2. This indicates that emerging market central banks also tend to lower policy interest rates in conjunction with foreign interest rates (as outlined in section 2 and 3). However, the interest rate cuts only partly mitigate the de-facto financial repression. The increase in reserve requirements outweighs the fall in domestic market rates.

Next, we re-estimate the parameters of our model using Generalized Method of Moments (GMM) to control for potential endogeneity of the reserve requirements and some of its explanatory variables (future inflation, growth and exchange rate changes). As widely used in the literature on monetary policy rules, lags of the regressors and a constant are included as instruments (Clarida et al. 1998). The results are presented in columns 3 and 4 of Table 1.

Column 3 of Table 1 suggests that the reserve requirement ratio is not independent of the ratio in the previous year. The 1-year lag enters with a positive and significant coefficient. Our earlier results are reconfirmed. A reduction in the relevant foreign interest rate causes a rise in the reserve requirement ratio. The coefficient on inflation is positive and significant. While reserve requirements seem to be raised in order to bring down future inflation, growth and exchange rate changes do not seem to play a role. Based on the empirical analysis we may argue that emerging markets use reserve requirements to tame inflationary pressure or to stem against capital inflows

Table 1: Estimation Results, Reserve Requirements and Foreign Interest Rates (1998-2012)

Variables	Reserve Requirements or Reserve Tax			
	Δrr	$\Delta(rr(i - i_R))$	rr	$rr(i - i_R)$
rr_{t-1}	-	-	0.493*** (0.177)	-
$rr_{t-1}(i_{t-1} - i_{R,t-1})$	-	-	-	0.461*** (0.097)
<i>(A) Foreign Monetary Policy Stance</i>				
Foreign Interest Rate	-0.260*** (0.082)	-0.078*** (0.033)	-0.325*** (0.135)	-0.067* (0.037)
<i>(B) Controls</i>				
Inflation (t+1)	0.084 (0.094)	0.045* (0.026)	0.572*** (0.240)	0.131*** (0.047)
GDP Growth	0.100*** (0.036)	0.001 (0.010)	0.067 (0.053)	-0.001 (0.163)
Exchange Rate Change	-0.001 (0.009)	0.001 (0.004)	-0.023 (0.018)	-0.006 (0.004)
Estimation	FE	FE	GMM	GMM
Observations	341	329	340	328
Countries	28	28	28	28
No. instruments	-	-	9	9
AR2 test	-	-	0.131	0.917
Prob>F	0.010	0.040	-	-

Data source: IMF: IFS, Datastream, Thomson Reuters, World Banks, central banks. *Note:* Blundell - Bond (1998) system GMM estimation using the Stata program xtabond2 written by Roodman (2009); Column 3: Δi_t . The reserve requirement ratio is the weighted reserve requirement ratio on domestic bank liabilities; robust standard errors in parentheses; significance levels: *** p<0.01, ** p<0.05, * p<0.1.

that can result from falling US or euro area interest rates.

Finally, the results using the reserve tax can be found in column 4 of Table 1. We find that a fall in the relevant foreign interest rates or an increase in expected inflation tends to raise the reserve tax. The coefficients on growth and exchange rate changes are not significant. Again the empirical analysis suggests that the increase in reserve requirements outweighs the fall in domestic market rates that goes along with the drop in the relevant foreign interest rate. Thus, earlier findings for the use of the reserve tax are reconfirmed. To sum up, our results suggest that emerging market central banks tend to repress financial markets to lean against inflationary pressure and to shield against capital flows when interest rates in the economies with

major funding and reserve currencies decline.

5. Conclusion

We have tested for a link between the US and euro area monetary policy and the use of reserve requirements in emerging markets. Using reserve requirement data for 28 emerging markets from 1998 to 2012 we have provided evidence that emerging markets tend to raise reserve requirements and thereby repress financial markets to prevent capital inflows when interest rates in the US or euro area decline or to lean against inflationary pressure.

Our finding suggests that the current low interest rate policies in the US and in the euro area may have collateral effects on emerging markets by triggering financially repressive policies. They may be incompatible with financial globalization. The resulting financial disintegration could put a drag on financial development in emerging markets.

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