Global Liquidity and Reserves Accumulation in Emerging Countries

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Abstract

The surge in reserves holdings in emerging countries since the last decade has been concurrent with unprecedented global liquidity developments. This paper tests the impact of global liquidity evolution on emerging economies reserves accumulation dynamics. Several measures are used to capture monetary liquidity in advanced economies as well as global markets liquidity. I find a strong positive relation between global liquidity expansion and reserves acumulation highlighting that capital flows to emerging countries are a major channel of transmission of advanced countries liquidity. In addition, deeper financial integration is associated with a higher impact of global liquidity on reserves accumulation. In this context push factors explain an important part of recent trends in reserves accumulation dynamics. Besides precautionary motivations, reserves are thus a policy instrument to relax constraints associated with the Trilemma allowing to achieve greater exchange-rate stability in a context of both financial integration deepening and monetary policy decoupling.

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1 Introduction

The last decade has witnessed a sharp increase in emerging countries reserves holdings. This new trend of reserves accumulation has been hardly accounted for by traditional frameworks of reserves hoarding. Notably, while many emerging economies have considerably reduced their external vulnerabilities since the "Asian crises", the view that emerging countries accumulate reserves as a precautionary buffer to face potential external shocks has been weakened. On the other hand, this surge in emerging countries reserves has been concurrent with unprecedented global liquidity developments. This paper develops the hypothesis that reserves accumulation is in part the outcome of policy tradeoffs that emerging economies face in a global environment characterized by abundant liquidity.

The organization of the paper is as follows. Section 2 presents recent evolutions in reserves accumulation. Notably, it contrasts the recent trend in reserves accumulation with previous periods' evolutions. It also compares the different patterns of accumulation between advanced and emerging countries. Section 3 reviews the existing literature on the determinants of reserves accumulation. It shows that the traditional frameworks of reserves accumulation: the precautionary framework and the mercantilist framework fail to explain the surge in reserves holdings in the 2000'. Section 4 briefly presents previous studies focused on the impact of global liquidity on emerging economies and develops the approach adopted in this paper. Section 5 presents the empirical specifications used to test the impact of global liquidity on reserves accumulation. I find that liquidity variables accounting for both monetary and market liquidity actually have a positive and significant impact on reserves accumulation. Results are commented in Section 6. Section 7 concludes.

2 Recent Trends in Reserves Accumulation

International reserves accumulation has accelerated sharply in the recent period. While world reserves assets grew at an average yearly rate of 7.9% between 1985 and 2001, they

increased by 18.5% per year on average since 2002. In 2010 world reserves holdings reached 10.8 Trillion dollars, 8.4 times their 1990 level. In the meantime, world GDP was only multiplied by 2.9 and international trade by 3.8 (Figure 1). As a consequence, the ratio of world reserves to world GDP reaches an all time high at 17.1% in 2010 against an average of 6% between 1985 and 2001. The global crisis temporarily slowed the accumulation pace in 2008 but it did not reverse the trend. Again, reserves accumulation paused in H2/2011 as global financial turbulences prompted again but yet in early 2012 reserves seem to pick up.

This evolution has not been uniform through countries. In fact, the recent acceleration trend is driven by middle-income countries and especially emerging Asia. Advanced countries reserves grew moderately and did not show any particular break with previous periods' trend. High-income countries reserves to GDP ratios remained rather stable around 8% during the last decade. On the contrary, reserves in middle-income countries which represented approximately 5% of GDP in 1990 now reach 25% of GDP on average and up to 45% in Asia (Figure 2). Several emerging countries also built-up Sovereign Wealth Funds adding to the total foreign assets held by emerging economies public authorities.

3 Traditional Determinants of Reserves Accumulation

Much research has been dedicated to highlighting the precautionary motivation for holding reserves. Among pioneer contributions, Heller (1966) [11] shows that reserves help to smooth external trade shocks by allowing the financing of transitory deficits and prevent costly adjustments in terms of welfare. As international financial integration deepened, the focus of attention has been moved from a trade openness perspective to a broader one that includes financial openness. Extended buffer-stock models aim at capturing these new vulnerabilities (external debt, foreign liabilities, capital account openness...) and the resulting fragilities for the domestic financial systems (currency mismatches, potential capital flight). Cheung and Ito (2009) [8] find that the explanatory power of trade openness has been declining over time while the importance of financial variables, in particular those related to external financing,

has been increasing. Obstfeld and al. (2010) [17] find that financial stability concerns such as potential sudden-stops and capital flight episodes actually explain a good part of reserves accumulation. Mendoza (2010) [16] shows that the precautionary motivation has gained momentum in the post-Asian crisis period and that countries vulnerable to sudden-stops tend to hold more reserves due to the scarcity of efficient alternative contingency instruments (lender of last resort, capital controls...).

According to the precautionary motivation, the adequate level of reserves is a function of the size and probability of occurrence of shocks, the potential cost of adjustment and the opportunity cost of holding reserves. In this context, the growing accumulation of reserves by emerging economies in the aftermath of the "Asian crisis" was seen, in the first place, as a buffer strategy to better handle future shocks. Indeed, in view of the increasing financial integration of emerging countries, reserves assets would be a key policy instrument to face foreign capital flows' volatility and its impact on domestic economies. But the rise in reserve holdings has been concurrent with a decrease in the macroeconomic and financial vulnerability of many emerging countries. Most of the imbalances that had been at the roots of the "Asian crisis" have been, to a large extent, corrected. Public finances have improved, driven by a reduction in fiscal deficits and debt ratios. Even if there is a huge diversity among emerging economies, many countries took advantage of terms-of-trade improvements and a dynamic external demand to consolidate their current account balances. On the financial stability side, macro-prudential regulations have been strengthened to prevent private sector exposition to debt mismatches (currency, maturity, interest rate type...) that could weaken the soundness of domestic financial and banking systems.

As a consequence, international reserves holdings started to exceed the level considered adequate for precautionary motives as measured by rule-of-thumb criteria or more sophisticated models. In the recent period, reserves have exceeded by far 3 months of imports as well as short-term debt (Guidotti-Greenspan rule). Reserves assets currently cover between

9.5 months of imports in Latin America and more than 2 years of imports in the Middle-East (Figure 3). Similarly, reserves are worth almost 7 times the level of total short-term debt in middle-income countries (Figure 4). Calibrated buffer-stock models based on an inter-temporal welfare maximization such as Jeanne and Ranciere (2006) [13] and Jeanne (2007) [12] also find that for several countries current reserves holdings are above the predicted levels. On the other hand, the high opportunity costs (inflation, quasi-fiscal costs...) of holding reserves do not seem to impact on emerging countries' accumulation trend. Alberola and Serena (2007) [5] find empirical evidence that sterilization actually allows for more intensive reserves accumulation in emerging economies. In this context, the precautionary motivation framework fails to explain the surge in reserves hoarding since the beginning of the 2000'.

The mercantilist motivation for holding reserves has been developed in response to the precautionary motivation failure to account for recent trends in reserves accumulation. It builds more specifically on the Asian experience and sees the accumulation of reserves as a consequence of current account surpluses. This approach highlights that the export-led development strategies adopted by Asian countries require a competitive exchange-rate that has led these countries to intervene on foreign-exchange markets to maintain their currencies undervalued. In this context, regional imitation is also at play. Aizenman (2009) [2] emphasizes the prevalence of "herd-behavior" among Asian countries as a consequence of trade competition. According to the mercantilist motivation framework, international reserves accumulation is not an insurance policy but the consequence of emerging countries integration in the global economy. In this case, the optimal level of reserves is not linked to the degree of vulnerability the country is faced with but it is the one that preserves external competitiveness. It is the outcome of the exchange-rate target which means that the resulting level of reserves is not necessarily bounded upward. Using a Panel Smooth Transition Model (PSTR), Delatte and Fouquau (2009) [10] find that the demand for reserves during the last decade has been non-linear and that price competitiveness is a good threshold vari-

able to account for non-linearity in the demand for reserves. Nonetheless, if the mercantilist framework can explain higher levels of reserves than those predicted by buffer-stock models, it does not fill all the caveats left by the precautionary motivation framework. Indeed, the export-led growth model existed prior to the acceleration of reserves hoarding as pointed by Aizenman (2006) [1]. On the other hand, the acceleration of reserves accumulation, if particularly significant in Asia, characterizes a broader group of emerging countries with different international integration patterns.

Consequently, there is still a lack of consensus on the motivations that are driving reserves accumulation and no model has been able to account for the surge in reserves hoarding in the last decade. Furthermore, the international crisis has brought new questions to the reserves accumulation puzzle. Indeed, in the aftermath of Lehman bankruptcy and the rise of global risk aversion, emerging countries faced large capital outflows and sharp terms-of-trade adjustments for commodity exporting countries. Nevertheless, large-scale foreign-exchange interventions have been limited (Russia, South Korea). Studying the link between the pre-crisis origin of reserves accumulation and the use of reserves during the crisis, Aizenman and Sun (2009) [4] show that the countries that accumulated reserves as a buffer against current account shocks did use their reserves (Russia for example) but countries that accumulated reserves for financial concerns were more reluctant to use them as it could appear as a source of weakness especially considering that the duration of the stress was unknown. The decrease in reserves holdings was quite limited in most cases and short (-4.1% between Q3:2008 and Q2:2009 for my sample). On the contrary, the exchange-rate adjustment was sharp, several emerging economies currencies depreciating more than 20% without causing domestic crises. Currently, despite an increased resilience of emerging economies to external shocks, reserves to GDP ratios are at an all-time high again.

4 Reserves Accumulation and Global Liquidity

The increase in emerging countries reserves holdings in the last decade has been concurrent with periods of unprecedented accommodative monetary policies in major economies and a trend of decreasing risk aversion and buoyant asset prices in global financial markets (Figure 5). Monetary and market liquidity are related. The surge in money supply and low-yielding traditional assets have prompted a "hunt-for-yield" and higher risk-taking behaviors. However, they are not substitutes. Indeed, the deepening of the international crisis after Lehman failure has shown that monetary liquidity does not necessarily imply market liquidity.

Psalida and Sun (2011) [20] study the impact of G4 liquidity on liquidity receiving countries. They find evidence that global liquidity is associated with a surge in capital flows to emerging countries, leading to a rise in domestic asset prices and reserves accumulation. Bar-Ilan and Marion (2009) [6] draw a model where the level of reserves is not an isolated decision but the by-product of targeting other macroeconomic variables such as output and inflation. In their model, the reserves accumulation process results from a trade-off between output and inflation targeting, the exchange-rate policy and a precautionary motive. Delatte and Fouquau (2009) [10] also highlight that there is a passive component in the reserve accumulation process. Notably, they find that the US macroeconomic context performs quite well in explaining the demand for reserves in a PSTR model.

This paper studies the impact of the rise in global liquidity, as measured by advanced economies monetary policies stance and global market liquidity on emerging countries reserves accumulation and the channels of transmission. The approach adopted in this paper is that, if precautionary motivations can explain part of the reserves accumulation process, the recent surge in emerging economies reserves holdings is also an outcome of the global macroeconomic and financial environment. Global liquidity channels to emerging countries through higher capital flows in a context of growing financial integration. Consequently, reserves are used as a policy instrument to deal with the Trilemma. In effect the "impossible

Trinity" states that a country cannot achieve simultaneously financial openness, monetary policy independence and exchange-rate stability and has to choose at most two of these objectives. However, as highlighted by Aizenman and al (2008) [3] , reserves accumulation enables to relax the Trilemma constraints, managed-float exchange-rate regimes allowing for higher exchange-rate stability while preserving a degree of monetary independence and deeper financial integration simultaneously.

5 Data and Methodology

This paper adopts an empirical approach to test the impact of global liquidity on emerging economies reserves holdings. The analysis covers a sample of 23 emerging economies[1] and uses quarterly data over the period 1995-2010. The panel is balanced and countries in the sample were selected among emerging economies according to data availability. This sample seems reasonably representative. The 23 emerging countries that compose it represent 75% of non-advanced countries GDP. In addition, their share in emerging and developing countries reserves holdings increased from 60% in 1995 to 76% in 2010. While most research on reserves determinants uses yearly data, this paper uses quarterly data to better capture short-term changes in the variables.

Four alternative indicators of advanced countries liquidity are used: G4 M0[2], G4 M2, the US 3 months treasury bills rate and the yield spread between US Treasury 10 years bonds and US Treasury 3 months bills. These measures encompass both monetary and market dimensions of liquidity. G4 M0 and G4 M2 are quantity measures of global liquidity. The choice of G4 countries allows capturing the evolution of monetary aggregates in major economies. Even if it is only a partial measure of global liquidity, the countries included account for most of advanced economies GDP and money creation. On the other hand, including only

[1] Argentina, Brazil, Bulgaria, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, South Korea, Malaysia, Mexico, Peru, Poland, Romania, Russia, Singapore, South Africa, Thailand, Turkey and Venezuela.

[2] G4 countries include the Euro Area, Japan, the United Kingdom and the United States.

four economies avoid problems related with measurement discrepancies when aggregating the data. G4 M0 is a restrictive measure of liquidity as it only includes currency in circulation and reserves at the Central Bank. However, it allows capturing non-conventional measures of monetary policy. G4 M2 is a broader measure of liquidity as it takes into account money created through financial intermediation. M2 aggregate includes currency in circulation as well as checking and saving accounts. The US Treasury bills 3 months rate is a price measure of liquidity. I use it as a proxy for monetary policy action on interest rates. I preferred this indicator to the Fed funds target rate because the later changes infrequently. However, due to the short maturity of the underlying asset, the 3 months rate is very close to the key interest rate and is thus a good proxy for monetary policy stance. In addition, I restricted the measure to the US indicator for several reasons. First, aggregating price measures is not as straightforward as it is the case for quantity measures and there is a risk that an average interest rate would not be representative of any constituent. Second, the US are usually considered as a "policy mover", other economies tending to follow with lags the decisions taken by the Federal Reserve. Finally, the dollar financial market remains the dominant one and the greenback is still the reserve currency. Thus, focusing on the US interest rates to account for global trends in liquidity, financial flows and reserves seems reasonable. Low short-term interest rates contribute to monetary expansion through financial intermediation as they make money cheaper and therefore foster credit. The corollary is also a fall in the yield of liquid assets and, everything else equal, an increase in the differential with foreign countries interest rates[3]. As a consequence a lower domestic interest rate would increase the attractiveness of foreign markets, notably through carry trade operations. The maturity spread between 10 years and 3 months US securities is a price measure of market liquidity. In effect, periods of high liquidity are associated with decreasing maturity premium which are reflected in a flattening of the yield curve. Therefore it implies a reduction in the maturity spread. In addition to these four liquidity variables, a measure of risk aversion is included. For this purpose, I use the Chicago Board Options Exchange Market Volatility

[3]or alternatively a reduction of such differential if foreign interest rates were lower at first. This is clearly not the case between the United States on the one hand and emerging economies on the other hand.

Index (VIX) which measures market short-term expectations of stock market volatility as suggested by S&P 500 stock index option prices. It relates to some extent to the stance of market liquidity as the risk premium includes a liquidity premium. In the end, I expect a positive relation between monetary aggregates and reserves and a negative impact of price measures of liquidity and risk aversion on reserves holdings.

Traditional determinants of reserves are included in the estimation along with global liquidity variables. All the variables and data sources are described in Table 1. The independent variable is the stock of foreign exchange reserves which includes, according to the IMF-IFS definition, "monetary authorities' claims on nonresidents in the form of foreign banknotes, bank deposits, treasury bills, short- and long-term government securities, ECUs (for periods before January 1999), and other claims usable in the event of balance of payments need". Two variables related to the exchange-rate are included as regressors. I expect the exchange-rate volatility to be negatively correlated with reserves. A higher volatility level would suggest turbulent times in the foreign exchange-market that could lead to a stagnation or a loss of reserves. The exchange-rate regime dummy allows to distinguish between *de jure* fixed exchange-rates and floating exchange-rates. Due to the need to defend the peg, countries with fixed exchange-rate regimes are expected to hold higher levels of reserves. Terms of trade, financial openness and the current account surplus dummy intend to capture the channels through which emerging economies accumulate reserves. An improvement in the terms of trade should improve the trade balance position and therefore lead to reserves accumulation if the country does not let the balance of payment adjust through exchange-rate appreciation. The current account surplus aims at controlling for countries with structural current account surpluses which are not necessarily related to terms of trade improvements. If terms-of-trade might control well for better current account position in the case of commodity exporting countries, other economies such as the Asian ones, have had strong current account surpluses associated with foreign exchange interventions to prevent local currency appreciation. Financial openness controls for the financial account channel of reserves accu-

mulation. More financially open economies are more subject to foreign capital inflows and might be more inclined to accumulate reserves for exchange-rate management as well as precautionary motivations. In the base model, I use a *de facto* measure of financial openness: the ratio of the stock of external financial liabilities to GDP. Alternatively, I use a *de jure* measure of financial openness: the KAOPEN index proposed by Chinn and Ito (2008). It is based on information contained on cross-border transaction restrictions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. I also expect global liquidity to have a stronger impact on reserves accumulation in more open economies as capital flows are a major channel of transmission of advanced countries liquidity. To test this hypothesis, I include interaction variables between global liquidity and financial openness. Total external debt is included to control for precautionary motivations. According to the precautionary motivation framework, higher levels of foreign liabilities should be matched by higher levels of liquid foreign assets so as to face potential reversals and smooth their impact on the domestic economies. Finally, a "Trilemma constraint" index is included to test the hypothesis that the "impossible trinity" constraint can be relaxed, to some extent, with reserves accumulation. The Trilemma indexes constructed by Aizenman, Chinn and Ito (2010) are normalized indexes that aim at quantifying the degree of achievement along the three dimensions of the Trilemma: monetary policy independance, exchange-rate stability and financial openness. Higher levels of the indexes indicate higher degrees of achievement. Financial openness is measured with the KAOPEN index described above. Monetary policy independance is measured with the correlation between the domestic interest rate and that of a base country and exchange rate stability is measured with the annual volatility of the domestic currency against a reference currency. I construct a trilemma constraint index by summing these three components. As the impossible trinity indicates that it is not possible for a country to achieve more than two of these three objectives, a greater achievement of one dimension should lead to a decrease in the achievement of a weighted combination of the other two. Consequently, the trilemma index should remain rather stable over time and it is bounded upward.

The empirical methodology adopted in the paper is as follows. First, I performed time series and panel data unit root tests. Results are presented in Table 2 and Table 3. Risk aversion (VIX), exchange rate volatility and the trilemma index are found to be stationary in level (I(0)). All the other variables are found to be integrated of order one (I(1)) and therefore difference-stationary. Second, I performed cointegration tests on four combinations of the I(1) variables plus the dummy variables. In effect, regressing I(1) variables in level might lead to misleading results unless the series are cointegrated, i.e. it exists a linear combination of them which is I(0). Two tests are performed and give contradictory results. They are presented in Tables 4 and 5. The two tests are single equation residual based (Engle-Granger) tests. Pedroni's tests allow for heterogenous intercepts and trend coefficient across cross-sections. A total of 11 statistics with varying degree of properties and two sets of alternative hypothesis (homogenous vs heterogenous cointegration) are generated. Kao's test specifies cross-section specific intercepts and homogenous coefficients on the first stage regressors. According to Kao test, there is evidence of cointegration for the four equations tested at the 10% confidence level or less. However, Pedroni cointegration test fails to reject the null hypothesis of no-cointegration under all alternative hypotheses.

Considering these results, I start by estimating the model of reserves determinants in first differences. The base model is written as follows:

$$\Delta ln(Res)_{it} = \beta_1 FXvolat._{it} + \beta_2 FXreg._{it} + \beta_3 \Delta ln(ToT)_{it} + \beta_4 \Delta ln(Fin.openness)_{it}$$

$$+\beta_5 \Delta ln(Tot.ext.debt)it + \beta_6 CAsurplus_{it} + \beta_7 VIX_t + \beta_8 \Delta ln(GlobalLiq.)_t + e_i + \varepsilon_{it};$$

The model is estimated using GLS and corrects for serial correlation and heteroskedasticity. Country fixed-effects are included. Preliminary tests were performed on simple OLS estimations and results are presented in Table 6.

In order, to test the financial account transmission channel of global liquidity, I interact global liqudity variables with coutries' financial openness. The model thus becomes:

$$\Delta ln(Res)_{it} = \beta_1 FXvolat._{it} + \beta_2 FXreg._{it} + \beta_3 \Delta ln(ToT)_{it} + \beta_4 \Delta ln(Fin.openness)_{it}$$

$$+\beta_5 \Delta ln(Tot.ext.debt)_{it} + \beta_6 CAsurplus_{it} + \beta_7 VIX_t + \beta_8 \Delta ln(GlobalLiq.)_t$$

$$+\beta_9 \Delta ln(GL)_t * \Delta ln(Fin.open.)_{it} + e_i + \varepsilon_{it};$$

According to Brambor and al (2006) [7], conclusions on interaction variables models cannot be drawn from the estimation tables. Therefore, I calculate marginal effects of global liquidity on reserves depending on financial openness and the corresponding standard errors using the following formulas:

$$\frac{\partial \Delta ln(Res)}{\partial \Delta ln(GL)} = \hat{\beta}_8 + \hat{\beta}_9 * \Delta ln(Fin.open.)$$

$$\hat{\sigma}_{\frac{\partial \Delta ln(Res)}{\partial \Delta ln(GL)}} = \sqrt{var(\hat{\beta}_8) + \Delta ln(Fin.open)^2 * var(\hat{\beta}_9) + 2 * \Delta ln(Fin.open) * cov(\hat{\beta}_8, \hat{\beta}_9)}$$

The resulting charts are presented in Figure 6.

Several robustness checks are performed. To test the stability of the model, I estimate the model on subsamples of countries and time spans. More precisely, I test the stability of the results between Asian and non-Asian countries. In effect, Asian countries reserves increased the most in the last decade. They have been associated with strong current account surpluses and a tight management of the exchange-rate. I thus want to check if global liquidity affects reserves accumulation the same way in Asian and non-Asian emerging economies. I also test the stability of the model before and after the "Asian crisis" period. In effect, reserves holdings of emerging economies have been increasing sharply especially in the last decade i.e in the post-Asian crisis period. Performing the estimation on both subsamples can help determine if this change in reserves dynamics is explained by changes in reserves

determinants or by changes in the dynamic of the determinants themselves. I also test a dynamic specification of the model. In effect, reserves may adapt sluggishly to changes in their underlying determinants. Including a lag of the independent variables in the regressors allows to control for potential inertia in the stock of reserves adjustment. The model becomes a partial adjustment ARDL(1,0,...,0):

$$\Delta ln(Res)_{it} = \beta_1 \Delta ln(Res)_{it-1} + \beta_2 FXvolat._{it} + \beta_3 FXreg._{it} + \beta_4 \Delta ln(ToT)_{it} + \beta_5 \Delta ln(Fin.open.)_{it}$$

$$+ \beta_6 \Delta ln(Tot.ext.debt)it + \beta_7 CAsurplus_{it} + \beta_8 VIX_t + \beta_9 \Delta ln(GlobalLiq.)_t + e_i + \varepsilon_{it};$$

Pesaran and Smith (1995) [18] and Pesaran, Shin and Smith (1999) [19] have shown that traditional methods to estimate dynamic panels such as fixed effects, instrumental variables and generalized method-of-moments (GMM) can produce misleading results when T becomes large because they impose strong homogeneity assumptions that are often not appropriate in large N large T panels. Therefore, I use the pooled-mean group estimator that they propose. It constrains long-run coefficients but allows short-term coefficients and error variances to differ across groups. The PMG estimator applies for both I(0) and I(1) variables.

Finally, I explore the cointegration hypothesis as Kao cointegration tests results suggested. I adopt an ARDL(1,1,...,1) specification reparameterized in an error-correction model and use the PMG estimator. I include in the cointegation equation the I(1) variables in level as well as the dummy variables. In the short-run dynamics equation I include the I(1) variables in first-difference, plus the I(0) variables (VIX and exchange-rate volatility):

$$\Delta ln(Res)_{it} = \phi_i [ln(Res)_{it-1} - \theta_{0i} - \theta_{1i} FXreg_{it} - \theta_{2i} ln(ToT)_{it} - \theta_{3i} ln(Fin.op.)_{it} - \theta_{4i} ln(ext.debt)_{it}$$

$$- \theta_{5i} CA.surplus_{it} - \theta_{6i} ln(GL)_{it}] + \gamma_{1i} \Delta ln(ToT)_{it} + \gamma_{2i} \Delta ln(Fin.op.)_{it} + \gamma_{3i} \Delta ln(ext.debt)_{it}$$

$$+ \gamma_{4i} \Delta ln(GL)_{it} + \gamma_{5i} VIX_{it} + \gamma_{6i} FX.volat._{it} + \epsilon_{it}$$

6 Results

GLS estimations of the base model are reported in Table 7. Results show that an increase in advanced countries monetary liquidity is associated with reserves accumulation in emerging countries. This result holds with several alternative liquidity measures supporting the hypothesis that the environment of abundant global liquidity that has been prevailing since the last decade explains a great part of the surge in emerging countries reserves holdings. Reserves accumulation responds to changes in all three measures of monetary liquidity. Positive changes in G4 monetary aggregates as well as negative changes in the US 3 months interest rate imply an acceleration of reserves accumulation. The coefficient is higher in the case of M2 aggregate which is consistent with its broader scope to capture liquidity.

Market liquidity as measured by the maturity premium (spread between the yield of US 10 years bonds and 3 months bills) has not a significant impact on reserves accumulation but higher risk aversion has a negative impact on the evolution of emerging countries reserves. Indeed, episodes of rising risk aversion (VIX) are often associated with a decrease in appetite for emerging markets or even lead to capital outflows (as it has been the case in the post-Lehman period and during H2-2011) implying losses or stagnation in emerging countries reserves. This result highlights that periods of combined high monetary and market liquidity lead to higher accumulation of reserves while a contraction in market liquidity, implying less capital flows to emerging countries tend to limit the spillover effects of abundant global monetary liquidity. Foreign-exchange volatility has a negative impact on reserves accumulation emphasizing that episodes of stress on exchange-rate markets cause a slowdown or a reversal in reserves accumulation. As expected, countries with a fixed exchange rate regime are found to accumulate more reserves which is consistent with the need to defend the peg.

The precautionary motivation hypothesis, measured by external debt holds in the esti-

mations: an increase in total external debt is associated with reserves accumulation. Higher financial openness is associated with higher accumulation of reserves. If this result can reflect precautionary motivations, it also highlights that capital inflows to emerging markets are a major channel through which global liquidity impacts on emerging countries reserves accumulation. While the financial account is a major transmission channel of global liquidity to reserves accumulation, current account dynamics add to this trend. The estimations show that terms-of-trade improvements and current account surpluses are associated with a greater accumulation of liquid foreign assets. This shows that countries with current acount surpluses tend to prevent adjustments through foreign-exchange appreciation and accumulate reserves instead.

Table 8 and Figure 6 show the results of the interaction variables model. The hypothesis that higher capital flows to emerging countries are a major channel of impact of global liquidity on emerging countries reserves is confirmed by the inclusion of interaction variables between financial openness and global liquidity. The intuition behind these interactions is that, if global liquidity channels to emerging economies through higher volumes of capital flows its impact should be higher for more financially open economies. Figure 6 shows the marginal impact of liquidity variables changes for different values of financial openness variations. The charts show that the impact of a rise in global liquidity on emerging countries reserves accumulation is stronger when the country deepens its financial integration. This result holds for the four liquidity measures. In particular, in the sample, the variations of financial integration are concentrated between the values -0.05 and 0.05. Over this interval, the marginal impact of G4 M2 on reserves accumulation is highly significant. The other three liquidity measures have marginal significant impacts on sub-intervals.

These findings emphasize that reserves accumulation is the outcome of active exchange-rate management policies in a context where growing global liquidity led to a surge in capital inflows to emerging markets. Consequently, reserves accumulation is a policy instrument to

deal with the "impossible Trinity". In a context of abundant global liquidity and deepening financial integration, emerging countries willing to maintain a certain degree of monetary independence[4] are accumulating reserves to dampen the appreciation pressures on their currencies and build-up buffers to face potential sharp reversals, thus preserving exchange-rate stability. The introduction of the "Trilemma index" confirms the link between higher Trilemma constraints and reserves accumulation as shown in table 9. Previous results are also found to hold when a *de jure* measure of financial openness (KAOPEN) is used instead of the *de facto* measure used first.

Table 10 presents the results of the model estimation separating Asian countries from the other emerging countries. Exchange rate volatility and risk aversion do not vary much along both subsamples as well as compared to pooled estimations. The exchange rate regime dummy becomes significant only for the non-Asian countries. In fact, in the sample, countries with *de facto* fixed exchange-rate regime over the period of study are almost all non-Asian, with the exception of China and Malaysia. The coefficient on the CA surplus dummy variable also remains positive and significant. However, the coefficient is higher for Asian countries which is consistent with the fact that these countries have had structural current account surpluses over the estimation period. More surprisingly, if the coefficient on the terms of trade remains of the same magnitude, it looses its significance under both subsamples. The coefficient on external debt increases for non-Asian countries and remains significant. However, in the case of Asian countries, the coefficient is lower and non-significant under some specifications which highlights that the precautionary motivation has not been at the centre of the reserves accumulation process for this group of countries. The coefficient on financial openness only becomes significant for the Asian economies subsample. This result is quite surprising and could be influenced by some specific countries. Considering that there are fewer observations in each subsample, results might capture outliers. Indeed, these results are sensitive to the financial openness measure choosen. In effect, using, *de jure* measure

[4]Indeed, in the last decade, several emerging economies have implemented inflation targeting regimes.

KAOPEN gives opposite results [5]. The coefficient on global liquidity variables are close and comparable to those found in the pooled regressions. However, G4 M0 does not appear significant in any subsample while the US spread is only significant for non-Asian economies. G4 M2 and the US 3 months interest rate are significant under both subsample estimations. Therefore, there is evidence that global liquidity helps explain reserves accumulation in both Asian and non-Asian economies.

Global liquidity also appears to have a significant impact on reserves accumulation before as well as after the "Asian crisis" as shown in Table 11. However, the impact is greater in the post Asian crisis period. Monetary aggregates have a positive and significant effect under both subsamples but coefficients are higher in the post Asian crisis period. The US 3 months interest rate is only significant in the post-Asian crisis model. Surprisingly, the maturity spread appears to be significant only in the pre-crisis period. Terms of Trade, CA surplus, financial openness and external debt have positive and significant impacts on reserves accumulation in both sub-periods. However, coefficient on terms of trade and the CA surplus dummy are higher in three out of four estimations in the pre-Asian crisis period while the coefficient on financial openness and external debt tend to be higher in the post-Asian crisis period. This is consistent with previous empirical studies which found that financial factors gained importance as determinants of reserves in the recent period while trade related factors lost importance. Exchange rate volatility has a negative and significant impact in both sub-period. The exchange rate regime dummy has a positive and significant impact on reserves accumulation under both subsamples but the coefficient is higher in the pre-Asian crisis period which can be explained by the fact that many countries abandoned their peg in the aftermath of the Asian crisis. Among the remaining pegged countries, economies such as Hungary or Venezuela were not among the one that increased their reserves holdings the most.

Dynamic estimations of the model in first-differences presented in table 12 validate again

[5]These results are not reported but are available upon request.

the impact of global liquidity on emerging countries reserves accumulation. All four liquidity variables have coefficient very close to those obtained in the case of the static model estimations. The three monetary liquidity measures are significant while the US spread is again not significant. As in the static model, risk aversion has a negative and significant impact on reserves accumulation. Exchange rate volatility, financial openness, external debt and current account surplus have a comparable impact as in the static specification. Yet, the coefficients on financial openness and external debt are slightly higher in the dynamic estimation. The most important difference between the static and dynamic estimations is that the exchange rate regime dummy and the terms of trade are not significant anymore in the dynamic case. Again this might indicate that financial determinants dominate the reserves accumulation process in emerging economies.

Finally, table 13 presents the results of the dynamic estimations of the cointegration equation. The estimation using the maturity premium as a proxy for global liquidity provides results that strongly depart from previous estimations. I believe this is because the cointegration hypothesis does not hold for this specification. In effect, Kao cointegration test reject the null hypothesis of no cointegration only at the 10% level against 5% for the specification with the other three liquidity variables. In the other three cases, liquidity variables as well as the exchange rate regime dummy, financial openness and the current account surplus dummy have the expected signs and their impact on reserves are significant in the long run. However, in all cases, the coefficients are higher than in previous estimations. The results for the terms-of-trade are less convincing and vary strongly depending on the liquidity variable used. Interestingly, total external debt is found to have a negative impact in the long term, significant in two out of three cases. This result might confirm that the trend of reserves accumulation in the last decade has been concurrent with a decrease in external vulnerabilities in most emerging countries. In the short term, shocks on exchange rate volatility and risk aversion have a negative and significant impact on reserves accumulation. External debt has a positive and significant impact which means that the precautionary motivation holds in

the short term. The US 3 months interest rate and G4 M2 aggregate also have significant impacts on reserve accumulation in the short term.

7 Conclusion

Traditional frameworks of reserves accumulation fail to explain the recent surge in emerging economies reserves holdings. Indeed, reserves accumulation in the last decade has been concurrent with a multi-dimensions process of reduction of macroeconomic and financial fragilities which constitutes a puzzle for the precautionary motivation framework. On the other hand, the mercantilist approach is quite restrictive and applicable above all to the Asian experience.

At the crossroads of research on international reserves and global liquidity, this paper finds robust evidence that global liquidity is a good determinant of reserves holdings. Notably, the unprecedented rise in monetary liquidity (lax monetary policies in advanced countries) and market liquidity (deeper financial integration and financial innovations) in the last decade explains a great part of the recent trend in reserves accumulation which has led to all-time high holdings in many emerging economies. In a context of growing financial integration, global liquidity impacts on emerging economies through increased capital inflows attracted by higher yields and favorable economic prospects. Besides, in the recent period, commodity exporting countries have also benefited from terms-of-trade improvements as a consequence of rising commodity prices.

Consequently, the surge in emerging countries reserves holdings is the outcome of active exchange-rate management aimed at preserving exchange-rate stability. In addition, recent developments show that emerging countries might be biased against currency appreciation rather than depreciation. Indeed, while periods of capital inflows have been accompanied by a sharp accumulation of reserves, many countries have been reluctant to run large-scale inter-

ventions during stress episodes allowing for sharp exchange-rate adjustments. The approach adopted in this paper departs from the mercantilist framework as it considers that exchange-rate management can be a transitory policy aimed at impeding an over-appreciation of domestic currencies rather than a strategy aimed at maintaining structurally undervalued currencies. On the other hand it departs from the precautionary framework as it puts push factors at the centre stage of recent accumulation dynamics. In this context, the level of reserves is a by-product of targeting other macroeconomic variables (notably the "Trilemma" variables) and not the outcome of adequacy benchmarks targeting.

Finally, one caveat is in order. While this paper focuses on the impact of advanced countries liquidity on emerging countries reserves, the literature on global liquidity has also highlighted the impact of reserves accumulation on global liquidity and notably in explaining the prevalence of low long-term interest rates in advanced countries. Disentangling further these various dimensions of liquidity expansion would be of great interest. In addition, while the partial decoupling between advanced and emerging economies growth cycles might persist in the short-term, going deeper in the comprehension of the interactions between advanced countries monetary policies, capital flows and emerging countries policy responses to the Trilemma and the global spillover effects of these respective policies is of major importance.

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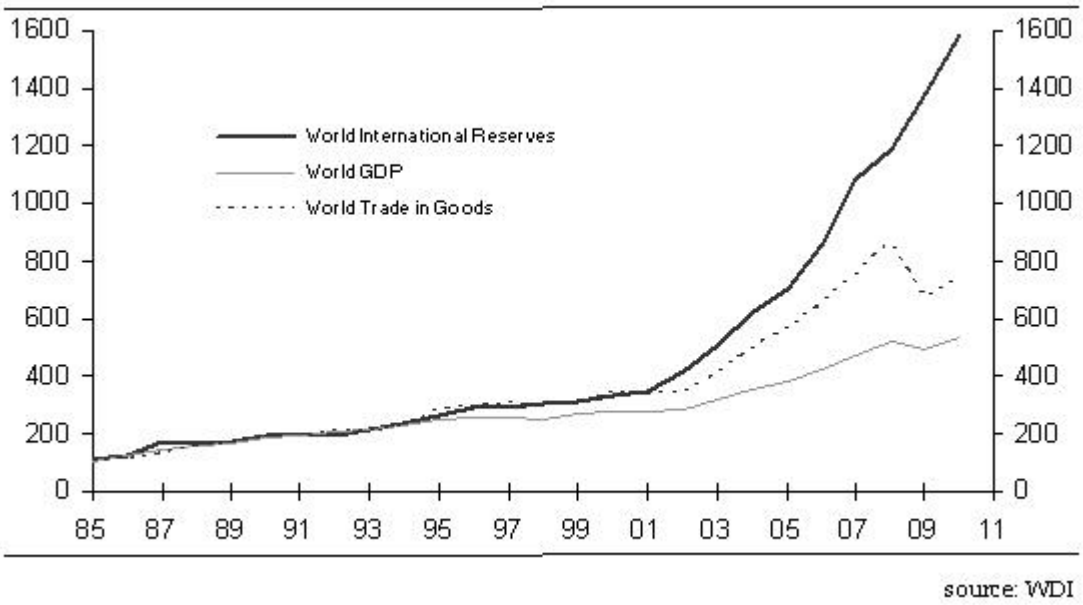
Figure 1: Reserves Accumulation in Perspective (base 100=1984)



source: WDI

Figure 2: Reserves to GDP ratios (%)

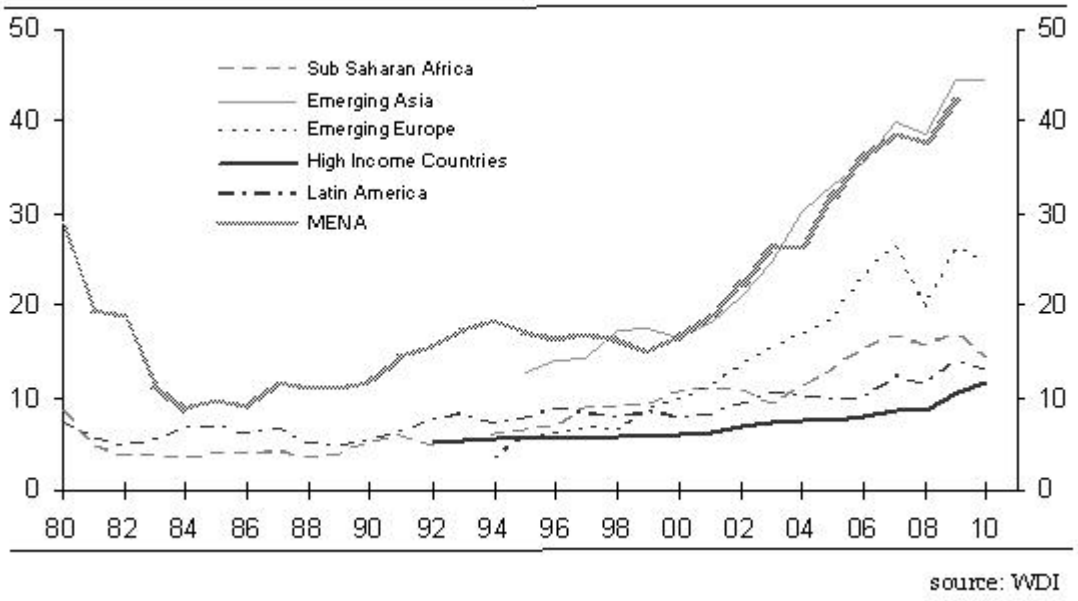


Figure 3: Total Reserves in months of imports

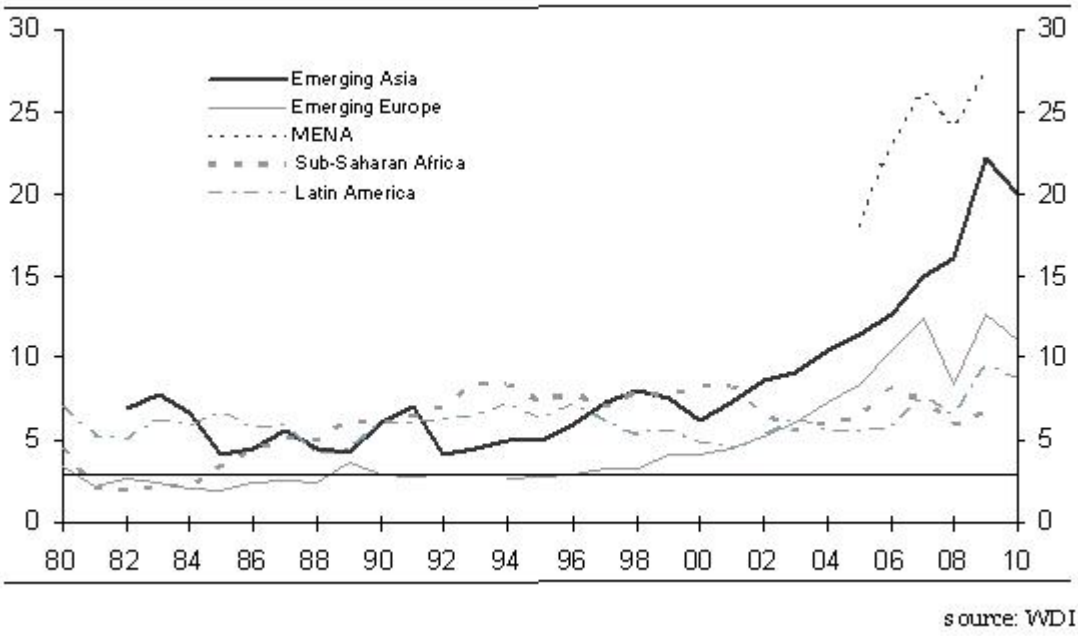


Figure 4: Reserves to short-term debt ratios (%)

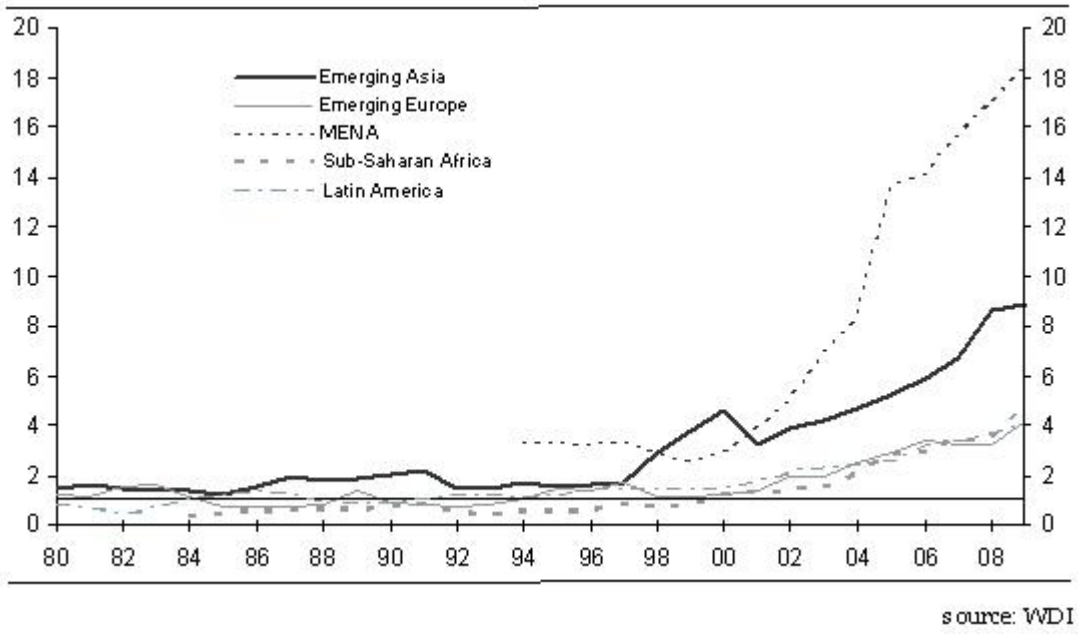


Figure 5: Emerging Countries Reserves and G4 Liquidity (Billion USD)

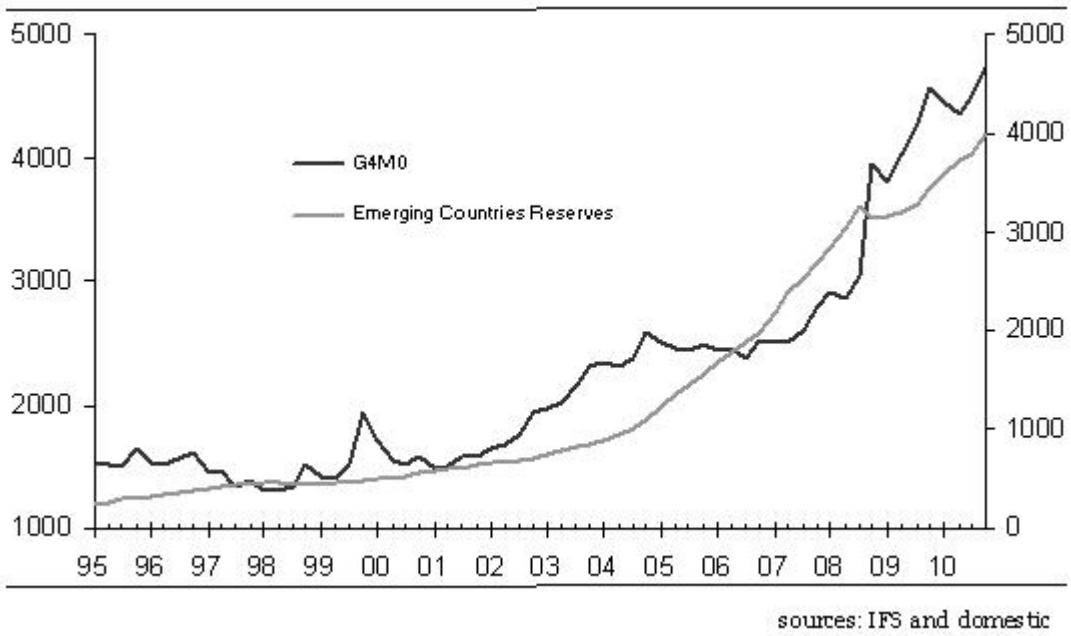


Table 1: Variables Description

Variable	Description	Frequency	Source
Res.	Foreign Exchange Reserves	Quarterly	IFS
FX volat.	Quarterly standard deviation of FX daily returns. The reference currency is choosen following Levy-Yeyati and Sturzenegger (2002) [15]	Quarterly	Datastream
FX reg.	Dummy for *de jure* exchange-rate regime. 1 corresponds to codes 1 and 2 in IMF coarse classification	Quarterly	IMF
ToT	Terms of Trade	Quarterly	Domestic sources
Fin. Openness	International Investor Position, Liabilities scaled to GDP	Quarterly date obtained from linear interpolation of annual data	IFS, Lane and Milesi-Ferretti (2007) [14], WDI
Total ext. debt	Total external debt	Quarterly date obtained from linear interpolation of annual data	EIU, WDI
CA surplus	Dummy for current account balance. 1 corresponds to a CA surplus	Quarterly	IFS
VIX	Chicago Board Options Exchange Volatility Index based on S&P 500 quotes	Quarterly	CBOE
US 3 months interest rate	US Treasury Bills rate, 3 months	Quarterly	Datastream
Us spread	Spread between the yield of US Treas. Benchmark bond 10 years and US Treas. Bill 3 months	Quarterly	Datastream
G4 M0	Sum of the monetary bases of the US, the UK, Japan and the Euro area	Quarterly	IFS and domestic sources
G4 M2	Sum of M2 aggregate (currency in circulation + checking and saving accounts) for the US, the UK, Japan and the Euro area	Quarterly	IFS and domestic sources
KAOPEN	Chinn and Ito *de jure* measure of financial openness	Quarterly date obtained from linear interpolation of annual data	Chinn and Ito (2008) [9]
Trilemma Index	Sum of the "Trilemma Indexes" of Aizenman, Chinn and Ito	Quarterly date obtained from linear interpolation of annual data	Aizenmann, Chinn and Ito (2008) [3]

All variables are expressed in log except FX volat., FX reg., VIX, US 3 months rate, US spread 10y/3m, CA surplus, KAOPEN and Trilemma Index

Table 2: Time Series Unit Root Tests

Augmented Dickey-Fuller test statistic	Level		First Difference		Cl
Null Hypothesis: Variable has a Unit root	t-Statistic	Prob.*	t-Statistic	Prob.*	
VIX	-3.803	0.005			I(0)
US 3 month interest rate	-1.952	0.307	-3.112	0.031	I(1)
US Spread 10y/3m	-1.975	0.297	-7.090	0.000	I(1)
G4 M0	1.584	0.999	-3.038	0.037	I(1)
G4 M2	0.842	0.994	-3.479	0.012	I(1)

Exogenous: Constant

* MacKinnon (1996) one-sided p-values

Lag Length automatic selection based on t-stat (max lags=12)

Table 3: Panel Unit Root Tests

		Level		First Difference		Conclusion
Variable	Method	Statistic	Prob.**	Statistic	Prob.**	
Res.	Levin, Lin & Chu t*	2,395	0,992	-8,392	0,000	I(1)
	Null: Unit root (assumes individual unit root process)					
	Im, Pesaran and Shin W-stat	6.067	1.000	-14.089	0.000	
	ADF - Fisher Chi-square	21.274	0.999	327.080	0.000	
	PP - Fisher Chi-square	25.193	0.995	711.999	0.000	
FX volat	Levin, Lin & Chu t*	30.756	1.000			I(0)
	Im, Pesaran and Shin W-stat	-9.054	0.000			
	ADF - Fisher Chi-square	216.448	0.000			
	PP - Fisher Chi-square	377.367	0.000			
ToT	Levin, Lin & Chu t*	1.322	0.907	8.619	1.000	I(1)
	Im, Pesaran and Shin W-stat	2.143	0.984	-10.530	0.000	
	ADF - Fisher Chi-square	38.477	0.777	233.742	0.000	
	PP - Fisher Chi-square	52.328	0.242	655.299	0.000	
Fin.	Levin, Lin & Chu t*	-0.976	0.165	15.128	1.000	I(1)
Openness	Im, Pesaran and Shin W-stat	-1.953	0.025	-5.553	0.000	
	ADF - Fisher Chi-square	66.783	0.024	101.986	0.000	
	PP - Fisher Chi-square	44.868	0.520	217.331	0.000	
Total ext.	Levin, Lin & Chu t*	-1.082	0.140	6.429	1.000	I(1)
debt	Im, Pesaran and Shin W-stat	0.300	0.617	-3.962	0.000	
	ADF - Fisher Chi-square	45.836	0.479	79.950	0.000	
	PP - Fisher Chi-square	28.299	0.981	148.510	0.000	
KAOPEN	Levin, Lin & Chu t*	-1.753	0.226	26.234	1,000	I(1)
	Im, Pesaran and Shin W-stat	-1.125	0.130	-1.648	0.050	
	ADF - Fisher Chi-square	66.571	0.003	46.689	0.158	
	PP - Fisher Chi-square	26.563	0.918	153.342	0,000	
Trilemma	Levin, Lin & Chu t*	1.033	0.849			I(0)
Index	Im, Pesaran and Shin W-stat	-2.331	0.010			
	ADF - Fisher Chi-square	62.360	0.054			
	PP - Fisher Chi-square	62.357	0.054			

Exogenous variables: Individual effects

Automatic lag length selection based on t-statistic (p=0.1) except for CA surplus and

KAOPEN: user-specified lags (12). Newey-West automatic bandwidth selection and Bartlett kernel

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution

All other tests assume asymptotic normality

Table 4: Kao Residual Cointegration Test

ADF	EQ1	EQ2	EQ3	EQ4
t-Stat	-1.964	-1.742	-3.055	-1.390
Prob	0.025	0.041	0.001	0.082

Automatic lag length selection based on t-stat with a max lag of 12

Eq1 includes Reserves, FX regime, Terms of Trade, Fin. openness, External debt, CA surplus, G4M0

Eq2 includes Reserves, FX regime, Terms of Trade, Fin. openness, External debt, CA surplus, G4M2

Eq3 includes Reserves, FX regime, Terms of Trade, Fin. openness, External debt, CA surplus, US 3m interest rate

Eq4 includes Reserves, FX regime, Terms of Trade, Fin. openness, External debt, CA surplus, US spread 10y/3m

Table 5: Pedroni Residual Cointegration Test

				Weighted Statistic	
Equation		Statistic	Prob.**	Statistic	Prob.**
Alternative hypothesis: common AR coefs. (within-dimension)					
EQ1	Panel v-Stat	-0.692	0.756	-0.620	0.732
	Panel rho-Stat	2.684	0.996	1.956	0.975
	Panel PP-Stat	2.452	0.993	0.979	0.836
	Panel ADF-Stat	2.132	0.984	2.673	0.996
Alternative hypothesis: individual AR coefs. (between-dimension)					
	Group rho-Stat	2.605	0.995		
	Group PP-Stat	1.236	0.892		
	Group ADF-Stat	2.409	0.992		
EQ2	Panel v-Stat	-0.122	0.549	-0.143	0.557
	Panel rho-Stat	2.104	0.982	1.573	0.942
	Panel PP-Stat	1.573	0.942	0.497	0.691
	Panel ADF-Stat	0.159	0.563	0.813	0.792
Alternative hypothesis: individual AR coefs. (between-dimension)					
	Group rho-Stat	2.341	0.990		
	Group PP-Stat	0.754	0.775		
	Group ADF-Stat	0.454	0.675		
EQ3	Panel v-Stat	-0.829	0.7970	-1.039	0.851
	Panel rho-Stat	2.510	0.994	1.888	0.971
	Panel PP-Stat	2.185	0.986	1.021	0.846
	Panel ADF-Stat	3.022	0.999	2.840	0.998
Alternative hypothesis: individual AR coefs. (between-dimension)					
	Group rho-Stat	2.450	0.993		
	Group PP-Stat	1.321	0.907		
	Group ADF-Stat	2.554	0.995		
EQ4	Panel v-Stat	-0.857	0.804	-0.955	0.830
	Panel rho-Stat	2.311	0.990	1.695	0.955
	Panel PP-Stat	1.916	0.972	0.723	0.765
	Panel ADF-Stat	0.659	0.745	0.897	0.815
Alternative hypothesis: individual AR coefs. (between-dimension)					
	Group rho-Stat	2.360	0.991		
	Group PP-Stat	1.067	0.857		
	Group ADF-Stat	0.554	0.710		

Automatic lag length selection based on t-stat with a max lag of 12

Table 6: Tests on Preliminary OLS Estimations

	(1)	(2)	(3)	(4)	(5)
Modified Wald Test for groupwise heteroskedasticity$Prob > Chi2$	0.000	0.000	0.000	0.000	0.000
Wooldridge Test for autocorrelation in panel data $Prob > F$	0.344	0.314	0.264	0.333	0.356
Pesaran's Test of cross-sectional independance $Prob=$	0.000	0.000	0.000	0.000	0.000
F Test for fixed effects significance $Prob > F$	0.001	0.001	0.001	0.000	0.001

OLS estimations are not reported. Models (1) to (5) correspond to those presented in Table 5.

Table 7: The Link Between Global Liquidity and Emerging Countries Reserves Accumulation

	(1) Res.	(2) Res.	(3) Res.	(4) Res.	(5) Res.
FX volat.	-0.021***	-0.019***	-0.019***	-0.019***	-0.019***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
FX reg.	0.028***	0.033***	0.034***	0.033***	0.032***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
ToT	0.056*	0.060**	0.057*	0.060**	0.060**
	(0.028)	(0.029)	(0.029)	(0.029)	(0.029)
Fin. openness	0.089*	0.090*	0.085*	0.080*	0.064
	(0.047)	(0.046)	(0.046)	(0.046)	(0.045)
Total ext. debt	0.206***	0.182***	0.179***	0.190***	0.179***
	(0.047)	(0.047)	(0.047)	(0.047)	(0.046)
CA surplus	0.039***	0.041***	0.041***	0.041***	0.038***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
VIX		-0.001***	-0.001***	-0.001***	-0.001***
		(0.000)	(0.000)	(0.000)	(0.000)
US 3 months rate		-0.013**			
		(0.006)			
US spread 10y/3m			-0.006		
			(0.005)		
G4 M0				0.082*	
				(0.044)	
G4 M2					0.550***
					(0.065)
Observations	1449	1449	1449	1449	1449

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Global Liquidity Transmission Channel

	(1) Res.	(2) Res.	(3) Res.	(4) Res.
FX volat.	-0.019***	-0.019***	-0.018***	-0.019***
	(0.003)	(0.003)	(0.003)	(0.003)
FX reg.	0.033***	0.034***	0.032***	0.032***
	(0.005)	(0.005)	(0.005)	(0.005)
ToT	0.061**	0.059**	0.049*	0.058**
	(0.029)	(0.029)	(0.029)	(0.029)
Fin. openness	0.080*	0.101**	0.022	0.015
	(0.047)	(0.046)	(0.049)	(0.047)
Total ext. debt	0.182***	0.168***	0.211***	0.188***
	(0.048)	(0.047)	(0.047)	(0.046)
CA surplus	0.041***	0.041***	0.040***	0.038***
	(0.004)	(0.004)	(0.004)	(0.004)
VIX	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
US 3 months rate	-0.014**			
	(0.006)			
Fin. open. * 3 months rate	-0.112			
	(0.096)			
US spread 10y/3m		-0.006		
		(0.005)		
Fin. open. * US spread		-0.182**		
		(0.083)		
G4 M0			0.074*	
			(0.045)	
Fin. open. * G4 M0			2.045***	
			(0.587)	
G4 M2				0.528***
				(0.067)
Fin. open. * G4 M2				2.982***
				(1.082)
Observations	1449	1449	1449	1449

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Figure 6: Marginal Effects of Global Liquidity Variations as Financial Openness Changes

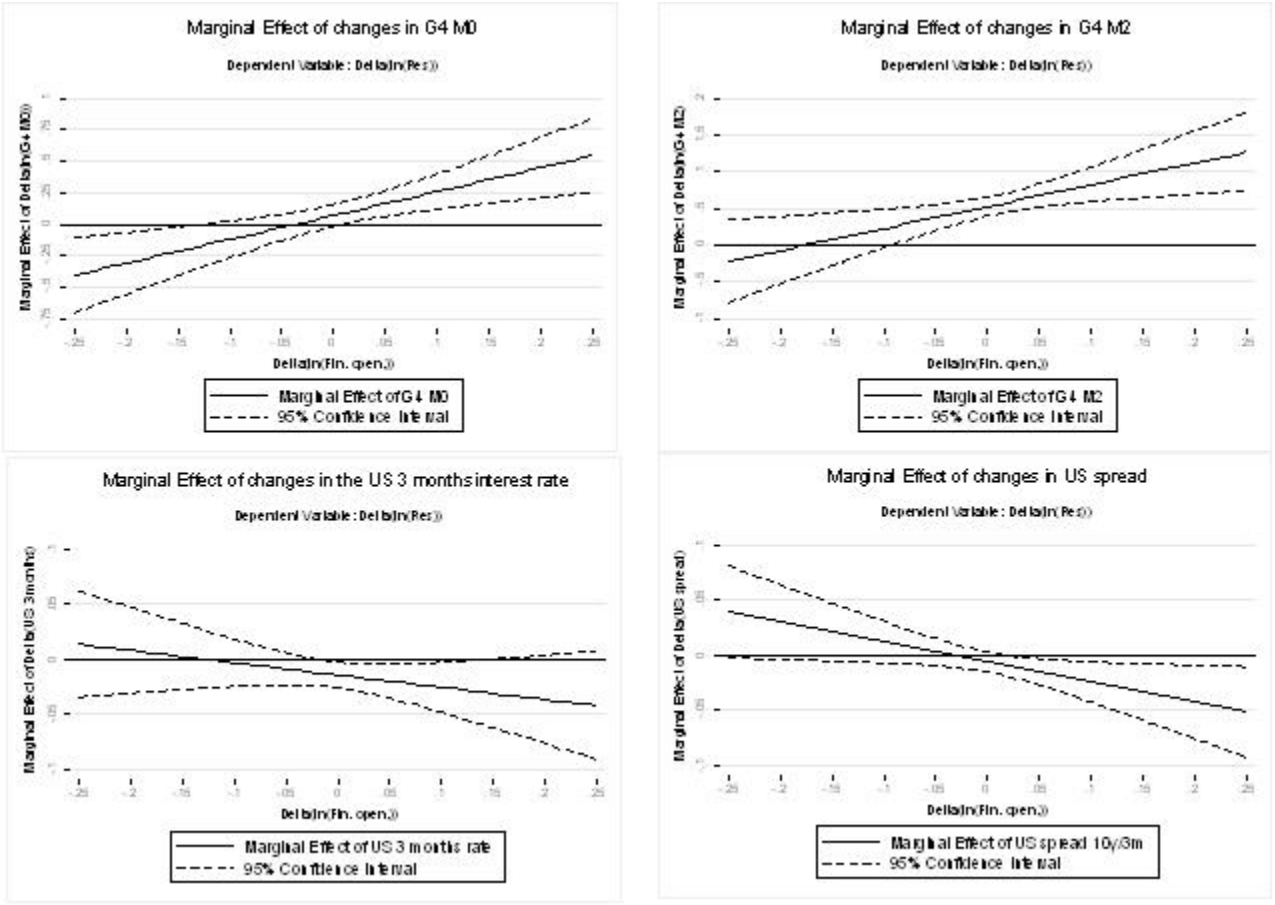


Table 9: The Link Between Global Liquidity and Reserves Accumulation: Alternative Financial Openness Measure

	(1) Res.	(2) Res.	(3) Res.	(4) Res.	(5) Res.
FX volat.	-0.019***	-0.018***	-0.019***	-0.019***	
	(0.003)	(0.003)	(0.003)	(0.003)	
FX reg.	0.034***	0.035***	0.034***	0.033***	
	(0.005)	(0.005)	(0.005)	(0.005)	
ToT	0.061**	0.057**	0.060**	0.060**	0.037
	(0.029)	(0.029)	(0.029)	(0.029)	(0.030)
KAOPEN	0.034***	0.035***	0.035***	0.035***	
	(0.011)	(0.011)	(0.011)	(0.011)	
Trilemma Index					0.019***
					(0.010)
Total ext. debt	0.203***	0.200***	0.210***	0.197***	0.183***
	(0.047)	(0.047)	(0.047)	(0.046)	(0.047)
CA surplus	0.042***	0.042***	0.041***	0.039***	0.035***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
VIX	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
US 3months rate	-0.012**				
	(0.006)				
US spread 10y/3m		-0.006			
		(0.005)			
G4 M0			0.085*		
			(0.044)		
G4 M2				0.552***	0.554***
				(0.065)	(0.062)
Observations	1449	1449	1449	1449	1449

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10: The Link Between Global Liquidity and Emerging Countries Reserves Accumulation: Stability Across Regions

	Asia Res.	Other EM Res.	Asia Res.	Other EM Res.	Asia Res.	Other EM Res.	Asia Res.	Other EM Res.
FX volat.	-0.020***	-0.021***	-0.020***	-0.020***	-0.019***	-0.021***	-0.019***	-0.020***
	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
FX reg.	0.011	0.036***	0.008	0.036***	0.011	0.035***	0.011	0.037***
	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)
ToT	0.052	0.079	0.047	0.070	0.053	0.088	0.052	0.080
	(0.048)	(0.054)	(0.049)	(0.055)	(0.048)	(0.054)	(0.048)	(0.054)
Fin. openness	0.215***	0.014	0.192***	0.005	0.218***	0.024	0.211***	0.031
	(0.072)	(0.065)	(0.070)	(0.065)	(0.072)	(0.065)	(0.072)	(0.065)
Total ext. debt	0.125*	0.331***	0.151**	0.322***	0.108	0.333***	0.120	0.325***
	(0.076)	(0.090)	(0.075)	(0.089)	(0.076)	(0.090)	(0.076)	(0.089)
CA surplus	0.046***	0.040***	0.042***	0.039***	0.046***	0.041***	0.046***	0.039***
	(0.008)	(0.005)	(0.007)	(0.005)	(0.008)	(0.005)	(0.007)	(0.005)
VIX	-0.001***	-0.001***	-0.001***	-0.001***	-0.002***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
G4 M0	0.068	0.071						
	(0.054)	(0.054)						
G4 M2			0.462***	0.315***				
			(0.083)	(0.097)				
US 3 months rate					-0.013*	-0.014*		
					(0.007)	(0.007)		
US spread 10y/3m							0.004	-0.011**
							(0.006)	(0.006)
Observations	441	1008	441	1008	441	1008	441	1008

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 11: The Link Between Global Liquidity and Emerging Countries Reserves Accumulation: Stability Over Time

	2003-2010 Res.	1995-2002 Res.	2003-2010 Res.	1995-2002 Res.	2003-2010 Res.	1995-2002 Res.	2003-2010 Res.	1995-2002 Res.
FX volat.	-0.019***	-0.016***	-0.018***	-0.016***	-0.018***	-0.017***	-0.018***	-0.016***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)
FX reg.	0.021***	0.056***	0.021***	0.056***	0.024***	0.056***	0.022***	0.062***
	(0.006)	(0.003)	(0.005)	(0.003)	(0.006)	(0.003)	(0.006)	(0.003)
ToT	0.085***	0.090***	0.072***	0.097***	0.081***	0.089***	0.074***	0.065**
	(0.019)	(0.029)	(0.018)	(0.029)	(0.019)	(0.030)	(0.018)	(0.030)
Fin. openness	0.124***	0.085**	0.110***	0.067*	0.151***	0.097**	0.104***	0.137***
	(0.037)	(0.041)	(0.034)	(0.040)	(0.037)	(0.041)	(0.037)	(0.041)
Total ext. debt	0.325***	0.174***	0.239***	0.180***	0.282***	0.162***	0.321***	0.095**
	(0.046)	(0.039)	(0.043)	(0.039)	(0.047)	(0.039)	(0.047)	(0.038)
CA surplus	0.046***	0.049***	0.039***	0.048***	0.047***	0.049***	0.045***	0.051***
	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)
VIX	-0.001***	-0.002***	-0.001***	-0.002***	-0.001***	-0.001***	-0.001***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
G4 M0	0.132**	0.098**						
	(0.054)	(0.048)						
G4 M2			0.638***	0.464***				
			(0.051)	(0.090)				
US 3 months rate					-0.016***	-0.007		
					(0.005)	(0.008)		
US spread 10y/3m							0.005	-0.029***
							(0.005)	(0.005)
Observations	736	713	736	713	736	713	736	713

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Global Liquidity and Reserves Accumulation: A Dynamic Specification

	(1) Res.	(2) Res.	(3) Res.	(4) Res.
FX volat.	-0.021***	-0.020***	-0.020***	-0.019***
	(0.004)	(0.004)	(0.004)	(0.004)
FX reg.	0.009	0.011	0.011	0.013
	(0.009)	(0.009)	(0.009)	(0.009)
ToT	0.030	0.024	0.028	0.032
	(0.049)	(0.050)	(0.050)	(0.049)
Fin. openness	0.161***	0.153**	0.144**	0.096
	(0.062)	(0.062)	(0.062)	(0.061)
Total ext. debt	0.241***	0.261***	0.267***	0.244***
	(0.080)	(0.080)	(0.079)	(0.075)
CA surplus	0.041***	0.040***	0.040***	0.037***
	(0.006)	(0.006)	(0.006)	(0.006)
VIX	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
US 3 months rate	-0.018***			
	(0.005)			
US spread 10y/3m		0.001		
		(0.004)		
G4 M0			0.083**	
			(0.033)	
G4 M2				0.544***
				(0.062)
Error Correction	-0.864***	-0.859***	-0.859***	-0.845***
	(0.038)	(0.038)	(0.039)	(0.039)
Observations	1426	1426	1426	1426

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 13: Dynamic Cointegration

	(1) Res.	(2) Res.	(3) Res.	(4) Res.
Long-term coefficients				
FX reg.	0.166	1.420***	0.471***	0.289**
	(0.304)	(0.358)	(0.151)	(0.124)
ToT	0.717	-1.288***	-0.275	-0.293*
	(0.548)	(0.284)	(0.218)	(0.174)
Fin. openness	1.976***	-0.054	0.868***	0.739***
	(0.566)	(0.214)	(0.185)	(0.148)
Total ext. debt	-0.438	0.927***	-0.331**	-0.423***
	(0.333)	(0.128)	(0.133)	(0.126)
CA surplus	1.628***	0.718***	0.627***	0.439***
	(0.333)	(0.130)	(0.100)	(0.074)
US 3 months rate	-0.141***			
	(0.038)			
US spread 10y/3m		-0.011		
		(0.026)		
G4 M0			1.143***	
			(0.103)	
G4 M2				1.783***
				(0.141)
Short-term coefficients				
Error Correction	-0.030***	-0.039***	-0.062***	-0.080***
	(0.005)	(0.012)	(0.011)	(0.012)
FX volat.	-0.031***	-0.037***	-0.037***	-0.030***
	(0.008)	(0.009)	(0.009)	(0.008)
ToT	-0.018	0.038	0.035	0.014
	(0.124)	(0.139)	(0.122)	(0.128)
Fin. openness	-0.137	-0.173	-0.244	-0.193
	(0.138)	(0.164)	(0.152)	(0.148)
Total ext. debt	0.536***	0.375**	0.626***	0.558***
	(0.154)	(0.169)	(0.169)	(0.159)
VIX	-0.002***	-0.002**	-0.001**	-0.001*
	(0.001)	(0.001)	(0.001)	(0.001)
US 3 months rate	-0.011***			
	(0.004)			
US spread 10y/3m		-0.008*		
		(0.004)		
G4 M0			0.086	
			(0.055)	
G4 M2				0.393***
				(0.098)
Observations	1449	1449	1449	1449

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$