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Financialization, International Reserves and External Debt: The Case of the Developing World

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Abstract: We examine whether countries differ from each other in terms of their fears of floating while accumulating international reserves. To test this hypothesis, we use a sample of 106 developing countries for the 1980-2012 period, and regress reserves-to-GDP ratios on the main traditional and financial-stability variables, along with an array of external-debt variables, by the pooled-OLS method. Our results are generally in line with the existing literature in terms of the effects of traditional and financial-stability variables; while our detailed analysis of the effect of external debt enables us to come with an original conclusion, leading us to establish a new intuitive connection between the international-reserves literature and the fear-of-depreciation literature. Therefore, we show that such country-specific differences can be expected to have significant effects on the reserve demands of their central banks. Countries with considerable external constraints are more likely to spend reserves while accumulating external debt; and hence their external debt can be expected to have a negative effect on their reserves. However, countries possessing the leeway to pursue neo-mercantilist motives are more likely to accumulate reserves while increasing their external debt; and hence their external debt can be expected to have a positive effect on their reserves.

Keywords: *International reserves, external debt, fear of floating, developing countries.*

JEL Classification: *E58, F34, F41*

Introduction

A substantial increase has been observed in the international reserve holdings of the central banks of less-developed countries and emerging economies in recent decades. A lively literature has flourished to explain the determinants of international reserves especially since the early 1990s. It has been generally shown that certain variables (such as trade openness, financial openness, financial depth, etc.) have potent explanatory power in accounting for the prominent rise in reserves. The recent empirical literature has usually focused upon precautionary and mercantilist motives, along with financial-stability concerns for holding larger amounts of reserves. However, the role of external debt in affecting international reserves has not been analyzed in sufficient detail. Some studies found external-debt variables to be statistically insignificant in affecting reserves. Some others, like our study, obtained significant yet negative coefficients for the external-debt variables, implying that higher external debt leads to lower reserves. This finding casts doubt on the empirical validity of the famous Guidotti-Greenspan rule, according to which international reserves should be held in (one-to-one) positive proportion to the (short-term) external debt (Greenspan, 1999). The seemingly 'unexpected' negative effect of external debt on reserves has been explained by arguing that external debt

and international reserves can function as *substitutes* for financing external transactions in less-developed countries (e.g., Eaton & Gersovitz, 1980; Lane & Burke, 2001).

We nonetheless think that further analyses are needed for clarifying the negative effect of external debt on international reserves. To fill this gap in the literature, we use a sample of 106 developing economies for the 1980-2012 period. We regress reserves-to-GDP ratios on the main traditional and financial-stability variables, along with an array of external-debt variables, by the pooled-OLS method. Focusing on the effect of external debt on international reserves, our regression models involve two novelties with respect to the existing literature: i) factor-analysis, by way of which we generate an 'external-debt factor' (EDF), and ii) several dummy variables derived from the EDF, which enable us to distinguish between high-debt and low-debt countries. Our regression sets include the whole period and the whole sample, as well as selected sub-periods and country groups (such as low-income, lower-middle income, and upper-middle income countries) in order to account for period- and country-specific circumstances. Our results are generally in line with the existing literature in terms of the effects of traditional and financial-stability variables; while our detailed analysis of the effect of external debt enables us to propose a new intuitive connection between the international-reserves literature and the fear-of-floating literature.

The Literature

The huge surge in international reserves held by central banks has stemmed dominantly from developing countries, implying that the phenomenon under consideration is a development issue, as well as a macroeconomic one. While average of reserves-to-GDP ratios for developed countries remained quite stagnant around 12-18% in the 1980-2012 period; that for developing countries exhibited a regular upward trend across the consecutive sub-periods: 5.2% (1980-1989), 8.8% (1990-1997), 14.3% (1998-2006), and 20.8% (2007-2012).[1] Thus, the question of why the developing countries (and especially the 'emerging markets') have started to accumulate so high amounts of reserves has drawn a lot of attention in recent decades.

In fact, this phenomenal rise in the demand for reserves by the central banks has brought about a revival and rapid evolution of an earlier literature that originated in the later phases of the Bretton Woods era. Heller (1966), who developed a cost-benefit framework of analysis, came with a seminal contribution in terms of initiating the relatively modern research on the optimal amount of reserves. Frenkel and Jovanovic (1981) were among the most prominent followers in this vein, thanks to their formal treatment of reserves as a 'buffer stock' in the context of an optimization problem.

In the milieu of the Bretton Woods system, shock probabilities and risks associated with *international trade* transactions were considered to be the main driver of reserve accumulation as a buffer. Over time, however, due attention was also paid to the connection between sovereign default risk and reserve accumulation as a *financial* 'precaution' (e.g., Ben-Bassat & Gottlieb, 1992; Aizenman & Marion, 2004). At a time when Dooley *et al*. (2003) revealed the link between export-oriented policies and

[1] In this article, the terms 'developed countries' and 'developing countries' are used in line with The World Bank's income-based classification: i) High-income countries, ii) Upper-middle-income countries, iii) Lower-middle-income countries, and iv) Low-income countries. While the first group refers to developed countries, the remaining three groups constitute the developing countries. The reserve-to-GDP ratios reported in the paragraph are our own calculations by using the World Development Indicators (WDI) of The World Bank. The rationale behind the periodization can be explained as follows: For many of the developing countries; the 1980-1989 period was characterized by a shift towards trade liberalization and export-led growth policies (as opposed to the trade protectionism and import-substitution industrialization experienced in the 1960s and 1970s), whereas the 1990-1997 period represented the era of capital-account liberalization, leading eventually to the Asian financial crisis. It was especially during the 1998-2006 period that many developing countries grew at very high rates in an environment of global financial expansion, characterized by low interest rates in the developed world, leading financial funds to flow towards the developing countries. The 2007-2012 period covers the latest 'global financial crisis'.

reserve accumulation, Flood and Marion (2002) showed that, in the post-Bretton Woods era of higher capital mobility, exchange-rate stability concerns and financial openness are more explanatory than the trade-based, conventional buffer-stock models. A set of further studies continued to explain accumulation of higher reserves by the increasing degree of financial integration that was accompanied by higher incentives for self-insurance against the risks of financial crisis (e.g., Aizenman & Marion, 2003; Aizenman & Lee, 2007, 2008). It was also demonstrated that, over time, finance has started to dominate trade in terms of determining the reserve-accumulation behavior (Cheung and Ito, 2009). As such, from the early 1990s onwards, the literature has evolved so as to put more emphasis on the explanatory role played by financial factors, as compared to the traditional role of trade-related factors in the previous decades. To be sure, the very rapid, if not unprecedented, financial integration process, experienced in the world economy since the early 1990s, has practically been the main source of this orientation in the literature from trade-based models towards finance-centered analyses.

Obstfeld *et al.* (2010) provided further evidence that their financial-stability model outperforms the traditional model. Moreover, they also showed that (short-term) external debt is not a statistically significant determinant of international reserves. We consider their study as a benchmark in order to focus on the effects of traditional, financial and debt-related variables on the reserve holdings of central banks. While our findings are usually similar to that of Obstfeld *et al.* (2010) in terms of the effects of traditional and financial variables, our detailed analysis of the effect of external debt variables enables us to come with different results and new conclusions, as we demonstrate and explain in the following pages.[2]

More recently, the prominent rise in the reserves of central banks has also been explained by the post-crisis responses of central banks that have started to adopt policies of self-insurance more intensively as the consequence of especially the Asian financial crisis, and especially against the rising risk of currency crises (Steiner, 2013a). "Fear of capital mobility" on the part of central banks has also been put forward as another reason behind the surge in international reserves, which serve as a sort of 'substitute' for capital controls in a financial environment of high capital mobility (Steiner, 2013b).

Last but not the least; the famous 'fear of floating' literature (Calvo & Reinhart, 2002) has also been linked to the reserve-accumulation behavior of central banks. It is generally argued in the context of fear-of-floating studies that seemingly 'free floating' countries, in fact, tend to avoid especially home currency *depreciations*, because of high dependence of exports and domestic production to imports, as well as high external-debt ratios. In such cases, fear of depreciation can be expected to play an important role in altering the reserve holdings of central banks. However, Levy-Yeyati *et al.* (2013) have argued that 'fear of floating' is characterized more by 'fear of appreciation' than by 'fear of depreciation', implying that 'neo-mercantilist' motives may constitute a more dominant incentive to avoid free floating, thereby affecting the reserve-accumulation behavior of central banks via a different route. As we will explain further in what follows, this last point motivates us to distinguish between 'fearers of depreciation' and 'fearers of appreciation' in interpreting the determinants of international reserves.

The data and the models

Covering the 1980-2012 period, our data-set includes 33 years and 106 developing countries (See fn. 1). The list of countries is provided in Appendix-1. Variable definitions and data sources can be seen in Appendix-2.

[2] For a quite comprehensive summary of the literature on the demand for international reserves, see Aizenman and Genberg (2012).

We consider two main regression models for explaining international reserves: The traditional model (IMF, 2003) and the financial-stability model (Obstfeld *et al.*, 2010). In both models, the dependent variable is the natural logarithm of the ratio of 'international reserves (excluding gold) held by central banks' to GDP; that is to say, ln(Res/GDP).

Using Obstfeld *et al.* (2010: 71-72) as our benchmark, main explanatory variables in the traditional model are:

- the natural logarithm of population,
- the natural logarithm of the ratio of 'volume of trade (exports plus imports)' to GDP,
- exchange rate volatility, and
- the natural logarithm of real GDP per capita.

Main explanatory variables of the financial-stability model are:

- financial openness,
- pegged-exchange rate dummy,
- soft-peg exchange rate dummy,
- the natural logarithm of the ratio of 'broad money (M2)' to GDP.

In addition to the main explanatory variables of the two models, we also use a conventional set of external-debt variables in order to focus on their effect on international reserves:

- the natural logarithm of the ratio of short-term external debt (STED) to GDP,
- the natural logarithm of the ratio of long-term external debt (LTED) to GDP,
- the natural logarithm of the ratio of total external debt (TED) to GDP,
- the natural logarithm of the ratio of short-term external debt (STED) to total external debt (TED).

'Factor analysis' of external debt

All the above-mentioned twelve explanatory variables (including the four conventional debt variables) have been widely used before in the empirical literature on the determinants of reserves-to-GDP ratio. One of our main contributions in this paper is due to our construction of some original debt variables, which are new with respect to the existing literature. We construct these new debt variables by means of factor analysis. It is known that factor analysis is commonly used to reduce a larger set of variables to fewer 'latent' variables that have a common variance (Bartholomew, Knott, & Moustaki, 2011). We use this factor-analysis methodology for creating a single 'external-debt factor', and also for designing several dummy variables that categorize developing countries by the size of their external debt.

First, we use five major external-debt variables (from the International Debt Statistics of The World Bank): i) Total debt service (% of exports of goods, services and primary income), ii) total external debt stocks (% of exports of goods, services and primary income), iii) total external debt stocks (% of GDP), iv) long-term external debt stocks (% of GDP), and iv) short-term external debt stocks (% of GDP). The results for the 'factor analysis' of external debt are presented in Table 1.

Table 1: Factor analysis for external-debt factor (EDF)

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	2.80320	2.10554	0.7981	0.7981
Factor2	0.69766	0.54063	0.1986	0.9967
Factor3	0.15703	0.16503	0.0447	1.0414
Factor4	-0.00800	0.12954	-0.0023	1.0392
Factor5	-0.13754	.	-0.0392	1.0000

The first external-debt factor (Factor1) has an eigenvalue greater than unity and explains about 80% of the variation. Therefore, we retain Factor1 as our external-debt factor (EDF). Expectedly, all the five external-debt variables are positively related with our EDF. This EDF, which we use as a separate explanatory variable, is denoted as "Debt_Factor" in our regression results.

Secondly, we design dummy variables for categorizing countries according to their degrees of indebtedness. To do so, we create five dummy variables (from the more general to the more specific) in order to capture the debt-related country-specific patterns of reserve accumulation among the developing countries. For example, the first dummy variable ('D_Debt' in regression results) is the most general one, which equals 1 if EDF is positive, and zero otherwise. In this way, the construction of the five explanatory dummy variables that we include in the regressions is summarized below:

Debt Dummy = 1 if EDF > 0, and 0 otherwise. (1)

High-Debt Dummy = 1 if EDF > [mean (EDF) + SD (EDF)], and 0 otherwise. (2)

Low-Debt Dummy = 1 if EDF < [mean (EDF) - SD (EDF)], and 0 otherwise. (3)

Upper-Mid-Debt Dummy = 1 if EDF > mean (EDF) & EDF < [mean (EDF) + SD (EDF)], and 0 otherwise. (4)

Lower-Mid-Debt Dummy = 1 if EDF < mean (EDF) & EDF > [mean (EDF) - SD (EDF)], and 0 otherwise. (5)

Descriptive outlook

Descriptive statistics for the variables used in the regressions are provided in Tables 2, 3 and 4 below. While Table 2 categorizes developing countries into three groups according to income level, Table 3 divides them into four according to external-debt level. Table 4 provides statistics for the four sub-periods from 1980 to 2012.

Table 2 shows that, as income level increases, developing countries tend to: i) have higher reserves-to-GDP ratios, ii) be financially more open, iii) be financially more developed (M2/GDP), iv) have lower short-term, long-term and total debt-to-GDP ratios, and v) have higher ratios of short-term debt to total debt. As the values of 'Debt_Factor' across country groups

indicates, external debt is a more serious problem for relatively poorer developing countries than the well-to-do ones. In terms of trade openness; low-income countries are considerably less open than the others, whereas lower-middle and upper-middle income countries are nearly the same in this respect.

According to Table 3, low-debt countries are remarkably different from the others in terms of the reserves-to-GDP ratio. While the average of this ratio is almost 18% for low-debt countries, it is around 9-12 percent for lower-middle, upper-middle and high-debt countries. In other words, the tendency to accumulate high amounts of reserves seems to be arising mainly from low-debt countries, which are also relatively richer (in terms of GDP per person), and more open in trade and finance. As far as low ratios of indebtedness can be regarded as a driver of higher reserve accumulation, one can argue that an important portion of reserve holdings may be explained by 'fear of appreciation', assuming that low-debt countries are also relatively more competitive in international trade. In order to remain competitive in trade, central banks of such countries, in their own foreign exchange markets, may tend to avoid home currency appreciations by regular purchases of foreign exchange (and sales of home currency), thereby accumulating large amounts of reserves. If so, the so-called 'mercantilist motive' for accumulating reserves can be a valid explanation for especially the low-debt countries that strive for keeping their competitiveness in international goods and services markets.

With respect to the four sub-periods we consider in Table 4 (1980-1989, 1990-1997, 1998-2006 and 2007-2012), one obvious result is that the reserves-to-GDP ratio has exhibited a very regular and prominent upward trend from 5.2% in 1980-1989 to 20.8% in 2007-2012. It is clear that the developing countries as a whole have acquired the 'habit' of accumulating more and more reserves throughout the last three decades. Not surprisingly, similar upward trends are also easily observable in terms of trade and financial openness, as well as financial development (M2/GDP). The simultaneity of the rise in trade- and finance-related variables and the increase in reserve-to-GDP ratios brings to mind the overall influence of the globalization process. In terms of the external-debt variables; short-term debt, long-term debt and total debt (all as % of GDP) seem to have increased from the first to the second sub-period, and then they all decreased considerably throughout the third and fourth sub-periods. The globalization process at its earlier stages seem to have resulted in higher debt burdens for the developing countries (presumably due to the 'international debt crisis' of the 1980s), while the later stages has exhibited significant reductions in those burdens.

Table 2. Descriptive statistics across countries (1980-2012)

Income Groups	Stats	Res_GDP	Population	Trade_GDP	Exch_Vol	GDP_Pers	Fin_Open	M2_GDP	STED_GDP	LTED_GDP	TED_GDP	STED_TED	Debt_F.
Low Income	N	1028	1287	1104	1169	1092	1113	1009	1083	1083	1083	1172	896
Countries	Mean	8.917232	1.85e+07	59.28621	.0382342	932.0847	.2530249	26.79578	12.30393	69.02764	88.20566	8.233802	.1804921
	St.Dev	7.162618	2.36e+07	29.46896	.2434184	537.4076	.252378	19.31789	55.49727	67.37954	129.67	9.329768	1.058009
	p25	3.415129	5699112	39.34434	0	556.371	.1629111	16.45335	1.230531	28.75902	33.60504	2.639417	-.5148244
	p50	7.360081	9928143	54.81992	.0086473	784.244	.1629111	22.60804	3.268495	54.4077	64.21033	6.212456	-.0138644
	p75	12.73787	2.04e+07	73.17851	.0235983	1142.846	.2858425	30.67912	7.182617	87.54095	101.6929	10.47235	.5425846
Lower-Mid Income	N	1029	1221	1105	1100	1098	1062	1066	1073	1073	1073	1080	1006
Countries	Mean	12.68146	8.55e+07	74.73376	.0284046	3064.536	.3384734	43.96508	9.847309	52.92409	65.08371	15.19352	.0013212
	St.Dev	12.11248	2.46e+08	36.26095	.1035986	2017.94	.2922609	28.76	15.40055	56.89232	69.96882	13.16064	1.122533
	p25	3.834026	4551762	47.69731	0	1677.394	.1629111	23.63007	2.422924	23.13431	29.00326	6.832761	-.5709213
	p50	9.621059	1.03e+07	67.49716	.0056346	2555.101	.1629111	37.40108	5.40143	42.55678	52.47771	11.5377	-.1970268
	p75	17.08807	4.87e+07	96.18619	.0182951	4010.604	.4487535	54.08666	10.88597	65.75134	78.47292	19.34939	.2052964
Upper-Mid Income	N	823	980	849	818	843	807	830	664	664	664	696	579
Countries	Mean	15.13878	2.79e+07	73.54244	.0330827	7711.682	.439445	48.10122	8.296508	37.79618	47.99619	18.56509	-.2816062
	St.Dev	20.07117	4.01e+07	39.73953	.0651485	3641.062	.3631616	34.86159	7.483935	21.95985	27.23709	13.35634	.4454454
	p25	5.030849	3450123	44.92281	.0030837	5013.043	.1629111	28.32329	3.923374	22.19317	29.72938	10.22199	-.5934736
	p50	9.836791	1.20e+07	64.36064	.0148103	6855.248	.4090769	38.07048	6.815321	33.44745	41.73253	15.62365	-.3716859
	p75	18.04275	3.30e+07	96.71695	.0321433	9678.574	.7559355	55.39159	9.981011	49.61688	60.82482	22.57482	-.0687391

Note: p25, p50 and p75 denote 25%, 50%, and 75% quantiles for a list of variables.

Table 3. Descriptive statistics for external-debt level (1980-2012)

Dummy Groups	Stats	Res_GDP	Population	Trade_GDP	Exch_Vol	GDP_Pers	Fin_Open	M2_GDP	STED_GDP	LTED_GDP	TED_GDP	STED_TED	Debt_F.
High-Debt	N	410	417	410	412	399	405	410	417	417	417	417	417
Countries	Mean	9.616374	5.63e+07	67.53881	.0482872	2871.5	.2497893	36.70167	16.63327	92.49829	114.3981	12.14316	.7895642
	St.Dev	9.876607	1.79e+08	37.3252	.1168456	2919.342	.2563672	28.67261	42.74337	81.13244	111.7519	10.86359	1.760083
	p25	3.418651	5133598	39.13679	.0007838	842.833	.1629111	20.07839	4.013255	50.33863	62.32032	5.063269	-.0600211
	p50	7.286494	1.19e+07	60.11097	.0134497	1631.547	.1629111	29.1971	8.058125	72.94453	87.05256	9.850127	.3487116
	p75	12.5177	2.74e+07	89.57155	.0409381	3874.098	.4090769	42.66956	15.69335	111.933	131.5805	16.73055	1.059869
Low-Debt	N	400	415	397	401	412	382	394	415	415	415	415	415
Countries	Mean	15.27528	5.63e+07	70.25589	.0240651	3618.034	.366599	40.94377	3.276449	23.68815	28.61508	11.831	-.618542
	St.Dev	15.24765	1.57e+08	33.42783	.1082156	3492.28	.3196687	28.9885	3.901498	14.23059	15.95726	11.35769	.2545547
	p25	6.262825	7178436	46.41749	0	1154.746	.1629111	23.26474	.9372557	14.97889	18.97952	3.892534	-.771424
	p50	11.86023	1.59e+07	65.3413	.0078573	2211.212	.1629111	33.98718	2.308032	21.34893	26.15302	9.27985	-.6608219
	p75	18.71739	3.68e+07	85.57936	.02167	4722.531	.5707858	48.61311	4.733163	28.02222	33.93455	16.24212	-.5258415
Lower-Mid Debt	N	855	875	866	857	845	848	854	875	875	875	875	875
Countries	Mean	11.89996	5.79e+07	70.27512	.0198123	3762.87	.3828995	40.98561	6.215893	39.25171	48.10191	14.74404	-.2890765
	St.Dev	11.28311	1.92e+08	38.00526	.0554132	3269.061	.3151433	30.74425	6.25615	25.45624	29.84568	13.09765	.4817829
	p25	4.327083	5248577	42.07084	0	1122.068	.1629111	21.0551	2.089958	22.06677	28.23081	5.615625	-.603103
	p50	8.955878	1.01e+07	61.34364	.0072269	2877.181	.1629111	31.08873	4.680295	32.19445	39.81387	11.57163	-.4176937
	p75	15.90853	3.48e+07	92.56346	.0187936	5672.858	.6949194	50.86148	8.110013	51.03515	60.32087	19.5041	-.0857686
Upper-Mid Debt	N	764	774	770	760	754	763	761	774	774	774	774	774
Countries	Mean	10.27293	4.82e+07	66.46721	.0283174	2728.613	.335896	35.90244	9.413346	66.27004	79.84535	11.65198	.2330603
	St.Dev	9.339306	1.60e+08	35.74909	.0877973	2718.052	.2951167	26.77012	15.71083	35.41138	45.25839	9.981599	.7244625
	p25	3.655898	5363069	41.64681	0	823.031	.1629111	20.22506	3.048455	42.04591	51.8087	4.703879	-.205989
	p50	8.07483	1.02e+07	56.70788	.008274	1623.273	.1629111	28.56081	5.994907	59.75207	69.21823	9.312109	.0552275
	p75	14.0926	2.42e+07	83.17124	.024434	3580.721	.4292142	43.63753	10.37114	81.32648	97.60823	15.21585	.5085799

Note: p25, p50 and p75 denote 25%, 50%, and 75% quantiles for a list of variables.

Table 4. Descriptive statistics for sub-periods (1980-2012)

Eras Groups	Stats	Res_GDP	Population	Trade_GDP	Exch_Vol	GDP_Pers	Fin_Open	M2_GDP	STED_GDP	LTED_GDP	TED_GDP	STED_TED	Debt_F.
1980_1989	**N**	681	1050	740	831	744	765	702	676	676	676	763	640
	Mean	5.220262	3.66e+07	54.62578	.0325262	2135.564	.2246502	33.89948	8.086658	55.9155	67.76771	13.16719	.0558896
	St.Dev	5.384544	1.27e+08	31.97624	.097503	2026.993	.2507899	21.77088	11.29116	47.91933	58.76601	12.56863	.9200103
	p25	1.641679	3759300	33.08211	0	592.5685	0	20.19561	2.691806	28.01196	34.96574	6.102239	-.4620027
	p50	3.495065	8111052	47.65291	.0063359	1372.498	.1629111	28.29328	5.489191	46.1256	54.54652	9.832837	-.1129669
	p75	6.897683	2.12e+07	65.30115	.022318	3224.582	.2849433	41.45114	9.172189	69.90146	85.20137	15.67078	.3074242
1990_1997	**N**	710	848	795	767	732	686	716	694	694	694	715	599
	Mean	8.846027	4.29e+07	65.59484	.0441159	2771.048	.2906729	35.15482	15.24403	74.98045	95.06784	13.18904	.2813722
	St.Dev	8.326562	1.46e+08	35.17256	.1058939	2377.127	.2580304	24.70295	53.92713	88.24967	150.7018	13.42556	1.271662
	p25	3.564915	4516050	41.90763	0	855.056	.1629111	19.52128	2.494345	28.4904	37.32769	4.46901	-.4294969
	p50	6.949214	9833104	57.20284	.0109308	1798.487	.1629111	28.73998	5.601452	53.64431	63.65418	9.782627	-.0134092
	p75	11.1572	2.54e+07	81.06936	.0308464	4248.281	.4090769	42.66972	11.38367	92.77425	109.4131	17.99397	.633742
1998_2006	**N**	797	848	829	800	829	819	805	772	772	772	780	661
	Mean	14.32124	4.91e+07	76.06195	.0201774	3923.138	.4026031	40.5284	11.01665	55.15833	70.47382	12.54999	-.0002486
	St.Dev	12.20475	1.63e+08	36.28495	.0611447	3348.856	.3303315	32.97745	40.14025	36.93148	74.29662	11.66195	.9449004
	p25	7.065809	5294073	50.11996	0	1138.217	.1629111	20.24657	2.113389	30.92456	36.55489	4.176264	-.4857746
	p50	11.53831	1.21e+07	68.68444	.0079005	2720.059	.1629111	31.12357	4.90937	46.63596	55.65808	9.422518	-.1858707
	p75	17.44576	3.03e+07	96.4409	.0213642	6187.237	.6949194	48.36162	8.949085	69.48868	84.07167	16.65633	.2586198
2007_2012	**N**	593	636	592	588	630	611	582	583	583	583	594	500
	Mean	20.84365	5.37e+07	80.88533	.0368934	5883.693	.4225342	49.45493	6.402507	30.71586	39.77293	14.37232	-.435535
	St.Dev	21.20104	1.74e+08	33.46705	.32869	4983.756	.3459854	34.58348	16.03279	20.49098	33.99099	12.86696	.5600061
	p25	10.87454	6043306	55.76219	0	1619.144	.1629111	29.27699	1.265914	17.73555	22.51958	4.604334	-.7098544
	p50	15.83214	1.42e+07	74.78377	.0093725	4400.701	.2461658	39.52405	3.579886	24.11557	30.4768	11.76906	-.5873921
	p75	24.79955	3.54e+07	100.3126	.0227223	9244.089	.7141575	56.14543	7.196818	40.28261	51.42413	19.62762	-.256821

Note: p25, p50 and p75 denote 25%, 50%, and 75% quantiles for a list of variables.

Regression results

We present our regression results in the three tables below (Tables 5-7). The dependent variable is the (natural logarithm of) reserves-to-GDP ratio in all tables. All regressions were run by the pooled OLS method. Tables 5 and 6 provide the results for the traditional model and financial-stability model, respectively. Table 7 brings all the variables of the two models together in the form of 'horserace' regressions. The conventional debt variables, along with our original 'external-debt factor' and dummy variables are included in all tables on a step-by-step basis, in order to focus on the effect of external debt on international reserves.

In Table 5, it can be seen that most of the explanatory variables under the traditional model are statistically significant across columns I-to-IX, generating R^2's between 0.22 and 0.26. Population, trade openness and GDP per capita all show up with the expected positive signs, while the negative significance of exchange rate volatility tends to vanish as external-debt variables are added. All conventional debt variables are statistically significant with negative signs (columns II-to-V), implying that the higher the debt ratios, the lower the reserves-to-GDP ratio. In other words, the traditional model yields the possible case of international reserves and external debt functioning as *substitutes* in financing transactions with the rest of the world (*a la* Eaton & Gersovitz, 1980; and Lane and Burke, 2001). However, further analysis via our debt factor and dummy variables provides us with some other possibilities of interpretation. The debt factor (in column VI) and the most general dummy (i.e., D_Debt in column VII) are both negatively significant. That is to say, the five debt variables that we reduced to a single factor work well in explaining (reductions in) reserve holdings; and moreover, the positive values associated with the debt factor (as captured by the D_Debt dummy) have a categorically negative influence on reserves. Using more specific dummy variables (in column VIII), the *negative* sign of D_HighDebt and the *positive* sign of D_LowDebt provide us with more detailed information as to the effect of the degree of indebtedness on reserve-holding behavior. While high-debt values tend to categorically generate a negative effect on reserves, low-debt values yield a positive causation. In other words, the degree of indebtedness matter in determining the direction of change in reserves. Being a low-debtor seems to be leading to larger reserve ratios, whereas being a high-debtor is more likely to be associated with smaller reserve ratios. Indeed, the significance and positive signs of D_LowDebt and D_LowerMiddleDebt, along with the insignificant D_UpperMiddleDebt, indicate that relatively lower ratios of indebtedness have a tendency to result in higher reserve-to-GDP ratios (column IX). The conventional debt variables as a whole produce negative effects on reserves, and this result can be stemming mainly from the cases of high indebtedness. On the other hand, cases of low indebtedness seem to suggest that countries might have important categorical differences in terms of their reserve policies, depending on the relative burdens of external debt they bear.

The financial-stability model, presented in Table 6, provides qualitatively similar results in terms of the significance and signs of the debt variables. All the financial-stability variables are statistically significant, except the pegged exchange rate dummy, and come with expected signs. Interestingly, the R^2-performance of the financial-stability model is slightly worse than that of the traditional model, unlike in Obstfeld *et al*. (2010). Here again, the conventional debt variables (columns II-to-V), debt factor (column VI) and D-Debt dummy (column VII) are all significant with negative signs, like in the traditional model. Moreover, the significance and signs of specific dummies (in columns VIII and IX) remain also the same (except the insignificance of D_HighDebt in column VIII and that of D_LowerMiddleDebt in column IX). Therefore, our interpretations regarding the debt factor and debt dummies in the case of the traditional model apply mostly to also the financial-stability model. The qualitative similarity between the results of the traditional and financial-stability models can also be interpreted to indicate that reserve accumulation can be explained more-or-less equally well by both models. However, our contention that the degree

of indebtedness matter in explaining reserves is further strengthened by the qualitative similarity of the results in Tables 4 and 5.

The 'horserace' regressions in Table 7 produce also interesting results. When the traditional and financial-stability variables are brought together; trade openness, financial openness and financial development (M2/GDP) remain as the most potent explanatory variables, presumably implying that globalization in trade and finance has been the major force behind the fast rising reserves-to-GDP ratios in developing countries. Conventional debt variables, debt factor and D-Debt dummy are again all significant with negative signs. Indeed, the significance and signs of the specific dummies (in columns VIII and IX) are exactly the same as in Table 6, implying the robustness of our previous interpretations regarding the 'nuanced' effect of external indebtedness on international reserves. All in all, the results reported in Tables 5, 6 and 7 are supportive of the argument that the degree of indebtedness should be taken into account in analyzing the determinants of reserve demand by the central banks of the developing countries.

Table 5. Traditional model (Dependent variable: ln (Res/GDP); Pooled OLS

	I	II	III	IV	V	VI	VII	VIII	IX
ln(population)	0.13***	0.14**	0.11**	0.10**	0.16***	0.14***	0.15***	0.17***	0.17
	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)
ln(Trade_GDP)	0.87***	0.92***	0.93***	0.94***	0.89***	0.98***	0.99***	0.93***	0.93
	(0.14)	(0.14)	(0.15)	(0.14)	(0.14)	(0.15)	(0.15)	(0.15)	(0.15)
Exch_Rate_Vol	-1.19**	-0.68	-1.08**	-1.00*	-0.79	-0.39	-0.47	-0.56	-0.55
	(0.54)	(0.49)	(0.55)	(0.56)	(0.49)	(0.41)	(0.40)	(0.40)	(0.40)
ln(GDP_Person)	0.24***	0.27***	0.16**	0.16**	0.29***	0.12*	0.12*	0.17**	0.17
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
ln(STED_GDP)		-0.16***							
		(0.05)							
ln(LTED_GDP)			-0.27**						
			(0.10)						
ln(TED_GDP)				-0.33***					
				(0.11)					
Ln(STED_TED)					-0.14**				
					(0.06)				
Debt_Factor						-0.25**			
						(0.12)			
D_Debt							-0.39***		
							(0.14)		
D_HighDebt								-0.20*	
								(0.11)	
D_LowDebt								0.24***	0.44***
								(0.08)	(0.16)
D_UpperMidDebt									0.16
									(0.11)
D_LowerMidDebt									0.25**
									(0.12)
Constant	-5.60***	-5.89***	-3.87***	-3.50***	-6.29***	-5.36***	-5.29***	-6.00***	-6.16***
	(1.28)	(1.29)	(1.26)	(1.23)	(1.38)	(1.23)	(1.19)	(1.31)	(1.34)
R-squared	0.217	0.255	0.240	0.248	0.238	0.238	0.235	0.225	0.225
N	2669	2470	2507	2507	2470	2287	2287	2287	2287

Robust standard errors clustered by country in parentheses. *, ** and *** indicate %10, %5 and %1 significance level, respectively.

Table 6. Financial-stability model (Dependent variable: In (Res/GDP); Pooled OLS

	I	II	III	IV	V	VI	VII	VIII	IX
Fin_Openness	0.67***	0.81***	0.67***	0.70***	0.79***	0.69***	0.65***	0.68***	0.67***
	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)	(0.19)	(0.19)	(0.20)	(0.20)
Peg	0.25	0.18	0.24	0.21	0.21	0.08	0.10	0.06	0.06
	(0.20)	(0.19)	(0.19)	(0.20)	(0.19)	(0.22)	(0.22)	(0.23)	(0.23)
Soft_Peg	0.33**	0.26**	0.31***	0.28**	0.31***	0.23**	0.25**	0.22**	0.22**
	(0.13)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)
ln(M2_GDP)	0.60***	0.65***	0.55***	0.55***	0.67***	0.65***	0.64***	0.67***	0.66***
	(0.10)	(0.10)	(0.09)	(0.09)	(0.10)	(0.09)	(0.09)	(0.09)	(0.09)
ln(STED_GDP)		-0.16***							
		(0.05)							
ln(LTED_GDP)			-0.24**						
			(0.09)						
ln(TED_GDP)				-0.28***					
				(0.10)					
ln(STED_TED)					-0.14***				
					(0.05)				
Debt_Factor						-0.12*			
						(0.07)			
D_Debt							-0.27**		
							(0.13)		
D_HighDebt								-0.08	
								(0.12)	
D_LowDebt								0.36***	0.45**
								(0.09)	(0.17)
D_UpperMidDebt									0.06
									(0.11)
D_LowerMidDebt									0.11
									(0.14)
Constant	-0.60*	-0.54*	0.48	0.72	-0.58*	-0.68**	-0.56*	-0.77**	-0.84**
	(0.33)	(0.31)	(0.48)	(0.53)	(0.32)	(0.33)	(0.33)	(0.34)	(0.36)
R-squared	0.173	0.222	0.200	0.205	0.204	0.198	0.200	0.201	0.201
N	2718	2525	2558	2558	2525	2339	2339	2339	2339

Robust standard errors clustered by country in parentheses. *, ** and *** indicate %10, %5 and %1 significance level, respectively.

Table 7. Traditional and financial-stability models together (Dependent variable: ln (Res/GDP); Pooled OLS

	I	II	III	IV	V	VI	VII	VIII	IX
ln(population)	0.09*	0.09*	0.06	0.05	0.12**	0.08	0.08	0.10*	0.10*
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
ln(Trade_GDP)	0.74***	0.77***	0.79***	0.82***	0.73***	0.81***	0.81***	0.75***	0.75***
	(0.14)	(0.14)	(0.15)	(0.15)	(0.14)	(0.16)	(0.16)	(0.16)	(0.16)
Exch_Rate_Vol	-0.25	0.05	-0.13	-0.02	-0.05	0.13	0.08	-0.03	-0.02
	(0.30)	(0.29)	(0.28)	(0.28)	(0.29)	(0.25)	(0.25)	(0.25)	(0.25)
ln(GDP_Person)	0.11	0.14*	0.02	0.02	0.17**	-0.01	0.00	0.05	0.05
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)	(0.07)	(0.07)
Fin_Openness	0.46**	0.59***	0.48**	0.50**	0.58***	0.53**	0.46**	0.50**	0.49**
	(0.23)	(0.21)	(0.22)	(0.22)	(0.22)	(0.22)	(0.22)	(0.22)	(0.22)
Peg	0.13	0.07	0.07	0.03	0.12	-0.10	-0.05	-0.07	-0.07
	(0.21)	(0.21)	(0.21)	(0.22)	(0.21)	(0.23)	(0.22)	(0.24)	(0.23)
Soft_Peg	0.22*	0.14	0.20*	0.17	0.16	0.11	0.16	0.12	0.12
	(0.12)	(0.11)	(0.12)	(0.12)	(0.11)	(0.12)	(0.11)	(0.12)	(0.12)
ln(M2_GDP)	0.32***	0.37***	0.33***	0.32***	0.37***	0.38***	0.39***	0.40***	0.39***
	(0.12)	(0.11)	(0.11)	(0.11)	(0.11)	(0.12)	(0.12)	(0.12)	(0.12)
ln(STED_GDP)		-0.18***							
		(0.06)							
ln(LTED_GDP)			-0.29***						
			(0.11)						
ln(TED_GDP)				-0.37***					
				(0.11)					
ln(STED_TED)					-0.17***				
					(0.06)				
Debt_Factor						-0.25**			
						(0.11)			
D_Debt							-0.37***		
							(0.14)		
D_HighDebt								-0.15	
								(0.12)	
D_LowDebt								0.30***	0.46**
								(0.09)	(0.17)
D_UpperMidDebt									0.12
									(0.12)
D_LowerMidDebt									0.19
									(0.14)
Constant	-4.91***	-5.02***	-2.79**	-2.32*	-5.53***	-4.13***	-4.10***	-4.75***	-4.87***
	(1.25)	(1.22)	(1.35)	(1.32)	(1.32)	(1.29)	(1.23)	(1.31)	(1.33)
R-squared	0.261	0.316	0.289	0.298	0.297	0.291	0.286	0.279	0.279
N	2554	2376	2409	2409	2376	2208	2208	2208	2208

Robust standard errors clustered by country in parentheses. *, ** and *** indicate %10, %5 and %1 significance level, respectively.

By way of conclusion: The debt-related link between fear of floating and international reserves

The negative effect of external debt on reserve holdings, which we obtained consistently throughout our regressions in the previous section, has been explained by the possibility that external debt and international reserves are *substitutes* in financing external transactions (e.g., Eaton and Gersovitz, 1980; Lane and Burke, 2001). This explanation can have some merit in itself; however, it may be insufficient to solely rely on this explanation in an international monetary environment that is increasingly characterized by financial openness and financial deepening. In recent decades, financial-instability concerns on the part of central banks might have started to dominate the concerns related to the transactions-demand for reserves. Therefore, we attempt to develop an additional explanation based on our regression results.

Starting mainly with Calvo and Reinhart (2002), the fear-of-floating argument in the literature has usually referred to fear of depreciation (of home currency). A central bank develops a tendency to fear home-currency depreciations especially when the country is constrained by two main external problems, that is to say:

i) when the country's domestic production and exports depend considerably on its imports (and especially when the country is a net importer of energy and intermediate goods), and
ii) when the country's external debt, especially short-term external debt, is considerably high.

In such cases, home-currency depreciations can: i) severely cut imports, and hence sharply reduce GDP and exports, leading to financial crises and serious recessions, and ii) drastically inflate the home-currency-value of external debt, leading to severe debt crises that may also culminate into serious recessions. Therefore, countries characterized by a high degree of dependence on imports and/or high debt ratios have an understandable tendency to fear home-currency depreciations.

Avoiding depreciations on the part of central banks usually requires regular sales of foreign reserves (and corresponding purchases of home currency) in the domestic foreign-exchange market (in addition to policy rate hikes). As such, this type of countries can have a tendency to decrease their reserves in the face of 'fear of depreciation' (due to high import-dependence and/or high external debt). For such countries (with fear of depreciation), it can be expected that growing external debt is associated with shrinking reserves, the causation running from the former towards the latter. Hence, this reasoning can explain, at least partially, the persisting significance of the negative effect of external debt on reserves in our regressions for the developing countries.

On the other hand, Levy-Yeyati et al. (2013) have recently demonstrated that "fear of floating" is characterized more by "fear of appreciation" than by "fear of depreciation", implying that "neo-mercantilist motives" may constitute a more dominant incentive to avoid free floating. Indeed, countries that do not suffer considerably from the above-mentioned external constraints (i.e., high import-dependence and high external debt) possess a leeway to engage in appreciation-avoiding policies. Central banks of such countries have the flexibility of selling home currency and buying foreign currency on a relatively regular

basis, so that they can avoid home-currency appreciation with an eye to improving the trade and current account balances as part of a neo-mercantilist growth strategy.[3] Fear of appreciation, thus, has a kind of built-in mechanism to accumulate reserves.

Consequently, in an attempt to synthesize the 'fear-of-depreciation' and 'fear-of-appreciation' literatures, one can argue that countries with less serious external constraints have a tendency to accumulate reserves, while the ones with more serious constraints have a tendency to spend reserves. In this regard, Rodrik (2006: 265) argues that, in recent decades, developing countries accumulated large amount of reserves without paying enough attention to curbing their (short-term) external debt: "They have over-invested in the costly strategy of reserve accumulation and under-invested in capital-account management policies to reduce their short-term foreign liabilities" (p. 265). Indeed, Table 2 in Rodrik (2006: 264) shows that both the short-term-debt-to-GDP ratios and reserves-to-GDP ratios increased together from 1990 to 2004 (even though the increase in the latter is much larger). Rodrik's study implies a weakly positive relationship between external debt and reserves. However, Rodrik (or any others, to our knowledge) did not take into account the possible difference between 'fearers of depreciation' and 'fearers of appreciation' in terms of their reserve-holding behavior, which we attempted (in an indirect way) in the preceding pages.

The upshot is that countries can differ from each other in terms of their fears of floating. Such country-specific differences can be expected to have significant effects on the reserve demands of their central banks. Countries with considerable external constraints (i.e., 'fearers of depreciation') are more likely to *spend* reserves while accumulating external debt; and hence their external debt can be expected to have a *negative* effect on their reserves. On the other hand, countries possessing the leeway to pursue neo-mercantilist motives (i.e., 'fearers of appreciation') are more likely to *accumulate* reserves while increasing their external debt; and hence their external debt can be expected to have a *positive* effect on their reserves. Therefore, treating all developing countries as homogeneous units in terms of their efforts to avoid exchange-rate flexibility can result in ignoring some important information embedded in their specific pattern of fear of floating. Hence, for future research, systematic categorization of countries into groups in terms of types of fear of floating can be a good idea for capturing country-specific differences based on their degrees of indebtedness.

[3] Be that as it may, Levy-Yeyati et al. (2013) show also that such a growth strategy works mainly through the deepening of domestic savings and capital accumulation, rather than through export promotion and import substitution. However, that is another subject-matter, which is beyond the scope of our study, and hence it should be dealt with separately in further research.

Appendix-1: List of countries

	Countries	Income Groups		Countries (contd.)	Income Groups (contd.)
1	Afghanistan	Low Income	54	Libya	Upper-middle Income
2	Albania	Lower-middle Income	55	Lithuania	Upper-middle Income
3	Algeria	Upper-middle Income	56	Madagascar	Low Income
4	Angola	Lower-middle Income	57	Malawi	Low Income
5	Argentina	Upper-middle Income	58	Malaysia	Upper-middle Income
6	Armenia	Lower-middle Income	59	Mali	Low Income
7	Azerbaijan	Lower-middle Income	60	Mauritania	Low Income
8	Bangladesh	Low Income	61	Mexico	Upper-middle Income
9	Belarus	Upper-middle Income	62	Moldova	Lower-middle Income
10	Benin	Low Income	63	Mongolia	Lower-middle Income
11	Bolivia	Lower-middle Income	64	Morocco	Lower-middle Income
12	Bosnia and Herzegovina	Upper-middle Income	65	Mozambique	Low Income
13	Brazil	Upper-middle Income	66	Myanmar	Low Income
14	Bulgaria	Upper-middle Income	67	Namibia	Upper-middle Income
15	Burkina Faso	Low Income	68	Nepal	Low Income
16	Burundi	Low Income	69	Nicaragua	Lower-middle Income
17	Cambodia	Low Income	70	Niger	Low Income
18	Cameroon	Lower-middle Income	71	Nigeria	Lower-middle Income
19	Central African Republic	Low Income	72	Pakistan	Lower-middle Income
20	Chad	Low Income	73	Panama	Upper-middle Income
21	Chile	Upper-middle Income	74	Papua New Guinea	Lower-middle Income
22	China	Lower-middle Income	75	Paraguay	Lower-middle Income
23	Colombia	Upper-middle Income	76	Peru	Upper-middle Income
24	Congo	Lower-middle Income	77	Philippines	Lower-middle Income
25	Congo Dem Rep	Low Income	78	Poland	Upper-middle Income
26	Costa Rica	Upper-middle Income	79	Romania	Upper-middle Income
27	Cote d'Ivoire	Lower-middle Income	80	Russian Federation	Upper-middle Income
28	Dominican Republic	Upper-middle Income	81	Rwanda	Low Income
29	Ecuador	Lower-middle Income	82	Senegal	Low Income
30	Egypt	Lower-middle Income	83	Serbia	Upper-middle Income
31	El Salvador	Lower-middle Income	84	Sierra Leone	Low Income
32	Eritrea	Low Income	85	South Africa	Upper-middle Income
33	Ethiopia	Low Income	86	South Sudan	Low Income
34	Georgia	Lower-middle Income	87	Sri Lanka	Lower-middle Income
35	Ghana	Low Income	88	Sudan	Lower-middle Income
36	Guatemala	Lower-middle Income	89	Syrian Arab Republic	Lower-middle Income
37	Guinea	Low Income	90	Tajikistan	Low Income
38	Haiti	Low Income	91	Thailand	Lower-middle Income
39	Honduras	Lower-middle Income	92	Republic of Macedonia	Upper-middle Income
40	India	Lower-middle Income	93	Togo	Low Income
41	Indonesia	Lower-middle Income	94	Tunisia	Lower-middle Income
42	Iran (Islamic Republic of)	Lower-middle Income	95	Turkey	Upper-middle Income
43	Iraq	Lower-middle Income	96	Turkmenistan	Lower-middle Income
44	Jamaica	Upper-middle Income	97	Uganda	Low Income
45	Jordan	Lower-middle Income	98	Ukraine	Lower-middle Income
46	Kazakhstan	Upper-middle Income	99	United Rep. of Tanzania	Low Income
47	Kenya	Low Income	100	Uruguay	Upper-middle Income
48	Kyrgyzstan	Low Income	101	Uzbekistan	Low Income
49	Lao People's Democratic	Low Income	102	Venezuela	Upper-middle Income
50	Latvia	Upper-middle Income	103	Vietnam	Low Income
51	Lebanon	Upper-middle Income	104	Yemen	Low Income
52	Lesotho	Lower-middle Income	105	Zambia	Low Income
53	Liberia	Low Income	106	Zimbabwe	Low Income

Appendix-2: Variable definitions and data sources

Variable	Definition	Source
International Reserves	Natural logarithm of the ratio of official international reserves to GDP.	World Development Indicators
Population	Natural logarithm of the population.	IMF, WEO
Trade Openness	Natural logarithm of the ratio of trade (exports plus imports) to GDP.	World Development Indicators
Exchange Rate Volatility	Annual standard deviations of the monthly exchange rate between the home country and the base country.	Aizenman et al. (2010)
Financial Openness Index	Based on Chinn-Ito 2006 index, scaled from 0 to 1.	Chinn and Ito (2006, 2008); Aizenman et al. (2010)
Financial Depth	Natural logarithm of the ratio of M2 to GDP.	World Development Indicators
Pegged-Exchange Rate Dummy	No separate legal tender; Pre announced peg or currency board arrangement; Pre announced horizontal band that is narrower than or equal to +/-2%; De facto peg.	Ilzetzki, Reinhart and Rogoff (2008); Ilzetzki et al. (2010)
Soft-peg Exchange Rate Dummy	Pre announced crawling band that is wider than or equal to +/-2%; De facto crawling band that is narrower than or equal to +/-5%; Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time); Managed floating.	Ilzetzki, Reinhart and Rogoff (2008); Ilzetzki et al. (2010)
GDP per capita	Gross domestic product per capita, in current USD.	IMF, WEO
Short-term External Debt[4]	Natural logarithm of the ratio of short-term external debt stocks to GDP.	World Development Indicators
Long-term External Debt	Natural logarithm of the ratio of long-term external debt stocks to GDP.	World Development Indicators
Total External Debt	Natural logarithm of the ratio of total external debt stocks to GDP.	World Development Indicators

[4] Short-term, long-term and total external debt data for Chile, Czech Republic, Poland, Russia and S. Korea are collected from the web sites of their central banks.

References

Aizenman, J. and Marion, N. (2003), "The High Demand for International Reserves in the Far East: What Is Going On?" Journal of the Japanese and International Economies, 17(3): 370– 400.

Aizenman, J. and Marion, N. (2004), "International Reserve Holdings with Sovereign Risk and Costly Tax Collection" Economic Journal, Vol. 114 (July), pp. 569-591.

Aizenman, J. and Lee, J. (2007), "International Reserves: Precautionary Versus Mercantilist Views, Theory and Evidence" Open Economies Review, 18(2): 191–214.

Aizenman, J. and Lee, J. (2008), "Financial versus Monetary Mercantilism: Long-run View of Large International Reserves Hoarding" The World Economy, 31: 593–611.

Aizenman, J. and Genberg, H. (2012), "Research on the Demand for International Reserves: Developments in Academia, the Contribution of IMF Researchers, and Influence on IMF Surveillance" IEO of IMF, BP/12/01.

Bartholomew, D. J., Knott, M. and Moustaki, I. (2011), "Latent Variable Models and Factor Analysis: A Unified Approach" John Wiley & Sons, Ltd., West Sussex, UK.

Ben-Bassat, A. and Gottlieb, D. (1992), "Optimal International Reserves and Sovereign Risk" Journal of International Economics, 33: 345–62.

Calvo, G. and Reinhart, C. M. (2002), "Fear of Floating" Quarterly Journal of Economics, 117 (May): 379–408.

Cheung, Y. and Ito, H. (2009), "Cross-Sectional Analysis on the Determinants of International Reserves Accumulation" International Economic Journal, 23 (4): 447–481.

Dooley, P. M., Folkerts-Landau, D. and Garber, P. (2003), "An Essay on the Revived Bretton Woods System" NBER Working Paper No. 9971 (Cambridge, MA: National Bureau of Economic Research).

Eaton, J. and Gersovitz, M. (1980), "LDC Participation in International Financial Markets: Debt and Reserves" Journal of Development Economics, 7, 3-21.

Flood, R. P. and Marion, N. (2002), "Holding International Reserves in an Era of High Capital Mobility." In Brookings Trade forum 2001, ed. Dani Rodrik and Susan M. Collins, 1–68. Washington, DC: Brookings Institution Press.

Frenkel, J. A. and Jovanovic B. (1981), "Optimal International Reserves: A Stochastic Framework" Economic Journal, 91(362), 507-514.

Greenspan, A. (1999), "Currency Reserves and Debt" Speech in the World Bank Conference on Recent Trends in Reserves Management, Washington, DC, April 29.

Heller, R. (1966), "Optimal International Reserves" Economic Journal, 76 (302), 296-311.

Lane, P. R. and Burke, D. (2001), "The Empirics of Foreign Reserves" Open Economies Review, 12(4): 423-34.

Levy-Yeyati, E., Sturzenegger, F. and Gluzmann, P. A. (2013), "Fear of Appreciation" Journal of Development Economics, vol. 101(C), pages 233-247.

Obstfeld, M., Shambaugh, J. C. and Taylor, A. M. (2010), "Financial Stability, the Trilemma, and International Reserves" American Economic Journal: Macroeconomics 2: 57–94.

Rodrik, D. (2006), "The Social Cost of Foreign Exchange Reserves" International Economic Journal, 20(3): 253–66.

Steiner, A. (2013a) “How Central Banks Prepare for Financial Crises - An Empirical Analysis of the Effects of Crises and Globalization on International Reserve Holdings” Journal of International Money and Finance, 33, 208-234.

Steiner, A. (2013b) “The Accumulation of Foreign Exchange by Central Banks: Fear of Capital Mobility?” Journal of Macroeconomics, 38, Part B, 2013, 409-427.