

Dollar Liquidity, Money and Credit in a Small Open Dollarized Economy

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What is Dollarization?

- Deposits dollarization is the willingness and the ability of the economy's residents to hold domestic banks deposits denominated in a currency other than the domestic currency.
- Liabilities dollarization is the willingness and the ability of the economy's residents to borrow money from a domestic bank in a currency other than the domestic currency.

Paper objectives

- Making an analysis of monetary mechanisms in dollarized economies.
- Proposing a new measure of Dollar liquidity in dollarized economies: the Gross Foreign Assets of the Consolidated Banks Sector.
- Studying the relationship between the balance of payments (BoP) and the deposit and credit components of the consolidated banks balance sheet in a dollarized small open economy.
- Testing our theoretical findings using data from Lebanon

Literature review (1)

- Capital inflows have often fueled credit expansions in advanced and emerging market economies alike.
- Credit booms are more frequent under less flexible exchange rate regimes: Mendoza and Terrones (2008), Montiel and Reinhart (2001), Magud, Reinhart and Vesperoni (2014), Boudias (2015)

Literature review (2)

- International banks foreign currency credit plays a major role in terms of liquidity and credit expansion in emerging economies: Borio, McCauley and McGuire (2011), Schnabl (2012), Baskaya, di Giovanni, Kalemli-Ozcan, Peydro and Ulu (2017), Baskaya, di Giovanni, Kalemli-Ozcan and Ulu (2017), Alper, Hulagu and Keles (2012), Alper, Kilinc and Yorukoglu (2015)

**Theoretical analysis:
monetary mechanisms and the
balance of payments in a
dollarized economy**

Deposits dollarization (1)

- The initial trigger of a Dollar deposit in a domestic bank is the receipt of a payment, an income transfer or a capital transfer (any form of fund transfer relating to a BoP flow) from a foreign country by a client of the domestic Bank.
- The share of deposits in Dollar and in the domestic currency reflects the non-banks sector depositors preference.
- The interaction between the domestic currency and the Dollar money supplies happens only when the domestic non-bank sector converts domestic money into Dollars (or the other way round).

Deposits dollarization (2)

Table 1: Deposits Dollarization

Bank A		US Bank		Domestic Central Bank	
1. Dollar Deposit at US Bank = X	2. Dollar Deposit of Client a = X	1. Loan to US non-bank sector = X	2. Dollar Deposit of Bank A = X		
Total = X	Total = X	Total = X	Total = X		

Reserve requirements on Dollar deposits (1)

- Banks reserve requirements on Dollar deposits are held in the form of Dollar deposits of the Central Bank at International Banks.
- ***It is best practice for Central Banks in dollarized economies to separate reserve requirements amounts from international reserves amounts.***

Reserve requirements on Dollar deposits (2)

Table 2: Deposits Dollarization with Reserves Requirements

Bank A		US Bank		Domestic Central Bank	
1. Dollar Deposit at US Bank = $X \cdot (1-r)$	3. Dollar Deposit of Client a = X	1. Loan to US non-bank sector = X	2. Dollar Deposit of Bank A = $X \cdot (1-r)$	1. Dollar Deposit at US Bank = $X \cdot r$	2. Dollar Reserves of Bank A = $X \cdot r$
2. Dollar Reserves at CB = $X \cdot r$			3. Dollar Deposit of CB = $X \cdot r$		
Total = X	Total = X	Total = X	Total = X	Total = $X \cdot r$	Total = $X \cdot r$

Liabilities dollarization (1)

- *The simple transaction of giving a Dollar denominated loan financed by a Dollar deposits in a dollarized economy is money creation in a currency (the Dollar) other than the sovereign currency.*
- Domestic banks multiply their gross Dollar assets in the same way they multiply domestic base money in a fractional reserves monetary system.

Liabilities dollarization (2)

Table 3: Liabilities Dollarization

Bank A		US Bank		Domestic Central Bank	
1. Dollar Deposit at US Bank = $X \cdot (1 - 2r)$	4. Dollar Deposit of Client a = X	1. Loan to US non-bank sector = X	2. Dollar Deposit of Bank A = $X \cdot (1 - 2r)$	1. Dollar Deposit at US Bank = $X \cdot 2r$	2. Dollar Reserves of Bank A = $X \cdot 2r$
2. Dollar Reserves at CB = $X \cdot 2r$	5. Dollar Deposit of Client a' = X		3. Dollar Deposit of CB = $X \cdot 2r$		
3. Dollar Loan to Client a' = X					
Total = $2 \cdot X$	Total = $2 \cdot X$	Total = X	Total = X	Total = $X \cdot 2r$	Total = $X \cdot 2r$

Central Bank intervention in the FX market and international reserves (1)

- Dollar inflows to the domestic banking system resulting from balance of payments surpluses increase domestic base money only if they are converted into domestic currency by banks.
- ***Under dollarization, if banks are allowed to hold foreign assets, balance of payments surpluses in a fixed exchange regime do not automatically lead to an increase in the Central Bank international reserves.***

Central Bank intervention in the FX market and international reserves (2)

Table 4: Central Bank Intervention in a Fixed Exchange Rate Regime

Bank A		US Bank		Domestic Central Bank	
1. DC Reserves at CB = $e.X$	3. DC Deposit of Client a = $e.X$	1. Loan to US non-bank sector = X	2. Dollar Deposit of CB = X	1. Dollar Deposit at US Bank = X	2. DC Reserves of Bank A of which: - RR = $r.e.X$ - ER = $(1-r).e.X$
Total DC = $e.X$	Total DC = $e.X$	Total Dollar = X	Total Dollar = X	Total Dollar = X	Total DC = $e.X$

The Gross Foreign Assets of the Consolidated Bank System (1)

- GFA CBS is the sum of the Central Bank's gross foreign assets (gross international reserves) and the consolidated domestic banks gross foreign assets.
- In practical terms, the computation of this aggregate should only include the gross foreign currency assets of the Central Bank and the gross foreign currency assets of domestic banks whose counterparts are non-resident agents.

The Gross Foreign Assets of the Consolidated Bank System (2)

- *In an economy where domestic banks are allowed to hold foreign assets, the bottom line of the BoP (i.e. the variation of the economy's international reserves) must be equal to the variation of the Gross Foreign Assets of the Consolidated Bank System (GFA_CBS), and not to the variation of the Central Bank's gross foreign assets (Central Bank's international reserves) only.*

The Gross Foreign Assets of the Consolidated Bank System (3)

- *GFA_CBS is an important aggregate alongside the Central Bank's international reserves when it comes to the ability to maintain a currency peg.*
- *GFA_CBS could be seen as the “Dollar Liquidity” or “Dollar Money Base” in the economy. The ratio of Dollar deposits in the banking system to the GFA_CBS could be seen as the “Dollar multiplier”.*

BoP surpluses and bank deposits (1)

- Net capital flows (excluding consolidated banks sector outflows) added to the balance of the current and capital accounts of the BoP, should translate directly or indirectly into a variation of the deposits of the consolidated bank sector, as the point of entry of most of those flows is through the transfer of funds to the domestic economy in the form of bank deposits.

BoP surpluses and bank deposits (2)

- Net current account balances induce a variation of both banks total deposits and the economy's Dollar liquidity (GFA CBS). These effects can sometimes come with a lag.
- Deposits transfers of non-residents increase domestic banks total deposits and the economy's Dollar liquidity (GFA CBS), in the same period they are effected.
- Foreign banks loans to domestic banks increase the economy's Dollar liquidity (GFA CBS) in the same period, but not total banks deposits directly.
- Portfolio Investments and FDI increase both Dollar liquidity (GFA CBS) and total banks deposits, sometimes partially and with a lag.

BoP surpluses and bank credit

- The increase of Dollar liquidity as a result of balance of payments flows gives room for domestic banks to expand credit to the non-bank sector in Dollar.
- Also, domestic banks can convert their Dollar liquidity into domestic currency deposits at the Central Bank, allowing them to expand domestic currency loans.
- However this process is not automatic as loan demand is determined by the economic activity needs and the interest rate level.

Empirical analysis: the case of Lebanon

Lebanon's general economic context

- Deposits dollarization ratio is 60.3% and loans dollarization ratio is at 69.3% at 2016 end.
- Net public debt to GDP ratio reached 128% at the end of 2016.
- At 2016 end international reserves of the Banque du Liban stand north of USD 50 billion - circa 97% of the country's GDP.
- The exchange rate of the US Dollar has been fixed since December 1997 at 1507.5 Lebanese Pounds.

Data (1)

- Balance of payments and domestic commercial banks assets and liabilities data are obtained from the Banque du Liban website “statistics and research” section.
- Annual current prices GDP, real growth and inflation figures are obtained from the IMF WEO October 2017.
- All the data is converted into USD Billions.

Data (2)

- The sample is the period spanning from January 2002 to June 2017, with quarterly periodicity.
- We use the cubic spline transformation to obtain quarterly nominal GDP, inflation, and real GDP growth figures from our yearly series.
- We transform monthly series to quarterly series by summing flow aggregates over the quarter and using quarter end figures for stock aggregates.

Stylized facts (1)

- Over the study period, the persistent negative net (current + capital) account balance is overcompensated by net capital inflows, leading to a substantial increase in the international reserves of the Central Bank.
- The large increase in the total banks deposits amount is mainly translated into an increase of banks deposits at the Central Bank. The increase of the credit to the domestic private sector, the credit to the government sector and banks foreign assets holdings are relatively moderate.

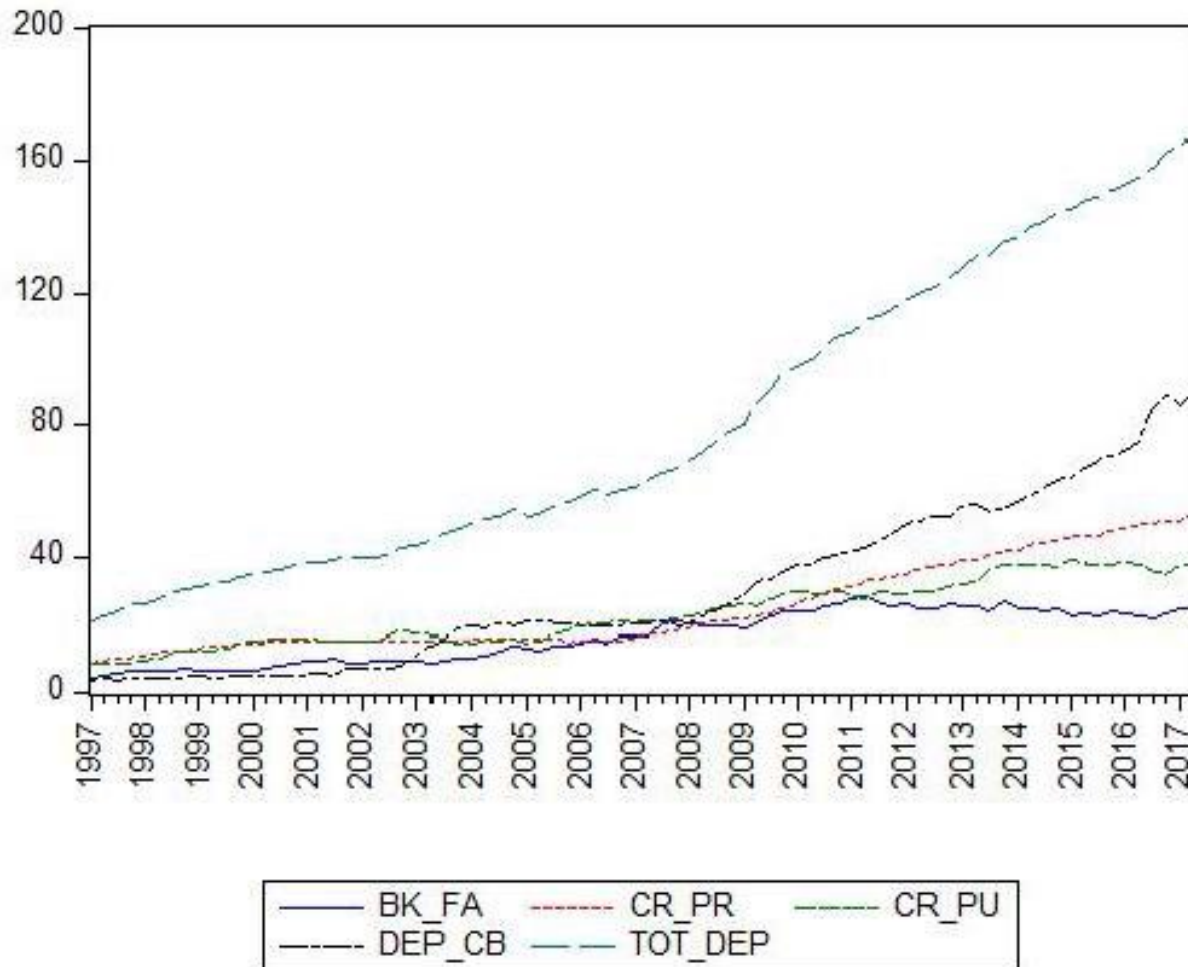
Stylized facts (2)

Table 5: Balance of Payments Components - Descriptive Statistics

	CURR_CAP	EO	RES_CHANGE	CAP_FLOWS	PI	OI	FDI
Mean	-1.414788	-0.026300	0.568676	2.009763	0.181786	1.291592	0.536385
Median	-1.378880	-0.021035	0.280700	1.705120	0.091370	1.209025	0.477130
Maximum	0.884890	3.829250	4.451590	6.617240	2.535400	3.670490	1.396760
Minimum	-3.300940	-5.278950	-1.878830	-1.285860	-2.124680	-1.483700	-0.069210
Std. Dev.	0.929704	1.672484	1.195253	1.577724	0.798354	1.226430	0.290598
Sum	-87.71688	-1.630630	35.25789	124.6053	11.27071	80.07872	33.25586
No. Obs	62	62	62	62	62	62	62

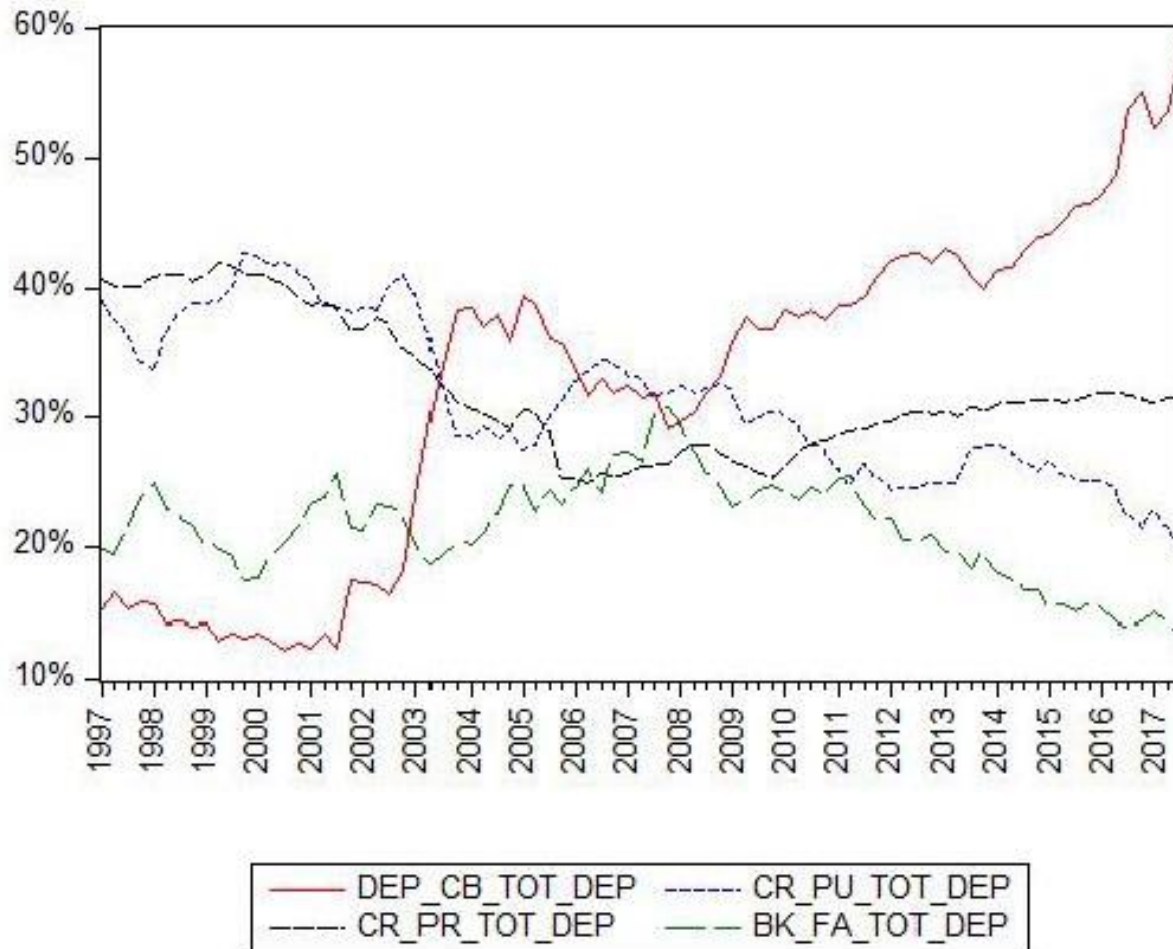
Stylized facts (3)

Figure 4: Banks Consolidated Balance Sheet Components



Stylized facts (4)

Figure 5: Banks Assets Components to Total Deposits Ratios

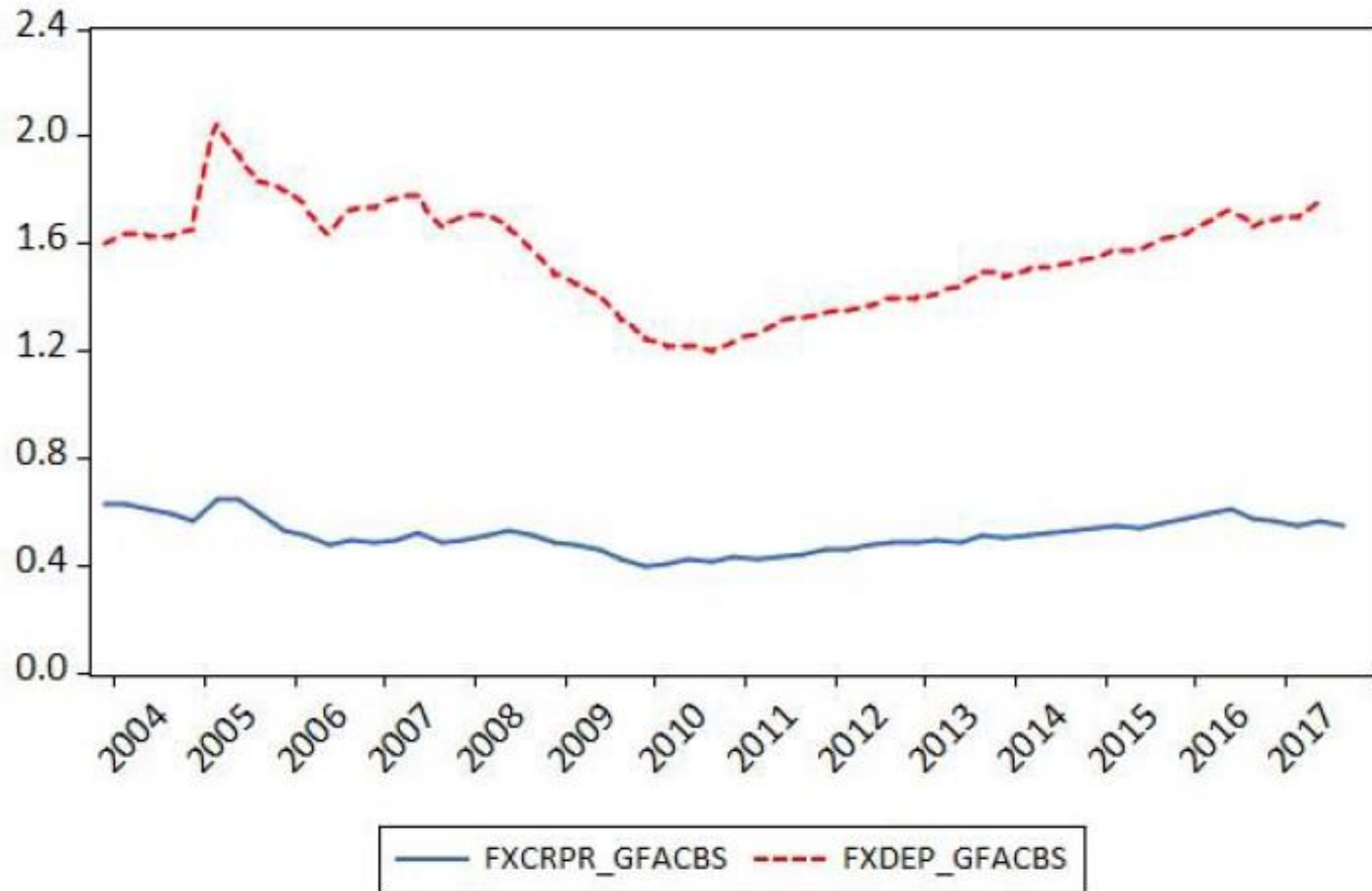


Stylized facts (5)

- The co-movement of the ratios of foreign currency deposits to GFA_CBS and foreign currency credit to GFA_CBS evidences the multiplying effect of foreign denominated loans on the foreign currency money supply.

Stylized facts (6)

Figure 5: Foreign Currency Deposits and Credit to GFA_CBS



Econometric analysis: long-run

- We aim at analyzing the statistical relationships of the growth of domestic banks deposits, domestic credit, banks deposits at the Central Bank, banks credit to the government, and banks foreign assets respectively with BoP flows.
- We use the ARDL and DOLS models in order to test for the presence of long-run co-integrating relationships amongst variables because of the limited number of quarterly observations in our sample that makes impossible the use of the VAR framework for co-integration analyses.

Econometric analysis: ARDL (1)

$$Y_t = \gamma_0 + \gamma_1 t + \sum_{k=1}^p \psi_k Y_{t-k} + \sum_{j=1}^m \sum_{l_j=0}^{q_j} \beta_{j,l_j} X_{j,t-l_j} + \epsilon_t$$

- Where: Y_t is the dependent variable at time t (respectively total consolidated banks deposits and total consolidated banks credit to the private sector), γ_0 is a constant, γ_1 is a coefficient associated with a linear trend, ψ_k are coefficients associated with lags of Y_t and β_{j,l_j} coefficients associated with lags of m regressors X_j for $j = 1, \dots, m$ and ϵ_t is the standard error term.

Econometric analysis: ARDL (2)

- F-bound tests identify strongly significant positive long-run relationships of total deposits and private credit with both measures of the cumulative BoP bottom line measures. However in case (1) of the best fit of the ARDL regression of total deposits on GFA_CBS, the long-run equation coefficients are found insignificant.

Econometric analysis: ARDL (3)

Table 6: ARDL Estimate results of long-run relationships

	(1) TOT_DEP		(2) TOT_DEP		(3) CR_PR		(4) CR_PR	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
CR_PR	3.0989	0.0565						
GFA_CBS	2.3838	0.2709			1.0665	0.0000		
IR_EXGOLD			1.6843	0.0000			1.4798	0.0000
CR_PU	-1.2453	0.6207						
F-bounds test	11.7486***		11.0453***		102.5606***		55.8021***	
t-Bounds test			-4.6019***		-4.0118***			
Obs.	62		64		64		64	

Notes: Model selection method: Schwarz criterion (SIC), maximum lags for dependent and independent variables: 4, fixed regressors: constant and trend (if significant). For F-Bounds test and t-Bounds test *** / ** / * denote significance at 1% / 5% / 10% level, respectively, according to finite sample critical values, as proposed by Narayan(2005).

Econometric analysis: DOLS (1)

$$y_t = \gamma_0 + \gamma_1 t + \sum_{j=1}^m \beta_j x_{j,t} + \sum_{j=1}^m \sum_{l_j=-q}^r \delta_{j,l_j} \Delta x_{j,t+l_j} + \epsilon_t$$

- Where: Y_t is the relevant dependent variable at time t (respectively, total consolidated banks deposits and total consolidated banks credit to the private sector), γ_0 is a constant, γ_1 is a coefficient associated with a linear trend, β_j coefficients associated with m regressors $x_{j,t}$ for $j=1, \dots, m$
 δ_{j,l_j} coefficients associated with q lags and r leads of the first differences of m regressors $\Delta x_{j,t+l_j}$ for $j=1, \dots, m$ and ϵ_t is the standard error term.

Econometric analysis: DOLS (2)

Table 7: DOLS results for long-run relationships

	(1) BK_TOTAL_DEP		(2) BK_TOTAL_DEP		(3) CR_PRIV		(4) CR_PRIV	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
CR_PRIV	0.943429	0.0000	1.722044	0.0000				
GFA_CBS	1.146412	0.0000			0.771785	0.0000		
IR_EX_GOLD			0.949369	0.0000			1.173734	0.0000
CR_PUBLIC	1.484171	0.0000	0.715247	0.0075				
Adj - R2	0.998920		0.993251		0.961034		0.984761	
Obs.	55		61		53		53	

Notes: Model selection method: Schwarz criterion (SIC), maximum lags for independent variables: 6, fixed regressor: constant (if significant).

- DOLS tests identified strongly significant positive long-run relationships of total deposits and private credit with both measures of the cumulative BoP bottom line.

Econometric analysis: Short-run (1)

- The strong long-run relationships we identified suggest that monetary authorities must closely monitor the bottom line of the balance of payments for monetary control purposes.
- We now perform a series of OLS regressions in order to highlight short run dynamic interconnections between variables.
- We first use our favored measure of the bottom line of the BoP (change in GFA_CBS), then the traditional measure (change in the Central Bank's international reserves).
- We use real GDP growth rate and the CPI inflation rate as control variables.
- We include lagged values of the dependent variables as most time series present statistical inertia.

Econometric analysis: Short-run (2)

$$\Delta Y_t = \gamma_0 + \sum_{k=1}^p \psi_k \Delta Y_{t-k} + \sum_{j=1}^m \sum_{l_j=0}^{q_j} \beta_{j,l_j} \Delta X_{j,t-l_j} + \sum_{s=1}^n \phi_s Y_{s,t} + \epsilon_t$$

- Where ΔY_t is the dependent flow variable or the first difference of the dependent stock variable at time t , γ_0 is a constant, ψ_k are coefficients associated with lags of ΔY_t , β_{j,l_j} coefficients associated with lags of m regressors $\Delta X_{j,t}$ (flow variables or first difference of stock variables) for $j = 1, \dots, m$, and ϕ_s coefficients associated with lags of n control variables $Y_{s,t}$ at time t for $s = 1, \dots, n$ and ϵ_t is the standard error term.

GFA_CBS regressions results (1)

- Strongly significant contemporaneous positive effect of the GFA_CBS in first difference on the growth of total banks deposits, banks deposits at the Central Bank and banks foreign assets. No statistical relationship with the growth of banks credit to the public sector.
- Strongly significant positive effect of lag 3 on the growth of credit to the private sector. This could be explained by the time the private sector credit process takes to materialize.

GFA_CBS regressions results (2)

- Alternating inertia in the banks deposits at the central bank time series between quarters (positive correlation with lags 1 and 3 and negative correlation with lag 2)
- Real GDP growth has a significant negative effect on the growth of commercial banks deposits at the Central Bank - this could mean that banks tend to favor safer Central Banks deposits over alternative uses of their funds in times of weak activity growth.

GFA_CBS regressions results (3)

D(TOT_DEP)	Coefficient	Prob.
C	0.829194	0.0002
D_GFA_CBS	0.687183	0.0000
D(TOT_DEP(-2))	0.325719	0.0002
Adj. R-squared	0.585824	
No. observations	63	
Sample (adj)	2002Q1 2017Q3	

D(M3)	Coefficient	Prob.
C	0.770657	0.0000
D_GFA_CBS	0.451542	0.0000
D(M3(-2))	0.312881	0.0009
Adjusted R-squared	0.533442	
No. observations	63	
Sample (adj)	2002Q1 2017Q3	

D(CR_PR)	Coefficient	Prob.
C	0.172348	0.0559
D(CR_PR(-2))	0.565067	0.0000
D_GFA_CBS(-3)	0.138928	0.0008
Adj. R-squared	0.419638	
No. observations	60	
Sample (adj)	2002Q4 2017Q3	

D(DEP_CB)	Coefficient	Prob.
C	0.987163	0.0225
D(DEP_CB(-1))	0.472456	0.0002
D(DEP_CB(-2))	-0.586335	0.0000
D(DEP_CB(-3))	0.572995	0.0000
D_GFA_CBS	0.508720	0.0020
REAL_GDP_GROWTH	-0.145879	0.0387
Adj. R-squared	0.424565	
No. observations	63	
Sample (adj)	2002Q1 2017Q3	

D(BK_FA)	Coefficient	Prob.
C	-0.192592	0.1852
D_GFA_CBS	0.482573	0.0000
Adj. R-squared	0.313283	
No. observations	63	
Sample (adj)	2002Q1 2017Q3	

Change in International Reserves regressions results (1)

- Strongly significant contemporaneous positive effect of RES_CHANGE on the growth of total banks deposits and banks deposits at the Central Bank. No statistical relationship with the growth of banks credit to the public sector.
- Strongly significant positive effect of lag 3 on the growth of credit to the private sector.

Change in International Reserves regressions results (2)

- A surprising significant negative contemporaneous relationship of RES_CHANGE with banks foreign assets growth (contrary to the GFA_CBS regression).
- We find a significant negative contemporaneous and lag 1 relationships between banks deposits at the Central Bank and banks foreign assets, showing that banks arbitrage between both items, within their foreign currency liquidity management.

D(DEP_CB)	Coefficient	Prob.
C	1.176678	0.0001
D(BK_FA)	-0.399532	0.0345
D(BK_FA(-1))	-0.355871	0.0624
D(DEP_CB(-1))	0.257581	0.0401
Adj. R-squared	0.142690	
No. observations	62	
Sample (adj)	2002Q1 2017Q2	

Change in International Reserves regressions results (3)

D(TOT_DEP)	Coefficient	Prob.
C	1.007066	0.0005
D(TOT_DEP(-2))	0.392807	0.0005
RES_CHANGE	0.468516	0.0008
Adj. R-squared	0.296197	
No. observations	62	
Sample (adj)	2002Q1 2017Q2	

D(M3)	Coefficient	Prob.
C	0.918519	0.0000
D(M3(-2))	0.309108	0.0071
RES_CHANGE	0.267337	0.0065
RES_CHANGE(-1)	0.183165	0.0693
Adj. R-squared	0.319126	
No. observations	61	
Sample (adj)	2002Q2 2017Q2	

D(CR_PR)	Coefficient	Prob.
C	0.129354	0.1500
D(CR_PR(-1))	0.296494	0.0116
D(CR_PR(-2))	0.364973	0.0029
RES_CHANGE(-3)	0.158638	0.0008
Adj. R-squared	0.460424	
No. observations	60	
Sample (adj)	2002Q4 2017Q3	

D(DEP_CB)	Coefficient	Prob.
C	1.142232	0.0023
D(DEP_CB(-1))	0.207111	0.0681
RES_CHANGE	0.760462	0.0000
REAL_GDP_GROWTH	-0.123701	0.0555
Adj. R-squared	0.286583	
No. observations	62	
Sample (adj)	2002Q1 2017Q2	

D(BK_FA)	Coefficient	Prob.
C	0.390348	0.0168
RES_CHANGE	-0.264811	0.0321
Adj. R-squared	0.058890	
No. observations	62	
Sample (adj)	2002Q1 2017Q2	

Conclusion (1)

- The empirical study in the case of Lebanon confirmed the results of our theoretical analysis.
- We revealed the choices of Lebanese banks in the use they make of the increased liquidity resulting from BoP flows.
- This interchangeability between banks gross foreign assets and deposits at the Central Bank proves that the GFA_CBS change is a better measure of the BoP bottom line than the change of the Central Bank international reserves.

Conclusion (2)

- Our results stress the importance of managing the Gross Foreign Assets of the Consolidated Banks Sector aggregate by the monetary authorities of dollarized economies, because of its effects on monetary aggregates and credit, and ultimately on inflation, the exchange rate, and financial stability.
- This induces a necessity to closely monitor the balance of payments bottom line. This monitoring can be achieved through the simultaneous management of capital flows and of the current account.

THANK YOU FOR YOUR ATTENTION