

Interest rates in emerging economies: exchange rate regime and public indebtedness in Lebanon

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Abstract

This study aims at analysing interest rate determinants in a small open dollarized economy under a fixed exchange rate regime. Using an autoregressive distributed lags model (ARDL) we are able to successfully test the theoretical predictions of a model adapted from Edwards and Khan (1984) for Lebanon. Specifically, we demonstrate that international interest rate pass-through is not complete and that is necessary to take into account international and domestic risk factors as well as measures of money supply.

Keywords: dollarization; emerging markets, interest rate formation

JEL Classification: E43; F31; F34

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1 Introduction

The prospect of a tightening in monetary policy in the United States may not be good news for emerging countries. They may be forced to tighten their own monetary policy in order to avoid capital outflows and currency depreciation. This problem may well concern both countries under fixed exchange rate regime and countries under flexible exchange rate regime if global financial flows have transformed the so-called Mundellian trilemma into a dilemma (Rey, 2016).

The international transmission of U.S. interest rates is not the only determinant of interest rates in emerging countries. The level of public indebtedness is another major factor, since it influences risk premiums and sovereign bond yields, and the latter impact other interest rates in the economy.

In Lebanon, the exchange rate of the Lebanese pound is fixed against the U.S. Dollar. It has not been modified since December 1997 (1 USD = 1,507.5 LBP). Large foreign exchange reserves enable the central bank to maintain the fixed exchange rate. However, it could be argued that the central bank has to maintain interest rates at a high level in order to attract foreign capital, finance the current account deficit (16 percent of GDP in 2016)¹ and avoid a depreciation of the pound. At the same time, gross public debt is high (143 percent of GDP in 2016) and net public debt as well (137 percent of GDP). In late August 2017, Moody's downgraded Lebanon's debt from B2 to B3.

Official international reserves and public debt exert opposite effects on interest rates: what is the predominant factor? Furthermore, the Lebanese economy is a highly dollarized economy: what is the interplay between this financial feature and the other determinants of interest rates in Lebanon? Monetary authorities may be reluctant to decrease interest rates on local-currency deposits in order to avoid an increase in the deposits dollarization rate in the economy. High interest rates on foreign-currency (U.S. dollar) deposits attract remittances. These are important issues, because the relatively high level of interest rates on deposits in Lebanon is one reason why residents have little incentive to use their savings in financing investment in productive activities. Should the government give up the fixed exchange rate regime? Or should it primarily address the issue of public debt? Should it do both at the same time? Both problems are closely intertwined. As a fixed exchange rate regime makes fiscal policy more potent, the government may have more incentives to sustain private consumption or investment by fiscal expansion than under a floating exchange rate regime. Indeed, higher demand for funds leads to higher interest rates, capital inflows, central bank's intervention on foreign exchange markets to keep the domestic currency from appreciating, and ultimately higher official international reserves. In other respect, as long as the Lebanese government borrows both in Lebanese pound and U.S. dollar, any fall in official international reserves would increase default risk and translate into higher interest rates, higher public spending and higher public debt.

We aim at addressing these issues by testing the determinants of interest rates

¹Source: International Monetary Fund, World Economic Outlook, April 2017.

in Lebanon. In particular, we want to determine whether the negative effect of official international reserves on interest rates (driving rates down) is stronger than the positive effect of public debt (the latter driving rates up). To our knowledge, there has been one work done on the subject by Poddar et al. (2006). While they succeeded in explaining a number of mechanisms pertaining to the determination of the main Lebanese interest rates (see the literature review in the next section), we want to give a robust theoretical backing for the empirical analysis, explain mechanisms and discuss the empirical model variables.

Our main contributions are the following: We provide a theoretical framework that describes the determination of interest rates in a dollarized emerging economy by combining the domestic money market equilibrium and the openness of the financial account. Specifically, we adapt the model of Edwards and Khan (1984) for the analysis of a dollarized emerging economy. In the empirical part of the paper, utilizing an autoregressive distributed lags (ARDL) modelization we are able to disentangle the international interest rate pass-through, the international risk factors and characteristics of the domestic economy as important determinants of interest rates. One limitation of our approach though is that the use of monthly data prevents us from taking into account the role of domestic inflation (Fisher equation) in the determination of interest rates because of the non-availability of a monthly data base.

In section 2, we review the related literature. In section 3, we explain the theoretical background of interest rate determination in a dollarized emerging economy. In section 4, we present the data. In section 5, we comment on our results from regression tests. In section 6, we conclude.

2 Related literature

The study by Poddar et al. (2006) is about the same subject as ours. They found that the degree of pass-through from U.S. interest rates to Lebanese interest rates is high (0.7 for five-year sovereign yields) but is still less than unity over the 1995-2005 period. This degree is estimated to be even lower for interest rates on foreign-currency deposits (0.4) and interest rates on local-currency deposits (0.36). For all three kinds of interest rate, the main determinant is foreign exchange reserves: a rise in the latter causes a decrease in interest rates. These authors use a part of external debt (privately held foreign-currency debt) as a proxy for public debt. A one percent increase in external debt would result in an increase of 1.4 basis points in sovereign yields while a one percent increase in international reserve would lead to a decrease in sovereign yields by 6.5 basis points. The effect of external debt on the other interest rates is not statistically significant. Finally, in their results, dollarization has a statistically significant negative effect only on foreign-currency deposits: an increase of one percentage point in the ratio of foreign-currency deposits to total deposits reduces the interest rate on foreign-currency deposits by 7.7 basis points.

Pioneering works on interest rate determination in emerging economies are those of Edwards (1984 and 1986) in which he proposes a set of macroeconomic

variables that can affect the sovereign risk spread component of emerging markets interest rates. Along the same lines, a number of authors have identified empirical country-specific determinants of the perceived sovereign risk spread (debt-to-GDP ratio, international reserves-to-GDP ratio, debt service ratio, export and import growth rates, domestic inflation rate, net foreign assets, terms of trade and real exchange rate, etc. . .). Also, external shocks as measured by real oil price and international interest rate were extensively tested as determinants of sovereign spreads. One of the first papers that followed this approach is Min (1998).

González-Rozada and Yeyati (2008) show that a large fraction of the variability of emerging market bond spreads is explained by the evolution of global factors such as risk appetite (as reflected in the spread of high yield corporate bonds in developed markets), global liquidity (measured by the international interest rates) and contagion (from systemic events like the Russian default). Hartelius et al. (2008) indicate that fundamentals, as embedded in credit ratings, are very important, but that expectations of future U.S. interest rates and volatility in those expectations are also a key determinant of emerging market spreads. Bellas et al. (2010) argue that fundamentals are significant determinants of emerging market sovereign bond spreads, while in the short run financial volatility is a more important determinant of spreads than fundamentals indicators. In Baldacci et al. (2008), political risk plays a significant role in sovereign bond spreads in emerging countries, but fiscal variables remain the most important factor. Comelli (2012) argues that the impact and significance of country-specific and global explanatory variables on bond spreads varies across regions, as well as economic periods and emphasizes the role played by global financial liquidity conditions among determinants of spreads.

The literature regarding the global transmission of interest rates is also important for our current work as we focus specifically on the pass-through from US interest rates to the Lebanese interest rates in the context of the country's dollarized banking sector. This literature is very rich; therefore we will only refer to few works supporting our analysis in the Lebanese context.

Frankel et al. (2004), using a large sample of developing and industrialized economies during 1970–1999, could not reject full transmission of international interest rates in the long run, even for countries with floating regimes. Only a couple of large industrial countries can choose their own interest rates in the long run. However, short-run effects differ across regimes: interest rates of countries with more flexible regimes adjust more slowly to changes in international rates, implying some capacity for monetary independence.

Edwards (2010) concluded that the degree of pass-through of U.S. Federal Funds interest rate to 8 emerging markets in Asia and Latin America is smaller than one. Miniane and Rogers (2003) estimate the effect of identified U.S. monetary shocks on the exchange rate and interest rates of twenty-six countries. They find that in highly dollarized countries, interest rates rise by more and currencies depreciate by less compared to their lowly dollarized counterparts. Finally, Chow (2014) provides some more empirical evidence supporting the view that Asian economies are still constrained by the open economy trilemma. The

strength of interest rate pass-through is thus related to each country's trilemma configuration.

3 Theoretical background

We extend the model in Edwards and Khan (1984) to a dollarized emerging economy. This model describes the determination of interest rates in a developing country which is partially open to capital flows. It combines closed-economy determinants (Fisher equation) and open-economy determinants (interest rate parity). We adapt it to the Lebanese economy taking into account the following features: interest-bearing deposits in local currency along with interest-bearing foreign currency deposits, fixed exchange rate without any modification of the parity for a long time, country risk premium and uncovered interest rate parity, and monetary financing of public deficits.

The nominal interest rate i_t is specified as follows:

$$i_t = \psi(i_t^* + \dot{e}_t + z_t) + (1 - \psi)(r_t + \pi_t^e) \quad (1)$$

where i_t^* is the foreign interest rate, \dot{e}_t the expected rate of depreciation of the domestic currency, z_t the country risk premium, r_t the real interest rate, π_t^e the expected inflation rate, and ψ a parameter (measure of the degree of financial openness of the country). The first component of Eq. (1) represents the uncovered interest rate parity (UIP) and the second the Fisher equation.

The domestic interest rate responds with a delay to any changes in the expected return of foreign financial assets (due to transaction costs, information lags or any other kind of frictions)²:

$$\Delta i_t = \theta [(i_t^* + \dot{e}_t + z_t) - i_{t-1}]$$

where Δ is the first difference operator, and θ the adjustment parameter ($0 \leq \theta \leq 1$). It follows:

$$i_t = \theta (i_t^* + \dot{e}_t + z_t) + (1 - \theta)i_{t-1} \quad (2)$$

The real interest rate is influenced by a liquidity effect. It deviates from its (constant) long-term equilibrium level, ρ , if there is any excess money supply ($EMS > 0$) in the money market:

$$r_t = \rho - \lambda EMS_t + \omega_t \quad (3)$$

where λ is a parameter ($\lambda > 0$) and ω_t an error term.

The excess money supply is defined as:

$$EMS_t = m_t - m_t^d \quad (4)$$

where m_t is the (log of) actual stock of money and m_t^d the (log of) desired equilibrium stock of real money balances. The demand for money (narrow

²In the Lebanese case, deviations from the arbitrage condition are due to the fact that non-residents are not allowed to borrow in local currency and there are no derivative markets.

aggregate) is specified in a standard manner, except that interest rates on local currency deposits (LCD) and interest rates on foreign currency deposits (FCD) are also taken into account (if money is to be defined as a narrow aggregate):

$$m_t^d = \alpha_0 + \alpha_1 y_t - \alpha_2(\rho + \pi_t^e) - \alpha_3 \pi_t^e - \alpha_4 i_{FCD,t} + \alpha_5 i_{LCD,t} \quad (5)$$

where y_t is (the log of) real income, $(\rho + \pi_t^e)$ the long-term nominal interest rate, $i_{FCD,t}$ the interest rate on foreign-currency deposits, and $i_{LCD,t}$ the interest rate on local-currency deposits. If money were to be defined as a broad aggregate, then $\alpha_4 = \alpha_5 = 0$.

As for money supply, the stock adjusts according to the following mechanism:

$$\Delta m_t = \beta (m_t^d - m_{t-1})$$

where β is the adjustment coefficient ($0 < \beta < 1$). This process allows the nominal interest rate to return eventually to its equilibrium (long-term) level. It can also be written as:

$$m_t = \beta m_t^d + (1 - \beta)m_{t-1} \quad (6)$$

We can finally derive the reduced-form equation for the nominal interest rate by using Equations (2)-(6) in (1):

$$i_t = \gamma_0 + \gamma_1 i_{t-1} + \gamma_2 (i_t^* + \dot{e}_t + z_t) + \gamma_3 y_t + \gamma_4 \pi_t^e + \gamma_5 i_{LCD,t} + \gamma_6 i_{FCD,t} + \gamma_7 m_{t-1} \quad (7)$$

with

$$\begin{aligned} \gamma_0 &= (1 - \psi) [\rho + \lambda(1 - \beta)(\alpha_0 - \alpha_2 \rho)] \\ \gamma_1 &= \psi(1 - \theta) \\ \gamma_2 &= \psi \theta \\ \gamma_3 &= (1 - \psi) \lambda(1 - \beta) \alpha_1 \\ \gamma_4 &= (1 - \psi) [1 - \lambda(1 - \beta)(\alpha_2 + \alpha_3)] \\ \gamma_5 &= (1 - \psi) \lambda(1 - \beta) \alpha_5 \\ \gamma_6 &= -(1 - \psi) \lambda(1 - \beta) \alpha_4 \\ \gamma_7 &= -(1 - \psi) \lambda(1 - \beta) \end{aligned}$$

With immediate adjustment to UIP, the lagged value of the nominal interest rate would disappear from Equation (7): $\theta = 1$ and $\gamma_1 = 0$.

International reserves and public debt are then explicitly incorporated into the model through monetary conditions and the interest rate parity.

- The effect of money supply m_t on the interest rate can be specified through counterparts of money supply: domestic assets (a_t) and international reserves (res_t). Domestic assets, in turn, are decomposed into loans to the private sector (l_t) and loans to the public sector (b_t). Indeed, a share of

domestic loans is used to finance public deficits. Public debt is either in local currency ($b_{LC,t}$) or in foreign currency ($b_{FC,t}$).³

- The expected rate of depreciation of the domestic currency is a negative function of international reserves and a positive function of public debt in foreign currency. As for the risk premium, it is a positive function of overall public debt as long as a higher level of public debt increases the probability of sovereign default (Bi, 2012). We can write:

$$\dot{e}_t = \delta_0 + \delta_1 res_{t-1} + \delta_2 b_{FC,t-1} \quad (8)$$

$$z_t = \mu_0 + \mu_1 b_t \quad (9)$$

with $\delta_1 < 0$, $\delta_2 > 0$ and $\mu_1 > 0$.⁴

Equation (7) can thus be rewritten using (8) and (9):

$$\begin{aligned} i_t = & \gamma_0 + \gamma_1 i_{t-1} + \gamma_2 i_t^* + \gamma_3 y_t + \gamma_4 \pi_t^e + \gamma_5 i_{LCD,t} + \gamma_6 i_{FCD,t} + \gamma_7 l_{t-1} \\ & + \gamma_8 b_{LC,t-1} + \gamma_9 b_{FC,t-1} + \gamma_{10} res_{t-1} \end{aligned} \quad (10)$$

with

$$\begin{aligned} \gamma_0 &= \theta\psi(\delta_0 + \mu_0) + (1 - \psi) [\rho + \lambda(1 - \beta)(\alpha_0 - \alpha_2\rho)] \\ \gamma_8 &= \theta\psi\mu_1 - (1 - \psi)\lambda(1 - \beta) \\ \gamma_9 &= \theta\psi(\delta_2 + \mu_1) - (1 - \psi)\lambda(1 - \beta) \\ \gamma_{10} &= \psi\theta\delta_1 - (1 - \psi)\lambda(1 - \beta) \end{aligned}$$

and parameters γ_1 to γ_7 as previously defined.

The effect of public debt on domestic interest rates is ambiguous (sign of parameters γ_8 and γ_9) because there are two opposite effects: there is a positive effect (first part of the parameters) through the risk premium and the expected depreciation rate, and there is a negative effect (second part of the parameters) because domestic banking loans to the public sector increase liquidity in the economy. In contrast, the effect of international reserves is unambiguously negative: $\gamma_{10} < 0$ since $\delta_1 < 0$. Finally, dollarisation has a negative effect on domestic interest rates (money market rates): its influence is captured in the interest rate on foreign-currency deposits $i_{FCD,t}$ and on loans in foreign currency which are part of domestic loans l_{t-1} (the sign of γ_6 and γ_7 is negative)

³Similarly, loans to the private sector are denominated in local currency ($l_{LC,t}$) and in foreign currency ($l_{FC,t}$).

⁴Restrictions are not necessary for the parameters (constants) δ_0 and μ_0 .

4 Data

We obtained balance of payment, public debt, and domestic commercial banks balance sheet and interest rates data from the Banque du Liban website “statistics and research” section. We obtained Lebanon generic 5Y Eurobond YTM, Lebanon 5 Years CDS, US generic 5Y Government YTM and JP Morgan EMBIG Index spread ⁵ data from Bloomberg. 1-Month, 3-Month LIBOR and VIX data were obtained from the St Louis FED website. We obtained Lebanon’s annual current prices and real GDP figures from the IMF WEO April 2017.

The sample for the empirical analysis is the period spanning from January 2002 to December 2016 as the data is available for all the aggregates during that period. All the data has been converted into USD Billions. Whenever the data is in LBP, it has been converted at the mid USD/LBP exchange rate of 1507.5, which has been fixed since December 1997. The fact that during all the sample period starting in January 2002 the exchange rate has been fixed excludes any bias that could come from currency valuation changes. We use monthly data series. We used the cubic spline transformation to obtain monthly nominal and real GDP figures from our IMF WEO yearly series.

The Gross Foreign Assets of the Consolidated Banking Sector (GFA_CBS) aggregate is important in dollarized economies in many ways: it is an important aggregate alongside the central bank’s international reserves when it comes to maintaining a currency peg. The central bank can potentially borrow foreign assets from the domestic banks in order to defend the external value of the domestic currency. It could also be seen as the “Dollar Liquidity” or “Dollar Money Base” in the economy.

Table 1 provides the descriptive statistics for the variables finally utilized in the analysis, and Table 2 displays correlation between the variables.

5 Regression tests

Like Égert et al. (2007), we use an autoregressive distributed lag model (ARDL). In our context this method has a number of advantages. First, as compared to VECM (utilized by Poddar et al., 2006), it relies on estimating a one-equation model, i.e., it assumes that left-side variables are exogeneous to the model. As we do not have monthly GDP series (only the constructed ones from annual series via cubic spline and thus unsuitable for regression analysis) nor monthly price levels, we can suppose that variables such as international reserves or gross foreign assets of the consolidated banking sector and even more USD Libor, US government bonds’ yields, EMBIG spread or VIX are not influenced themselves by the interest rate in Lebanon. These variables, in line with the theoretical analysis carried out above in section 2, can be legitimately hypothesized to influence interest rates in a small dollarized economy maintaining a fixed exchange rate to the U.S. Dollar. Thus, following Wickens and Breusch (1988)

⁵We use EMBIG (Emerging Market Bond Index Global) to capture sovereign risk premium as in Baldacci et al. (2008), Edwards (2010), and Comelli (2012)

subsequently we estimate first the following equation:

$$i_t = \gamma_0 + \gamma_1 t + \sum_{k=1}^p \psi_k i_{t-k} + \sum_{j=1}^m \sum_{l_j=0}^{q_j} \beta_{j,l_j} x_{j,t-l_j} + \epsilon_t \quad (11)$$

where: i_t is the relevant interest rate at time t (respectively, deposit interest rate or Lebanese Eurobond yield to maturity), γ_0 is a constant, γ_1 is a coefficient associated with a linear trend, ψ_k are coefficients associated with lags of i_t and β_{j,l_j} coefficients associated with lags of m regressors $x_{j,t}$ for $j = 1, \dots, m$ and ϵ_t is the standard error term. When estimating these models for each set of regressors, the optimum number of lags of each variable is selected according to Schwartz criterion (with a maximum of 12 for both interest rate and exogenous regressors). Such an ARDL model can be also expressed as a long-run relationship with the error correction term representing a cointegrating relationship (Pesaran, Shin, & Smith, 2001). The advantage of such a procedure is that it allows to ignore the exact order of integration of variables (more precisely, it allows for a test of cointegrating relationship that is robust to whether variables of interest are I(0), I(1) or mutually cointegrated). In tables 3 and 4, we report, respectively the results of the long-run relationships and bounds tests.⁶

In general, we are able to confirm most of intuitions coming from the literature and the theoretical model above. First, while testing for a “pure pass-through” model (i.e., containing only the relevant foreign interest rate, models (1) in Tables 3 and 4), we are able to see that in such a case the coefficient on the foreign rate is highly significant and not significantly different from 1. However, for the deposits’ rate we are unable to reject the null of no long-run relationship. In the remaining estimates (2) - (6) in Table 3 and (2) - (7) in Table 4 we test models containing a foreign interest rate, an international measure of risk (VIX or EMBIG spread) and a domestic factor of risk as gross public debt to GDP, international reserves to GDP (providing for more security) or GFA_CBS_GDP. In the case of M2 or remittances - an important source of foreign currency in a dollarized economy - these variables cannot be seen as directly measuring risk, but may clearly influence the level of the interest rate from the supply side. We are also unable to test a bigger number of risk factors in the same regression, as they are very significantly correlated, as can be seen in Table 4.

In each case of models (2) - (6) presented in Table 3 as well as all models presented in Table 4 (with an exception of model (4) we are able to strongly reject the null hypothesis of no long-run relationship by bounds tests.⁷ After

⁶For parsimony, we do not report here the direct results of estimating equation (11). They are available from the Authors upon request. Interestingly, they attain R^2 levels of order 0.86-0.96 for the 5Y Eurobond YTM and even 0.96 - 0.99 for the deposits rate. Obviously, the interest rates are also strongly auto-correlated (with coefficients on the first lag of the order of 0.6-0.8 in case of the Eurobond YTM and sometimes even exceeding 1 for the deposit rate - in this case compensated by negative coefficients on higher lags).

⁷For the sake of caution, we refer to critical values as provided by Narayan (2005), for finite samples of 80 observations (the maximum number he provided), as the critical values provided by Pesaran et al. (2001) are appropriate for large samples. The ours (of 150-

including risk factors, the long-term pass-through coefficients are in most cases clearly lower than unity, but always positive and highly significant. We are able to confirm the hypotheses that gross foreign assets of the consolidated financial sector (as a ratio to GDP) clearly decrease interest rates, however, the impact of international reserves seems even stronger (models (2) and (4) of Table 3 as well as (3) and (4) of Table 4). Gross public debt as a share of GDP clearly represents a risk factor and increases the interest rates, but in terms of absolute value it is weaker than GFA, international reserves or M2 for the deposits rate. On the other hand, it has a relatively stronger influence on the Eurobonds of the Lebanese government (which is quite intuitive), in this case quantitatively comparable to that of international reserves (in terms of absolute value - cf. models (2) and (6) vs. (4) and (7) in Table 3). Interestingly, quantitatively the influence of the money supply M2 as a share of GDP is stronger than either GFA, public debt or international reserves. Somewhat surprisingly strong effect comes from remittances, but in spite of its strength it is significant only at 10% level and the lack of no long-run relationship is very strongly rejected by the F-bounds test whereas much less convincingly by the t-Bounds test.

Interestingly, the pass-through to Eurobond YTM rate seems slightly stronger in terms of significance (although not necessarily systematically greater quantitatively) from the LIBOR rate than from the corresponding US rate (YTM on 5y treasuries). Also, EMBIG spread performs better as an international risk factor than VIX. The bottom line is, however, that the formation of Lebanese interest rates is clearly influenced by three types of factors: international interest rates, international risk factor as well as domestic factors (either risk or money supply side).

6 Conclusion

This paper attempted to assess the interest rate formation in Lebanon - a significantly dollarized small open economy with a fixed exchange rate regime. The interest rates in Lebanon, in line with theoretical considerations, are significantly influenced by three types of factors - international (US dollar) interest rates, international measures of risk (or risk appetite) as well as domestic variables characterizing the evolution of the country risk profile or the supply of money (including dollar deposits fuelled by remittances). In particular, we found that the public debt has a strong positive effect on Lebanese interest rates (deposit rate in Lebanese pounds and 5 year Lebanon Eurobonds) whereas international reserves have a negative and stronger impact on them. This is in line with the results obtained by Poddar et al. (2006) but the latter rely on external debt instead of public debt, and are associated with a higher impact of international reserves than in our estimates. In contrast, we found that the degree of pass-through from U.S. interest rates to Lebanese interest rates is higher than in their estimates, and even above unity in some cases.

270 observations) are certainly larger than the Narayan's, they are also clearly smaller than necessary for asymptotical distributions.

The avenues for further research include exploration of some proxies of domestic economic activity and prices - then more prone to be explored by a vector auto-regression or even more probably vector error correction model given the cointegration of variables detected by the bounds tests in the present study. Additionally, cross-checking of the presented results with some cointegration testing according to standard Johansen-Juselius or Engel-Granger procedures might provide for their robustness (preliminary results clearly confirm that). Finally, checking Granger causality, including augmented Granger causality (via the Toda-Yamamoto procedure) would constitute an additional proof of influence the analyzed factors exert on Lebanese interest rate. And obviously, analogical studies applied to other developing economies are called for.

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TABLES

Table 1 Descriptive statistics

	LBP_DEP_RATE	LEB_5Y_YTM	LIBOR1M_USD	REM_GDP	M2_GDP	GPD_GDP	GFA_CBS_GDP	US_GOV_5Y_YTM	VIX	EMBIG_SPREAD
Mean	8.8471	6.5041	2.8572	0.0051	0.7865	1.3603	1.1743	3.6765	20.0567	4.2642
Median	7.5200	6.0490	2.4613	0.0051	0.7624	1.3765	1.2148	3.6943	18.0300	3.6919
Maximum	19.0900	13.9530	6.8038	0.0592	1.0553	1.8860	1.5070	7.8270	62.6400	10.0100
Minimum	5.3700	4.5400	0.1505	-0.0078	0.4118	0.4936	0.6512	0.5810	10.8200	1.5486
Std. Dev.	3.2136	1.5503	2.3666	0.0054	0.1653	0.3285	0.1954	1.9631	7.8930	1.8787
Skewness	0.6996	1.0320	0.1446	5.4914	-0.0131	-0.6539	-0.8379	0.1177	1.9397	1.0093
Kurtosis	2.4221	4.8824	1.3313	57.3644	1.7691	2.6710	3.3353	1.7635	9.0148	3.2740
Jarque-Bera	26.4521	49.4238	33.1048	23070.84	17.4958	20.9918	22.1486	18.2852	591.2418	35.2719
Probability	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0001	0.0000	0.0000
Sum	2450.6600	988.6205	791.4549	0.9125	217.8675	376.8045	213.7233	1018.3790	5555.71	869.9015
Sum Sq. Dev.	2850.2520	362.9238	1545.8420	0.0052	7.5449	29.7750	6.9077	1063.6150	17194.57	716.5130

Table 2 Correlation table between dependent and independent variables

	LBP_DEP_RATE	LEB_5Y_YTM	LIBOR1M_USD	REM_GDP	M2_GDP	GPD_GDP	GFA_CBS_GDP	US_GOV_5Y_YTM	VIX	EMBIG_SPREAD
LBP_DEPOSITS_RATE	1.0000	0.8102	0.8240	0.1317	-0.8927	0.9259	-0.5213	0.8812	0.1048	-0.2103
LEB_5Y_YTM	0.8102	1.0000	0.7354	0.1615	-0.7893	0.8251	-0.5488	0.7092	0.2863	0.0465
LIBOR1M_USD	0.8240	0.7354	1.0000	0.2084	-0.8635	0.9175	-0.5084	0.9066	-0.1793	-0.5339
REM_GDP	0.1317	0.1615	0.2084	1.0000	-0.1698	0.1924	-0.0689	0.1618	0.0206	-0.0556
M2_GDP	-0.8927	-0.7893	-0.8635	-0.1698	1.0000	-0.8717	0.5397	-0.8320	0.0421	0.3485
GPD_GDP	0.9259	0.8251	0.9175	0.1924	-0.8717	1.0000	-0.5964	0.9354	-0.0350	-0.3037
GFA_CBS_GDP	-0.5213	-0.5488	-0.5084	-0.0689	0.5397	-0.5964	1.0000	-0.5613	0.3241	0.0054
US_GOV_5Y_YTM	0.8812	0.7092	0.9066	0.1618	-0.8320	0.9354	-0.5613	1.0000	-0.2083	-0.4696
VIX	0.1048	0.2863	-0.1793	0.0206	0.0421	-0.0350	0.3241	-0.2083	1.0000	0.6895
EMBIG_SPREAD	-0.2103	0.0465	-0.5339	-0.0556	0.3485	-0.3037	0.0054	-0.4696	0.6895	1.0000

Table 3 ARDL Estimate results of long-run relationships for deposit rate in Lebanese Pounds

	(1)		(2)		(3)		(4)		(5)		(6)	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
LIBOR1M_USD	1.1349	0.0014	0.4814	0.0000	0.4481	0.0000	0.2581	0.0162	0.2042	0.0036	0.5028	0.0000
EMBIG_SPREAD			0.4106	0.0028	0.5408	0.0000	0.2810	0.0138	0.4030	0.0000	0.5486	0.0000
GFA_CBS_GDP			-2.3419	0.0318								
GPD_GDP					1.5779	0.0984						
INT_RES_GDP							-3.7208	0.0000				
M2_GDP									-6.1448	0.0000		
REM_GDP											193.92	0.0837
F-bounds test	2.7305		5.6843**		5.5273**		7.3213***		8.4775***		12.323***	
t-Bounds test	-2.3291		-4.6795***		-4.5960***		-5.3031***		-5.5046***		-3.7053*	
Obs.	274		182		204		181		204		175	

Notes: Model selection method: Schwarz criterion (SIC), maximum lags for dependent and independent variables: 12, fixed regressors: constant (if significant). For F-Bounds test and t-Bounds test *** / ** / * denote significance at 1% / 5% / 10% level, respectively, according to finite sample critical values (80), as proposed by Narayan (2005).

Table 4 ARDL Estimate results of long-run relationships for 5-year Lebanon Eurobonds in USD (yield to maturity).

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
US_GOV_5Y_YTM	1.0029	0.0000	0.4190	0.0107	1.1234	0.0001	0.9430	0.0079						
LIBOR1M_USD									0.8176	0.0000	0.5647	0.0000	0.7563	0.0000
EMBIG_SPREAD									0.5299	0.0007	0.4730	0.0041	0.4334	0.0093
VIX					0.0365	0.2193	0.0676	0.0046						
GFA_CBS_GDP					-3.2176	0.0564								
GPD_GDP			3.5327	0.0000							2.5756	0.0000		
INT_RES_GDP							-4.3866	0.0323					-2.2523	0.0819
F-bounds test	7.2431**		7.7214***		6.6592**		4.7230*		13.588***		9.2717***		10.580***	
t-Bounds test	-3.6825**		-4.6536***		-4.0721*		-3.4687		-5.9097***		-5.7091***		-5.4694***	
Obs.	150		151		151		150		151		151		150	

Notes: Model selection method: Schwarz criterion (SIC), maximum lags for dependent and independent variables: 12, fixed regressors: time dummies for October and November 2008, constant / 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 (80), as proposed by Narayan (2005).