Liquidity Determinants of Moroccan Banking Industry

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Abstract

This paper analyzes the behavior of Moroccan bank's liquidity during the period 2001 – 2012. The research aims to identify the determinants of Moroccan bank's liquidity. We first evaluate Moroccan banks' liquidity positions through different liquidity ratios to determine the effects of financial crisis on bank's liquidity. We then highlight the effect of banks' size on banks' liquidity. Finally, we identify determinants of Moroccan bank's liquidity using panel data regression. From results obtained, we can conclude that liquidity has decreased during the last decade. This decline has increased since 2007 with the financial crisis. We also conclude that banks' size is a determinant of banks' liquidity since liquidity is correlated with size of banks. Large banks are more liquid than small banks. Results show that in Morocco, liquidity is mainly determined by eleven 11 determinants: size of banks, share of own bank's capital of the bank's total assets, external funding to total liabilities, return on assets, foreign direct investment, monetary aggregate M3, foreign assets, growth rate of gross domestic product, public deficit, inflation ratio and the effects of financial crisis. Thus, liquidity of Moroccan banking industry is positively correlated with bank's size, share of own bank's capital of the bank's total assets, external funding to total liabilities, monetary aggregate M3, foreign assets, foreign direct investment and negatively correlated with return on assets, inflation rate, growth rate of gross domestic product, public deficit and financial crisis. However, bank's return on equity, equity to total assets and unemployment rate have no impact on Moroccan bank's liquidity.

1. Introduction

The financial turmoil of 2007 revealed the importance of liquidity for the smooth functioning of the global financial system. The crisis that erupted due to credit crisis linked to subprime mortgage credit was quickly transformed into a liquidity crisis causing bankruptcies, quasi-bankruptcies and nationalizations of large financial institutions. The global financial crisis has demonstrated the importance of establishing a level of liquidity sufficient to cope with adverse conditions. These tensions in the financial markets have highlighted serious flaws in the methods of management of liquidity risk of individual banks.

In 2000, the Basel Committee on Banking Supervision defined liquidity as "the ability to fund increases in assets and meet obligations as they come due" (BCBS, 2000). A more general definition was introduced in 2008 defining liquidity as "the ability of a bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses" (BCBS, 2008).

Liquidity risk is "the risk that a financial firm, though solvent, either does not have enough financial resources to allow it to meet its obligations as they fall due, or can obtain, such funds only at excessive cost" (VENTO and LAGANGA, 2009). In general, the bank collects short-term deposits and

transforms them into long-term loans. Liquidity risk appears when there are differences between the size and maturity of assets and liabilities on the balance sheet.

There are generally two types of liquidity risk: funding liquidity risk and market liquidity risk. Funding liquidity risk is the risk that the bank is not able to respond effectively to current needs as well as future cash needs without affecting its daily operations and financial condition. Market liquidity risk is defined as the risk that a bank cannot easily offset or eliminate a position without significantly affecting the market price.

Since 2007, Moroccan bank's liquidity has transit from a situation of liquidity excess to a persistence of liquidity deficit. Thus, after a period of abundant liquidity since 2001, the interbank market has experienced a continuous tightening of banks' liquidity which prompted the Moroccan Central Bank (BANK AL-MAGHRIB) to inject liquidity. Indeed, the financial crisis had a negative impact on several economic sectors and resulted in a decrease in tourist arrivals, a decline in foreign direct investment, a decline in exports, an increase of unemployment rate and closure of bank. In addition, Moroccan banks' liquidity becomes more and more disturbing. Thus, banks' cash deficit increased from 16 billion DH in 2011 to 66 billion in mid-April 2012.

This paper analyzes the behavior of Moroccan banks' liquidity during the period 2001 – 2012. The research aims to determine the effect of the financial crisis on Moroccan banks' liquidity, to define the relationship between banks' liquidity and its size and to identify the determinants of liquidity in Moroccan banks.

The paper is organized as follows. In section 2, we review the existing literature on bank's liquidity and its determinants. The methodology adopted in this paper is presented in section 3 while section 4 is devoted to the presentation of data. Results obtained are presented in section 5. Finally, section 6 offers conclusions.

2. Literature Review

Banks generally face liquidity risk which increases in times of crisis and then endanger the functioning of financial markets. VENTO and LAGANGA defined three methods to measure liquidity risk: the stock approach, the cash-flows based approach and the hybrid approach. The first approach looks at liquidity as a stock. This approach aims to determine the bank's ability to reimburse its short-terms debts obligations as a measurement of the liquid assets' amount that can be promptly liquidated by the bank or used to obtain secured loans. The idea behind this model is that each financial institution is exposed to unexpected cash outflows that may occur in the future due to unusual variations in the timing or extent therefore needs a quantity much higher than the cash amount required for banking projects. The second approach aims to safeguard the bank's ability to meet its payment obligations and calculating and limiting the liquidity maturity transformation risk, based on the measurement of liquidity-at-risk figures. The last approach combines elements of the stock approaches and of the cash-flows based approaches.

However, despite the importance of bank liquidity in financial crises, only a few studies have explored liquidity risk and its determinants. According to FIELDING and SHORTLAND (2005), liquidity in Egypt is positively determined by the discount rate, the rate of depreciation of the black market exchange rate and by the violent political incidence. Liquidity is negatively correlated with cash-to-deposit ratio and the economic reform. LUCCHETTA (2007) analyze the determinants of European banks' liquidity. Banks' liquidity is positively affected by the interbank interest rate, the bank's size and the behavior of the bank on the interbank market. However, an increase of monetary policy rate, share of loans on total assets and share of loan loss provisions on net interest revenues causes a decrease of bank's liquidity. BUNDA and DESQUILBET (2008) analyze determinants of emerging countries banks' liquidity. They conclude that banks' liquidity depends on the ratio of equity to assets, on the total assets, on the lending interest rate, on the rate of inflation, on the realization of financial crisis and on the exchange rate regime. In his study which provides an assessment of the main determinants of bank liquidity and the evaluation of the impact of banking crises on liquidity in Latin

America and the Caribbean, MOORE (2010) found that liquidity tends to be inversely related to the business cycle, interest rates, the volatility of cash to deposit ratio and the money market rate of interest. According to DELÉCHAT, HENAO, MUTHOORA and VTYURINA (2012), banks' liquidity buffers in Central America depends on bank size, profitability, capitalization and financial development.

Other studies that focused on the determinants of liquidity in Central Europe (Poland, the Czech Republic and Slovakia) were made by VODOVA (2011). These studies analyzed the banks liquidity positions and identified the determinants of bank liquidity. The main conclusion was the positive correlation between unemployment rate and liquidity. On the other hand, the author noted the negative impact of inflation, financial crisis and the size on banks liquidity.

3. Methodology

The purpose of this paper is to identify the determinants of Moroccan bank's liquidity. To do this, we first evaluate Moroccan bank's liquidity positions through different liquidity ratios to determine the effects of financial crisis on bank's liquidity. We then highlight the effect of banks' size on bank's liquidity. Finally, we identify determinants of Moroccan bank's liquidity.

As various authors provide the use of the stock approach (YEAGER and SEITZ, HEMPEL et al., FIELDING, LUCCHETTA, MOORE) which is the more popular both in the academic literature and in practice, we use in this paper following ratios:

$L_1 = \dfrac{Liquid\ assets}{Total\ assets} \times 100$, measures the ability of a bank to absorb liquidity shocks. A high ratio means a high ability to absorb shocks which can be interpreted as bank's efficiency since liquid assets yield lower income and incur high opportunity costs for the bank.

$L_2 = \dfrac{Liquid\ assets}{Short\ term\ liabilities} \times 100$, measures the ability of a bank to cope a high demand of short term liquidity. A high ratio means that the bank is liquid at short-term.

$L_3 = \dfrac{Liquid\ assets}{Deposits} \times 100$, measures bank's liquidity in the case that the bank cannot borrow from other banks. A high ratio means that the bank is able to cope long term liquidity risk.

$L_4 = \dfrac{Loans}{Total\ assets} \times 100$, measures the share of loans in total assets. It shows the percentage of the bank's assets related to illiquid loans. When this ratio is high, it means that the bank is less liquid.

$L_5 = \dfrac{Loans}{Deposits + SHort\ term\ liabilities} \times 100$, measures the relationship of illiquid assets and liquid liabilities. When this ratio is high, it means that the bank is less liquid.

$L_6 = \dfrac{Bank's\ loans - customer\ deposits}{Total\ assets}$, measures liquidity risk exposure. A high ratio means a high exposure to liquidity risk. Defined as the difference between a bank's loans and customer deposits, financing gap is divided by total assets to standardize and get the ratio of financing gap to total assets (FGAPR).

Table 1:   Moroccan banks' balance sheet's schematic representation

ASSETS	LIABILITIES
Liquid assets	Short-term liabilities
Loans to credit institutions and equivalent	Liabilities to credit institutions and equivalent
Loans and advanced to customers	Customers deposits
Other assets	Other liabilities
Total Assets	**Total Liabilities**

Our methodology consists on the calculation of different ratios presented above. We calculate descriptive statistics of each ratio to show the impact of the financial crisis on the Moroccan banks during the period 2001-2012. We then analyze the relationship between banks' size and bank's liquidity. To conduct this analysis, we divided banks studied in two groups: small banks with total assets less than 150 billion dirham and large banks whose capital exceeds 150 billion dirham. This classification allowed us to place BANQUE MAROCAINE POUR LE COMMERCE ET L'INDUSTRIE (**BMCI**), CREDIT AGRICOLE DU MAROC (**CAM**) and CREDIT DU MAROC (**CDM**) in the first group and ATTIJARIWAFA BANK (**AWB**), BANQUE CENTRALE POPULAIRE (**BCP**), BANQUE MAROCAINE DU COMMERCE EXTERIEUR (**BMCE**), CREDIT IMMOBILIER ET HOTELIER (**CIH**), SOCIETE GENERALE MAROCAINE DE BANQUES (**SGMB**) in the second group.

The last aim of the research is to identify determinants of Moroccan banks' liquidity. To do this, we use a panel data regression. Thus, we estimate for each of the previously defined ratios the following equation:

$$L_{it} = \alpha + \beta.X_{it} + \delta_i + \varepsilon_{it}$$

with: L_{it} one of different liquidity ratios for bank i at time t, α a constant; X_{it} vector of explanatory variables for bank i at time t; β coefficient which represents the slope of variables; δ_i fixed effects on the bank i and ε_{it} the error term. The use of panel data regression is justified by the fact that panel data analysis is a more accurate inference of model parameters and a simplifying computation and statistical inference. It has a greater capacity for capturing the complexity of human behavior than a single cross-section or time series data including constructing and testing more complicated behavioral hypotheses, controlling the impact of omitted variables, uncovering dynamic relationships, generating more accurate predictions for individual outcomes by pooling the data rather than generating predictions of individual outcomes using the data on the individual in question and providing micro foundations for aggregate data analysis (HSIAO, 2007).

It is important to choose the most appropriate explanatory variables. The selection of these variables is made on the basis of previous studies. We also take into account other factors that may affect the liquidity of banks Moroccan. The explanatory variables that we use in this study are: logarithm of the total assets of the bank LAGA to measure the size of banks; share of own bank's capital of the bank's total assets CTA; return of assets ROA; return on equity ROE; external funding to total liabilities EFL; equity to total assets ETA; unemployment rate UNE; inflation rate INF; growth rate of gross domestic product GDP; foreign direct investment FDI; monetary aggregate M3; foreign assets FA; public deficit PD and a variable that we simulated for detecting the realization of the financial crisis FIC. The value of this variable is 1 for the years 2008, 2009 and 2010 and 0 for the other years.

It should be noted that the sources of information for the specific variables are banks' annual reports and banks' annual financial statements (LAGA, CTA, ROA, ROE, EFL, ETA), while the sources of information on macroeconomic variables (UNE, INF, GDP, FDI, M3, FA, PD and FIC) are the databases of the World Bank, the International Monetary Fund, the Moroccan Ministry of Economy and Finance and the Moroccan High Commission for Planning.

We estimate the equation $L_{it} = \alpha + \beta. X_{it} + \delta_i + \varepsilon_{it}$ separately for each of the five ratios already defined. We gradually change the components of the vector of explanatory variables X_{it}. The aim is to find the model with the highest coefficient adjusted R-squared and choose the statistically significant variables.

4. Data

The data used in this paper are obtained from annual reports and annual financial statements of the commercial Moroccan banks for the period 2001-2012 and from databases of the World Bank, the International Monetary Fund and the Moroccan High Commission for Planning. Our study concerns Moroccan commercial banks, thus we have listed the various existing banks in Morocco in the last decade during a minimum of seven (7) years to capture the effects of the financial crisis. We then

selected banks that have existed throughout the study period and whose financial statements are available. We obtained eight (8) banks which are the largest Moroccan banks.

Table 2: List of commercial Moroccan banks for the period 2001 – 2012

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
ATTIJARIWAFA BANK (AWB)			X	X	X	X	X	X	X	X	X	X
BANQUE CENTRALE POPULAIRE (BCP)	X	X	X	X	X	X	X	X	X	X	X	X
BANQUE MAROCAINE DU COMMERCE EXTERIEUR (BMCE BANK)	X	X	X	X	X	X	X	X	X	X	X	X
BANQUE MAROCAINE POUR LE COMMERCE ET L'INDUSTRIE (BMCI)	X	X	X	X	X	X	X	X	X	X	X	X
CREDIT AGRICOLE DU MAROC (CAM)	X	X	X	X	X	X	X	X	X	X	X	X
CREDIT DU MAROC (CDM)		X	X	X	X	X	X	X	X	X	X	X
CREDIT IMMOBILIER ET HOTELIER (CIH)			X	X	X	X	X	X	X	X	X	X
SOCIETE GENERALE MAROCAINE DE BANQUES (SGMB)						X	X	X	X	X	X	X
NUMBER OF BANKS	**4**	**5**	**7**	**7**	**7**	**8**	**8**	**8**	**8**	**8**	**8**	**8**

5. Results
5.1. Descriptive Statistics for Liquidity Ratios

Descriptive statistics measured for the ratio L1 are presented in Table 2. As has already been presented, the greater the value of this ratio is, the more the bank is liquid and has a high capacity to absorb liquidity shocks. From the observation of the ratio's mean of L1, it is clear that the Moroccan banks' liquidity has declined over the period, mainly between 2006 and 2011. However, we note an increase of L1 between 2001 and 2005 explained by the fact that Moroccan banks hold a large share of liquid assets mainly treasury bills and cash values.

Table 3: Descriptive statistics for liquidity ratios (en %)

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
L1	Mean	22,75	24,07	28,36	28,72	29,02	24,79	22,19	21,45	21,73	15,53	15,21	16,39
	Median	24,23	24,76	26,89	28,28	28,30	23,16	18,96	17,28	18,31	14,72	15,17	15,20
	Std-deviation	4,95	3,57	8,20	4,90	4,94	6,03	7,56	9,35	9,89	4,02	4,83	5,57
	Maximum	28,41	28,28	40,96	35,21	35,78	33,73	34,72	39,87	40,76	21,95	21,27	22,67
	Minimum	16,68	19,56	19,51	22,62	23,87	18,07	14,70	15,79	14,00	10,78	9,60	10,05
L2	Mean	53,45	52,54	61,74	61,28	56,45	50,69	49,95	50,98	50,11	34,36	35,42	36,46
	Median	56,69	51,83	53,17	52,28	47,78	47,52	44,61	49,72	44,87	35,88	31,50	31,82
	Std-deviation	19,32	18,46	25,87	14,61	12,87	14,38	20,34	13,29	14,83	6,08	10,29	11,27
	Maximum	73,00	74,81	91,38	81,12	72,60	69,26	83,00	71,24	75,34	41,59	50,14	51,07
	Minimum	27,43	31,69	28,64	48,30	45,84	32,49	32,49	35,20	36,00	24,89	24,19	24,83
L3	Mean	55,89	95,33	80,85	90,57	93,99	58,66	54,47	57,28	55,39	37,88	37,23	37,14
	Median	55,40	55,46	73,04	77,51	94,08	51,53	47,96	48,04	44,17	26,78	35,25	34,76
	Std-deviation	17,97	72,31	29,47	31,35	42,06	17,19	18,95	34,07	34,98	23,88	17,53	18,63
	Maximum	77,63	178,80	124,23	143,57	159,89	85,05	78,82	116,64	123,58	83,02	60,98	65,60
	Minimum	35,14	51,72	51,29	66,66	54,26	43,82	32,49	34,15	25,20	22,11	15,97	17,83

Table 3: Descriptive statistics for liquidity ratios (en %) - continued

L 4	Mean	54,81	58,13	51,96	53,06	53,58	53,76	63,26	66,77	65,97	73,02	75,83	76,48
	Median	68,26	69,56	59,19	59,07	58,94	62,41	64,51	70,63	65,70	75,13	76,70	77,53
	Std-deviation	26,14	22,79	23,87	24,47	23,06	26,01	8,59	8,72	15,27	13,65	8,85	10,71
	Maximum	70,41	74,43	72,95	75,08	76,27	71,97	73,09	76,72	85,69	87,52	85,79	86,75
	Minimum	9,35	19,83	11,96	10,99	14,60	7,87	50,10	55,59	43,16	51,37	63,04	62,14
L 5	Mean	71,20	62,42	62,66	65,81	62,72	70,49	75,71	75,49	82,85	80,89	162,51	160,66
	Median	81,82	70,19	66,86	67,12	71,76	73,02	81,19	78,52	83,96	82,89	166,61	159,10
	Std-deviation	34,16	35,29	31,33	31,26	31,18	9,36	10,71	17,75	14,77	9,39	46,27	40,68
	Maximum	99,57	96,30	98,44	101,60	88,68	80,60	87,43	95,97	97,45	93,86	226,96	220,33
	Minimum	21,61	13,00	11,98	15,97	8,54	57,66	63,63	47,88	58,98	69,53	90,92	86,08
L 6	Mean	0,27	-0,03	-0,03	-0,08	0,04	-0,26	-0,26	0,09	0,11	0,10	0,20	0,21
	Median	0,14	-0,08	-0,07	-0,07	-0,06	-0,20	-0,13	0,09	0,08	0,08	0,12	0,14
	Std-deviation	0,44	0,17	0,24	0,34	0,34	0,38	0,38	0,46	0,19	0,11	0,21	0,19
	Maximum	0,87	0,20	0,35	0,43	0,78	0,07	0,03	0,87	0,48	0,25	0,61	0,59
	Minimum	-0,09	-0,20	-0,25	-0,62	-0,22	-1,12	-1,06	-0,61	-0,13	-0,06	0,02	0,03

The financial crisis had a negative impact on the liquidity of Moroccan banks. This effect increased between 2010 and 2012 which is explained by the decrease of the mean, of the maximum and of the minimum value. However, the increase in the standard deviation in times of crisis (2007 and 2008) shows that the effect of the crisis was not the same for all banks. Thus, BMCE BANK, BMCI, CAM, AWB and CDM experienced a decrease of liquid assets to total assets from 2007, while ratio of liquid assets to total assets for BCP increased in the same period.

The second ratio measures bank's ability to face a high demands of liquidity in short-term. The results show that liquidity of Moroccan banks declined in short-term during in the last decade, mainly from 2005. This decline has been exacerbated by the financial crisis since between 2009 and 2010, the ratio L2 fell 15 points. The maximum and minimum value and the standard deviation decreased between 2001 and 2012 which means that all banks have experienced a decline in short-term liquidity. These results reinforce previous evidence. However, we note that this ratio has increased during the period 2001-2004.

The results for the ratio L3 show that Moroccan banks are less liquid in the long term. In fact, the mean dropped 35 points between 2005 and 2006 and 18 between points between 2009 and 2010. It should be noted that L4 increased sharply between 2001 and 2002, which is mainly explained by the increase of the ratio L3 for BCP whose share of liquid assets to deposits ratio increased from 77.63% to 178.80%. This evolution is justified by higher cash values that are passed from 661 million dirhams to 5 billion dirhams due to the injection of the amount relating to the monetary reserve in the account of the BCP held in the Moroccan Central Bank.

The ratio of loans to total assets measured by L4 has increased sharply since 2007. This ratio measures the percentage of the bank's assets related to illiquid loans which means that Moroccan banks' liquidity decreased from 2007. We note that the standard deviation and the difference between the maximum value and the minimum value has fallen sharply in 2007 and 2008 which means that the effect of the crisis was the same for all banks.
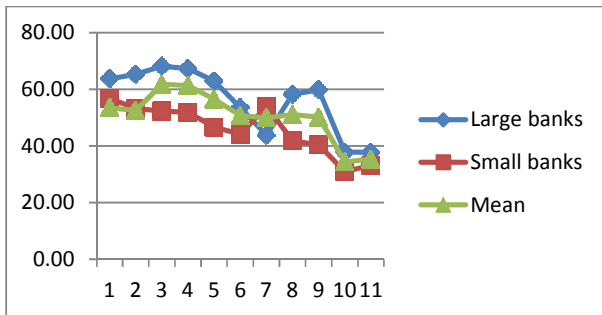
Descriptive statistics of ratio L5 – the mean, the minimum and the maximum - show that this ratio has increased sharply since 2007. This increase is explained by the sharp increase in claims on credit institutions and customers for CAM, the BCP, AWB and CDM. Results for ratio L6, which measures the liquidity risk exposure, show that Moroccan banks are more exposed to liquidity risk since 2008. This result can be explained by the effect of the financial crisis. Thus, ratio L6 was negative between 2002 and 2007 which means the absence of liquidity risk and positive between 2007 and 2012 which means a high exposure to liquidity risk.

From different results obtained, we can conclude that liquidity has decreased during the last decade. This decline has increased since 2007 with the financial crisis. In what follows, we will analyze in more detail the evolution of liquidity in the Moroccan banking system. To do this, we analyze relationship between banks' size and banks' liquidity.

5.2. Liquidity Ratios by Group of Banks

In what follows, we will analyze the relationship between banks' size and banks' liquidity. To conduct this analysis, we divided banks studied in two groups: small banks with total assets less than 150 billion dirham and large banks whose capital exceeds 150 billion dirham. This classification allowed us to place BANQUE MAROCAINE POUR LE COMMERCE ET L'INDUSTRIE **(BMCI)**, CREDIT AGRICOLE DU MAROC **(CAM)** and CREDIT DU MAROC **(CDM)** in the first group and ATTIJARIWAFA BANK **(AWB)**, BANQUE CENTRALE POPULAIRE **(BCP)**, BANQUE MAROCAINE DU COMMERCE EXTERIEUR **(BMCE)**, CREDIT IMMOBILIER ET HOTELIER **(CIH)**, SOCIETE GENERALE MAROCAINE DE BANQUES **(SGMB)** in the second group.
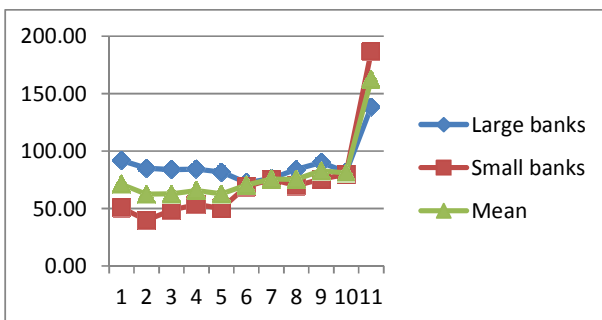
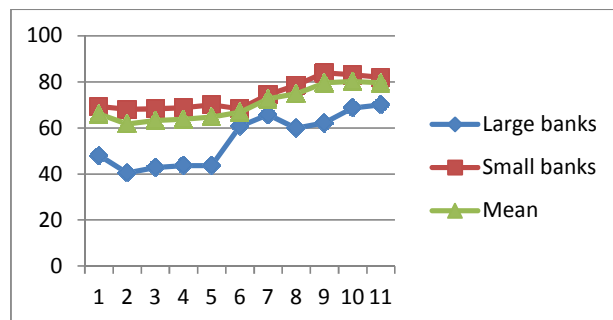**Graph 1:** Evolution of ratio L_1 by group of banks (%)   **Graph 2:** Evolution of ratio L_2 by group of banks (%)
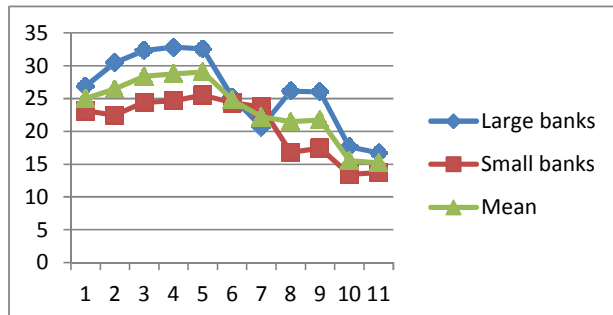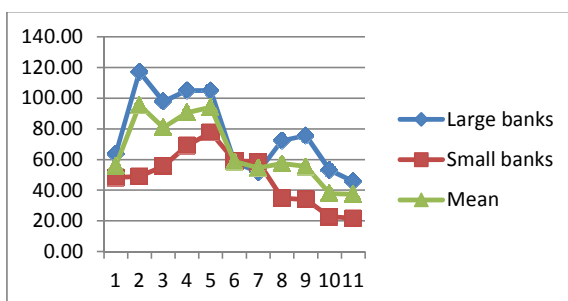

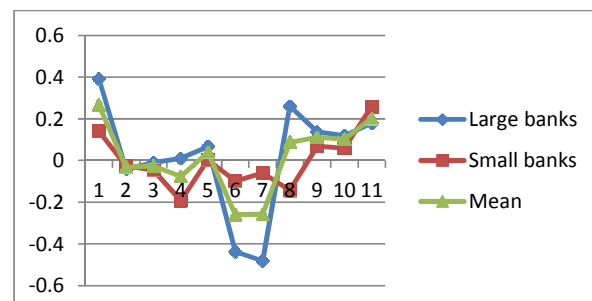**Graph 3:** Evolution of ratio L_3 by group of banks (%)   **Graph 4:** Evolution of ratio L_4 by group of banks (%)

Graph 5: Evolution of ratio L_5 by group of banks (%)   **Graph 6:** Evolution of ratio L_6 by group of banks (%)

Graph 1 shows that the ratio L1 decreases with the size of the bank: small banks are less liquid than large banks. Large banks have a high capacity to absorb liquidity shocks than small banks. However, in 2007, small banks have become more liquid than large banks. The ratio L2 decreased during the period 2001-2012. However, despite the decrease of this ratio, large banks are more liquid

than small banks. This situation was reversed in 2007 as the short-term liquidity of large banks falls and became lower than the short-term liquidity of small banks.

In the long term, large banks are more liquid than small banks (Graph 3). In 2011, ratio L3 increased for both large and small banks. This is due to the increase of the ratio of liquid assets to deposits. For large banks, this ratio has increased from 84.42% to 153.32% for BMCE, from 85.67% to 180% for ATTIJARIWAFA BANK, and from 69.52% to 227% for the BCP. For small banks, this ratio increased from 93.86% to 184.77% for CREDIT DU MAROC, from 70.48% to 90.91% for BMCI and from 81.37% to 139.21% for CREDIT AGRICOLE.

The evolution of ratio L4 is shown in graph 4. Indeed, we note that the share of loans in total assets has increased between 2001 and 2011. However, we remark that the ratio L4 of large banks is less than L4 of small banks. We conclude that big banks are more liquid than small banks. This result confirms the previous results.

Regarding the ratio L5 measuring the share of illiquid assets in liquid liabilities, there is a decrease for both groups of banks, which confirms the decrease Moroccan banks' liquidity between 2001 and 2011. Graph 6 shows that the ratio L6 decreases between 2001 and 2007 and increases between 2008 and 2012. Indeed, large banks and small are both expose to liquidity risk. However, small banks seem to be less exposed to liquidity risk than large banks.

From results obtained, we conclude that banks' size is a determinant of banks' liquidity since liquidity is correlated with size of the bank. Large banks are more liquid than small banks.

5.3. The Determinants of Moroccan Banks Liquidity

Table 4 presents results obtained for studied ratios. Regarding the ratio L1, we note that the explanatory power of this model is moderate. Measuring the liquidity ratio L1 shows that liquidity is positively correlated with the size of the bank. This result confirms the results already obtained in the first part and show that large banks are more liquid than small banks. Small banks rely more on the interbank market and the Central Bank and large banks rely mainly on their own resources. Results show that liquidity ratio L1 is positively correlated with share of own bank's capital of the bank's total assets and with foreign direct investment. We also note that growth rate of gross domestic product is negatively correlated with liquidity. For the ratio L2 measuring short-term liquidity and which its explanatory power is low, results show that no variable is representative.

Table 4: Determinants of liquidity measured for ratios L1 to L5

L1			L2		
Variable	**Coefficient**	**Std. Error**	**Variable**	**Coefficient**	**Std. Error**
C	-125,1054*	73,45025	C	59,34659	1155,207
LAGA	37,67694*	18,03278	LAGA	-91,33828	28,36150
CTA	2,304161*	1,083574	CTA	2,795001	1,704217
ROA	0,191696	0,198640	ROA	-0,306034	0,312417
ROE	0,014580	0,119991	ROE	-0,041304	0,188718
EFL	-0,677820	2,790233	EFL	3,233426	4,388408
ETA	2,385297	6,565979	ETA	2,394644	10,32680
UNE	-3,299574	2,176082	UNE	-5,311789	3,422486
INF	0,407697	0,790080	INF	-0,581162	1,242618
GPD	-0,788962*	0,437018	GPD	-0,727246	0,687331
FIC	-1,079627	2,182606	FIC	-5,206877	3,432747
FDI	2,450234*	1,278743	FDI	3,156732	2,798813
M3	1,673487	17,65074	M3	2,867234	4, 209218
FA	0,157345	1,763424	FA	0,687233	3,763444
PD	2,543832	3,652376	PD	1,873474	0,763478
Adjusted R-squared	0,531603		Adjusted R-squared	0,273281	

Table 4: Determinants of liquidity measured for ratios L1 to L5 - continued

L3			L4		
Variable	**Coefficient**	**Std. Error**	**Variable**	**Coefficient**	**Std. Error**
C	19,75216*	11,55122	C	8,66360*	3,885441
LAGA	5,063268*	2,835941	LAGA	-21,62986*	9,538775
CTA	4,782005*	1,704091	CTA	-10,43342*	5,697200
ROA	-0,548914*	0,312394	ROA	2,432672*	1,047399
ROE	0,077134	0,188705	ROE	-0,364953	0,632045
EFL	13,61743*	4,388084	EFL	-28,76149*	14,62192
ETA	-20,45181	10,32604	ETA	-26,58014	34,70285
UNE	-4,051627	3,422234	UNE	-15,76738	11,37897
INF	-1,523582	1,242527	INF	10,07146*	4,145577
GPD	0,000277	0,687280	GPD	-0,177217	4,145577
FIC	-1,225918*	3,432495	FIC	2,534188*	2,654894
FDI	4,490267	2,005894	FDI	1,019808*	5,982609
M3	-0,555612*	0,569295	M3	-0,320646*	1,569368
FA	-1,008976*	1,088644	FA	-9,987630*	2,804206
PD	0,547475*	1,294173	PD	-3,489689	3,618077
Adjusted R-squared	0,809248		Adjusted R-squared	0,484118	
L5			L6		
Variable	**Coefficient**	**Std. Error**	**Variable**	**Coefficient**	**Std. Error**
C	-17,04010	24,20751	C	29,48552	41,87702
LAGA	77,79172	59,43190	LAGA	-4,181313	10,28123
CTA	-2,047977	3,751209	CTA	-0,051970	0,061779
ROA	0,047428	0,654673	ROA	-0,002817	0,011325
ROE	-0,128854	0,395462	ROE	-0,001817	0,006841
EFL	-7,959147	9,195968	EFL	0,045562	0,159083
ETA	26,23975	21,63996	ETA	0,707343	0,374354
UNE	21,52867	7,17866	UNE	-0,295887	0,124067
INF	0,040074	2,603923	INF	-0,147940*	0,045046
GPD	4,137689*	1,440311	GPD	-0,000950*	0,024916
FIC	8,976246*	7,193367	FIC	-0,218577*	0,124439
FDI	7,862309	4,194345	FDI	3,132111	7,245471
M3	-0,555612	0,569295	M3	0,035284	0,012333
FA	-1,008976	1,088644	FA	0,162590	0,023585
PD	0,547474	1,294173	PD	-0,022945*	0,028038
Adjusted R-squared	0,753926		Adjusted R-squared	**0,830721**	

* Variable statistically representative at the 5%

For the ratio L3, the explanatory power is strong. Results show that banks' size, share of own bank's capital of the bank's total assets, monetary aggregate M3, foreign assets and external funding to total liabilities are positively correlated with bank's liquidity. However, return on assets, public deficit and the simulated variable FIC decrease with liquidity.

The results of L4 and L5 ratios must be interpreted conversely since large ratio means low liquidity. Thus, a positive ratio is synonymous of negative correlation and vice versa. The explanatory power for the ratio L4 is moderate. Results for this ratio are almost the same for L3 and show that banks' size, share of own bank's capital of the bank's total assets, external funding to total liabilities, monetary aggregate M3 and foreign assets are positively correlated with bank's liquidity. In the other side, return on assets, inflation ratio and the financial crisis effects decrease with liquidity. The results of ratio L5, which its explanatory power is fairly strong, are the same as those already obtained. We found that growth rate of gross domestic product and the effects of financial crisis are negatively correlated with liquidity.

For the ratio L6, the explanatory power is strong. Results show that liquidity is negatively correlated with inflation ratio, growth rate of gross domestic product, public deficit and with the effects of financial crisis.

Thus, as can be seen, the results show that in Morocco, liquidity is mainly determined by eleven 11 determinants: size of banks (large banks are more liquid than small banks), share of own bank's capital of the bank's total assets, external funding to total liabilities, return on assets, foreign direct investment, monetary aggregate M3, foreign assets, growth rate of gross domestic product, public deficit, inflation ratio and the effects of financial crisis. Thus, liquidity of Moroccan banking industry is positively correlated with bank's size, share of own bank's capital of the bank's total assets, external funding to total liabilities, monetary aggregate M3, foreign assets, foreign direct investment and negatively correlated with return on assets, inflation rate, growth rate of gross domestic product, public deficit and financial crisis. However, bank's return on equity, equity to total assets and unemployment rate have no impact on Moroccan bank's liquidity.

6. Conclusion

The purpose of this paper is to analyze the evolution of bank's liquidity in Moroccan banks and to explain the impact of the financial crisis on bank's liquidity in Morocco. This paper also aims to determine the relationship between the size of the bank and its liquidity and to identify the determinants of liquidity in Morocco.

First, we calculated the various ratios presented above, for each bank. The analysis of results showed a decrease in liquidity during the period 2001-2012. This decrease was mainly pronounced in times of crisis. The financial crisis has a negative impact on Moroccan banks' liquidity.

We then studied the relationship between bank size and liquidity. We have divided the banks into two groups: small banks and large banks. The results of different ratios studied showed that large banks are more liquid than small banks. Thus, we can conclude that the size is a key determinant of bank liquidity Moroccan.

Finally, we were interested to the determinants of bank liquidity. The application of panel data regression allowed us to identify the main determinants of bank liquidity which are: size of banks (large banks are more liquid than small banks), share of own bank's capital of the bank's total assets, external funding to total liabilities, return on assets, foreign direct investment, monetary aggregate M3, foreign assets, growth rate of gross domestic product, public deficit, inflation ratio and the effects of financial crisis.

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