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Relationship between capital, risk and liquidity: a comparative study between Islamic and conventional banks in MENA region

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ABSTRACT

The aim of this paper is to investigate the determinants and the joint relationship between capital, risk and liquidity of conventional and Islamic banks. Particularly, we focus on the impact of financial and political instabilities on the risk-taking behavior of conventional and Islamic banks. Using the simultaneous equation model with partial adjustment, we find a positive bidirectional relationship between capital and risk of Islamic banks. Moreover, results highlight the risky aspect of this category of banks mainly caused by the type of contracts put in practice, obeying Sharia principles, such as Moudharaba and Moucharaka contracts. Also, changes in liquidity affect positively risk within Islamic and conventional banks, suggesting that both types of banks, by accumulating liquid assets; tend to have relatively riskier portfolios. Moreover, we find a significant impact of the Global financial crisis on the capital, risk and liquidity of conventional and Islamic banks.

1. Introduction

Islamic banking is growing widely over the last thirty years. We are seeing more and more an increasing number of banks, branches and amount of capital that is invested (Khan, 2010). This is well supported by the fact that many international conventional financial institutions are now offering Islamic finance services through their Islamic windows (Citigroup, Bank of America, Standard Chartered, HSBC, …). Subsequently, Islamic financial institutions, more particular Islamic banks, have become an important element in the global financial industry.

Like all financial institutes, Islamic banks must control their level of capital, risk and liquidity to rival their conventional competitors. A sufficient level of capital makes it possible to absorb losses and strengthen solvency. It also offers easy access to financial markets and protects against liquidity problems caused by the outflow of funds. In addition, the capital of the bank reduces the risk taking. So, the second pillar of Basel II highlights the close link between risk and capital position when it confirms that a bank's capital position is consistent with its overall risk profile. In this context, Islamic banks, identical to conventional ones, face many types of risks. This is intensified after the recent subprime crisis which has introduced a critical financial atmosphere and significant challenges. Liquidity position and liquidity risk are the most important challenges for Islamic banking (IFSB Stability Report, 2013). Salman (2013) show that Islamic banks are called upon to make greater efforts to manage their liquidity and thereby to control liquidity risk. This shift in the Islamic bank liquidity is of importance since the assets of Islamic banks are not as liquid as conventional ones. Moreover, Islamic banks have usually difficulties to raise funds quickly from the markets because of the slow development of financial instruments (Ahmed 2011).

Vogel and Hayes (1998) proposes that to increase liquidity requires to establish an Islamic secondary market. This will generate

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liquidity by allowing banks to start moving away from Murabahah operations. Islamic banks cannot utilize lender of last resort facilities and moreover, most of them do not have a ready formal liquidity management systems. All these factors exacerbate the liquidity risk in Islamic banks that also requires banks to hold more capital.

Then, banks' capital, risk and liquidity positions prompt us to explore in depth their relationship between conventional and Islamic banks.

This paper investigates capital, risk and liquidity decisions of conventional and Islamic banks in the MENA region over the period 2005–2013. Our estimations show that there is a positive bidirectional relationship between capital and risk for Islamic banks suggesting excessive risk taking at these financial institutions. This result highlights the risky aspect of this category of banks that originated in the type of contracts put in practice, obeying Sharia principles, such as the Moudharaba and Moucharaka contracts. As for changes in liquidity, they positively affect risk within Islamic and conventional banks, suggesting that both types of banks, by accumulating liquid assets, tend to have relatively riskier portfolios.

This paper contributes to the debate on the banking literature in several ways. First, it is the first to jointly examine capital, risk and liquidity decisions in Islamic banks. Moreover, it is the first that makes a comparative study between Islamic and conventional banks. Second, in this study we focus on the impact of financial instability such as the 2008 global financial crisis and political instability caused by the 2011 Arab revolutions on the risk-taking behavior of conventional and Islamic banks

This paper is organized in the following manner: the introduction is followed by a brief literature review; subsequently, methodology and model specification are described; thereafter the data used are detailed; the empirical results is conducted in order to understand the behavior of each banking type towards the relationship capital risk and liquidity and finally, the conclusion is offered.

2. Literature review

Rapid growth of Islamic banking and the important place occupied in many countries, has encouraged many researchers to examine the relative competency of Islamic banks compared to conventional banks from several different dimensions including performance, stability, efficiency, etc.

The interrelation between capital, risk and liquidity is of great importance for banking sector. Brown et al. (2007) show that Islamic banks have higher levels of equity capital than conventional ones. In contrary, Hassan (2006) and Beck et al. (2013) show that Islamic banks have a higher intermediation ratio as well as are better capitalized. However, as capital is costly, banks with higher capital may increase their level of risk to maximize revenues. This case is analyzed in a first attempt by Shrieves and Dahl (1992) who study adjustments between banks' capital and risk levels and emphasize that exposure to risk and the level of capital are simultaneously linked. They argue that the majority of banks tend to mitigate the effects of rising capital levels by increasing their exposure to asset risks.

In the Islamic context, studies examining risks are rather limited. Cihak and Hesse (2008) show that small Islamic banks are more stable than conventional banks of similar size. Abedifar et al. (2013), Beck et al. (2013) suggest little difference in terms of stability between Islamic and conventional banks, showing that the quality of loans given by Islamic banks is less sensitive to domestic interest rates than to conventional banks. Ghosh (2014) shows that conventional banks generally increase capital to address the growing risks, and not the reverse. They also conclude that there is an unequal impact of regulatory pressure and market discipline on the attitude of banks to risk and capital. As for Islamic banks, they increase their capital more compared to conventional banks. Rahmen et al. (2015) examine the effect of capitalization on credit risk and overall risk in Islamic and conventional banks. They found a negative relationship between credit risk and the level of capitalization.

While researches on banking capital and risk in the banking system has become abundant, liquidity, on the contrary, as a more complex concept, appeared only recently in the banking literature. Djankov et al. (2007) and Acharya et al. (2011) conclude in their studies that better access to information reduces surveillance expenditures, allowing banks to retain more of their capital reserves. According to these authors, this available capital could allow banks to take more risks and provide more loans, which can ultimately help to create more liquidity.

Distinguin et al. (2013) examine the link between bank capital and liquidity, using a model of simultaneous equations. They show that banks reduce their capital ratios due to decreases in liquidity.

The above contradictions imply that there might not be any direct causal relation between bank risk, capital and liquidity. Consequently, the relationship between capital, risk and liquidity is not linear. The joint relationship between capital, risk and liquidity has not been well explored by researchers. Empirically, Repullo (2005) is the first to examine the joint relationship between capital, risk and bank liquidity. He studies the strategic interaction between a bank and a lender of last resort to calculate optimal levels of liquidity, capital and banking risk with and without capital adjustment and with and without a penalty rate. He concludes that a higher capital requirement reduces the level of risk in the bank's loan portfolio and reduces its liquidity. Aspachs et al. (2005) are the first to test the empirical implications of Repullo (2005). They begin their study on a sample of UK banks to analyze the determinants of bank liquidity. They find that obtaining potential support from the central bank adversely affects the level of "liquidity-buffer" in banks. Their work focuses only on "liquidity-buffer", its determinants and the effect of macroeconomic conditions on liquidity assets. Jokipii and Milne (2011) argue that the more liquid banks tend to have a lower level of "buffer" and are more likely to increase their credit risk. However, their liquidity estimates are not statistically significant.

In a recent study, Salman (2013) points out that the liquidity position of Islamic banks and their liquidity risk change over the years. Indeed, most banks evolve from a situation of "liquidity surplus" in the year 2000 to a situation of "lack of liquidity" in the year 2009. This requires a great deal of effort as regards their management of liquidity risk.

Kochubey and Kowalczyk (2014) also examine the decisions of US commercial banks in terms of capital, liquidity and risk during

the period 2001–2009. They extend the model of simultaneous equations with partial adjustment introduced by Shrieves and Dahl (1992) to study the relationship between bank liquidity adjustments, capital and risk in the presence of securitization. Their results indicate that banks simultaneously coordinate short-term adjustments between capital, risk and liquidity.

This joint relationship is not the subject of studies on Islamic banks. To our knowledge, this is the first work that deals with this issue in a comparative framework between conventional and Islamic banks.

3. Data and methodology

3.1. Model specification

The main objective of this paper is to examine the relationship between liquidity, capital and banking risk. Our idea is inspired from the article of Repullo (2005), the first that analyzed jointly the relationship between capital, risk and liquidity of conventional banks.

To ensure this joint coordination, it is necessary to use a simultaneous equation model with partial adjustment, to consider the interrelationship between these three components. This approach suggested by the financial theory and emphasized in the empirical works of Shrieves and Dahl (1992), Jacquers and Nigro (1997), Jokipii and Milne (2011) and Kochubey and Kowalczyk (2014). According to this approach, observed changes in bank capital, risk and liquidity are the result of bank discretionary behavior and exogenous random shock. Formally, the model can be expressed as follows:

$$\Delta CAP_{it} = \Delta CAP_{it}^{bank} + u_{it} \tag{1}$$

$$\Delta RISK_{it} = \Delta RISK_{it}^{bank} + v_{it} \tag{2}$$

$$\Delta LIQ_{it} = \Delta LIQ_{it}^{bank} + \varepsilon_{it} \tag{3}$$

Where ΔCAP_{it}, $\Delta RISK_{it}$ et ΔLIQ_{it} are the observed changes in bank capital, risk and liquidity, respectively. ΔCAP_{it}^{bank}, $\Delta RISK_{it}^{bank}$, ΔLIQ_{it}^{bank} are the changes in capital, risk and liquidity managed by banks, while u_{it}, v_{it} and ε_{it}, are exogenous random shocks in capital, risk and liquidity levels for bank i at time t.

Therefore, changes in capital, risk and liquidity are modeled as the sum of a discretionary component and a random shock.

Financial theory advocates that banks are always threatened by financial turmoil and must prepare for adjustment costs to make instant adjustments in their capital, risk and liquidity.Accordingly, we first modeled a discretionary portion of changes in capital, risk and liquidity by using a partial adjustment framework. This approach assumes that banks choose optimal levels of capital, risk and liquidity. Then they make adjustments over time. Thus, adjustments in bank capital, risk and liquidity are defined as:

$$\Delta CAP_{it}^{bank} = \alpha(CAP_{it}^{*} - CAP_{it-1}) \tag{4}$$

$$\Delta RISK_{it}^{bank} = \beta(RISK_{it}^{*} - RISK_{it-1}) \tag{5}$$

$$\Delta LIQ_{it}^{bank} = \gamma(LIQ_{it}^{*} - LIQ_{it-1}) \tag{6}$$

Where α, β and γ are the respective adjustment speeds on capital, risk and liquidity of banks. CAP_{it}^{*}, $RISK_{it}^{*}$ andLIQ_{it}^{*} are the optimal levels of capital, risk and liquidity, respectively. CAP_{it-1}, $RISK_{it-1}$and LIQ_{it-1} are the respective levels of capital, risk and liquidity for the previous period.

By substituting Eqs. (4)–(6) respectively in Eqs. (1)–(3), we obtain the following expressions:

$$\Delta CAP_{it} = \alpha(CAP_{it}^{*} - CAP_{it-1}) + u_{it} \tag{7}$$

$$\Delta RISK_{it} = \beta(RISK_{it}^{*} - RISK_{it-1}) + v_{it} \tag{8}$$

$$\Delta LIQ_{it} = \gamma(LIQ_{it}^{*} - LIQ_{it-1}) + \varepsilon_{it} \tag{9}$$

Observed changes in capital, risk and liquidity depend on their optimal levels, delayed levels and random shocks. Target capital, risk and liquidity levels are not directly observable, but are assumed to depend on a set of variables describing the observable conditions of the bank, state of the country, and study period.

In a next step, the model is completed by adding changes to the level of capital, risk and liquidity in each equation, which explains the simultaneity of changes in capital, risk and liquidity.

$$\Delta CAP_{it} = \alpha(CAP_{it}^{*} - CAP_{it-1}) + \phi_1 \Delta RISK_{it} + \phi_2 \Delta LIQ_{it} + u_{it} \tag{10}$$

$$\Delta RISK_{it} = \beta(RISK_{it}^{*} - RISK_{it-1}) + \theta_1 \Delta CAP_{it} + \theta_2 \Delta LIQ_{it} + v_{it} \tag{11}$$

$$\Delta LIQ_{it} = \gamma(LIQ_{it}^{*} - LIQ_{it-1}) + \varphi_1 \Delta CAP_{it} + \varphi_2 \Delta RISK_{it} + \varepsilon_{it} \tag{12}$$

Given that changes in liquidity, capital and risk are influenced by different individual characteristics of the bank, we estimate the following equations:

$$\Delta CAP_{it} = \alpha_0 + \alpha_1 SIZE_{it} + \alpha_2 LLP_{it} + \alpha_3 ROA_{it} + \alpha_4 LOAN_{it} + \alpha_5 \Delta RISK_{it} + \alpha_6 \Delta LIQ_{it} - \alpha_7 CAP_{it-1} + \alpha_8 INF + \alpha_9 GDP + \alpha_{10} CRISIS + \alpha_{11} SPRING + u_{it} \quad (13)$$

$$\Delta RISK_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 LLP_{it} + \beta_3 FUND_{it} + \beta_4 NII_{it} + \beta_5 LOAN_{it} + \beta_6 \Delta CAP_{it} + \beta_7 \Delta LIQ_{it} - \beta_8 RISK_{it-1} + \beta_8 INF + \beta_9 GDP + \beta_{10} CRISIS + \beta_{11} SPRING + v_{it} \quad (14)$$

$$\Delta LIQ_{it} = \gamma_0 + \gamma_1 SIZE_{it} + \gamma_2 ROA_{it} + \gamma_3 NIM_{it} + \gamma_4 LOAN_{it} + \gamma_5 \Delta CAP_{it} + \gamma_6 \Delta RISK_{it} - \gamma_7 LIQ_{it-1} + \gamma_8 INF + \gamma_9 GDP + \gamma_{10} CRISIS + \gamma_{11} SPRING + \varepsilon_{it} \quad (15)$$

Where ΔCAP_{it} are changes in capital for bank i in year t, $\Delta RISK_{it}$ are changes in risk for bank i in year t, ΔLIQ_{it} are changes in liquidity for bank i in year t, $SIZE_{it}$: size of the bank measured by the natural logarithm of its total assets. ROA_{it}: Return on assets, measured by the ratio "Net income/Total assets". NIM_{it}: Net interest margin, measured by the ratio "Net interest income/Average earning assets". $LOAN_{it}$:Loan growth rate. LLP_{it}: loan loss provision. $FUND_{it}$: funding. NII_{it}: net interest income. CAP_{it-1}: Capital level of the previous period. $RISK_{it-1}$: Risk level of previous period. LIQ_{it-1}: Level of liquidity in the previous period. *INF*: Macroeconomic variable indicating the level of inflation for the year t. *GDP*: Macroeconomic variable for GDP in year t. *CRISIS*: Binary variable for the subprime crisis: 1 for years 2007, 2008; 0 if not. *SPRING*: Binary variable to capture the impact of Arab revolutions: 1 for years 2011, 2012, 2013; 0 if not.

Contrasting to (Shrieves and Dahl, 1992; Jacques and Nigro, 1997), we use dynamic panel data technique to control for bank-specific heterogeneity μi. In particular, we use the two-step Arellano-Bond difference GMM estimator (Arellano and Bond, 1991). Our choice is motivated by the fact that the presence of fixed effects in the model make lagged dependent variable endogenous.

3.2. Data description

we need to check the relation between capital, risk and liquidity. In this regard, we apply three regression equations. The first model equation explains banking sector capital, the second model equation checks bank risk levels and the final model equation examines the determinants of bank liquidity. The first model uses the ratio of equity to total assets as a proxy for banking capital as dependent variable, whereas in the second model, Z score (risk) is the dependent variable and, finally, in the third model the ratio of liquid assets to total assets (liquidity) is the dependent variable.

Capital is calculated simply as the ratio of equity to total assets (ΔCAP_{it}). Z score is used as a measure of banking risk ($\Delta RISK_{it}$). Higher levels of Z score indicate a greater banking risk. Liquidity is obtained by the ratio of liquid assets to total assets. The liquid assets include cash, reverse repurchase agreements, marketable securities and federal funds sold. The liquidity ratio is delayed by a period, as credit rating agencies continue to monitor liquidity levels before issuing credit ratings (Bordeleau and Graham, 2010).

A variety of bank-specific variables are also included which are also believed to explain the variation in bank capital, risk and liquidity. SIZE and LOAN are employed in the three equations. SIZE is measured by a logarithm of its total assets and LOAN includes all credit categories, namely customer loans and interbank loans. For Islamic banks, they do not offer loans in a similar way to conventional banks. Thus, the term LOAN is a generic term used to describe the equity financing products it uses.

Loan loss provisions (LLP) are also introduced as an explanatory variable in the capital and risk equation. For Islamic banks, this variable is measured by the bank's total loan loss provisions, including those shared with depositors (including the Moucharaka and Moudharaba participative contracts (Farook et al., 2012)).

Return on assets (ROA) is measured by the ratio of net income to total assets in order to control capital and liquidity equation. For Islamic banks, this ratio is presented as the ratio of Net income after tax and Zakat to Total assets. ROA provides information on the ability of the bank to manage profitability and the overall efficiency of the bank.

The Funding (FUND) is introduced following Huang and Ratnovski (2011), Adrian and Shin (2009) and Raddatz (2010), who show that banks relaying heavily on their funding are more affected by the liquidity crisis. Non-interest income (NII) is measured by the ratio of non-interest income to total operating revenue to control the bank's risk. Net interest margin (NIM) is measured by the ratio of net interest income to average earning assets. In Islamic banks, this ratio is called (NPM) "Net Profit and Loss Sharing/PLS margin" (Ascarya and Yumanita, 2010). In the rest of this paper, we will adopt the same nomination for both types of banks (NIM), to facilitate interpretations.

It should be noted that Islamic banks do not deal with interest rates, which implies, for this type of bank, fixed costs of profit or financing costs as interest expenses.

Changes in banks' liquidity, capital and risk might be influenced by individual's bank characteristics. We account for bank unobserved heterogeneity by incorporating bank fixed effects, which are designed to absorb all time invariant bank heterogeneity.

lLogarithm of GDP per capita (GDP) and inflation (INF) are incorporated in three equations.

Given that the estimate covers the period of the Arab revolutions and in order to test the impact of changes in the political and economic environment on capital, risk and bank liquidity, a binary variable is added to the specification. Thus, we awarded 1 for the years 2011, 2012 and 2013 and 0 for the rest of the period.

We introduce a binary variable taking 1 for the years 2007, 2008 and 0 for the remainder of the period to account for the effect of the subprime crisis.

Relevant data mentioned above are collected from the Bankscope database for 88 conventional banks and 42 Islamic banks. Descriptive statistics of data are presented in Table 1.

Table 1
Descriptive Statistics of Islamic and Conventional Banks variables.

	N	Mean	SD	Min	Max	Skewness	Kurtosis
Panel A: Conventional Banks							
CAP	873	0,13	0,06	−0,01	0,49	1,84	8,68
RISK	873	2,88	0,96	−1,87	5,34	−0,7	4,08
LIQ	873	0,25	0,17	0	1,17	1,62	6,44
SIZE	873	6,77	0,66	4,74	8,09	−0,26	2,58
LOAN	873	0,93	4,81	0,02	117,64	19,02	423,47
LLP	873	0,01	0,01	−0,01	0,23	9,92	166,43
NIM	873	3,96	2,23	−2,08	33,26	3,92	40,24
NII	873	3,96	0,17	−0,45	1,65	1,35	11,05
FUND	873	0,68	0,14	0,14	2,01	1,07	18,96
ROA	873	1,26	5,93	−19,29	63,17	5,28	35,26
GDP	873	4,67	4,21	−15,09	0,66	8,61	0,89
INF	873	5,97	5,2	−10,07	53,23	2,56	20,64
Δ CAP	776	0	0,02	−0,11	0,17	0,69	10,58
Δ RISK	776	−0,01	0,29	−2,94	3,08	0,25	44,23
Δ LIQ	776	−0,01	0,08	−0,4	1,06	2,49	38,09
Panel B: Islamic Banks							
CAP	342	0,23	0,22	−0,13	1,19	2,13	7,36
RISK	342	2,52	0,98	−3,79	6,47	−1,16	8,35
LIQ	342	6,21	0,75	2,72	7,92	−0,22	3,64
SIZE	342	0,29	0,23	0	2,05	2,59	15,38
LOAN	342	0,71	1,6	0	14,65	6,46	47,19
LLP	342	0,01	0,03	−0,11	0,47	11,45	174,13
NIM	342	4,45	5,08	−4,05	48,2	4,25	29,57
NII	342	0,45	0,96	−1,17	16,23	13,21	213,45
FUND	342	0,63	0,47	0	6,7	6,66	85,64
ROA	342	0.01	0.08	−0.88	0.16	−6.48	59.09
GDP	342	4,81	4,41	−15,09	26,17	0,36	9,06
INF	342	5,87	5,7	−10,07	53,23	2,55	18,46
Δ CAP	304	−0,01	0,13	−1,06	1,06	−0,38	33,91
Δ RISK	304	−0,09	0,52	−4,57	2,72	−3,12	36,11
Δ LIQ	304	0	0,19	−1,05	1,64	1,65	27,59

4. Results and discussion

Table 1 presents summary statistics for variables in the study. The mean of each variable is calculated using observations for all banks for all years of the study period (2005–2013), and the standard deviation of a variable measures the dispersion of its observations from its mean. Maximum and minimum columns present the highest and lowest observation fined for bank-related variables. Skewness and kurtosis are also recorded in the descriptive statistics of banks variables.

We note a net superiority of variable NII (3.96) for conventional banks compared to Islamic banks (0.45). In addition, the average risk of conventional banks (2.88) is higher than that of Islamic banks (2.52). This result is due to the sets of variables associated with the stability of the banking environment. We note that the average capital ratio of the Islamic sample is 23%, whereas it is 13% for conventional one. High levels of capitalization show that Islamic banks have managed to maintain financial strength, despite strong competition from conventional banks.

Next, we present a graphical analysis showing the evolution of capital, risk and liquidity during the period of the study in order to test the effect of the subprime crisis and the Arab revolutions on the main indicators of Islamic and conventional banks. Figs. 1–3

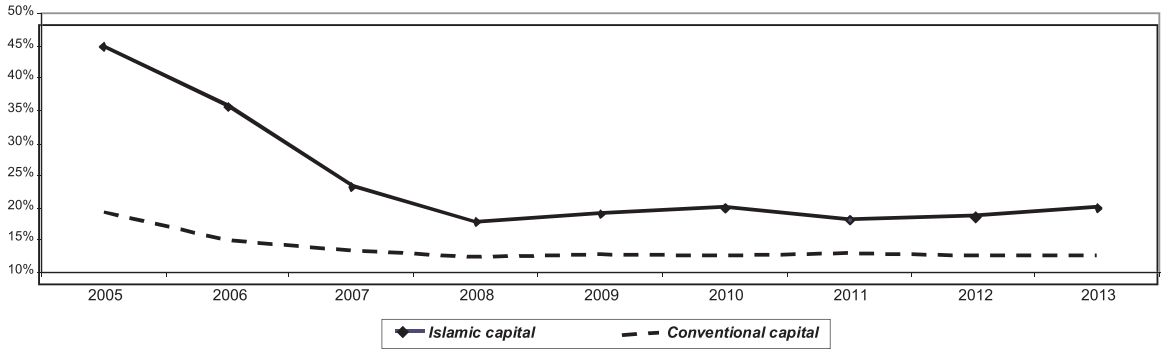

Fig. 1. Capital evolution of Islamic and conventional banks.

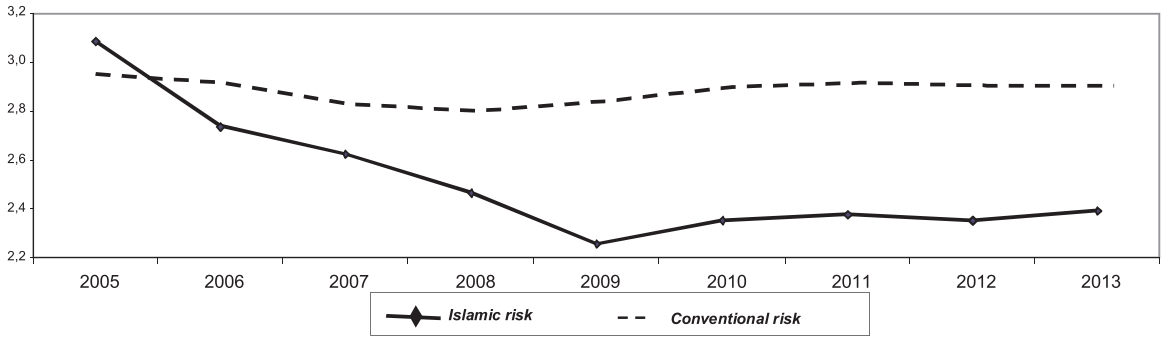

Fig. 2. Risk evolution of Islamic and conventional banks.

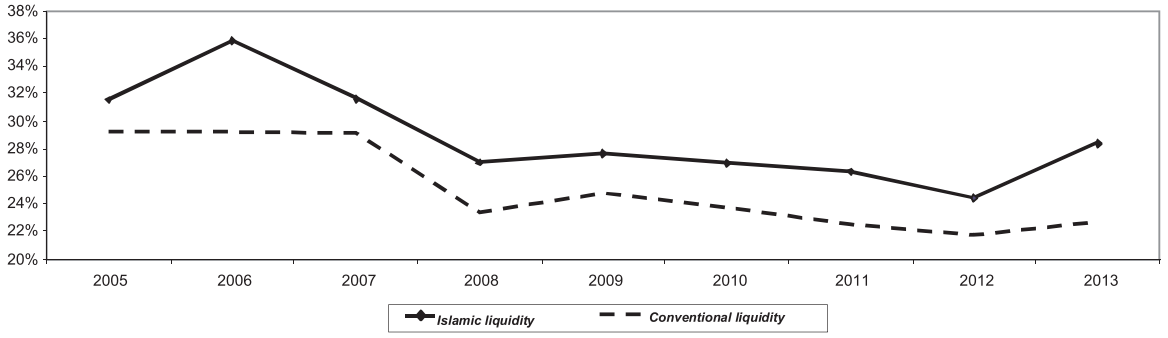

Fig. 3. Liquidity evolution of Islamic and Conventional Banks.

shows respectively the evolution of capital, risk and liquidity for Islamic and conventional banks for the period 2005–2013.

Fig. 1 shows that the capital ratio is higher for Islamic banks compared to their conventional counterparts. Moreover, a remarkable drop is noted during the period 2005–2007. A slight increase in the capital of the Islamic banks is observed during the year 2010, then it decreased during the period 2011–2012 coinciding with the Arab revolutions.

Fig. 2 shows that the evolution of the risk of conventional banks is almost stable during the study period. In addition, we note a decline in the risk level of Islamic banks even in times of crisis, followed by a slight increase in subsequent years. So, the political risk generated by the revolution seems to have a greater effect on the risk of Islamic banks than that of the global financial crisis.

Fig. 3 shows that behavior towards liquidity for Islamic banks is unstable during the study period. Liquidity decreased from 2006 to 2008 with intensity and start to rise in 2012. In general, the financial crisis has a more intense effect on the liquidity of both types of banks.

4.1. Determinants of bank capital

Table 2 presents the estimation results for the capital Eq. (13) for Islamic and conventional banks.

Table 2
Capital Determinants of Conventional and Islamic Banks.

	Islamic banks		*Conventional Banks*	
	Coef	*P > |z|*	*Coef*	*P > |z|*
CAP $_{t-1}$	0,112**	0.023	−0,010	0.466
SIZE	0,015	0.297	0,001**	0.013
LLP	−1,765*	0.068	0,336	0.366
ROA	0,103**	0.017	0,000**	0.017
LOAN	0,001***	0.001	0,002***	0.004
Δ RISK	0,062**	0.010	0,024	0.484
Δ LIQ	−0,421	0.225	0,110	0.498
SPRING	0,023	0.211	−0,003	0.159
CRISIS	−0,015**	0.015	−0,001***	0.001
INF	−0,002	0.322	−0,000	0.158
GDP	−0,001***	0.000	−0,001**	0.037
CONS	−0,097	0.364	0,014	0.177

***, ** and * Denote statistical significance at 1, 5 and 10%, respectively.

The results show that capital is positively influenced by the change in risk for Islamic banks. This implies that a high level of capital generates a higher risk. This can be attributed to the fact that when the bank accumulates a high level of capital, it can protect itself against excessive risk taking. Indeed, Shrieves and Dahl (1992) confirm that a positive correlation between capital and risk may result from regulatory costs, the unintended impact of minimal capital requirements, avoidance of bankruptcy costs, or risk aversion by the bank's managers. The result also shows that the change in capital is positively influenced by the level of risk for Islamic banks at the 5% level.

Changes in liquidity have insignificant effect and negatively influence the capital of Islamic banks. This is consistent with results of Kochubey and Kowalczyk (2014) who indicates that these banks increase their liquidity following a decline in the capital ratio.

Profitability measured by “ROA” variable is positively related to capital for both types of Islamic and conventional banks. The higher the ROA, the greater will be the retained earnings of the business, which will increase the bank's capital ratio.

Size and capital are positively related for both categories of banks. This is consistent with Miah and Sharmeen (2015) result, who suggest that large banks should operate with a higher level of capital. This result is only significant for conventional banks. We assume that this result may be related to the capital adequacy requirement associated with the size of bank assets during the sampling period of our study, especially as this period covers the years of crisis and after crisis. Generally, at such times, banks try to rebuild themselves in terms of solidity. Boyd and Runkle (1993) explain this finding by the fact that large banks having easier access to investment opportunities, capital markets and financing, can maintain higher levels of risk.

A significant part of the bank’s assets appears in the form of loans, and therefore banks with a higher level of the loan portfolio tend to have a higher level of capital to maintain the optimal leverage ratio. This confirm the conclusion of Berger (1993) showing that the level of capital and profitability are positively related to Islamic and conventional banks.

As for the loan loss provision variable, it is not significant for the conventional sample but negative for Islamic banks. It shows that banks of this type are not cautious about changes in capital, as they have a lower level of loan loss provision. However, they dispose of a large proportion of these provisions in order to protect themselves against risks. Such contradiction in the behavior of Islamic banks may reflect the lack of experience of these banks.

The rate of growth of loans have a positive effect on the capital of two types of banks showing that financial risk management dominates the strategy of banks, because banks are asked to increase their capital ratio for a safer structure when their loan ratio is high.

The GDP coefficient is significant and negative at the 1% level. The negative relationship between economic growth and capital confirms that investment decisions are influenced by the economic cycle. During periods of economic expansion, Islamic banks are better able to raise their capital levels and finance the riskiest projects. Conversely, during periods of recession, the reduction in risk-taking and the increase in forecast losses lead banks to reduce their volume of assets in order to improve their position on capital. With regard to the effect of the Subprime crisis and the Arab Spring, we note that the crisis variable has a negative and significant impact on the capital of Islamic and conventional banks. This suggests that during this period banks decrease their capital ratios, which reflects the logic of the Subprime crisis. As regards SPRING, we find no significant effect on capital for both types of banks.

4.2. Determinants of bank risk

Table 3 presents the estimation results for the risk Eq. (14) for Islamic and conventional banks.

The results show that the growth rate of loans has a positive effect on the risk of Islamic and conventional banks. Several evidences show that banks with high rates of loan growth are riskier. This may indicate that banks tend to reduce their collateral requirements to increase loan growth. According to Foos et al. (2010), banks with higher rates of loan growth can attract customers who do not have the opportunity to have credit in other institutions. Our results are coherent with those of Altunbas et al. (2007) and

Table 3
Determinants of Risk for Islamic and Conventional Banks.

	Islamic Banks		*Conventional Banks*	
	Coef	*P > |z|*	*Coef*	*P > |z|*
$RISK_{t-1}$	0,041***	0.005	0,012***	0.005
SIZE	−0,057	0.551	0,013	0.448
LLP	−2,188***	0.001	−4,189	0.343
FUND	0,398*	0.094	0,0409	0.867
NII	0,007**	0.026	−0,109	0.240
LOANS	0,007	0.548	0,021**	0.048
Δ *CAP*	1,789**	0.049	9,573**	0.038
Δ *LIQ*	2,001**	0.003	1, 484***	0.001
SPRING	0,065	0.331	0,019	0.561
CRISIS	0,041**	0.021	0,052**	0.011
INF	−0,013**	0.025	−0,004***	0.002
GDP	−0,005**	0.020	0,004	0.631
CONS	0,036	0.944	−0,177	0.501

***, ** and * Denote statistical significance at 1, 5 and 10%, respectively.

Foos et al. (2010), who find that banks with higher loan growth rates are riskier.

Funding is not a relevant determinant of risk taking for conventional and Islamic banks. This result is consistent with recent studies by Adrian and Shin (2009), Raddatz (2010), and Ratnovski and Huang (2009). Non-interest income (NII) has a positive and significant impact on the risk of Islamic banks mainly attributed to the fact that a large share of non-interest income can destabilize banks. Indeed, NII are usually more volatile than interest income because regulators encourage banks to hold less capital against non-interest income-generating activities, leverage may be greater and therefore involve excessive volatility in profits (DeYoung and Roland, 2001). These explanations suggest that banks with a high share of non-interest income may also be less stable than banks that primarily provide loans. In this sense, we recall that Islamic banks do not provide loans at interest according to the principle of the prohibition of interest, and the PLS principle, which makes the Islamic banks products riskier. Liquidity adjustments (ΔLIQ) have a positive impact on risk adjustments for Islamic and conventional banks. This positive relationship suggests that banks that accumulate liquid assets tend to have less secure portfolios. This result suggests a positive relationship between the level of liquidity and risk taking in Islamic and conventional banks. This confirms one of the implications of Distinguin et al. (2013), which document a positive relationship between bank capital and liquidity for European and American commercial banks before the recent financial crisis. Nevertheless, this result contradicts the theoretical predictions of Repullo (2005).

The positive coordination of capital and risk for Islamic and conventional banks is in line with the findings of Shrieves and Dahl (1992) and Jokipii and Milne (2011), which indicate that banks are increasing their capital ratios in response to an increase in the risk of the bank's loan portfolio and vice versa. These suggest that banks increase the overall risk of their asset portfolio and reduce the risk of their loan portfolio when faced with a lower level of capital.

Inflation is negatively related to the risk of conventional and Islamic banks. This result is proved by Vong and Chan (2009) who suggest that inflation could affect the money value, purchasing power and the real interest rate billed and received by conventional banks as well as the profit margin of Islamic banks. The GDP affects negatively the risk of Islamic banks.

Global financial Crisis as well as Arab spring affect positively to risk changes in Islamic and conventional banks.

4.3. Determinants of bank liquidity

Table 4 presents the estimation results for the liquidity Eq. (15) for Islamic and conventional banks.

SIZE is statistically insignificant for conventional banks, which refers to a poor market valuation for liquidity needs and will further increase the risk (Akhtar et al., 2011).

ROA affects positively the liquidity of both types of banks. This finding is conforming to Wasiuzzaman and Tarmizi (2010) suggesting that more liquid is the bank, the lower are its return on assets. This stipulate that the bank can use its good revenue to cover its short-term obligation.

The positive impact of the net interest margin on the liquidity of conventional banks indicates that the most profitable banks maintain higher liquidity ratios. This variable is non-deterministic in the liquidity equation of Islamic banks.

We find a negative and significant effect of crisis on the liquidity of conventional and Islamic banks. These results are consistent with Vodova (2011). Indeed, the subprime crisis is a crisis of confidence which prompt the majority of depositors to withdraw their funds, which led to an inability to repay, and thus a reduction on liquidity in banks. Banks' reaction to the "Arab Spring" is insignificant for both types of banks.

5. Conclusion

Capital, risk and liquidity are three key factors in the banking activities. Indeed, an effective synchronization between these three determinants can reduce financial turbulence; especially in instability periods. Toward, this paper examines the relationship between

Table 4
Determinants of Liquidity for Islamic and Conventional Banks.

	Islamic Banks		*Conventional Banks*	
	Coef	*P > |z|*	*Coef*	*P > |z|*
LIQ_{t-1}	−0,015***	0.002	−0,003**	0.033
SIZE	−0,021***	0.010	−0,001	0.871
ROA	0,531**	0.039	0,002**	0.044
NIM	0,002	0.673	0,002**	0.017
LOAN	−0,000	0.910	0,006	0.328
Δ *CAP*	−0,320	0.666	3,129	0.238
Δ *RISK*	0,164	0.433	0,056	0.617
SPRING	−0,022	0.303	0,011	0.488
CRISIS	−0,061**	0.048	−0,006***	0.001
INF	−0,001	0.775	0,001	0.674
GDP	0,001	0.668	0,003	0.252
CONS	0,148	0.558	−0,022	0.732

***, ** and * Denote statistical significance at 1, 5 and 10%, respectively.

capital, risk and liquidity for both conventional and Islamic banks with considering the effect of financial and political instabilities. We use the simultaneous equation model with partial adjustment introduced by Shrieves and Dahl (1992) to examine a relationship between bank liquidity, capital and risk adjustments on 88 conventional banks and 42 Islamic banks for the period 2005–2013.

By examining the variables introduced to control the relationship between capital, risk and liquidity, we conclude that all findings confirm a riskier character for the Islamic banks in our sample. Indeed, the principle of sharing losses and profits in Islamic banks is applied through the Profit Sharing Investment Accounts (PSIA), which account for a large share of the liabilities of Islamic banks. As a result, through these PSIA accounts, Islamic banks are able to invest in costly transactions such as Moudharaba and Musharaka, which are more risky than commercial operations (Archer and Karim, 2009). Moreover, in the context of incomplete information and lack of transparency, Investment Account Holders (IAH) are faced with the risk of mismanagement of Moudharaba funds because they are unable to effectively monitor the investment decisions made by the bank (Islamic Financial Services Board (IFSB, 2008)). Similarly, the PLS seems to constitute a constraint on liquidity for Islamic banks, since in some critical situations, it's so difficult for Islamic banks to liquid assets.

Unlike conventional banks, Islamic ones face many problems, such as the Shariah issue (asset sale and securitization), the structure of the assets (lack of diversification, concentration), the inefficiency of Islamic money markets (lack of liquidity management tools preventing banks from managing their cash flow and improving risk diversification).

With regard to the effect of the Subprime crisis, we note that it has a negative and significant impact on capital of Islamic and conventional banks. This suggests that during this period banks decrease their capital ratios, which reflects the logic of the Subprime crisis. The impact of the Global Financial Crisis is well emphasized on the risk equation since it affects positively risk changes in Islamic and conventional banks. Results found on changes in liquidity highlights more the effect of crisis on conventional and Islamic banks. As regards SPRING, we find no significant effect on capital, risk and liquidity for both types of banks.

From a practical perspective, Islamic bank regulators will be better prepared to supervise the Islamic banking system if they take into account that they should improve their Profit and Loss Sharing investment in order to reduce their liquidity risk. In addition, it is essential to strengthen instruments of liquidity risk management.

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