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**Article**

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# Liquidity creation and bank performance: evidence from MENA

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Liquidity  
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## Abstract

**Purpose** – Islamic banks have significantly different balance sheets from their conventional counterparts, leading to different implications in relation to liquidity creation compared to conventional banks. This work, first, investigates the liquidity creation of conventional and Islamic banks in Middle Eastern and North African (MENA) countries between 2011 and 2016. It then tests the relationship between liquidity creation and performance of these banks.

**Design/methodology/approach** – It uses the data of 491 commercial banks across 18 MENA countries between 2011 and 2016. The analysis is based on panel data techniques.

**Findings** – The banks created US\$18.596 trillion of liquidity, about 28.4% of total assets. Conventional banks created more liquidity compared with Islamic banks. Nevertheless, Islamic banks created more liquidity per asset compared with conventional banks. The regression analysis revealed a significant and negative correlation between liquidity creation and performance of the banks using return on average equity (ROAE) measure. However, no significant relationship is observed between liquidity creation and return on average assets (ROAA) of MENA banks. Moreover, there is no difference between Islamic and conventional banks in the relation between liquidity creation and bank performance.

**Research limitations/implications** – The data are limited to the period 2011–2016; the period of this study was selected based on yearly data availability from the data source. Accounting measures were used to study the effect of liquidity creation on bank profitability, and the market-based measures were excluded, as there is no uniform sources in these countries that can be used to collect market-based data.

**Practical implications** – Bank managers must reach a trade-off between the advantages and disadvantages of liquidity creation, as well as consider the negative relationship between liquidity creation and bank performance when making their decisions.

**Originality/value** – First, to the best of the authors' knowledge, this work is the first to analyse the relationship between the liquidity creation and performance of conventional and Islamic banks in MENA. Second, this study uses a sample of Islamic and conventional banks in MENA that have detailed information on the Orbis Bank Focus dataset, which is the most comprehensive database of commercial banks in the MENA region.

**Keywords** Liquidity creation, Bank performance, ROAA, ROAE, MENA

**Paper type** Research paper

## Introduction

Banks have indispensable roles in supporting the economy of any country through their liquidity creation and risk transformation functions. However, previous studies have often



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focused on the latter function. Nevertheless, liquidity creation has attracted significant research attention over the past decade after [Berger and Bouwman \(2009\)](#) introduced a new approach for assessing the liquidity creation efficiency of banks.

According to the liquidity creation theory, banks convert their liquid assets into illiquid liabilities or finance their illiquid assets with liquid liabilities to create liquidity for their customers ([Berger and Bouwman, 2009](#)). These institutions also conduct off-balance sheet activities, such as loan commitments, to create liquidity ([Holmström and Tirole, 1998](#); [Kashyap et al., 2002](#)).

The Islamic banking sector is amongst the fastest-growing financial sectors in the world ([Hasan and Dridi, 2010](#)). A report from [Ernst and Young \(2016\)](#) reveals that the financial assets of Islamic banks increased by 16 per cent from 2010 to US\$882bn in 2014; and according to [Statista \(2019\)](#), the same has doubled to US\$1584.5bn in 2017. The Islamic banking sector is also the fastest growing financial sector in Middle Eastern and North African (MENA) countries. These countries had total Islamic banking assets amounting to US\$1279bn in 2017.

Islamic banks are committed in all their activities to the principles of Islamic law. Islamic banking promotes a number of principles that distinguish it from its conventional counterpart, the most important of which is the prohibition of *ribā* (interest) in financial transactions. It also prohibits all forms of monopoly as well as the hoarding of funds. Rather, it favours the channelling of funds to real economic activities that benefit the society and prohibits their employment in areas that are forbidden in Islam such as the selling and buying of alcohol, weapons or pork ([Beck et al., 2013](#)). These main differences lead Islamic banks to have significantly different balance sheets from their conventional counterparts, leading to different implications in relation to liquidity creation compared to conventional banks ([Mohammad, 2014](#)).

Despite the fundamental functions banks play in creating liquidity, little research has been tested in emerging countries and in the countries where Islamic banks are active. This study aims to explore the liquidity creation of banks in the MENA countries by various types and sizes, and to test the relationship between the creation of liquidity and the profitability of these banks during the period 2011-2016.

Our empirical analysis contributes to the literature in three ways. First, this study extends the work of [Mohammad \(2014\)](#) and [Berger et al. \(2018\)](#) by including almost all banks of 18 MENA countries. Second, this work is the first to analyse the relationship between liquidity creation and performance of conventional and Islamic banks in MENA. Third, this study uses a sample of Islamic and conventional banks in MENA that have detailed information in the Orbis Bank Focus dataset, which is the most comprehensive database of commercial banks in the MENA region.

The rest of this paper is organised as follows. The second section reviews the literature on liquidity creation. The third section presents the data and methodology that are employed for the analyses. The next sections describe the empirical results and the outcomes of the robustness check, respectively. The last section concludes the paper.

## Literature review

Liquidity creation is an important function of banks. They convert their liquid assets into illiquid liabilities or finance illiquid assets with liquid liabilities to create liquidity. They also undertake off-balance sheet activities to create liquidity ([Holmström and Tirole, 1998](#); [Kashyap et al., 2002](#)). Granting long-term loans by using customer deposits is another source of liquidity creation. In other words, liquidity creation is a result of the incompatibility between long-term (illiquid) assets and short-term (liquid) liabilities. Banks may also reduce

their liquidity creation by increasing their cash balance through the issuance of long-term debts. However, these institutions do not create any liquidity when purchasing securities (liquid liabilities) by using customer deposits (liquid assets).

Berger and Bouwman (2009) found that the amount of liquidity created by USA (US) banks increased annually between 1993 and 2003. They also revealed that banks create this liquidity through either on-balance sheet activities or off-balance sheet activities. In this case, the role of off-balance sheet activities in creating liquidity is as important as that of on-balance sheet activities. Fungáčová and Weill (2012) found that large banks are the biggest contributors to liquidity creation. Rauch *et al.* (2010) revealed that savings banks in Germany increased their liquidity from €120.7bn in 1997 to €182.2bn in 2006. Lei and Song (2013) found that the amount of liquidity created by Chinese banks increased from RMB22bn in 1988 to RMB2.463tn in 1998 and RMB11.404tn in 2008.

For about four decades, researchers (Short, 1979; Bourke, 1989) have widely studied bank profitability and its determinants. Many studies have followed in trying to identify the factors affecting bank profitability. Some used either a cross-section or panel data of one country for their analysis. Examples include (Molyneux and Thornton, 1992; Goddard *et al.*, 2004; Pasiouras and Kosmidou, 2007; Flamini *et al.*, 2009; Dietrich and Wanzenried, 2011; Menicucci and Paolucci, 2016; Adelopo *et al.*, 2018; Kohlscheen *et al.*, 2018). These studies have different findings with different data sets, time periods, environments and countries.

However, only a few studies have directly examined the relationship between liquidity creation and bank profitability. For instance, Berger and Bouwman (2009) found that the creation of additional liquidity would increase the amount of net surpluses shared amongst stakeholders and the non-bank public. In this way, liquidity creation has a positive influence on the value of banks. Meanwhile, Bordeleau and Graham (2010) found that banks can reduce their illiquid risk and probability of default by holding more liquid assets. As a consequence, those banks with a higher amount of liquid assets tend to face lower funding costs and higher net income. Following these arguments, Tran *et al.* (2016) showed that banks generally have low profitability if they have high liquidity creation and liquidity risk. However, in spite of these findings, the overall effect of liquidity creation on bank performance remains theoretically unknown.

Mohammad (2014) used a sample of 58 banks from Gulf Cooperation Council (GCC) countries over the period 1992-2011. The study investigated and compared the amount of liquidity created by Islamic, conventional and hybrid banks of these countries. The findings showed that Islamic banks created more liquidity than their conventional and hybrid counterparts with 12.66 per cent of their total assets for Islamic banks compared with 3.26 per cent for conventional banks and 3.95 per cent for hybrid banks. Berger and Bouwman (2015) conducted a correlation analysis between normalised liquidity creation and bank profitability of US banks over the period 1984:Q1 to 2014:Q4. The analysis showed that the relationship is positive for large banks, but negative for medium and small banks. Sahyouni and Wang (2018) explored the amount of liquidity creation of Brazil, Russia, India, China and South Africa (BRICS) and G7 (excluding US) countries' banks spanning the years 2011 to 2015 and tested the effect of liquidity creation on the profitability of these banks. The results showed that the banks included in the sample created US\$74.29tn during the sample period. The findings of the regression analysis concluded that liquidity creation significantly and negatively affected bank profitability (return on average assets (ROAA), return on average equity (ROAE)) of the entire sample, including the emerging countries' banks' ROAA and developed countries' banks' ROAE. However, the results found that there is no impact of liquidity creation on the net interest margin (NIM) of these banks.

Chen *et al.* (2018) examined the factors influencing liquidity risk and the connection between liquidity risk and bank profitability. They used panel data of 12 developed economies over the years 1994-2006. The outcomes demonstrated that liquidity risk, estimated by financing gap, is essentially and contrarily connected with ROAA and ROAE. Higher financing gap (higher liquidity creation) will diminish bank profitability estimated by ROAA and ROAE.

### Hypothesis development

Islamic banks are considered key contributors to economic growth through their unique Islamic financial principles, operations and products. Khan (2010) argues that by creating effective and productive financial activities, Islamic banks help to achieve equitable distribution of national income and thus contribute to improving the standard of living in a society. In addition, profit and loss contracts operated by Islamic banks promote long-term investments and create more liquidity (Mohammad, 2014). In sum, the nature of the activities and principles of Islamic banks lead to the following hypothesis:

*H1.* Islamic banks create more liquidity per asset than conventional banks.

When banks increase the liquidity created, this increases the return on interest on loans and increases the surplus distributed to the shareholders of the bank, which increases the value of the bank (Berger and Bouwman, 2009). On the other hand, when a bank has liquid assets, it reduces the risks it faces and reduces the financing costs it pays, which increases the profitability of the bank and reduces its exposure to bankruptcy (Bordeleau and Graham, 2010; Tran *et al.*, 2016). Moreover, holding liquid assets will reduce liquidity risk premium and lower bank's net interest margin (Angbazo, 1997). Bordeleau and Graham (2010) found that banks can reduce their illiquid risk and probability of default by holding more liquid assets. As a consequence, those banks with a higher amount of liquid assets tend to face lower funding costs and higher net income. Following these arguments, Tran *et al.* (2016) showed that banks generally have low profitability if they have high liquidity creation and liquidity risk. Allen and Gale (2004) found that when banks create more liquidity, the probability of distress rises and severity of loss worsens if assets need to be liquidated to meet the liquidity demands.

According to Basel III liquidity requirements, banks are required to hold high-rated securities to maintain funding stability. This reduces the amount of loans granted and increases the amount of liquid assets held, in turn, lowering net interest margin and reducing revenues (lower interest received and higher interest paid). As a consequence, those banks with a higher amount of liquid assets (lower liquidity creation) tend to have lower net interest margin and lower revenues (King, 2013).

However, in spite of these findings, the overall effect of liquidity creation on bank performance remains theoretically unknown. Thus, the second hypothesis is formulated as follows:

*H2.* Liquidity creation significantly affects bank performance.

### Data and methodology

The sample covers the years 2011 to 2016 and includes almost all commercial banks in 18 MENA countries. Along with duplicate observations, all observations related to the central banks of these countries are excluded from the sample because this study only aims to explore the liquidity creation of commercial banks. A total of 491 commercial banks (69

Islamic and 422 conventional banks) with 2117 bank-year observations ( $N = 2117$ ) are eventually included in the sample. [Table I](#) lists all MENA countries under consideration and the number of Islamic and conventional banks in each country. As can be seen in the table, Egypt has the largest number of banks (50) amongst all MENA countries, Bahrain has the largest number of Islamic banks (17), and Morocco, Tunisia and Libya do not have any Islamic banks as at 2016. [Table II](#) lists and describes the main regression variables as well as providing the sources of data.

### *Measures of liquidity creation*

[Berger and Bouwman \(2009, 2015\)](#) classify balance sheet items (e.g. assets, liabilities and equities) and off-balance sheet activities into liquid, semi-liquid or illiquid depending on the ease, cost and time the bank needs to meet its obligations and provide liquidity to meet borrowers' demands as well as the ease, cost and time for depositors to get their money from the bank. In the second step, each item of the balance sheet, classified in the first step, takes a weight of ( $\frac{1}{2}$ , 0, or  $-\frac{1}{2}$ ) based on its contribution to the creation or destruction of liquidity as defined by the liquidity creation theory. In the third and final step, the amounts of all activities that have a weight of  $\frac{1}{2}$  are combined and then multiplied by  $\frac{1}{2}$ ; the amounts of all activities that have a weight of  $-\frac{1}{2}$  are combined and then multiplied by  $-\frac{1}{2}$ ; and the amounts of all semi-liquid items are combined and then multiplied by 0. Finally, the summation of all combinations is the amount of liquidity created by the bank during the period.

After the construction of the bank liquidity creation measure, [Berger and Bouwman \(2009\)](#) introduced four different measures based on two criteria. First, the loan's classification is based on category or maturity; second, the off-balance sheet items are included or excluded from the calculations. If the loans are classified based on their categories then it is called "cat" and if they are classified based on their maturities then it is called "mat". Moreover, when off-balance sheet items are included it is called "fat" and when they are excluded it is called "nonfat". Accordingly, the four different measures are:

Country	No. of banks	Conventional banks	Islamic banks
Algeria	20	19	1
Bahrain	41	24	17
Egypt	50	47	3
Iran	25	23	2
Iraq	46	34	12
Jordan	28	24	4
Kuwait	37	35	2
Lebanon	44	40	4
Libya	14	14	0
Morocco	23	23	0
Oman	24	20	4
Palestine	8	6	2
Qatar	15	13	2
Saudi Arabia	20	15	5
Syria	15	12	3
Tunisia	33	33	0
United Arab Emirates (UAE)	39	33	6
Yemen	9	7	2
<i>Total</i>	<i>491</i>	<i>422</i>	<i>69</i>

**Table I.**  
Details of banks

**Table II.**  
Definition of  
variables

Code	Formula	Source
<i>Dependent variables</i>		
ROAA	Net income/Total average assets	Bank Focus
ROAE	Net income/Total average equity	Bank Focus
<i>Independent variables</i>		
Bank-specific factors (internal factors)		
LCR <sub>1</sub>	Total liquidity creation measured by cat.fat/Total Assets	Bank Focus
LCR <sub>2</sub>	Total liquidity creation measured by cat.nonfat/Total Assets	Bank Focus
AM	Operating income/Total assets	Bank Focus
B_size	Logarithm of total assets	Bank Focus
TD_TA	Total deposits/Total assets	Bank Focus
EQ_TA	Total equity/Total assets	Bank Focus
LOAN	Loan loss provisions/Total loans	Bank Focus
CIR	Total costs/Total income	Bank Focus
FC	Interest paid/Total deposits	Bank Focus
Loan_int	Interest received/Total loans	Bank Focus
Market-specific factors		
HH_index	Bank-level Herfindahl index based on the assets share	Bank Focus
Market_share	Share of bank's deposits to total deposits	Bank Focus
Macroeconomic Factors (external factors)		
GDP_Growth	Annual Growth of GDP (%)	World Bank
INF	Annual Inflation Rate (%)	World Bank

- (1) “cat.fat” which means that loans are category based and off-balance sheet items are included;
- (2) “mat.fat” which means that loans are maturity based and off-balance sheet items are included;
- (3) “cat.nonfat” which means that loans are category based and off-balance sheet items are excluded; and
- (4) “mat.nonfat” which means that loans are maturity based and off-balance sheet items are excluded.

To measure liquidity creation, this paper uses ‘cat.fat’ which has been widely adopted in the literature because of its ability to classify loans according to their category and for its inclusion of off-balance sheet activities (Berger and Bouwman, 2009). ‘Cat.nonfat’ is an alternative version of ‘cat.fat’ that excludes off-balance sheet activities from the calculation. Panel A of Table III illustrates the classification and weighting of bank activities, whilst Panel B illustrates the calculation of cat.fat and cat.nonfat.

*Analysis of liquidity creation*

Panel A of Table IV shows the liquidity created by each type of bank in the sample. Cat.fat reveals that during the sample period, commercial banks in MENA created US\$5.281tn worth of liquidity that accounts for 28.4 per cent of their assets. Meanwhile, cat.nonfat reveals that these banks created US\$4.354tn of liquidity during the sample period, which indicates that 17.55 per cent of the liquidity created by MENA banks originated from off-balance sheet activities. Therefore, such activities do not have important roles in the liquidity creation of MENA banks.



Assets

*Panel A: Liquidity Classification of Bank Activities*

Illiquid assets (weight = 1/2)	Semiliquid assets (weight = 0)	Liquid assets (weight = -1/2)
Corporate and commercial loans	Residential mortgage loans	Cash and due from banks
Investments in property	Other mortgage loans	Trading securities and at fair value through income
Foreclosed real estate	Other consumer/retail loans	Tradable derivatives
Fixed assets	Loans and advances to banks	Available-for-sale securities
Goodwill	Reverse repos and cash collateral	Held to maturity securities
Other intangibles		At-equity investments in associates
		Other securities
Other assets		
Liabilities plus equity		
Liquid liabilities (weight = 1/2)	Semiliquid liabilities (weight = 0)	Illiquid liabilities plus equity (weight = -1/2)
Customer deposits – current	Customer deposits – term	Senior debt maturing after one year
Customer deposits – savings	Deposits from banks	Subordinated borrowing
Tradable derivatives	Repos and cash collateral	Other funding
Trading liabilities	Other deposits and short-term borrowings	Credit impairment reserves
	Fair value portion of debt	Reserves for pensions and other
		Current tax liabilities
		Deferred tax liabilities
		Other deferred liabilities
		Other liabilities
		Total equity
Off-balance-sheet activities		
Illiquid activities (weight = 1/2)	Semiliquid activities (weight = 0)	Liquid activities (weight = -1/2)
Acceptances and documentary credits reported off-balance-sheet	Managed securitized assets reported off-balance-sheet	
Committed credit lines	Other off-balance-sheet exposure to securitizations	
Other contingent liabilities		
guarantees		

*Panel B: Liquidity Creation Formula*

Cat.fat	$= + 1/2 * \text{illiquid assets} + 0 * \text{semiliquid assets} - 1/2 * \text{liquid assets} \\ + 1/2 * \text{liquid liabilities} + 0 * \text{semiliquid liabilities} - 1/2 * \text{illiquid liabilities} - 1/2 * \text{equity} \\ + 1/2 * \text{illiquid off-activities} + 0 * \text{semiliquid off-activities} - 1/2 * \text{liquid off-activities}$	
Cat.nonfat	$= + 1/2 * \text{illiquid assets} + 0 * \text{semiliquid assets} - 1/2 * \text{liquid assets} \\ + 1/2 * \text{liquid liabilities} + 0 * \text{semiliquid liabilities} - 1/2 * \text{illiquid liabilities} - 1/2 * \text{equity}$	

**Table III.**  
Liquidity  
classification of bank  
activities and  
construction of  
liquidity creation  
measures

**Source:** Adapted from [Lei and Song \(2013\)](#)

As for conventional banks, cat.fat reveals that these financial institutions created US \$4.173tn worth of liquidity or 79 per cent of the total liquidity created in MENA during the sample period. Although Islamic banks only have less than 16 per cent market share in the entire MENA banking sector, they created US\$1.108tn worth of liquidity that accounts for 21 per cent of the total liquidity created during the sample period. Meanwhile, cat.nonfat reveals that Islamic banks account for 25 per cent of the created liquidity during the sample



**Table IV.**  
Liquidity creation of  
MENA banks

Liquidity creation	<i>N</i>	TA (US\$bn)	cat.fat (US\$bn)	cat.nonfat (US\$bn)	LCR <sub>1</sub>	LCR <sub>2</sub>
<i>Panel A: liquidity creation by bank type</i>						
All Banks	2117	18595.925	5281.255	4354.262	0.284	0.234
Conventional	1815	15713.559	4172.799	3259.495	0.266	0.207
Islamic	302	2882.367	1108.456	1094.767	0.385	0.380
<i>Panel B: liquidity creation by country</i>						
Algeria	81	1197.040	−270.564	−317.938	−0.226	−0.266
Bahrain	188	932.450	199.725	173.658	0.214	0.186
Egypt	216	1141.591	120.137	82.785	0.105	0.073
Iraq	174	165.848	38.463	14.507	0.232	0.087
Iran	103	1842.237	733.233	707.351	0.398	0.384
Jordan	134	667.235	115.003	76.467	0.172	0.115
Kuwait	157	1543.694	573.942	524.472	0.372	0.340
Lebanon	167	1464.004	216.193	179.811	0.148	0.123
Libya	36	211.436	29.857	−4.750	0.141	−0.022
Morocco	101	1038.923	357.654	338.149	0.344	0.325
Oman	93	391.692	176.652	156.343	0.451	0.399
Palestine	42	31.520	12.052	11.354	0.382	0.360
Qatar	72	1627.688	621.520	399.367	0.382	0.245
Saudi Arabia	94	3130.419	1141.540	1027.613	0.365	0.328
Syria	79	82.454	25.521	15.856	0.310	0.192
Tunisia	155	214.216	106.818	96.050	0.499	0.448
UAE	198	2880.454	1078.681	868.769	0.374	0.302
Yemen	27	33.024	4.828	4.398	0.146	0.133
<i>Panel C: liquidity creation across time</i>						
2011	204	2010.119	684.442	573.394	0.340	0.285
2012	223	2421.505	833.899	714.513	0.344	0.295
2013	383	3373.672	902.906	730.740	0.268	0.217
2014	443	3686.217	991.987	809.328	0.269	0.220
2015	449	3667.743	980.092	811.320	0.267	0.221
2016	415	3436.669	887.929	714.968	0.258	0.208
<i>Panel D: liquidity creation by bank size</i>						
Small	853	314.934	15.261	2.981	0.048	0.009
Medium	413	770.117	150.358	114.991	0.195	0.149
Large	851	17510.874	5115.636	4236.291	0.292	0.242

period. Such discrepancy between the cat.fat and cat.nonfat calculations can be ascribed to the fact that these banks do not create liquidity by engaging in off-balance sheet activities. Specifically, off-balance sheet activities only account for less than 2 per cent of the liquidity created by these banks because. Islamic law prohibits these institutions from dealing with financial derivatives, while most off-balance sheet activities involve the use and issuance of these derivatives.

Panel B shows the amount of liquidity created in each sampled country. Both cat.fat and cat.nonfat reveal that banks in Saudi Arabia and the UAE generate the highest amount of liquidity in MENA followed by those in Iran. Meanwhile, banks in Algeria create the lowest amount of liquidity (US\$0.271tn according to cat.fat and US\$0.318tn according to cat.nonfat) followed by those in Libya (US\$0.030tn according to cat.fat and US\$4.75bn according to cat.nonfat), which mostly create liquidity by engaging in off-balance sheet activities. In terms of liquidity as a percentage of total assets, banks in

Tunisia are ranked the best (49.9 per cent of total assets), followed by those in Oman (45.1 per cent) and Iran (39.8 per cent). Banks in Algeria (−22.6 per cent) and Libya (−2.2 per cent) also emerge as the worst performers in this respect according to cat.nonfat. In terms of off-balance sheet activities, Iraqi banks show the highest degree of dependence on off-balance sheet activities to create liquidity (62 per cent), whilst Iranian banks show the lowest degree of dependence (3.5 per cent).

Panel C shows the liquidity creation of the sampled banks over time. In sum, the amount of liquidity created by these banks increased between 2011 and 2014 yet decreased in 2015 and 2016. However, the total amount of created liquidity increased from US\$573bn in 2011 to US\$715bn in 2016. However, the amount of liquidity created by these banks as a percentage of their total assets declined in almost every year covered by the sample. Moreover, the liquidity creation rate of these banks decreased from 34 per cent in 2011 to 25.8 per cent in 2016, and such decline can be ascribed to the unstable situation in the MENA region since 2011, during which banks have adopted a highly conservative stance in liquidity creation and showed a tendency to hold more liquid assets, thereby affecting their liquidity creation function.

Panel D classifies the banks into different sizes (following [Berger and Bouwman, 2009](#)) and compares their liquidity creation. Small, medium and large banks have assets of less than US\$1bn, between US\$1bn and US\$3bn and more than US\$3bn, respectively.

Amongst these banks, the large ones create the highest amount of liquidity (US\$5.116tn or 96.86 per cent of all liquidity created by banks in MENA) and have the highest amount of created liquidity as a percentage of total assets (29.2 per cent and 24.2 per cent according to cat.fat and cat.nonfat, respectively). Large banks are closely followed by medium banks, which created US\$150bn worth of liquidity (or 19.5 per cent of their total assets) during the study period. Small banks created the lowest amount of liquidity (US\$15.26bn or only 4.8 per cent of their total assets).

### *Variable selection*

Return on average assets (ROAA) and return on average equity (ROAE) are the chief accounting measures of bank profitability. ROAA is the ratio of after-tax profit over average total assets. While ROAE is the ratio of after-tax profit over average total equity. ROAA indicates the ability of a bank's management to generate profits from the bank's assets. It shows the profits earned per dollar of assets as well as how effectively the bank's assets are managed to generate revenues. Additionally, the analysis of the ROAE neglects financial leverage and the risk associated with it. Therefore, ROAA and ROAE show the efficiency of management in using its assets to make profits.

To reflect the internal determinants of bank profitability, this paper uses liquidity creation over total assets ratio, bank size, asset management, capital ratio, cost-to-income ratio, loan-loss provisions over total loans, deposits over total assets ratio, funding costs and interest on loans ratio.

[Iannotta et al. \(2007\)](#) and [Athanasoglou et al. \(2008\)](#) used the ratio of equity to assets (capital ratio) as a measure of capital strength. Generally, they find that banks with higher capital ratios are considered safer. The conventional risk-return hypothesis would thus indicate a negative relationship between the equity to assets ratio and bank profitability. However, a lower risk should increase a bank's creditworthiness and reduce its funding cost. Moreover, banks with a higher equity to assets ratio generally have a reduced need for external funding, which in turn sustains a positive influence on their profitability. Thus, the overall effect is theoretically undetermined.

Bank size, a logarithm of total assets, is seen as a significant causal factor of profitability (Demirgüç-Kunt and Huizinga, 1999; Athanasoglou *et al.*, 2008). Larger banks are expected to have economies of scale (increased operational efficiency) and economies of scope (higher degree of product and loan diversification) advantages than smaller ones. Additionally, Pasiouras and Kosmidou (2007) found a positive impact of size on bank profitability and discovered that extremely large banks show a negative relationship between size and profitability because of bureaucratic and some other reasons linked to size. Thus, the overall influence needs to be studied empirically.

The cost to income ratio is defined as operating costs over total generated revenues (Pasiouras and Kosmidou, 2007) and it is expected to have a negative relationship with bank profitability. To proxy credit risk, the loan-loss provisions to total loans ratio is applied. Theory suggests that an increased exposure to credit risk is associated with decreased bank profitability. Thus, a negative effect of credit risk on bank profitability is expected. Moreover, banks need to pay interest on their deposits. These funding costs (interest expenses over average total deposits) vary across banks and over time. Generally, banks that have the ability to raise funds more cheaply are expected to be more profitable.

The Herfindahl-Hirschman Index is used as a proxy of the market structure. This index is calculated as the sum of the squares of the ratio of each bank's assets to total assets within the banking sector of the country in which the bank operates. It ranges from 0 to 100, with 0 indicating high levels of competition and 100 representing high levels of concentration. Another proxy of the market structure is the share of a bank's deposits to total deposits which is also used in this study.

Considerable evidence shows that the country-level macroeconomic variables along with the financial structure variables have a significant effect on bank profitability. A positive impact on a bank's profitability is expected to occur, according to the literature that studies the relationship between economic growth and financial sector profitability (Demirgüç-Kunt and Huizinga, 1999; Athanasoglou *et al.*, 2008).

The effect of inflation on bank profitability depends on whether wages and other operating expenses grow at a faster rate than inflation. Studies like Bourke (1989) and Molyneux and Thornton (1992) have found a positive relationship between inflation and profitability. All the same, if inflation is not anticipated and banks do not adjust their interest rates correctly, costs may increase faster than revenues and henceforth affect bank profitability adversely. Thus, the overall effect is theoretically undetermined. For a summary of the definitions of dependent and explanatory variables (Table II).

#### *Regression model*

To decide between fixed or random effects, a Hausman test was run where the null hypothesis is that the preferred model is random effects vs. the alternative fixed effects. The null hypothesis is rejected (Chi-square (13) = 55.39,  $p$ -value = 0.000 < 0.05) which indicate that the fixed effects model is appropriate in this study (See Table AI of Hausman test in the Appendix).

Overall, this study conducts regression analyses and applies the following fixed effects model to empirically investigate the effects of liquidity creation on bank performance:

$$BP_{i,t} = C + \beta_1 LCR_{it-1} + \sum \beta_j X_{i,t-1} + \text{Year Dummy} + \text{Country Dummy} + \varepsilon_{i,t-1} \quad (1)$$

Where

- $BP_{it}$  = Return on average assets (ROAA) or return on average equity (ROAE) of the  $i_{th}$  bank at time  $t$ ;  
 $i = 1, \dots, N$ , and  $t = 1, \dots, T$ ;  
 $LCR_{it}$  = Liquidity creation divided by total assets; and  
 $X_{i,t}$  = The control variables (e.g., equity ratio, deposit ratio, bank size, credit quality, asset management ratio, operating efficiency, funding costs and macroeconomic environment).

All independent variables are lagged for one year to overcome the potential endogeneity problem (Berger *et al.*, 2016).

### Descriptive analysis

Table V presents the summary statistics of all variables. Firstly, Islamic banks are more profitable than conventional banks according to the ROAA and ROAE ratios, whilst medium banks have a higher ROAA than small and large banks. However, small banks have lower ROAE because of their higher equity ratios.

Second, Islamic banks have a higher amount of created liquidity as a percentage of total assets compared with conventional banks. Liquidity creation per unit of asset using cat.fat measure ( $LCR_1$ ) is equal to 39.8 per cent and 26.6 per cent for Islamic and conventional banks respectively, whilst liquidity creation per unit of asset using cat.fat measure ( $LCR_2$ ) is equal to 38 per cent and 20.7 per cent respectively. These results are supported by the results of T-test (mean comparison test) (see Table AII in the Appendix). Large banks have created the highest amount of liquidity followed by medium and small banks.

Third, Islamic and conventional banks show no significant differences in their equity ratios. In terms of size, small banks have the highest equity ratio of 43.1 per cent, whilst medium and large banks have equity ratios of 18 per cent and 13 per cent, respectively.

The table reports mean (standard deviation) values of the variables used in the regression analyses. For the notation of the variables (Table II). The full sample includes 2117 observations from 491 banks and 18 MENA countries. The period covers the years 2011-2016. The data source for the bank-specific is Bank Focus. The macroeconomic indicators were provided by the database of the World Bank.

### Empirical results

Based on the results of the Hausman test, this study applies a fixed effects model for analysis, as shown in Table AI. Table VI shows the results of the regression analysis (with standard errors in parentheses) where  $LCR_1$  is used as the main independent variable. Columns 1 and 2 report the results for ROAA; columns 3 and 4 report the results for ROAE.

Liquidity creation ( $LCR_1$ ) has a significant and negative relationship with bank performance (ROAE) at the 5 per cent level. These results are in line with the expected bankruptcy cost hypothesis, which posits a negative correlation between liquidity creation and profitability of banks. Liquidity creation can increase the level of illiquidity risk and subsequently reduce the profitability of banks and increase their probability to face bankruptcy (Tran *et al.*, 2016). Meanwhile, liquidity creation does not affect the ROAA of MENA banks. The coefficients of the interaction term between Islamic banks and liquidity creation are insignificant, indicating that there is no difference between the two types of banks on the relationship between liquidity creation and bank performance.

**Table V.**  
Descriptive statistics  
of regression  
variables

Variables	All	Conventional	Islamic	Small	Medium	Large
ROAA	1.513 (3.562)	1.481 (3.238)	1.705 (5.096)	1.562 (4.301)	1.662 (3.366)	1.392 (2.744)
ROAE	8.316 (22.514)	8.207 (23.058)	8.973 (18.943)	7.999 (12.126)	8.962 (14.806)	8.32 (31.741)
LCR <sub>1</sub>	28.4 (38.524)	26.555 (38.904)	38.456 (35.616)	4.846 (43.129)	19.524 (33.548)	29.214 (26.392)
LCR <sub>2</sub>	23.415 (36.835)	20.743 (36.779)	37.982 (35.588)	0.946 (41.397)	14.932 (31.104)	24.193 (25.662)
EQ_TA	26.185 (25.076)	25.579 (24.712)	29.828 (26.915)	31.382 (27.412)	22.61 (22.843)	22.711 (22.667)
TD_TA	65.969 (26.327)	66.23 (26.316)	64.39 (26.39)	61.81 (27.916)	68.399 (26.02)	68.783 (24.333)
B_size	14.353 (2.067)	14.346 (2.064)	14.391 (2.088)	13.678 (1.907)	14.424 (2.016)	14.995 (2.036)
AM	81.955 (441.461)	88.845 (472.611)	40.597 (148.752)	189.303 (682.022)	19.361 (36.163)	5.202 (11.228)
CIR	57.023 (50.915)	56.774 (49.446)	58.52 (59.059)	56.132 (43.306)	58.931 (63.883)	56.868 (50.535)
LOAN	9.616 (14.347)	9.454 (13.71)	10.563 (17.626)	11.92 (16.52)	10.37 (14.7)	7.313 (11.595)
FC	13.807 (72.162)	14.908 (75.356)	7.163 (48.217)	18.097 (90.343)	12.988 (65.334)	10.059 (52.842)
Loan_int	6.599 (18.616)	6.426 (18.301)	7.674 (20.469)	8.165 (26.234)	5.425 (6.358)	5.665 (12.777)
HH_index	20.387 (15.511)	20.23 (15.54)	21.342 (15.316)	23.145 (16.441)	17.576 (11.703)	15.809 (7.153)
Market_share	65.659 (29.811)	66.547 (29.137)	60.244 (33.155)	46.26 (30.848)	71.341 (22.122)	77.384 (19.706)
INF	6.82 (10.378)	6.645 (10.293)	7.889 (10.835)	9.243 (13.815)	6.118 (10.591)	3.58 (4.458)
GDP_Growth	1.969 (12.589)	2.002 (13.293)	1.766 (6.866)	0.015 (9.136)	1.326 (8.728)	2.797 (6.748)

Variables	ROAA		ROAE	
	(1)	(2)	(3)	(4)
LCR <sub>1</sub>	−0.005 (0.004)	−0.004 (0.004)	−0.042** (0.020)	−0.038* (0.021)
Islamic* LCR <sub>1</sub> (Islamic is a dummy. It equals to one for Islamic banks and zero otherwise)		−0.010 (0.013)		−0.027 (0.072)
EQ_TA	0.026*** (0.006)	0.025*** (0.006)	−0.028 (0.023)	−0.028 (0.023)
B_size	−0.055 (0.043)	−0.055 (0.042)	0.684*** (0.211)	0.686*** (0.211)
TD_TA	0.002 (0.004)	0.002 (0.004)	0.017 (0.016)	0.017 (0.016)
AM	0.002*** (0.001)	0.002*** (0.001)	0.007*** (0.002)	0.007*** (0.002)
CIR	−0.049*** (0.003)	−0.049*** (0.003)	−0.225*** (0.014)	−0.224*** (0.014)
LOAN	−0.005 (0.006)	−0.006 (0.006)	−0.003 (0.029)	−0.003 (0.029)
FC	0.132* (0.078)	0.132* (0.078)	0.372 (0.235)	0.373 (0.235)
Loan_int	0.045** (0.021)	0.045** (0.021)	0.234*** (0.070)	0.234*** (0.070)
HH_index	−0.029*** (0.008)	−0.029*** (0.008)	−0.106** (0.042)	−0.106** (0.042)
Market_share	−0.006** (0.003)	−0.006** (0.003)	0.008 (0.013)	0.007 (0.013)
INF	−0.009 (0.011)	−0.009 (0.011)	−0.064 (0.077)	−0.065 (0.076)
GDP_Growth	−0.001 (0.012)	−0.001 (0.012)	−0.043 (0.061)	−0.043 (0.061)
C	5.151*** (0.780)	5.164*** (0.782)	13.912*** (3.611)	13.947*** (3.633)
Time effect	YES	YES	YES	YES
Country effect	YES	YES	YES	YES
N	1413	1413	1413	1413
F	27.282	25.639	34.017	31.994
R_square	0.410	0.410	0.392	0.392

**Note:** \*\*\*, \*\* and \* indicate significance at the 1, 5 and 10 per cent levels, respectively

Liquidity  
creation and  
bank  
performance

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**Table VI.**  
Regression analysis  
on the relationship  
between liquidity  
creation and bank  
performance

The coefficients of the efficiency measure, namely, cost-to-income ratio, are significantly negative across all specifications. This result not only confirms the expectation that a higher bank efficiency corresponds to a higher profitability, but also supports the findings of other studies, such as [Athanasoglou et al. \(2008\)](#) and [Dietrich and Wanzenried \(2011\)](#), both of which define efficient cost management as a prerequisite for increasing the profitability of banks in MENA. Those banks with higher capitalization are safer than those with low capital ratios and may face lower costs of funding because of their low potential bankruptcy costs. This result is supported by the empirical evidence from [Bourke \(1989\)](#), [Demirgüç-Kunt and Huizinga \(1999\)](#) and [Berger and Bouwman \(2013\)](#). Moreover, the coefficients of asset management, interest on loans and HH index show significant values in all specifications. However, the coefficients of equity ratio, bank size, funding cost and market share show significant numbers in the regression results of one dependent variable (ROAA or ROAE).

## Robustness test

### *An alternative measure of liquidity creation*

This study uses LCR<sub>1</sub>, which denotes liquidity creation (according to cat.fat) divided by total assets, as the main independent variable in the main analysis. By contrast, it uses LCR<sub>2</sub>, an alternative measure of liquidity creation that is computed by dividing liquidity creation (according to cat.nonfat) by total assets, as the main variable in the robustness test. LCR<sub>2</sub> is used for two reasons. First, off-balance sheet activities contribute to less than 2 per cent of the total liquidity created by Islamic banks because Islamic law prohibits these institutions from dealing with financial derivatives. The same reason also applies to small banks;

wherein off-balance activities only contribute 4.8 per cent to their liquidity creation. Second, off-balance activities only contribute to less than 20 per cent of the total liquidity created by banks in most MENA countries. These activities even have negative contributions to the liquidity creation of banks in Algeria and Libya. Therefore, using  $LCR_2$  is more appropriate than using  $LCR_1$ .

Table VII shows the results of the regression analysis (with standard errors in parentheses) where  $LCR_2$  is used as the main independent variable. Columns 1 and 2 report the results for ROAA, while columns 3 and 4 report the results for ROAE.  $LCR_2$  shows a significant and negative relationship with ROAE at the 5 per cent level which is consistent with the results of the main regression. In other words, a higher liquidity creation can reduce the profitability of banks in MENA. The relationship between ROAA and  $LCR_2$  is also negative, yet insignificant. These results are in line with those of the main regression analysis that uses  $LCR_1$  as the main independent variable. The results show that the coefficients of the interaction term between Islamic banks and liquidity creation are insignificant, indicating that there is no difference between the two types of banks on the relationship between liquidity creation and bank performance.

*Excluding high-inflation countries*

The results might be affected by extreme values of certain macroeconomic determinants. For instance, countries with very high inflation rates might drive the main results. So, the countries which recorded higher inflation rates are excluded from the sample. The model is

Variables	ROAA		ROAE	
	(1)	(2)	(3)	(4)
$LCR_2$	-0.008 (0.004)	-0.007 (0.005)	-0.048** (0.024)	-0.044* (0.026)
Islamic* $LCR_2$ (Islamic is a dummy. It equals to one for Islamic banks and zero otherwise)		-0.007 (0.013)		-0.023 (0.074)
EQ_TA	0.025*** (0.006)	0.025*** (0.006)	-0.028 (0.023)	-0.028 (0.023)
B_size	-0.054 (0.043)	-0.054 (0.043)	0.693*** (0.211)	0.694*** (0.211)
TD_TA	0.002 (0.004)	0.002 (0.004)	0.016 (0.016)	0.016 (0.016)
AM	0.002*** (0.001)	0.002*** (0.001)	0.007*** (0.002)	0.007*** (0.002)
CIR	-0.049*** (0.003)	-0.049*** (0.003)	-0.225*** (0.014)	-0.224*** (0.014)
LOAN	-0.005 (0.006)	-0.005 (0.006)	-0.003 (0.029)	-0.003 (0.029)
FC	0.131* (0.078)	0.131* (0.078)	0.370 (0.235)	0.371 (0.235)
Loan_int	0.045** (0.021)	0.045** (0.021)	0.232*** (0.070)	0.232*** (0.070)
HH_index	-0.029*** (0.008)	-0.028*** (0.008)	-0.105** (0.042)	-0.105** (0.042)
Market_share	-0.006** (0.003)	-0.007** (0.003)	0.007 (0.013)	0.006 (0.013)
INF	-0.009 (0.011)	-0.009 (0.011)	-0.065 (0.076)	-0.066 (0.076)
GDP_Growth	-0.001 (0.012)	-0.001 (0.012)	-0.042 (0.061)	-0.042 (0.061)
C	5.161*** (0.779)	5.170*** (0.781)	13.836*** (3.620)	13.864*** (3.641)
Time effect	YES	YES	YES	YES
Country effect	YES	YES	YES	YES
N	1413	1413	1413	1413
F	27.307	25.690	33.711	31.602
R_square	0.410	0.410	0.392	0.392

**Table VII.**  
Regression analysis  
on the relationship  
between liquidity  
creation and bank  
performance (ROAE)

**Note:** \*\*\*, \*\* and \* indicate significance at the 1%, 5%, and 10% levels, respectively



re-estimated with the censored sample. The results are shown in Table VIII and conclude that the findings of the main regression persist again.

## Conclusion

The theory of liquidity creation posits that aside from transforming risks, banks also create liquidity as one of their most important functions. This study explores the liquidity creation of commercial banks in 18 MENA countries between 2011 and 2016. It also examines the relationship between liquidity creation and profitability of these banking institutions.

According to cat.fat, banks in MENA created US\$5.281tn worth of liquidity that accounts for 28.4 per cent of their total assets during the study period. This liquidity is smaller than that generated by banks in the USA and China. MENA banks also gradually increased their liquidity creation between 2011 and 2014, but the amount of this liquidity slightly declined in 2015 and 2016. Specifically, the amount of liquidity created by these institutions increased by approximately 29.73 per cent between 2011 and 2016, but the amount of liquidity created as a percentage of total assets significantly declined during the same period. Conventional and Islamic banks account for 79 per cent and 21 per cent, respectively, of the total liquidity created by MENA banks. However, Islamic banks outperform their conventional counterparts in terms of liquidity creation as a percentage of total assets. Banks in Saudi Arabia created the largest amount of liquidity in MENA followed by banks in the UAE and Iran. Meanwhile, banks in Algeria created negative liquidity during the study period, thereby making them the poorest performing banks in

Variables	ROAA		ROAE	
	(1)	(2)	(3)	(4)
LCR <sub>1</sub>	−0.006 (0.004)	−0.005 (0.004)	−0.046** (0.021)	−0.050** (0.023)
Islamic* LCR <sub>1</sub> (Islamic is a dummy. It equals to one for Islamic banks and zero otherwise)		−0.009 (0.013)		0.019 (0.052)
EQ_TA	0.021*** (0.005)	0.021*** (0.005)	−0.025 (0.022)	−0.025 (0.023)
B_size	−0.105*** (0.040)	−0.104*** (0.040)	0.459** (0.189)	0.457** (0.188)
TD_TA	0.003 (0.004)	0.003 (0.004)	0.022 (0.015)	0.022 (0.015)
AM	0.002*** (0.001)	0.002*** (0.001)	0.006*** (0.001)	0.006*** (0.001)
CIR	−0.047*** (0.003)	−0.047*** (0.003)	−0.224*** (0.015)	−0.224*** (0.015)
LOAN	−0.015* (0.008)	−0.015* (0.008)	−0.069** (0.029)	−0.069** (0.029)
FC	0.043 (0.075)	0.042 (0.075)	−0.004 (0.165)	−0.003 (0.165)
Loan_int	0.037 (0.026)	0.037 (0.026)	0.174*** (0.066)	0.175*** (0.066)
HH_index	0.020* (0.010)	0.020* (0.010)	0.204** (0.084)	0.204** (0.084)
Market_share	−0.011*** (0.003)	−0.011*** (0.003)	−0.011 (0.011)	−0.011 (0.011)
INF	0.065*** (0.023)	0.066*** (0.023)	0.149 (0.093)	0.148 (0.093)
GDP_Growth	0.031** (0.013)	0.030** (0.013)	0.092 (0.065)	0.093 (0.065)
C	5.217*** (0.750)	5.226*** (0.750)	12.821*** (3.553)	12.803*** (3.557)
Time effect	YES	YES	YES	YES
Country effect	YES	YES	YES	YES
N	1150	1150	1150	1150
F	26.982	25.500	36.656	34.345
R_square	0.405	0.405	0.430	0.430

Note: \*\*\*, \*\* and \* indicate significance at the 1, 5 and 10 per cent levels, respectively

**Table VIII.**  
Regression analysis  
on the relationship  
between liquidity  
creation and bank  
performance

MENA in terms of liquidity creation. Large banks have created the largest amount of liquidity, accounting for 96.86 per cent of the total liquidity in the region, and even surpassed the liquidity creation rates achieved by banks in the USA and China.

The regression analysis on the relationship between liquidity creation and performance of banks reveals that liquidity creation has a negative and significant influence on profitability using the ROAE measure. This result supports the expected bankruptcy cost hypothesis, which posits that liquidity creation can increase the level of illiquidity risk, which in turn reduces the profitability of banks and increases their probability of facing bankruptcy. However, liquidity creation has no significant effect on profitability when ROAA is used. These results are consistent with those obtained in the robustness check.

In sum, bank managers must reach a trade-off between the advantages and disadvantages of liquidity creation as well as consider the negative relationship between liquidity creation and bank performance when making their decisions.

Following Berger and Bouwman (2009), a lot of issues related to bank liquidity creation have been discussed and explored in the context of developed and emerging markets such as bank capital and liquidity creation, the cyclicalities of bank liquidity creation and the role of corporate governance on bank liquidity creation. However, these issues have not been tested in the MENA region yet. It will, therefore, be useful to study such topics in future research. In addition, it will be interesting to examine the effects of country instability on bank liquidity creation in the countries that face armed conflicts such as Iraq, Libya, Syria and Yemen.

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Variables	Coefficients		(b – B) Difference	sqrt (diag(V_b – V_B)) S.E.
	(b) fe	(B) re		
LCR <sub>1</sub>	–0.00695	0.001525	–0.0084724	0.0052799
EQ_TA	0.030286	0.032066	–0.0017799	0.0036062
B_size	0.061474	0.03948	0.021993	0.0328666
TD_TA	–0.00738	–0.00236	–0.0050156	0.0021357
HH_index	–0.0348	–0.01575	–0.01905	0.0068526
Market_share	–0.01004	–0.00567	–0.0043635	0.003037
LOAN	0.000893	0.001932	–0.0010389	0.0034832
CIR	–0.03331	–0.03374	0.00043	0.0009679
AM	3.31E-05	3.62E-05	–3.08E-06	0.0000122
FC	0.023323	0.048151	–0.0248276	0.008492
Loan_int	0.021626	0.026177	–0.004551	0.0020131
INF	–0.00205	0.022914	–0.024961	0.0054919
GDP_Growth	0.027194	0.007895	0.0192982	0.0085127

**Notes:** b = consistent under H<sub>0</sub> and H<sub>a</sub>; obtained from xtreg. B = inconsistent under H<sub>a</sub>, efficient under H<sub>0</sub>; obtained from xtreg. Test: H<sub>0</sub>: difference in coefficients not systematic  $\chi^2(13) = (b-B)' [(V_b - V_B)^{-1}] (b-B) = 55.39$ . Prob>chi2 = 0.0000

**Table AI.**  
Results of Hausman  
test

Variable	Group	Obs	Mean	Std. Err.	Diff	t-test	p-value
LCR1	Conventional	1815	26.555	0.913	–11.901	–2.9591	0.0031
	Islamic	302	38.456	2.049			
LCR2	Conventional	1815	20.743	0.863	–17.239	–5.1814	0.000
	Islamic	302	37.982	2.048			

**Table AII.**  
T-test (Mean  
comparison test)

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