



## FRIM: A New Tool for Financial Risk Monitoring in MENA

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**Introduction:** The impact of the global financial crisis on banking systems and banks in the Middle East and North Africa (MENA) has highlighted the importance of differentiating across countries and among financial institutions. While the region avoided systemic banking distress, the crisis had a stronger impact on countries in the Gulf Cooperation Council (GCC), where financial systems were more globally integrated and banks more overextended. Countries elsewhere in the region, including transition countries, weathered the crisis better. However, protracted economic weakness is likely to have a significant impact on several banking systems and banks, which can have profound consequences for credit intermediation and ultimately economic growth and job creation. This underscores the need for better tools to monitor financial risk and vulnerabilities in MENA.

Most importantly, the global financial crisis revealed significant differences in the resilience of individual banks. This was largely the result of the quality of management, corporate governance arrangements and banks' business models, sometimes mitigated by pre-emptive policy actions taken by country authorities. For example, the Kuwaiti authorities promptly recapitalized a domestic bank during the recent turmoil. In many cases, knowledge about the specific features underpinning individual financial institutions' health has been crucial for identifying problems and informing policy action. This suggests that an early warning system built on bank-specific fundamentals can provide a useful monitoring tool, helping World Bank Group staff detect vulnerable financial institutions in the region to better inform policy dialogue and advisory activities.



**A sound banking system is critical for access to finance for small and large enterprises. (World Bank Photo Collection)**

To this end, we have developed a simple analytical tool which allows a *preliminary* assessment of the health of individual financial institutions in the MENA region. In particular, we develop a Bank Risk Indicator (BRI) and provide nearly-automated spreadsheet templates, FRIM, to facilitate the exercise. We show that the BRI can be useful for initial identification of individual bank fragility. However, we also note its limitations and acknowledge the need to complement this analysis with more rigorous quantitative and qualitative assessments.

**Methodology and Data:** The starting point for the analysis of vulnerabilities in MENA's banking systems is the construction of the BRI, a proxy for insolvency risk derived from a set of bank fundamental indicators. The BRI provides an indication of the probability of insolvency of an individual bank. It is calculated for each bank in each MENA country at each point in time using a multivariate logistic regression framework.<sup>2</sup>

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<sup>2</sup> See Calice, 2014. "Predicting Bank Insolvency in the Middle East and North Africa", World Bank Policy Research Working Paper #6969.

Bank insolvency is defined as a state where  $(car + roa) \leq 0$ , where *car* is the bank's capital-asset ratio and *roa* its return on assets. The BRI is estimated by summing up five fundamental indicators which are statistically correlated with the probability of bank insolvency in MENA. Indicators are taken from individual banks' income statements and balance sheets. To visually represent the BRI, "traffic light" icon sets are subsequently generated to provide a snapshot of a particular bank (see below).

The following financial variables are used for calculating the BRI:

- *Size*: log of total assets. This accounts for the fact that larger banks may be better able to diversify their loan portfolio, both sectorally and geographically, thus reducing asset risk and ultimately the probability of insolvency.
- *Capitalization*: ratio of equity to total loans. A measure of the extent of leverage based on loans instead of total assets provides a sensible indication of the bank's buffer stock which can serve as a cushion to absorb loan losses since banking crises typically involve shock to the loan portfolio and MENA banks' main risk is constituted by lending risk. Higher levels of capital act as a buffer against financial losses and are expected to reduce the risk of bank insolvency.
- *Asset quality*: ratio of loans to total assets and ratio of loan loss provisions to net interest income. An asset mix characterized by a high proportion of loans relative to other earning assets indicates a riskier asset portfolio. On the other hand, high provisioning reflects high nonperforming loans (NPLs) and therefore higher insolvency risk.
- *Management quality*: cost to income ratio. Higher values for this indicator signal relatively poor managerial quality and therefore higher insolvency risk.
- *Liquidity*: ratio of liquid assets to deposits and short-term funding. Low liquid assets compared to short-term sources of funding signal a stretched liquidity position which can ultimately jeopardize the bank's solvency.

Bank-level financial indicators are lagged by two years to generate the BRI in the MENA region. Two-year lags

are common in off-site surveillance models employed by supervisors. For example, since 1994 the Federal Reserve uses an early warning system known as SEER or System to Estimate Examination Ratings to monitor the condition and performance of state member banks. The model estimates the probability that a bank will fail or become critically undercapitalized within the next two years.

BRI's are generated automatically by FRIM, an Excel-based tool, which downloads the requisite data for 385 individual banks from *Bankscope* and automatically generates the corresponding risk measures<sup>3</sup>. BRI's are shown as icon sets in the form of traffic lights to easily differentiate among financial institutions in a particular period and over time. A "traffic light" icon set is a graphical representation of data where the individual values contained in a matrix are represented as colors. Typically, the green color is associated with the "best" value; the red represents the "worst" value; whereas intermediate values are presented in yellow based on their proximity to the red zone.

The FRIM ranking is calibrated on the historical probability of insolvency observed in MENA. As the objective of FRIM is to develop an early warning system for bank insolvency, it is important to identify a threshold above which the model would send a signal that the bank is approaching the insolvency point. Therefore, banks whose BRI are above the in-sample probability of insolvency will be denoted in red; banks whose BRI is approaching the in-sample probability of insolvency will be represented in yellow; and healthy banks will be denoted by a green light.

**Application of the BRI and FRIM:** In this section we show the application of the BRI and the output from the FRIM template. We begin by calculating the BRI of MENA banks in 2014 and compare it with the BRI in 2013 to demonstrate the tool (Table 1).<sup>4</sup> An overview of the results suggests that:

- For the sample of MENA banks where financial data are available, the proportion of banks at risk of insolvency (red light) decreased in 2014 compared to 2013 (from 2.2 percent to 1.6 percent).
- However, the share of banks approaching the risk of insolvency (yellow light) increased in

<sup>3</sup> For more on Bankscope see [bvinfo.com](http://bvinfo.com)

<sup>4</sup> Due to the two-year lag of bank-level financial indicators, the BRI for 2014 is calculated using 2012 audited financial statements while the BRI for 2013 is based on 2011 data.

2014 compared to 2013, from 3.7 percent to 4.4 percent.

- Tunisia is the country with the largest number of banks where the probability of insolvency is above or close to historically observed values.

Next we move to the case study of the Tunisian banking system as a backdrop for testing the usefulness of the BRI. A joint IMF/World Bank Financial System Stability Assessment conducted in 2012 found that the banking sector in the country faced significant challenges due to a weak domestic economy combined with the legacy of the previous regime. These were reflected in deteriorating solvency, asset quality and profitability metrics across the board.<sup>5</sup>

Of particular concern was the weak performance of state-owned banks (SOBs) such as Société Tunisienne de Banque and Banque de l'Habitat. In particular, their financial profile had deteriorated due to weaknesses in underwriting and deficiencies in corporate governance standards which led to inappropriate lending to well-connected borrowers. Against this background, the Tunisia authorities were urged to take preemptive actions to raise bank capital and a number of initiatives in this respect are underway, including the establishment of an asset management company to dispose of NPLs and a recapitalization of SOBs.

Table 1

	2013			2014		
Algeria	0	0	15	0	0	15
Bahrain	0	0	25	0	2	23
Djibouti	0	0	3	0	0	3
Egypt	0	0	27	0	0	26
Iran	0	0	13	0	0	10
Iraq	0	0	14	0	0	6
Jordan	1	0	17	0	1	17
Kuwait	0	0	15	1	0	15
Lebanon	0	0	34	0	0	32
Libya	0	0	7	0	0	7
Morocco	0	2	12	0	1	11
Oman	0	1	8	0	1	7
Palestinian Territories	0	0	4	0	0	4
Qatar	0	0	10	0	0	10
Saudi Arabia	0	0	12	0	0	12
Sirya	0	2	13	0	1	8
Tunisia	5	4	9	2	5	9
United Arab Emirates	0	1	26	1	0	26
Yemen	0	0	8	0	0	9
<b>Total</b>	<b>6</b>	<b>10</b>	<b>272</b>	<b>4</b>	<b>11</b>	<b>250</b>

Based on end-2011 accounting data, we estimate the BRI for Tunisian banks in 2013 as a first-pass analysis of their financial soundness. The “traffic lights” icon sets which are subsequently generated using FRIM shows clear differentiation in the soundness of banks within the system. The results are consistent with the findings of the FSAP, notably that SOBs are among the weakest and less resilient banks with the system along with a smattering of smaller, less systemically important institutions (Table 2).<sup>6</sup>

All in all, the back-tests show the general effectiveness of the BRI in highlighting banking system vulnerabilities and differentiating the soundness of banks within a system.

**Caveats:** As with all synthetic indicators, the BRI presents a number of caveats which have to be considered when interpreting its information content. First is the issue of aggregation. The BRI is the sum of five financial indicators which are significant predictors of bank insolvency in the MENA region. As such, the BRI provides an overall indication of the probability of insolvency of a particular bank yet it can also hide valuable granular information about specific aspects of individual banks’ performance.

Table 2

Tunisia, BRI 2013	
Société Tunisienne de Banque	
Banque Nationale Agricole	
Banque de l'Habitat	
Bank 1	
Bank 2	
Bank 3	
Bank 4	
Bank 5	
Bank 6	
Bank 7	
Bank 8	
Bank 9	
Bank 10	
Bank 11	
Bank 12	
Bank 13	
Bank 14	
Bank 15	

Second is the issue of in-sample bias. The BRI is calculated based on an empirical assessment of the determinants of bank insolvency within the MENA region and during a specific time period. The use of a

<sup>6</sup> We anonymize private banks to avoid implicating any particular institution.

<sup>5</sup> Available at <https://www.imf.org/external/pubs/ft/scr/2012/cr12241.pdf>.

global sample to produce the BRI would improve the signaling value of the indicator. Related to the latter is the issue of cross-sectional comparability. The BRI does not adjust for nuances associated with heterogeneity across banks. FRIM should ideally be applied in a homogenous environment, i.e. to institutions with similar business models, ownership structures, similar regulatory and supervisory requirements etc. An analysis of the BRI should take these aspects into consideration.

Finally, given the definition of insolvency underlying the assessment analysis, the BRI is generally able to predict the occurrence of an insolvency event only when the latter originates from widespread losses on the asset side of a bank's balance sheet, which leads to a progressive deterioration of the bank's fundamentals. Insolvency events, however, can also originate from the liability side of a bank's balance sheet, such as a traditional bank run or a wholesale bank run, as the recent crisis showed on a large scale and in GCC countries as far as MENA is concerned. These point to the importance of supplementing the signaling value of the BRI with any other relevant quantitative and qualitative information.

**Concluding Remarks:** Recent episodes of global financial stress have underscored the importance of individual banks to the stability of their own or even the global financial system. Therefore, the analysis of the soundness of individual institutions based on their fundamentals has been established as a central component of surveillance and crisis management frameworks. This is especially important in the MENA region, which has shown significant differences in the relative health of financial institutions.

Against this backdrop and to respond to the need of World Bank Group staff for a wider diagnostic toolkit, we have developed the BRI, an icon set in the form of a traffic light to enable *preliminary* analyses of individual

banks' financial soundness in the region, and an Excel-based spreadsheet tool (FRIM) to facilitate its calculation and presentation. A back-test based on actual developments in the Tunisian banking system suggests that the BRI is able to accurately differentiate banks according to their financial health.

Still, the signaling value BRI should be interpreted with caution as there are a number of caveats attached to its use. In particular, the BRI is the result of the aggregation of a number of individual indicators so the relative performance of the latter should also be taken into account in any analysis. Moreover, the BRI is calculated based on an assessment of the health of individual banks within the MENA region, which implies some sort of selection bias. The differences in business models and other intrinsic bank characteristics should also be considered when interpreting the results. In addition, the definition of insolvency implied by the BRI is such that it is not able to signal the risk of insolvency stemming from *other-than* deterioration in the bank fundamentals. Finally, it is important that the user has familiarity with the specific features of any banking system under analysis and that any assessment is supplemented by any other relevant quantitative and qualitative information.

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