

## Appendix A

### Revision in Financial Sector Vulnerability Index (FSVI)

FSVI was first introduced in FSR 2016, and since then it has been modified and regularly published in the subsequent reviews. The index has been initially developed on yearly basis; however, the frequency was increased to quarterly basis in FSR 2017. For the current year, few more modifications have been made in the FSVI in terms of coverage, indicators and methodology.

In addition to the four areas of risk initially covered in FSR 2016, the scope of FSVI for 2018 has been enhanced by incorporating three more sectors. These include Development Finance Institutions (DFIs), Non-Banking Financial Institutions (NBFIs) and Insurance sector. In addition, some indicators have been added/removed, to avoid duplication and to improve risk coverage. See Table 1 below for details.

While the new FSVI continues to be largely based on the methodology described in Aikman et. al. (2015)<sup>254</sup>, few alterations have been made in the aggregation procedure of the index. Previously, z-scores at aggregate level were scaled between 0 and 1 using the empirical cumulative distribution function (ECDF). This meant that the highest point, at the aggregate level, were bound to be ranked 1 (highest risk). As a result, the financial vulnerability could have been overestimated. To correct this deficiency, the revised methodology carries out the scaling at indicator level rather than at aggregate level. The consolidated index is derived by taking simple averages of all the scaled indicators. The revised methodology ensures that the highest rank of 1 is assigned only if all of the underlying indicators, simultaneously, perform at their worst levels.

Moreover, the revised methodology makes the results of FSVI consistent with other composite indicators, such as the Banking Sector Stability Map (BSSM), used in the FSR.

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<sup>254</sup>

<https://www.federalreserve.gov/econresdata/feds/2015/files/2015059pap.pdf>

Table 1: FSVI and FSHM: Risk Areas, Risk Dimensions and Indicators

Sr. No.	Risk Area	Risk Dimension	Risk Indicator(s)	Impact on Financial Stability
1	Banking	Capital Adequacy (C) $C = \frac{1}{n} \sum_{i=1}^n c_i, n = 3$	$c_1 = \text{Capital Adequacy Ratio (CAR)}$ $c_2 = \text{TIER 1 (CAR)}$ $c_3 = \text{Capital to Asset Ratio}$	Positive Positive Positive
		Asset Quality (AQ) $AQ = \frac{1}{n} \sum_{i=1}^n aq_i, n = 3$	$aq_1 = \text{NPLs to Total Loans}$ $aq_2 = \text{Net NPLs to Capital}$ $aq_3 = \text{Loss to NPLs}$	Negative Negative Negative
		Earnings (E) $E = \frac{1}{n} \sum_{i=1}^n e_i, n = 6$	$e_1 = \text{Return on Assets Before Tax}$ $e_2 = \text{Return on Equity (Avg. Equity and Surplus) Before Tax}$ $e_3 = \text{Net Interest Margin}$ $e_4 = \text{Net Interest Income/Gross Income}$ $e_5 = \text{Cost to Income Ratio}$ $e_6 = \text{Trading Income to Total Income}$	Positive Positive Positive Positive Negative Negative
		Liquidity (L) $L = \frac{1}{n} \sum_{i=1}^n l_i, n = 3$	$l_1 = \text{Liquid Assets/Total Assets}$ $l_2 = \text{Liquid Assets/Total Deposits}$ $l_3 = \text{Liquid Assets/Short term liabilities}$	Positive Positive Positive
		Deposits (D) $D = \frac{1}{n} \sum_{i=1}^n d_i, n = 2$	$d_1 = \text{Deposits to Assets}$ $d_2 = \text{Deposit growth (YoY)}$	Positive Positive
		Interconnectedness (I) $I = \frac{1}{n} \sum_{i=1}^n i_i, n = 2$	$i_1 = \text{Call lending and borrowing/Total Assets}$ $i_2 = \text{Financial Liabilities (SBP exclusive)}$	Negative Negative
2	Corporate	Corporate Debt	<i>Debt Burden (average of asset/equity and debt/equity)</i>	Negative
3	Financial Markets	Foreign Exchange	<i>Mid-Weight Interbank Exponential Moving Weighted Average (EMWA) Volatility</i>	Negative
		Money Market	<i>Overnight Repo Rate Exponential Moving Weighted Average (EMWA) Volatility</i>	Negative
		Capital Market	<i>KSE-100 Index Exponential Moving Weighted Average (EMWA) Volatility</i>	Negative
4	Macro economy	External Sector (Ex) $Ex = \frac{1}{n} \sum_{i=1}^n ex_i, n = 3$	$ex_1 = \text{Total Liquid Foreign Reserve Position (with SBP)}$ $ex_2 = \text{Current Account Balance as Percentage of GDP}$ $ex_3 = \text{Balance of Trade as Percentage of GDP}$	Positive Positive Positive
		Real Sector	<i>Real GDP Growth</i>	Positive
		Fiscal Sector	<i>Fiscal Deficit as Percentage of GDP</i>	Negative
		Inflation	<i>CPI inflation</i>	Negative

Table 1: FSVI and FSHM: Risk Areas, Risk Dimensions and Indicators

Sr. No.	Risk Area	Risk Dimension	Risk Indicator(s)	Impact on Financial Stability
5	DFIs	Capital Adequacy (C) $C = \frac{1}{n} \sum_{i=1}^n c_i, n = 3$	$c_1 = \text{Capital Adequacy Ratio (CAR)}$ $c_2 = \text{TIER 1 (CAR)}$ $c_3 = \text{Capital to Asset Ratio}$	Positive Positive Positive
		Asset Quality (AQ) $AQ = \frac{1}{n} \sum_{i=1}^n aq_i, n = 3$	$aq_1 = \text{NPLs to Total Loans}$ $aq_2 = \text{Net NPLs to Capital}$ $aq_3 = \text{Net NPLs to Net Loans}$	Negative Negative Negative
		Earnings (E) $E = \frac{1}{n} \sum_{i=1}^n e_i, n = 4$	$e_1 = \text{Return on Assets Before Tax}$ $e_2 = \text{Return on Equity (Avg. Equity and Surplus) Before Tax}$ $e_3 = \text{Net Interest Income/Gross Income}$ $e_4 = \text{Cost to Income Ratio}$	Positive Positive Positive Negative
		Liquidity (L) $L = \frac{1}{n} \sum_{i=1}^n l_i, n = 3$	$l_1 = \text{Liquid Assets/Total Assets}$ $l_2 = \text{Liquid Assets/Total Deposits}$ $l_3 = \text{Advances/Deposits}$	Positive Positive Positive
6	NBFIs	Assets	<i>Asset Growth (YoY)</i>	Positive
		Earnings	<i>Net Sales</i>	Positive
7	Insurance	Life (Li) $Li = \frac{1}{n} \sum_{i=1}^n li_i, n = 4$	$li_1 = \text{Claims ratio}$ $li_2 = \text{Return on Assets before tax}$ $li_3 = \text{Return on Investment before tax}$ $li_4 = \text{Capital to Assets}$	Negative Positive Positive Positive
		Non-life (NL) $NL = \frac{1}{n} \sum_{i=1}^n nli_i, n = 5$	$nli_1 = \text{Claims ratio}$ $nli_2 = \text{Premium Retention}$ $nli_3 = \text{Return on Assets before tax}$ $nli_4 = \text{Return on Investment before tax}$ $nli_5 = \text{Capital to Assets}$	Negative Negative Positive Positive Positive