3. Online Annex. Higher for Longer: What are the Macrofinancial Risks?

Annex 1. Scenarios for Stress Tests

A1.1. Corporate Sector Stress Test

The analysis covers more than 1,000 listed firms from 16 ME&CA countries (Azerbaijan, Bahrain, Egypt, Jordan, Kazakhstan, the Kyrgyz Republic, Kuwait, Lebanon, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Sudan, Tunisia, and the United Arab Emirates).[8]

The stress test is based on the identification of zombie firms to then assess the extent of debt at risk of default. Following Acharya and others (2022), zombies are defined as unhealthy firms whose average interest coverage ratio (ICR) over two years falls below 2.5 (the mean ICR for BB-rated firms) and simultaneously receive “subsidized” lending (that is, their effective interest rate is below that of top-rated firms).

Historically, the share of zombie firms typically peaked after large shocks/recessions (for example, after the global financial crisis or the 2014–15 oil-price shock). However, zombie firms have virtually disappeared in the aftermath of the pandemic (Annex Figure 1.1, panels 1 and 2), with the share of zombie-held debt dropping to about 12 percent in 2022 from more than 30 percent in 2020. There are two reasons for this evolution. First, about 10 percent of the zombie firms exited during the pandemic shock. Second, firms benefited from an improvement in ICRs, reflecting pandemic-related government support such as interest payment moratoria and credit guarantees, in addition to a lower interest rate environment. Overall, pre- and post-pandemic, zombie firms are considerably less profitable and more leveraged than healthy firms (Annex Figure 1.1, panels 3 and 4), leading to a misallocation of resources.

To assess the evolution of zombie firms and debt at risk of default ahead, the corporate stress scenario simulates two shocks.[9] First, the effective interest rate is assumed to increase homogenously for each firm by 100 basis points per year (the “higher-for-longer” hypothesis) over 2023–24, a similar increase to that seen across firms following the global financial crisis. Second, a global slowdown shock is simulated through a sector-specific EBIT shock which is applied to each firm. The EBIT shock was calibrated based on the observed changes in profitability after the global financial crisis (that is, in 2009 and 2010) for each sector. In each simulation, a sector specific random return is drawn for each firm.

As a robustness check, an alternative scenario is simulated in which the sector-specific profitability shock is calibrated following the 2014-15 oil price shock (Annex Figure 1.1, panels 5 and 6). Under the global financial crisis calibrated scenario, the share of zombie-held debt increases from about 12 percent in 2022 to almost 30 percent in 2024. Under the alternative stress scenario, the share of zombie-held debt increases to 25 percent of total debt by 2024. Looking across sectors, transportation and food and beverages remain the sectors most sensitive to the interest rate shock in the alternative scenario.

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[8] While our sample consists exclusively of listed firms, which are typically larger and have better access to financing than nonlisted firms, the firm distribution is representative across economic sectors.

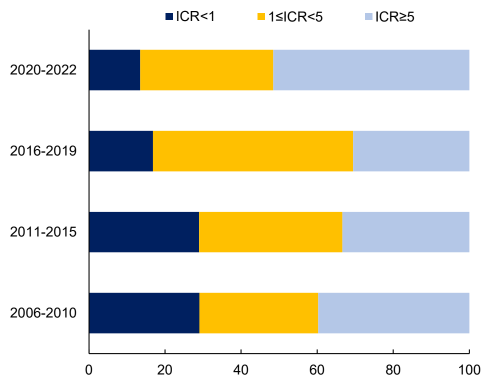
[9] This analysis focuses primarily on the direct effects of higher-for-longer interest rates. However, by considering a global slowdown shock and two consecutive years (2023-24) in the simulation exercise, the exercise implicitly accounts for second-round effects, i.e., the feedback effects between corporate and banking sectors.

Annex Figure A1.1 Corporate Sector Vulnerabilities

The share of debt held by riskier firms has declined after the pandemic.

1. Corporate Debt by Interest Coverage Ratio

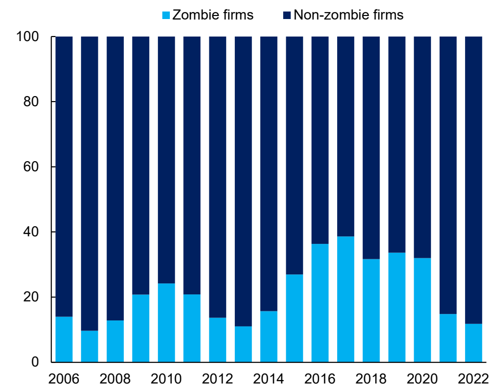
(Percent of Total Debt; ICR = Interest Coverage Ratio)



Zombie-held debt typically increases during and after periods of stress.

2. Corporate Debt Held by Zombie vs Non-Zombie Firms

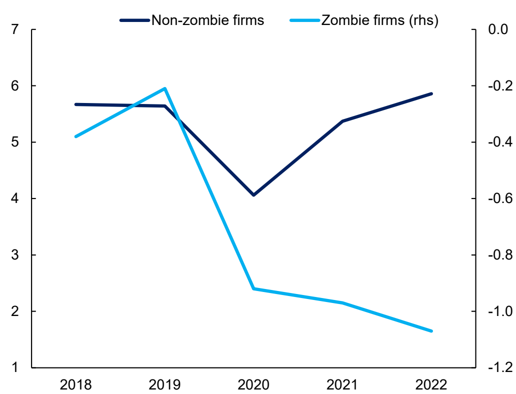
(Share of Total Debt)



The profitability of zombie firms is significantly lower than that of non-zombies and has not recovered after the pandemic…

3. Median Return on Assets

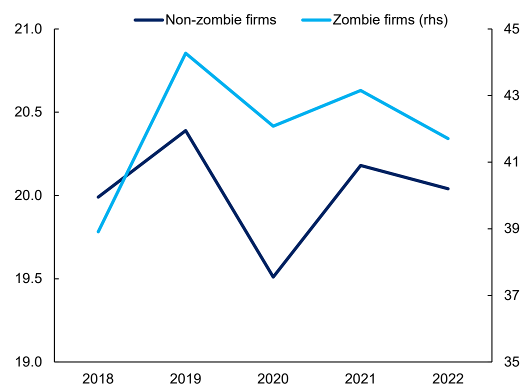
(Ratio of EBIT to Total Assets, Percent)



…while leverage is substantially higher, crowding out healthier firms

4. Median Leverage Ratio

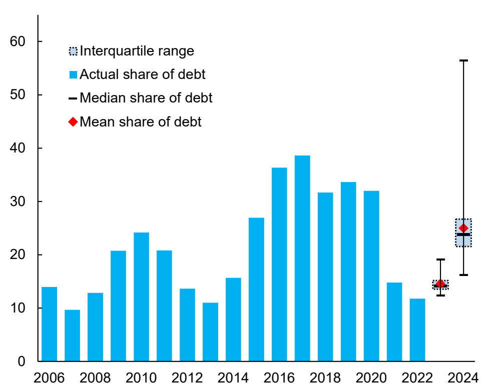
(Total Liabilities to Total Assets; Percent)



The share of zombie-held debt could reach ¼ of total by 2024 in the alternative stress scenario combining an oil price shock with higher-for-longer interest rates…

5. Corporate Debt Held by Zombie Firms

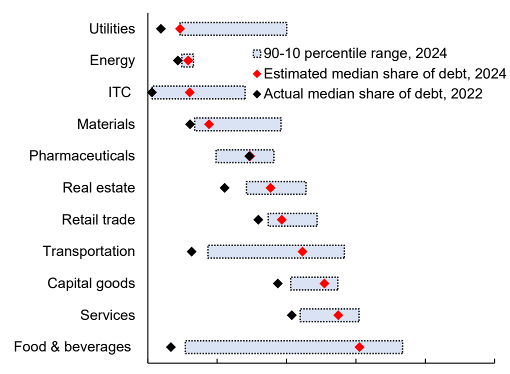
(Percent of Total Debt, Simulation results during 2023–24)



Transportation and food and beverages sectors are found to be the most sensitive to interest rate shock, in the presence of lower profitability under an oil price shock.

6. Sectoral Zombie-Held Debt

(Percent of Total Debt in each sector; Simulation results by 2024)



Sources: S&P Capital IQ; and IMF staff calculations.

Note: Country coverage: AZE, BHR, EGY, JOR, KAZ, KGZ, KWT, LBN, MAR, OMN, PAK, QAT, SAU, SDN, TUN, and UAE; EBIT = Earnings before interest and taxes; ICR = Interest coverage ratio.

A1.2. Banking Stress Test[10]

This section estimates the impact of stress scenarios on the banking sector, considering both liquidity stress and corporate sector stress amid a higher-for-longer interest rate environment. Building on the methodology from Copestake, Kirti, and Liu (forthcoming) and Jiang and others (2023), the liquidity stress test assesses the impact of a 20-percent deposit withdrawal scenario using valuation assumptions based on the increase in interest rates and the changes in sovereign spreads since January 2022. In the second scenario, the liquidity stress test is combined with a 200 basis points interest rate increase. The corporate stress scenario builds on the corporate sector stress test. A fourth scenario is a confluence of corporate sector and liquidity stress amidst higher interest rates.

A1.2.1. Scenarios

The liquidity stress test assumes a deposit withdrawal scenario. Consistent with the moderate scenario in Copestake, Kirti, and Liu (forthcoming), we assume a withdrawal of 20 percent of deposits with a stronger withdrawal (30 percent) of foreign deposits and wholesale funding.[11] Because foreign deposit information is not consistently available on a bank-by-bank basis, we use the country-level share of foreign deposits from the Financial Soundness Indicators. Banks are assumed to meet withdrawals first with cash, then government bonds, other securities, and loans.

The second scenario builds on the first one and adds a 200 basis points increase in interest rates. This increase in rates, which is similar to the assumed increase in rates for the corporate scenario, reflects two downside risks. First, further monetary tightening in the face of sticky core inflation. If core inflation does not revert to trend, central banks may face pressures to further tighten interest rates to achieve their inflation targets. Second, a global risk-off shock may increase external spreads for countries in ME&CA, which would also be reflected in higher rates and lower sovereign bond valuations.[12]

The corporate sector scenario builds on the earlier corporate sector stress test. Using the simulated results from the corporate sector stress test for 2024 when the peak impact occurs in the corporate sector, we first compute the distribution of ICRs in the corporate sector under the 2022 baseline and under the adverse scenario for 2024. The deterioration of ICRs (Annex Figure 1.2) is mapped into changes in probabilities of default using the mapping from Damodaran (2023).[13] Using the estimates, this implies an increase in nonperforming loans of 2.1 percent of net loans for 2023 and 2.7 percent of net loans for 2024. It is assumed that banks provision 100 percent against these increase in nonperforming loans.[14] These increases in provisioning adversely affect net income in the corporate stress test and the combined corporate + liquidity stress test.

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[10] The liquidity stress scenarios assume stable return on assets, which is consistent with empirical evidence in normal times for ME&CA countries and other jurisdictions (Drechsler, Savov, and Schnabl, 2021, for the US). This is a simplifying assumption that reflects, however, the ambiguous impact of higher rates on bank profitability as higher net interest income may be offset by increased provisioning and other forces (IMF forthcoming). In the corporate stress scenario, a crisis scenario including a shock to EBIT calibrated based on the global financial crisis is simulated. Here, return on assets is negatively affected by the extraordinary surge in provisioning needs in response to rising corporate sector distress.

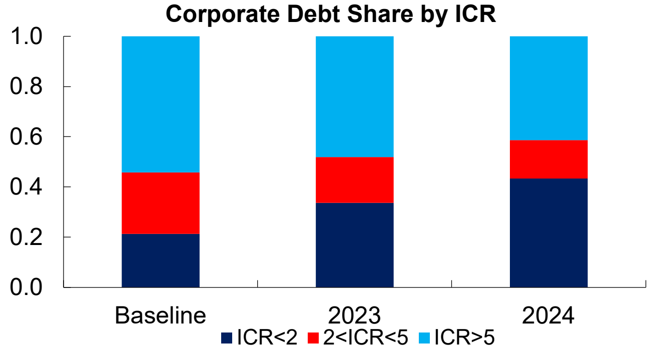
[11] Designing scenarios comparable to Copestake, Kirti, and Liu (forthcoming) ensures comparability of results. However, the liquidity stress scenarios are broadly comparable to scenarios from recent FSAPs in the region (for example, IMF 2023).

[12] When conducting the liquidity stress tests in isolation, the analysis assumes that higher rates are neutral for bank profitability. As highlighted in IMF (forthcoming), higher rates have ambiguous effects on profitability as higher net interest income may be offset by increased provisioning.

[13] https://pages.stern.nyu.edu/~adamodar/.

[14] For Kuwait, where provisioning ratios currently exceed 200 percent for some banks, we assume that banks increase their provisions by the minimum of the increase in nonperforming loans and the amount needed to maintain a provisioning ratio of at least 150 percent.

Annex Figure 1.2. Corporate Sector Vulnerabilities



Sources: Capital IQ and IMF staff calculations

Note: Figure reports distribution of interest coverage ratios across firms (weighted by debt) for 2022 baseline, 2023 and 2024 scenarios. The 2023 scenario assumes a negative shock to EBIT consistent with first year of the global financial crisis and 100 basis points higher interest rates. The 2024 scenario assumes an EBIT shock consistent with the second year of the global financial crisis and an additional 100 basis points increase in interest rates.

The combined corporations and liquidity stress scenario amidst higher interest rates assumed that all shocks occur jointly. Corporate sector stress and deteriorating nonperforming loans reduce banks' net income through higher provisioning needs. Simultaneously, liquidity stress tests banks' liquidity position, which is also affected by higher rates since higher rates imply larger unrealized capital losses on hold-to-maturity fixed income assets.

A1.2.2. Liquidity Stress Test

The liquidity stress testing exercise simulates how banks in ME&CA would fare in case of a sudden withdrawal of deposits amid a higher-for-longer interest rate environment. The methodology is built on the recent paper by Jiang and others (2023) and work by Copestake, Kirti, and Liu (forthcoming). When faced with deposit withdrawals, banks would first exhaust their cash buffers, without any impact on the securities portfolio. If deposit withdrawals exceed existing cash buffers, banks would have to sell parts of their securities portfolio. Government securities, which are likely to be the most liquid ones in ME&CA countries, would likely be the first assets to be sold before any other securities or, if outflows can still not be covered, loans would be sold at last. Using valuation assumptions based on the increase in interest rates and the changes in sovereign spreads observed since early 2022, this section provides insights into the size of potential capital losses that may materialize for banks in ME&CA if there are sudden deposit withdrawals.

The liquidity stress-test methodology[15] involves three steps. First, we calculate indicative current market prices to use when marking assets to market. Second, we use scenarios as discussed in A1.2.1. for the extent of deposit withdrawals to determine the size of asset sales required, at current market values, to meet these withdrawals. Third, we scale the resulting realized losses by regulatory capital if they exceed ex-ante net income.

Market values: On the asset side, we distinguish between sovereign bonds and other securities. We start with the reported carrying value of sovereign bonds and securities as of the end of 2022. Without reliable pricing data on local currency government bonds for many of the countries in our sample,[16] we use the change of the US

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[15] Methodology developed by Alex Copestake, Divya Kirti, and Yang Liu (RESMF) and adopted with changes to ME&CA countries. The following exposition draws on their work.

[16] In many MECA countries, liquidity in local currency bond markets is low amidst limited secondary market trading, implying that yield curves are not well-established.

yield curve since January 2022 at the duration of the portfolio of local currency sovereign bonds outstanding in each country, plus an additional country-specific spread, as a proxy. This gives:

$$Discount_c = \left[\Delta_{Today-1/1/22} r_{UST}(\overline{Duration_c}) + \Delta_{Today-1/1/22} Spread_c\right] \times \overline{Duration_c}$$

where $\overline{Duration_c} = \sum_j (w_{j,c} \times Duration_{j,c})$ where $w_{j,c}$ is the share of bond j in all outstanding bonds of country c. $Spread_c$ is the par-value weighted spread across the country's sovereign bonds with more than one-year remaining maturity, calculated from the IMF Sovereign Debt Monitor.

Given the illiquidity of many sovereign bond and corporate bond markets in the region, we impose a fire sale discount on the sale of fixed income securities throughout. The discount is simulated based on the increase in sovereign spreads between February 2020 and the average from July-September 2020 during the COVID-19 pandemic. We draw 1,000 times for each bank and country and report the median result throughout.

Bank data are from Fitch Connect, bond data are from Bloomberg Finance L.P., and yield curve changes from the Federal Reserve.

Withdrawal scenarios: Turning to liabilities, we distinguish between three types of funding: resident customer deposits, non-resident deposits, and other short-term funding (for example, wholesale funding). Throughout, we assume a 20 percent withdrawal of resident customer deposits. For nonresident deposits, we assume a stronger 30 percent withdrawal, with nonresident deposits inferred using the country-level share of nonresident deposits. We also assume 30 percent withdrawal of wholesale funding and other short-term funding. We assume that banks initially meet withdrawals using their available cash and equivalent liquid assets and face no market value losses in doing so.

$$EWithdrawals_b^S = .2\ Domestic\ Deposits_b + .3\ (Wholesale_b + Foreign\ Deposits) - Cash_b$$

where we constrain that $EWithdrawals_b^S \geq 0$.

Using these scenarios, we back out the book value of securities that must be sold—at current market prices—to raise sufficient funds to meet withdrawals.[17] The larger the MTM discounts, the more book-value securities must be sold. We assume for simplicity that banks first sell off sovereign bonds, and only sell other securities if sovereign bond sales are insufficient. Throughout, banks first sell mark-to-market assets and only then securities with unrealized capital losses.[18] If all securities are sold, other remaining assets are sold at a further discount. This pins down sales of each type of asset in each withdrawal scenario:

$$SovBondSales_b^S = \begin{cases} \dfrac{EWithdrawals_b^S}{[1 - Discount_c]} \text{ if } \dfrac{EWithdrawals_b^S}{1 - Discount_c} < SovBonds_b^{2022} \\ SovBonds_b^{2021} \text{ if } \dfrac{EWithdrawals_b^S}{1 - Discount_c} \geq SovBonds_b^{2022} \end{cases}$$

[17] We assume the sales occur at the current market prices minus a fire sale discount as described above.

[18] Based on available information, we assume that banks first liquidate available-for-sale (AFS) securities and only then held-to-maturity securities. This avoids over-estimating losses since AFS securities are already mark-to-market. Nonetheless, banks realize additional losses on their AFS securities when selling those because of to the fire sale discount that is simulated. This accounts for the illiquidity of many secondary bond markets in the region where selling larger amounts of government bonds is likely to induce a negative price impact.

$$OtherSecSales_b^S = \begin{cases} 0 & \text{if } \frac{EWithdrawals_b^S}{1 - Discount_c} < SovBonds_b^{2022} \\ \frac{EWithdr.s_b^S - SovBonds_b^{2021} \times [1 - Disc.t_c]}{[1 - \widehat{Discount_c}]} & \text{if } \frac{EWithdrawals_b^S}{1 - Discount_c} \geq SovBonds_b^{2022} \end{cases}$$

$$OtherAssetSales_b^S = \begin{cases} 0 & \text{if } EWithdrawals_b^S < T \\ \frac{EWithdrawals_b^S - T}{[1 - 1.3 \times \widehat{Discount_c}]} & \text{if } EWithdrawals_b^S \geq T \end{cases}$$

where $T = SovBonds_b^{2022} \times [1 - Disc.t_c] + OtherSecurities_b^{2022} \times [1 - \widehat{Discount_c}]$. The resulting value of assets is then (in the case that $EWithdrawal_b^S > 0$):

$$Assets_b^S = SovBonds_b^{2022} - SovBondSales_b^S + OtherSecurities_b^{2022} - OtherSecSales_b^S + OtherAssets_b^{2022} - Cash_b - OtherAssetSales_b^S$$

Assessing losses: To assess banks at risk, we compare losses to regulatory capital, after taking into account net income buffers. Specifically, we focus on those losses that exceed net income and can thus not be absorbed by banks' ex-ante profitability.

$$Excess\ Losses_b^S = Net\ Income_b\ SovBondSales_b^S \times Discount_c + OtherSecSales_b^S \times \widehat{Discount_c} + OtherAssetSales_b^S \times 1.3 \times \widehat{Discount_c}$$

For the corporate scenario, we first compute the counterfactual net income that would arise if banks provision 100 percent against the projected increase in nonperforming loans under the corporate stress scenario. And then compute the excess losses relative to that benchmark.

A1.2.3. Assumptions for CCA Stress Test

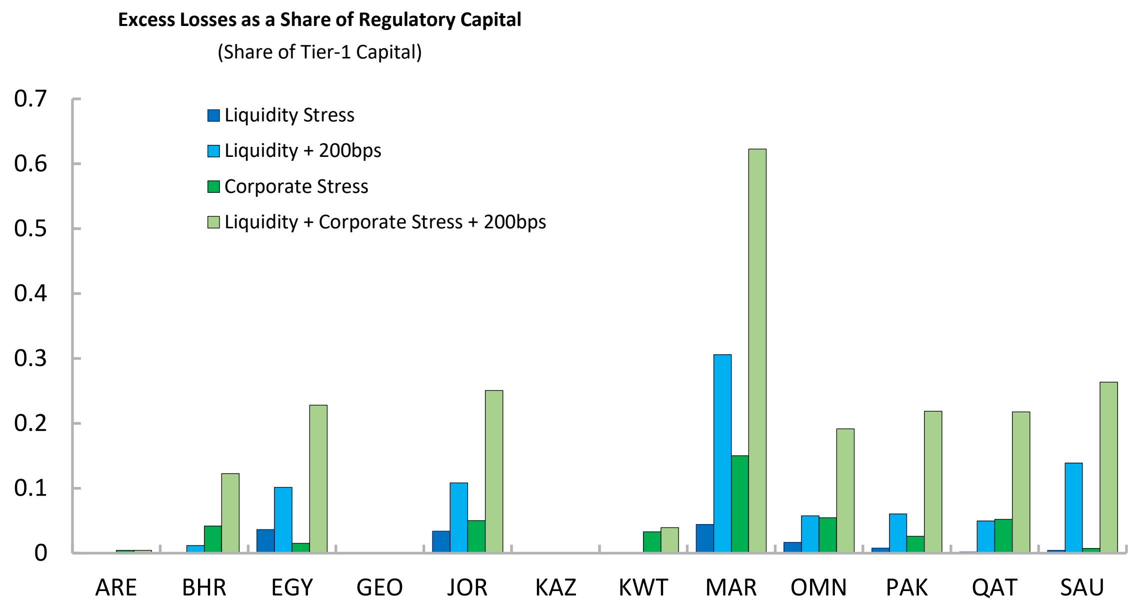
On profitability, it is assumed that the boost to profitability because of Russian inflows ceases, and profitability returns to the 2015-19 average of 1.72 percent return on assets.

For the rise in sovereign spreads, a scenario similar to the adverse scenario with capital outflows from the 2021 Georgia Financial Sector Assessment Program (FSAP) is assumed. This implies a 600 basis points rise in sovereign spreads for Georgia and a 300 basis points rise in sovereign spread for Kazakhstan.

On the corporate side, we first assume the increase in provisioning implied by the corporate stress test because of a recessionary global financial crisis -style shock. In addition, loan dollarization is sizable in Georgia at 40.4 percent in 2022 while it has been falling substantially in Kazakhstan where it stood at 9.9 percent at the end of 2022.). Most FX borrowers are unhedged (for Georgia, 75 percent of corporate loans are in FX with only 20 percent hedged, for example). For Georgia, the 2021 FSAP reports that a 15 percent depreciation triggered a 50 percent rise in nonperforming loans in 2015–16. Hence, for the 30 percent depreciation scenario, an 80 percent rise in nonperforming loans from unhedged FX borrowers is assumed after adjusting for the secular decline in dollarization. The shock is scaled proportionately for Kazakhstan to reflect its lower dollarization.

Annex 2. Country-level Stress Test Results

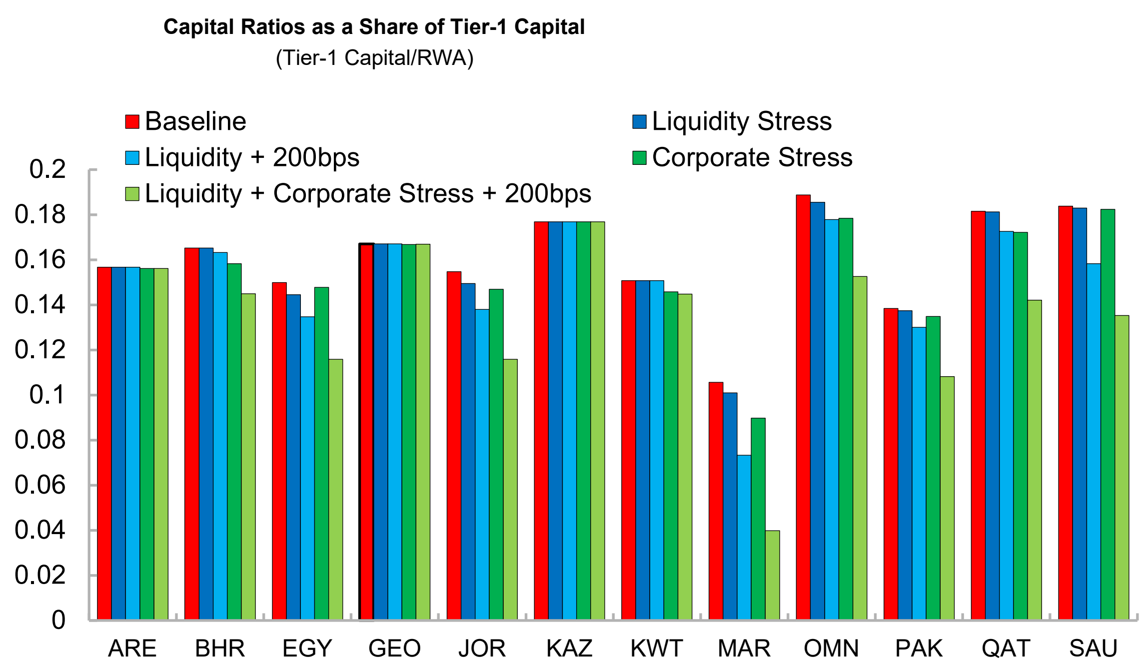
Annex Figure 2.1. Country-Level Losses under Stress Test Scenarios



Sources: Fitch Connect, Bloomberg Finance L.P.; and IMF staff calculations.

Note: Figure shows losses—aggregated at the country-level—measured in excess of net income, as a fraction of Tier-1 regulatory capital. GCC countries include Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. MENA EM&MI and PAK includes Egypt, Jordan, Morocco, and Pakistan. CCA include Georgia and Kazakhstan.

Annex Figure 2.2. Country-Level Capital Ratios under Stress Test Scenarios



Sources: Fitch Connect, Bloomberg Finance L.P; and IMF staff calculations.

Note: Panel reports aggregate Tier-1 capital ratios at the country-level for banks across current baseline and four stress scenarios.

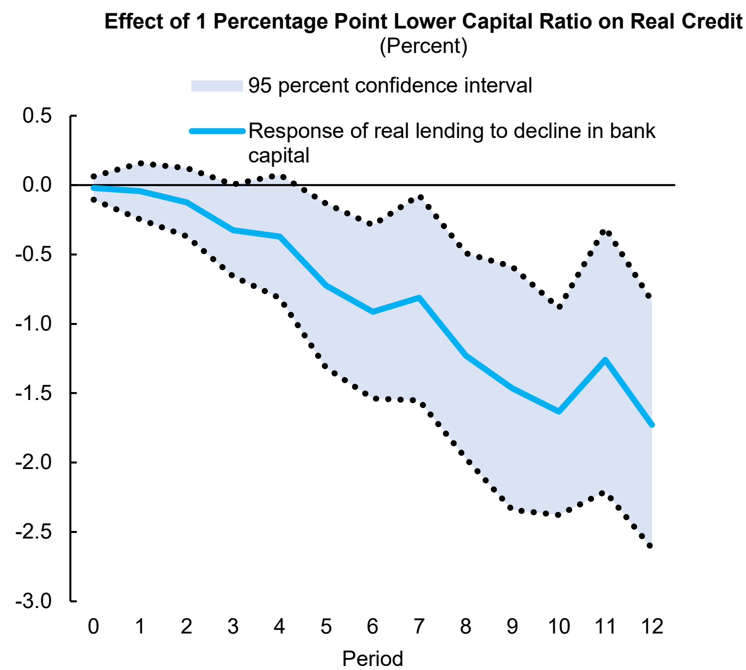
Annex 3. Estimating the Correlation of Bank Capital Ratios and Lending

This Annex describes the methodology to estimate the relationship between bank capital ratios and real lending using a local projections approach:

$$\Delta y_{i,t+h-1} = \alpha_i^h + \alpha_q^h + \beta^h CR_{i,t-1} + \gamma^h X_{i,t-1} + \delta^h Z_{t-1} + \varepsilon_{i,t+h}$$

$\Delta y_{i,t+h-1}$ is the growth rate of real lending at bank i from time $t-1$ to time t+h, measured as the log difference of real lending. α_i^h is a bank fixed effect that absorbs time-invariant bank-level factors. $CR_{i,t-1}$ is the lagged Tier-1 capital ratio of bank i. $X_{i,t-1}$ captures other (lagged) bank-level controls, including the share of liquid assets and the nonperforming loan ratio. Finally, Z_{t-1} are macro controls, including country-level inflation, GDP growth, the change in the policy rate, and the change in the nominal effective exchange rate. We also include the change in the oil price, the level of the US policy rate, and the VIX as global controls. Finally, α_q^h are quarter-of-the-year fixed effects that address potential seasonality.

Annex Figure 3.1. Response of Real Credit to Lower Bank Capital Ratios



Sources: Fitch Connect; and IMF staff calculations.

Note: Figure reports response of real credit to lower bank capital ratios from local projections estimation along with 95 percent confidence bands, with standard errors double clustered by bank and time. The sample includes Bahrain, Egypt, Georgia, Jordan, Kazakhstan, Kuwait, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, and the United Arab Emirates.

Annex Figure 3.1. displays the estimated series of coefficients β^h for up to 12 quarters ahead, estimated on quarterly bank-level data for the sample of countries included in the stress testing exercises, along with the corresponding 95-percent confidence bands. Standard errors are clustered by time and country. Variables are scaled so that the estimated coefficient represents the impact of a 1 percentage point reduction in a banks' Tier-1 capital ratio. A 1-percentage point lower Tier-1 capital ratio is associated with 1.5 percentage points lower real lending after 10–12 quarters. The effect is statistically significant from five quarters onward and grows over time.

Different robustness exercises confirm that this relationship holds qualitatively and quantitatively to the inclusion of country-time fixed effects rather than country-level macro controls, to the use of real asset growth rather than real lending growth, and to the inclusion of banks' leverage ratio (Equity/Assets) instead of Tier-1 capital ratios. Across specifications, the quantitative results should be interpreted as a correlation rather than a causal relationship since causality could also run from lending to capital ratios.

Annex 4. A Simple Model with Macro-Financial Links

Credit Cycle

The model assumes that credit fluctuations are largely related to the business cycle. In other words, a strong/weak economy leads to strong/weak credit:

$$c_t = \rho_1 c_{t-1} + \rho_2 y_{t-1} + \epsilon_t^c$$

where c_t is the real credit gap, y_t is the real output gap, and ϵ_t^c is a stationary autocorrelated shock to real credit ($\epsilon_t^c = \phi\epsilon_{t-1}^c + \varepsilon_t^c$). Thus, banks are assumed to set their desired level of credit based on past levels of economic activity (demand). Because banks cannot immediately adjust credit levels (for example, because of an inability to recall credit that has already been extended), it is also assumed that credit levels are slow to adjust to output fluctuations, reflected in the term $\rho_1 c_{t-1}$.

Business Cycle

It is assumed that shocks to credit that are unrelated to past levels of output and inertia reflect changes in the lending practices of banks that can directly affect output. In this simple model, the output gap is assumed to be related to its own lag and "autonomous" credit shocks:

$$y_t = \alpha_1 y_{t-1} + \alpha_2 \epsilon_t^c + \epsilon_t^y$$

where ϵ_t^y is a stationary autocorrelated demand shock ($\epsilon_t^y = \tau\epsilon_{t-1}^y + \varepsilon_t^y$) that is assumed to capture all demand shocks uncorrelated with domestic credit shocks (for example, real interest and exchange rates, commodity prices, and global demand shocks).

Stochastic Processes and Definitions[19]

The output and credit gaps are expressed as percentage point deviations from long-term trends:

$y_t = Y_t - \bar{Y}_t$, and $c_t = C_t - \bar{C}_t$

where Y_t and C_t are (log) levels of real GDP and real credit, respectively, and $\bar{Y}_t$ and $\bar{C}_t$ are their associated long-term trends. The long-term trends are assumed to follow I(2) processes**:**

$\Delta\bar{Y}_t = \Delta\bar{Y}_{t-1} + \varepsilon_t^{\bar{Y}}$, and $\Delta\bar{C}_t = \Delta\bar{C}_{t-1} + \varepsilon_t^{\bar{C}}$**,**

Data and Estimation

The parameters and trends in the model described above are estimated using quarterly data ranging from the fourth quarter of 2001 to the first quarter of 2023 using the Kalman filter and Bayesian methods (estimation details are available on request). The observable variables used for each country are real GDP and real credit, where real credit is defined to be banking sector claims on the non-financial private sector and nominal credit is deflated with the Consumer Price Index.[20] The long-term trends in the model are calibrated using the HP filter with the standard smoothing parameter for quarterly data (1600).

Estimated Output Responses Following Past Credit Downturns

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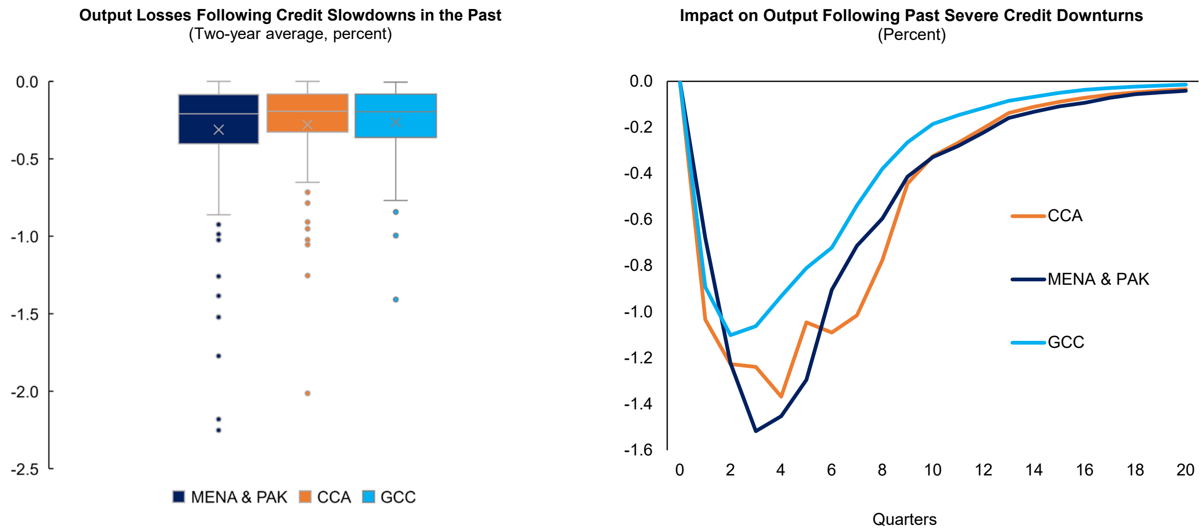
[19] All shocks (denoted ε_t^x for variable x_t) are assumed to independently and identically distributed white noise processes.

[20] Country coverage: AFG, DZA, ARM, AZE, BHR, DJI, EGY, GEO, IRQ, KAZ, KWT, KGZ, MAR, OMN, PAK, QAT, SAU, SDN, SYR, TJK, TUN, ARE based on the most recently available data.

Annex Figure 4.1.1 shows the estimated effects on output from credit slowdowns that have occurred in the region over the past two decades.[21] The results show that adverse shocks to credit typically reduce output by 0.2 to 0.4 percent on average over a two-year period. However, some countries in the region have experienced much more severe credit contractions suggesting that downside risks to output in an adverse scenario could be significant. Annex Figure 4.1.2 shows that the most severe credit contractions experienced in the past (the 95th percentile) in the region led to large and persistent output losses lasting up to several years.

Annex Figure 4.1 Output Losses Following Past Credit Downturns



Sources: Haver Analytics and IMF staff calculations.

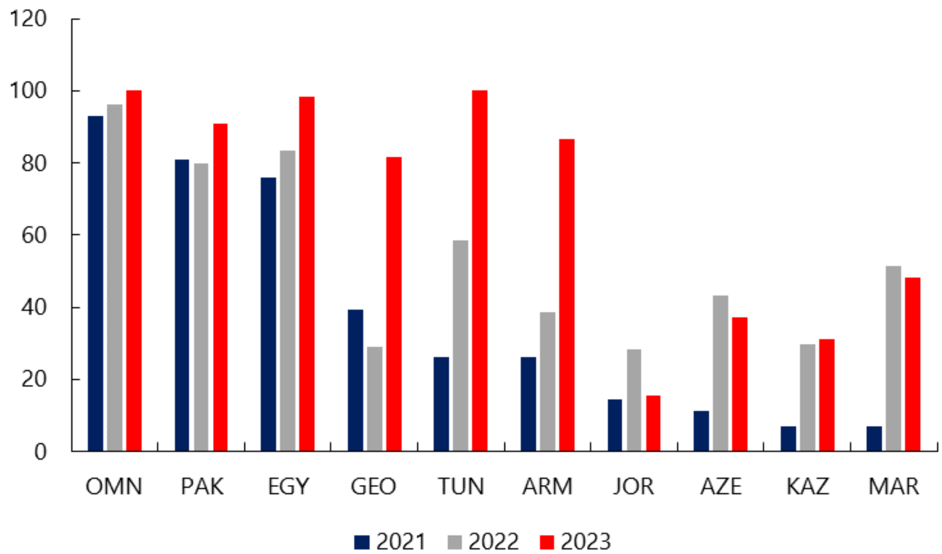
Note: LHS figure reports output losses following historic credit slowdowns across regions, with output losses reported as 2-year average in percent. RHS figure displays dynamic impulse response of output following historic severe credit downturns, with severe credit downturns defined as credit downturns in the 95th percentile.

[21] A credit slowdown is a negative shock or a sequence of negative shocks to private credit estimated from historical data beginning in the fourth quarter of 2001.

Annex 5. Change of Maturity Structure in Response to Higher Interest Rates

In response to the higher interest rate environment, governments have changed the maturity structure of their bond issuances by shifting to shorter-duration bonds (Annex Figure 5.1). This could be due to several factors: (i) governments might have found it less costly to borrow short-term instead of locking in longer-term borrowing at higher rates; (ii) investors might have less appetite for longer-term bonds, especially where central banks are expected to increase interest rates further; and (iii) investors might demand higher yields on longer-term bonds to compensate for higher risk, pushing governments to issue more short-term (cheaper) debt.

Annex Figure 5.1 Share of Short-term Domestic Issuances



Sources: Bloomberg Finance L.P; and IMF staff calculations.