



KINGDOM OF SWAZILAND

SELECTED ISSUES

December 2015

This Selected Issues paper on Kingdom of Swaziland was prepared by a staff team of the International Monetary Fund as background for the periodic consultation with the member country. It is based on the information available at the time it was completed on November 24, 2015.

Copies of this report are available to the public from

International Monetary Fund • Publication Services
PO Box 92780 • Washington, D.C. 20090
Telephone: (202) 623-7430 • Fax: (202) 623-7201
E-mail: publications@imf.org Web: <http://www.imf.org>
Price: \$18.00 per printed copy

International Monetary Fund
Washington, D.C.



KINGDOM OF SWAZILAND

November 24, 2015

SELECTED ISSUES

Approved By
The African
Department

Prepared by Yi Wu and Manabu Nose

CONTENTS

ASSESSING SWAZILAND'S EXPORT DIVERSIFICATION AND QUALITY	2
REFERENCES	7
MACRO-FINANCIAL RISKS IN SWAZILAND'S BANKING SECTOR ASSOCIATED WITH THE SACU REVENUE FALL	8
A. Background	8
B. Exploring Macro-Financial Linkages	9
C. Mapping the Macroeconomic Shocks to Bank's Asset Quality	11
D. Stress Testing Exercise	12
E. Conclusion	15
BOXES	
1. VAR Estimate on the Impact of SACU Shock on the Economy	16
2. Satellite Model: Estimate on the Macroeconomic Shock on Credit Quality	17
FIGURES	
1. Banking System Performance	19
2. Stress Test Calibration — Macroeconomic Assumptions	20
3. VAR Analysis — Impulse Response Functions (without Feedback Effect)	21
4. VAR Analysis — Impulse Response Functions (with Feedback Effect)	21
TABLES	
1. Kingdom of Swaziland Stress-Testing Scenario	22
REFERENCES	23

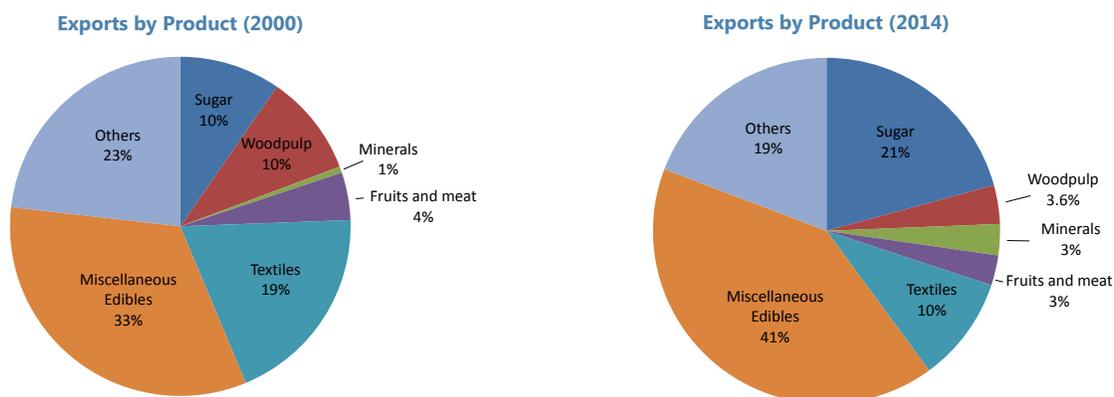
ASSESSING SWAZILAND'S EXPORT DIVERSIFICATION AND QUALITY¹

Swaziland's exports are relatively diversified with good quality index compared with its peers. However, diversification and product quality have declined in recent years, while the expiration of the access to AGOA calls for enhanced efforts in this area. Improving education and training, strengthen institutional framework, and further developing the financial market will help improve export diversification and quality upgrading.

1. This note analyzes Swaziland's export diversification and product quality. A more diversified export base would make export performance more resilient to idiosyncratic shocks. This is particularly important for small open economies such as Swaziland. IMF (2014a, 2014b) finds that higher diversification in exports and in domestic production and upgrading the quality of existing product have been conducive to faster economic growth and greater macroeconomic stability in developing countries.

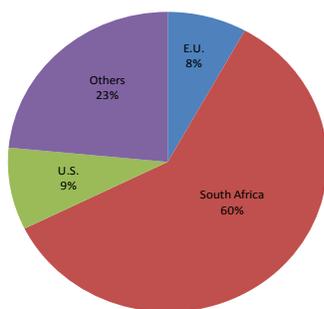
2. Existing references on Swaziland's export diversification point to somewhat conflicting conclusion. The Economic Recovery Strategy cites an undiversified export base as one of the factors contributing to Swaziland's slow growth. On the other hand, the World Bank (2015) and Edwards et al. (2013) find that Swaziland's export base is quite diversified relative to peers, as measured by the Herfindahl-Hirschman Index.

3. Swaziland's export structure has experienced sizable changes over the past 15 years. The share of textile exports has halved, and the expiration of trade benefits under AGOA implies that the share of textile exports would decline further. In contrast, the importance of sugar exports have increased substantially, and also (though to a lesser extent) for miscellaneous edibles (which includes the all-important Coca-Cola concentrates). Relatedly, E.U.'s share of Swaziland's exports has increased and the U.S. market's share has declined. At the same time, the overall export-to-GDP ratio has declined from 56 percent in 2000 to 43 percent in 2014.



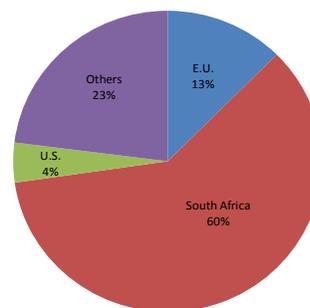
¹ Prepared by Yi Wu (AFR).

Export Destination (2000)



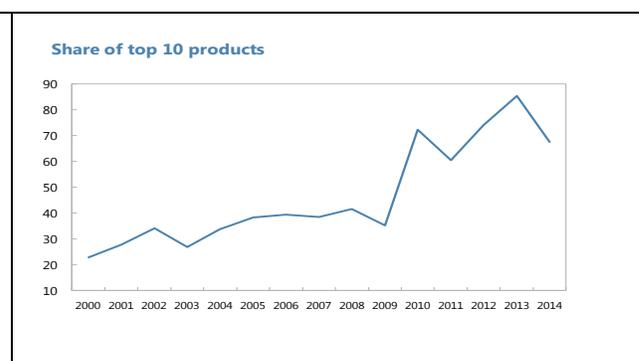
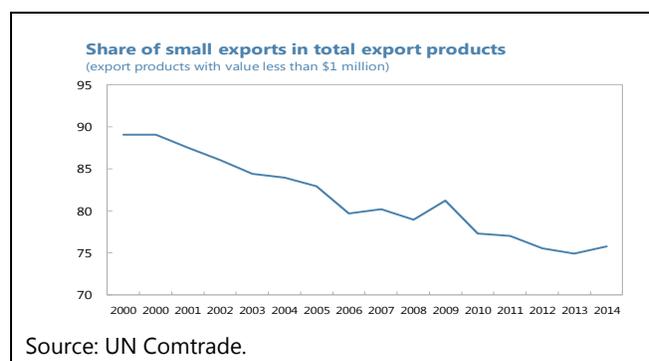
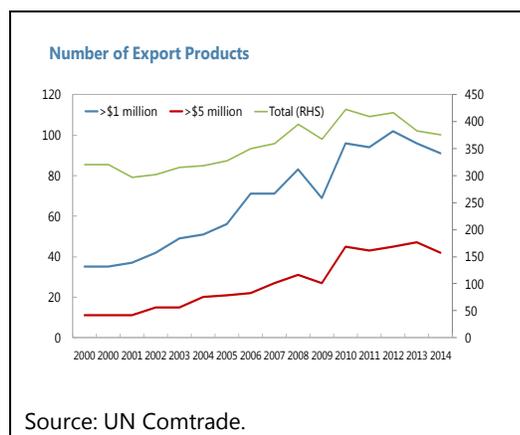
Sources: Central Bank of Swaziland, UN Comtrade database.

Export Destination (2014)



Sources: Central Bank of Swaziland, UN Comtrade database.

4. Simple measures of export diversification give a somewhat mixed picture. Using Standard International Trade Classification (SITC, Rev.1, data from UN Comtrade database, available for 2000–14) at the four-digit level², the total number of products has increased since 2000 and peaked in 2010, then declined moderately afterwards. The number of export products above \$1 and \$5 million (to minimal potential bias from a large number of small exports) show similar patterns. The data also point to a large portion of relatively small exports (exports less than \$1 million), accounting for about three quarters of exports in 2014, although the share has gradually declined over the years. However, large export items dominate in export receipts: the share of top 10 products has increased markedly since 2010, and stood at 68 percent as of 2014. The two largest export items are “Synth. perfume & flavour materials” (which includes Coca-Cola concentrates) and “raw sugar, beet & cane”. They also contributed to the jump in the trade share of top 10 products in 2010.



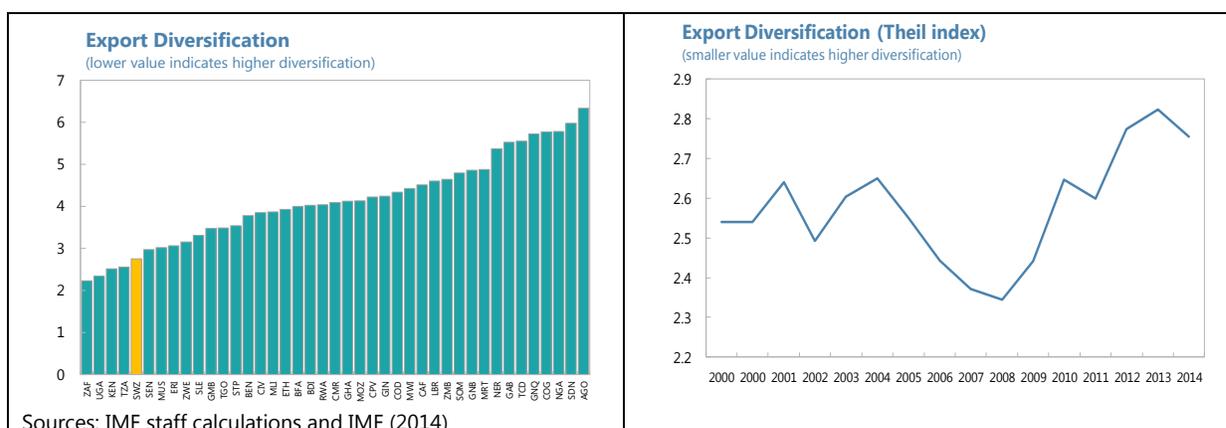
² Export data reported by Swaziland are only available up to 2007. Data are therefore compiled using import data reported by Swaziland’s trading partners. Exports less than \$1,000 are dropped. Keeping these observations yields broadly similar results.

5. Export diversification is analyzed more formally using the Theil index. The Theil index is a commonly used measure of export diversification (Gigineishvili et al.2014; IMF 2014). It is compiled as

$$= \frac{1}{n} \sum_{k=1}^n \frac{x_k}{\mu} \ln \left(\frac{x_k}{\mu} \right), \text{ where } \mu = \frac{1}{n} \sum_{k=1}^n x_k,$$

where x_k is the export value of product k (at the SITC 4-digit level) and n is the total number of products; μ is the product’s average value. A smaller value of the index indicates higher diversification. The index is then calculated for each individual year.

6. Theil index shows that Swaziland is relatively diversified but diversification has declined in recent years. The Theil index shows that Swaziland is among the more diversified exporters in Sub-Saharan Africa from the perspective of products. On the other hand, export diversification has decreased since 2008, as the largest export items have become more dominant, and at the same time there was little increase in the number of products, which would have generally lead to an increase in diversification. Using the coefficient from IMF (2014b) that estimates the impact of export diversification on growth for low-income countries,³ if Swaziland’s export diversification improves to its level in 2008, output growth would be increased by about 0.4 percentage points.



7. At the same time, Swaziland’s share of global (non-mineral) exports has declined.

This points to a loss of competitiveness. Notwithstanding some real exchange rate depreciation since 2010, staff analysis finds that the real exchange rate is moderate overvalued (please see annex 1 of the staff report).

³ The coefficient for middle-income countries is of the same sign but statistically insignificant.

Text Table 1. Selected Indicators

	Secondary education enrollment, gross	Quality of public institutions (max. 7)	Extent of market dominance*	Private sector credit/GDP (2014)
	Percent	Value	Rank	Percent
Botswana	81.7	4.4	121	32.0
Lesotho	53.3	3.9	84	20.1
Namibia	64.8	4.1	90	47.5
South Africa	101.9	4.2	48	67.2
Swaziland	59.9	3.9	111	21.2

Sources: The Global Competitiveness Report, 2014–15, World Economic Forum, country authorities.

*Rank is out of 144 countries. Higher rank means higher market dominance.

10. Similar factors are also crucial for quality upgrading. Quality upgrading is found to be associated with a skilled labor force (to move to higher value-added production) and strong institutional quality, as strong institutions encourage investments needed for moving up the value chain. A well-developed domestic financial markets support a faster pace of quality upgrading.

11. Although there is no one-size-fits-all recipe, there is substantial scope for improvement for Swaziland in many of these areas. As discussed in the staff report, these are the same areas responsible for low private sector investment (including FDI). Making progress in these areas will not only help improve export diversification and product upgrading, but will also improve business climate, boost investment, and support growth and employment.

12. In summary, notwithstanding its relatively diversified exports and relatively good quality index, Swaziland needs to reverse the deterioration in export diversification and product quality in recent years. The expiration of AGOA eligibility makes diversifying exports even more important. Past studies have identified improving human capital and institutional quality, as well as financial deepening as important factors to enhance export diversification and quality upgrading.

References

- Edwards, Lawrence, Frank Flatters, Matthew Stern and Yash Ramkolowan, 2013, "Swaziland Economic Diversification Study," DNA Economics.
- Gigineishvili, Nikoloz, Paolo Mauro, and Ke Wang, 2014, "How Solid Is Economic Growth in the East African Community," IMF working paper 14/150.
- Henn, C., C. Papageorgiou, and N. Spatafora, 2013, "Export Quality in Developing Countries," IMF Working Paper 13/108.
- International Monetary Fund, 2014a, Sustaining Long-run Growth and Macroeconomic Stability in Low-income Countries—the Role of Structural Transformation and Diversification
- _____, 2014b, Sustaining Long-run Growth and Macroeconomic Stability in Low-income Countries—the Role of Structural Transformation and Diversification—Background Notes.
- Jerzmanowski, M., and D. Cuberes, 2009, "Democracy, Diversification and Growth Reversals," *The Economic Journal*, Vol. 119, pp. 1270–1302.
- World Bank, 2015, "Kingdom of Swaziland Growth Report."

MACRO-FINANCIAL RISKS IN SWAZILAND'S BANKING SECTOR ASSOCIATED WITH THE SACU REVENUE FALL¹

The fall in the revenues from the Southern African Customs Union (SACU) could have serious macroeconomic consequences. In addition to adverse impacts on fiscal and external balances, financial sector would also be affected. This section focuses on the likely impacts of prospective SACU revenue shock on the financial sector. Specifically, staff analysis demonstrates that the SACU revenue fall would increase sovereign spread and reduce private credit growth, while the government itself may face liquidity problem and run arrears (as experienced in the 2010–11 fiscal crisis). These developments would also affect borrowers' payment capacity and eventually worsen bank's asset quality, possibly resulting in further negative feedback to the economy.

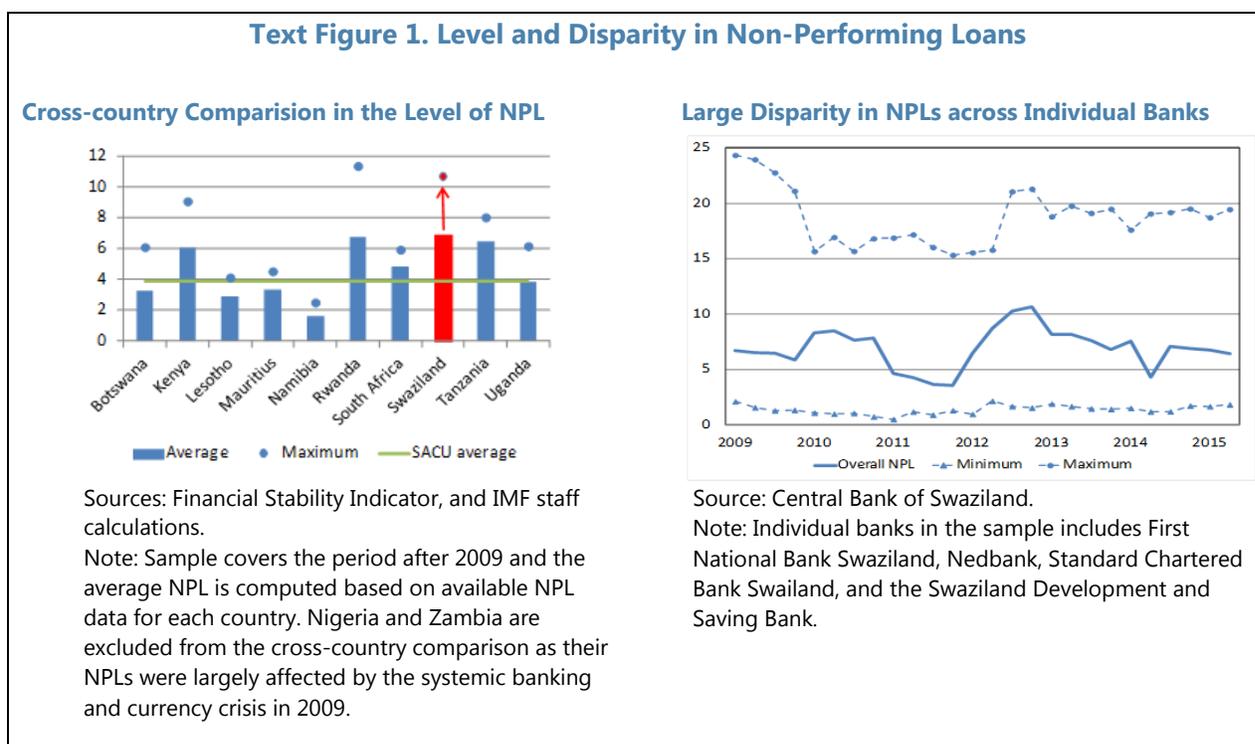
A. Background

1. **Swaziland's banking system currently functions well with sufficient capital buffer (Table 7 of the Article IV staff report), though it is vulnerable to exogenous shocks.**² Capital ratios of commercial banks are above the regulatory minimum, and their profitability is high. The banking sector, however, is highly exposed to exogenous shocks, reflecting the economy's vulnerability (e.g., a small open economy and heavy reliance on the SACU revenues). Furthermore, the high level of concentration on the balance sheets and the almost unitary business model of three of the banks pose additional structural weaknesses which would augment the negative impact of various shocks (in particular, the high volatility in the SACU revenues).
2. **During the 2010–11 fiscal crisis (following the SACU revenue fall), nonperforming loans (NPL) increased, while commercial bank credit declined (Figure 1).** The rise in NPLs started immediately with the outbreak of the 2010–11 fiscal crisis, while the loan-to-deposit ratio dropped and stayed low due to a decline in private sector credit growth during the crisis period. In 2012, the NPL increased sharply owing to economic contraction which led to defaults of private borrowers in the government-related sectors (e.g., construction) and the small and medium-sized enterprises (IMF, 2013). The change in NPLs exhibits positive correlation with the sovereign spread throughout the period, which remained high during the period when the sovereign risk premium was above 50 bps (in the bottom right chart in Figure 1).
3. **The degree of structural vulnerability is high compared with other SACU countries (Text Figure 1).** Although the NPL ratio declined to 6.4 percent in 2015Q2, the average NPL ratio in recent years was the highest among the SACU countries, and was one of the highest after the 2010–11 crisis among the Sub-Saharan African countries. This exhibits high sensitivity of asset quality in Swaziland's

¹ Prepared by Manabu Nose (AFR).

² Swaziland's banking system is predominantly foreign-owned. Three commercial banks (which comprise 85 percent of total banking system asset) are subsidiaries of South African Banks and operate similar business models. The remaining 15 percent of asset is owned by a state-owned bank which plays a development banking role.

banking sector to shocks. Bank-level data also show that the deterioration in asset quality since the 2010–11 fiscal crisis was wide-spread across all four banks. Some banks have much higher NPLs than others for their high exposures to construction and other small businesses which experienced financial distress during the crisis. These exposures are not only large but also volatile, which has caused high volatility in NPLs at both country- and individual bank-levels.



4. In view of the expected fall in the SACU revenues in coming years, this note explores the impact (stress) of the prospective fiscal shock on the stability of the banking system and its feedback effect on the real economy. The stress testing exercise is carried out in the following three stages:

- (i) Exploring the macro-financial links from stress event (SACU revenue shock) to macroeconomic variables using a vector auto-regression (VAR) model,
- (ii) Mapping the macroeconomic shocks to banks' asset quality (i.e., NPL ratio) using cross-country panel regression, accounting for the feedback effect of banks' credit risk on the real economy, and
- (iii) Stress testing based on the calibrated NPL shock and the stress-testing model developed in the recent MCM TA (IMF, 2015), based on the standard macro stress-testing framework (Čihák, 2007).

B. Exploring Macro-Financial Linkages

5. The dynamic impact of the SACU shock is mapped into macroeconomic variables using the VAR model. The SACU shock would directly affect the real economy by worsening fiscal position, possibly crowding out private sector credit and increasing sovereign risk premium (and thus real interest

rate), and could indirectly affect the economy through the deterioration of asset quality in the banking sector. Shocks to the banking sector may also feedback to the economic growth through bank's deleveraging which reduces private investment. The following reduced form VAR is used:

$$y_t = \alpha + Ay_{t-1} + \gamma z_t + \varepsilon_t \quad (1)$$

where y_t is a set of endogenous variables with one quarter lag. The quarterly series of following endogenous variables are included: (i) the growth in electricity consumption (in millions kilowatt hours, as proxy for real GDP) and in credit to private sector (quarter-on-quarter) and (ii) the de-trended sovereign spread (Swazi 3-month T-bill rate minus South African T-bill rate) and the current gross official reserves at the Central Bank of Swaziland which remove their historical trend components.^{3 4} The deviation of actual SACU disbursements from the trend, computed by applying HP filter to the actual and projected SACU disbursement in the baseline framework, is included as an exogenous variable z_t (see Figure 2).

6. The VAR estimates and the impulse response functions show that a SACU revenue fall would adversely affect real economic growth by increasing sovereign risk premium (and thus interest rate as well as market confidence), which results in lower credit extension to the private sector. The VAR regression in Box 1 and the impulse response function in Figure 3 show that growth is sensitive to a reduction in private credits (with a lag of one quarter), while a fall in SACU revenues (below its trend) would significantly reduce the international reserves, leading to a hike in sovereign spread (above its trend) and a reduction in private credit growth. A large negative coefficient of international reserve on the hike of sovereign spread suggests high elasticity of Swaziland's spread in response to the SACU revenue shock. The impulse response of sovereign spread to international reserve shock demonstrates that the risk premium would be peaked with 4 quarter lag after the SACU revenue shock, and the risk premium remain elevated over the medium-term. This would have immediate impact on growth and credit intermediation through direct channels (by worsening market confidence which could potentially trigger short-term outflow of capital from Swaziland banking sector, affecting the liquidity situation) as well as indirect channels (by increasing real interest rate).

7. Based on the VAR estimates, output growth could be as low as -2 percent in 2016–17. Based on the estimates, the evolutions of macroeconomic variables for 2015–2018 are explored under two difference scenarios. The benchmark scenario assumes that the economy will experience the SACU shock as same magnitude as projected in the staff report (**Scenario 1**). An alternative scenario (**Scenario 2**) puts prolonged shock in SACU revenue which persistently stays lower than the historical trend in SACU disbursement. The charts in Figure 2 highlight a large and immediate spike in sovereign spread and sharp

³ The deviations of international reserve, sovereign spread, and SACU payments are computed as the gap of actual gross official reserve, sovereign spread, and SACU disbursements from the trend component. The trend component is computed by applying the Hodrick-Prescott (HP) filter to the quarterly series with the smoothing parameter of 1,600.

⁴ In the absence of quarterly GDP data, quarterly electricity delivered and consumed by households and industries is the best available quarterly series in conducting the macro-financial analysis, which appears to track short-term fluctuations in growth well. See recent literature (Henderson, Storeygard, and Weil, 2012) for the application of night light (and electricity consumption if available) data as an alternative measure of growth in Sub-Saharan African countries where the quality of national account data is weaker than developed and emerging countries.

slowdown in growth due to sluggish credit intermediation, resulting in annual growth of electricity consumption to about -2 percent during the shock period.⁵

C. Mapping the Macroeconomic Shocks to Bank's Asset Quality

8. The sensitivity of loan quality to the change in macroeconomic shock is assessed using a cross-country satellite panel model. This regression estimates the transmission of macroeconomic shocks to the financial sector. Given the insufficient length of time series data for Swaziland, the fixed effect estimation based on the panel data of the CMA countries (in our case, Lesotho, Swaziland, and Namibia) is used.⁶

$$\Delta NPL_{it} = \alpha_1 \sum_{s=0}^1 \Delta MACRO_{i,t-s} + \alpha_2 Crisis_{i,t} + \mu_i + \lambda_t + \Delta \varepsilon_t \quad (2)$$

where ΔNPL_{it} stands for the change in aggregate NPL ratios for country i in year t , and $\Delta MACRO_{i,t}$ includes the changes in sovereign spread and SACU revenues.⁷ A lag of private sector credit growth variable is also added. To capture an immediate and sharp rise in NPL ratio in Swaziland (see the bottom chart in Figure 1), a crisis dummy ($Crisis_{i,t}$), which indicates the period when the NPL ratio grows by more than 30 percent, is included. The sample covers the period of 2009-2014 in quarterly frequency. To account for country-specific and period-specific factors, country dummies (μ_i) and quarter dummies (λ_t) are included. α_1 capture the average effect of each macroeconomic variables on the growth in NPLs across three countries.

9. The estimates of the cross-country and bank-level satellite models suggest that the NPL ratios would rise following the SACU revenue fall due to higher sovereign risk premium, slower growth, and the likelihood for government arrears for suppliers (Box 2). In the cross-country satellite panel regression, the coefficients had the expected signs overall. A spike in the country's spread by 100 bps beyond the historical trend has immediate impact in higher NPL ratio by 10.8 percent. Private sector credit growth also appears to increase the NPL ratio. Based on the previous crisis episode, this result may reflect an increase in unsecured lending and/or lumpy credit extension to specific borrowers (including construction and small and medium-sized enterprises), although the effect is not statistically significant. We also run the satellite regression using the NPL data for four individual banks in Swaziland. This regression could also include the quarterly electricity consumption growth as one of the explanatory variables (see Box Table 3). The result using bank-level data also confirms that higher sovereign risk premium (which is associated with government's liquidity problem and an event of government domestic

⁵ The VAR model is backward-looking, which estimates the macro-financial linkage based on the historical data and does not take into account future policy reactions to prospective SACU revenue fall. The analysis uses higher frequency data (quarterly) to increase the number of observations in the regression and employs a proxy measure of quarterly growth (electricity consumption) which is not a perfect measure for data availability. For these reasons, the calibrated series of growth and private sector credit based on the VAR model show larger volatilities than the annual projection in the staff report, though the overall trends are consistent between two frameworks.

⁶ Botswana is excluded from the sample as Botswana's quarterly NPL data is not available from the FSI database.

⁷ In the panel regression, electricity consumption growth cannot be included as quarterly series are not available for Lesotho and Namibia.

arrears during the fiscal crisis) and stagnant real economy activities (which is captured by the electricity consumption growth) would contribute to higher NPL ratios as observed in the past for Swaziland.

10. The feedback effect between the real economy and banking sector is also incorporated into the VAR regression which confirms the strong macro-financial linkages in Swaziland (Figure 4).

While lower growth significantly increases NPLs mainly by weakening borrowers' solvency to repay debt, the deterioration of bank's asset quality could also affect the real economy through credit supply channel (see Klein (2013)). We use the same VAR specification as in Eq. (1) with the change in aggregate NPL ratio as an additional endogenous variable to capture this feedback effect. The impulse response function in Figure 4 confirms that an increase in NPLs leads to a temporary reduction in private credit growth and contraction in economic growth. The contraction in the private economy and deterioration in fiscal situation would worsen the payment capacity of borrowers in government-related sector (e.g., construction) and small and medium-sized enterprises, partly due to the government's arrears to suppliers and vendors as observed after the 2010–11 fiscal crisis period, which then contribute to higher NPL ratio.

11. Finally, the evolution of NPL ratios is predicted based on the estimates in the VAR model as specified in Eq. (1) (which incorporated the feedback effect). On the basis of future SACU revenue streams as assumed in scenario 1 and 2, the evolution of NPL ratio is projected as shown in the last chart in Figure 2. When prolonged SACU revenue shock is assumed, the NPL ratio is projected to rise rapidly when the SACU crisis materializes in 2016 which would be peaked in the same year as similarly found by Hardy and Schmieder (2013) from past crisis episodes. Based on the calibrated credit shock, the next section examines the adverse impact of the NPL shock on the capital adequacy ratio (CAR) when the NPL ratio is peaked in each scenario.

D. Stress Testing Exercise

12. A stress test considers the impacts of the materialization of credit risk combined with interest rate risk and concentration risks on the capital adequacy ratio under three scenarios.

Table 1 provides a detailed description of each scenario. Besides the credit risk estimated by the VAR model, we incorporate interest rate risk and concentration risk in alternative scenarios to conduct stress tests. The hurdle rate used in the stress test is summarized as follows:

- **Scenario 1:** Only a credit shock (an increase in NPLs) as calibrated from the benchmark model (assuming SACU disbursements projected in the staff report) is applied.
- **Scenario 2:** Larger credit shock due to more prolonged SACU shock is applied. Moreover, the interest rate shock (an increase in interest rates by 10 percentage points as assumed in IMF (2015)) is added as an increase in real interest rates could potentially affect the bank's net interest income due to the re-pricing of interest earning assets and interest bearing liabilities.
- **Scenario 3:** A larger credit shock is applied for vulnerable banks (whose NPLs spiked up much larger than others) where the level of NPL shock is set at their historical maximum during the sample period. Moreover, the loss-given-default for the largest exposure is set at 100 percent only in scenario 3. For the three South African subsidiary banks, the counterparty risk of largest exposure is assumed to be partly taken by South African parent banks via off-balance risk sharing

agreements. The analysis assumes that the losses for subsidiaries will be capped at the 50 percent of the regulatory capital in the case of a default of largest exposure.⁸

13. The stress test is performed with a balance sheet approach based on a modified Čihák framework to examine the CAR relative to the regulatory requirement under the Basel I. The bank-level balance sheet and income statement data as of end-December 2014 are used for this assessment. Currently, all commercial banks in Swaziland need to comply with the Basel I capital requirement which requires banks to hold at least 4 percent Tier 1 capital and 8 percent total regulatory capital compared with the risk weighted asset (RWA). As the case of most Sub-Saharan African countries, the CARs of all four commercial banks in Swaziland comfortably exceed the regulatory minimum at end-December 2014.

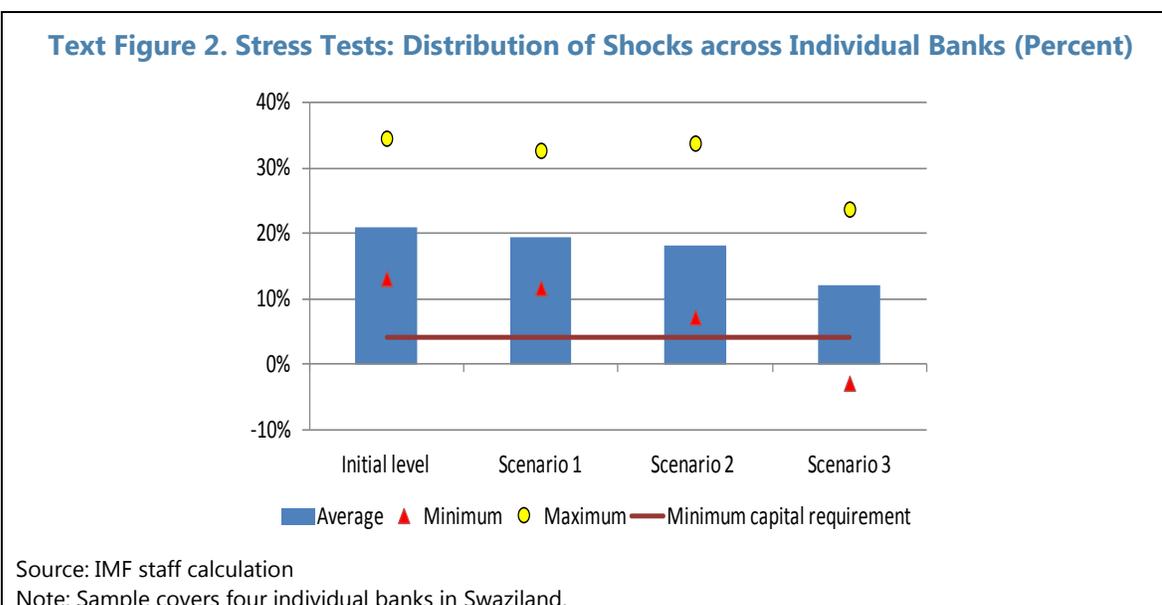
14. The results show that the SACU shock could depress the asset quality, especially when the NPL shock is combined with concentration risk, though the shocks would be generally absorbed by the current large capital buffer. The stress-testing results for the entire banking system under three different scenarios (summarized in Text Table 1) show the reduction in the initial capital ratios due to three shocks (NPL shock, interest rate shock, and default of largest exposure). Under scenario 1, the deterioration in loan quality caused by the SACU shock (under the baseline) alone is estimated to create losses of 1.6 percent of the Tier 1 regulatory capital, while the capital would stay well above the regulatory requirement.

15. The capital adequacy ratios will decline further if losses due to the default of the largest exposures are added. Under scenario 2, the prolonged SACU shock would trigger a sharper rise in NPLs and create losses of 3.3 percent of regulatory capital. The effect on the net-interest margin appears to be small but positive as the changes in interest rates are passed into both risk-earning assets and risk-bearing liabilities, leaving the net interest margin close to unchanged with marginally positive impact on the capital adequacy ratio. With the severe shock under scenario 3, the credit shock would create slightly larger losses in capital, driven by a sharper rise in NPLs for vulnerable banks. The concentration risk is estimated to be sizable, demonstrating the losses of 7.1 percent of regulatory capital should the largest exposures experience defaults due to economic contraction during the SACU crisis. This extreme shock scenario would significantly depress the capital adequacy ratio down to 7.6 percent.

⁸ The risk sharing agreement stipulates that the parent bank will recapitalize the subsidiary for losses exceeding 25 percent of the regulatory capital of the subsidiary. Given some uncertainty of the ability and willingness of the South African parent banks to honor this agreement, we cap the losses at 50 percent of a bank's regulatory capital rather than 25 percent as agreed in the risk sharing document.

Text Table 1. Stress Tests: Shocks to Bank’s Capital (In percent)	
	Entire banking system
<u>Initial Tier 1 capital-to-RWA ratio</u>	19.1%
<u>Subtractions due to shocks:</u>	
1. Aggregate NPL shock	
Scenario 1	-1.6%
Scenario 2	-3.3%
Scenario 3	-4.4%
2. P/L effect of interest rate shock (scenario 2 and 3)	0.2%
3. Default of largest exposure (Scenario 3)	-7.1%
<u>Tier 1 capital-to-RWA ratio (under stress)</u>	
Scenario 1	17.4%
Scenario 2	15.9%
Scenario 3	7.6%
<p>Source: IMF staff calculation. Note: The NPL shock assumes a jump in NPLs from the current level to the peak NPL level calibrated from the VAR model as shown in Figure 1. Scenario 1 and 2 apply a uniform rise in NPLs for all banks, while scenario 3 puts larger credit shock for vulnerable banks which experienced larger spikes in NPLs in the past.</p>	

16. The stress testing result demonstrates that the banking sector as a whole could still be compliant with the Basel I’s capital adequacy requirement but with large variability across individual banks. Under scenarios 2 and 3, the maximum impact of underlying shocks on the capital adequacy ratio is estimated to be significantly larger than the average impact. Although the capital adequacy ratio for the entire banking system could still be compliant with the Base I requirement, it will likely affect its financing intermediation function. Under the most extreme case, the capital adequacy ratio could potentially be negative. This points the importance of strong bank supervision and regulation.



E. Conclusion

17. The macro-financial analysis reveals that the prospective SACU revenue shock could trigger a rise in NPL ratios through the emergence of the government arrears, higher real interest rate (with higher risk premium), and sluggish private credit growth, which could put banking system stability at risk. The VAR regression reveals that a rise in risk premium, caused by lower SACU revenues, could lead to higher real interest rate and subdued economic activities, which also trigger a rise in NPL ratios as shown by the satellite regressions. These results suggest that, not only to ensure fiscal and external sustainability, but also to safeguard the financial sector stability, fiscal consolidation would be critical to mitigate the adverse impacts of the SACU revenue shock. Strong policy response with fiscal consolidation would help contain a rise in risk premium and mitigate the crowding-out of private credits, while allowing the government to avoid possible cash management problem.

18. While the banking system currently shows high capital ratios, the SACU revenue shock could worsen the capital adequacy of the whole Swazi banking sector close to the regulatory limit, particularly if the SACU shock should be accompanied by increases in interest rate and default of large borrowers. Banks seem to be sufficiently capitalized to withstand a SACU revenue fall alone, but with more adverse scenarios (with interest rate and concentration risks), borrowers' payment capacity could be eroded, and the banks' asset quality would worsen. Therefore, to address the expected SACU revenue shock, in addition to a strong policy response with fiscal consolidation, it is essential to strengthen supervision for financial sector, as recommended by the IMF (2015), and also to mitigate the risks to banks stemming from the high concentration risk.

Box 1. VAR Estimate on the Impact of SACU Shock on the Economy

The following table shows estimates of the VAR regression as specified in Eq. (1). We run the model using macroeconomic series for Swaziland (2009Q3-2014Q4) to analyze how the exogenous shock of the SACU revenue fall will endogenously affect growth, credit, real interest rate, sovereign spread, and gross international reserves (GOR). The preferred specification includes growth rate of electricity consumption ($\Delta electricity$; proxy for quarterly GDP growth due to data limitation), private sector credit growth ($\Delta private\ credit$), the detrended sovereign spread (above South African T-bill rate; \widehat{Spread}) and gross international reserve (\widehat{GOR}) which remove the respective historical trends as endogenous variables, all are lagged by one quarter. It also includes the detrended SACU disbursements which removes its historical trend (\widehat{SACU}) as an exogenous variable.

The result below shows significant positive correlation between SACU disbursement and the gross international reserve, and significant negative correlation between GOR and sovereign spread. A large negative coefficient of international reserve on the hike of sovereign spread suggests high elasticity of Swaziland's spread in response to the SACU revenue shock. This VAR estimate implies that a fall in SACU (below its trend) would significantly reduce the international reserves, leading to a hike in sovereign spread (above its trend).

Box Table 1. Macroeconomic Impacts of SACU Shock

	$\Delta electricity$	$\Delta private\ credit$	\widehat{Spread}	\widehat{GOR}
Endogenous variable				
L. $\Delta electricity$	-0.521718 (0.19551) [-2.66855]	-0.019287 (0.18743) [-0.10290]	-0.8408 (0.82942) [-1.01373]	-0.078058 (0.16792) [-0.46486]
L. $\Delta private\ credit$	0.405596 (0.26616) [1.52390]	-0.072109 (0.25516) [-0.28260]	0.614151 (1.12915) [0.54391]	0.539687 (0.22860) [2.36086]
\widehat{Spread}	0.0429 (0.03544) [1.21066]	-0.028326 (0.03397) [-0.83381]	0.630648 (0.15033) [4.19503]	0.054652 (0.03044) [1.79570]
L. \widehat{GOR}	0.132894 (0.09583) [1.38682]	-0.047377 (0.09187) [-0.51571]	-0.997718 (0.40654) [-2.45419]	0.831425 (0.08230) [10.1019]
Constant	-0.007991 (0.01504) [-0.53146]	0.031063 (0.01442) [2.15492]	-0.018394 (0.06379) [-0.28835]	-0.018291 (0.01291) [-1.41632]
Exogenous variable				
\widehat{SACU}	-0.009716 (0.04219) [-0.23030]	-0.001971 (0.04044) [-0.04874]	0.112312 (0.17898) [0.62752]	0.162097 (0.03623) [4.47359]
R-squared	0.43284	0.058147	0.794076	0.941532
Sum sq. resids	0.054704	0.050277	0.984562	0.040354
Mean dependent	0.000877	0.0287	0.03692	-0.024326
S.D. dependent	0.067772	0.050418	0.477153	0.18129

Sources: IMF staff calculation, Central Bank of Swaziland.

To examine the channel how the hike in risk premium would affect the real economy, we experiment with the specification with the change in real interest rate ($\Delta real\ interest\ rate$). The impulse response functions in Figure 3 demonstrates that an increase in sovereign spread (above the historical trend), caused by negative shock in gross international reserves, tend to last longer and increase real interest rate. This then leads to a reduction in private credit growth and results in lower consumption growth.

Box 2. Satellite Model: Estimate on the Macroeconomic Shock on Credit Quality

The following table shows estimates of the fixed effect regression as specified in Eq. (2). The preferred specification includes the deviation of each country's sovereign spread (above South African T-bill), private sector credit growth, and the crisis dummy (which is one if the country-quarter observation experienced a spike in NPL ratios by more than 30 percent points). The crisis dummy well captures a spike in the NPL ratio at the onset of the fiscal crisis.

In the satellite cross-country panel regression, the coefficients of sovereign spread is significantly positive, highlighting the spread is a critical factor in determining the asset quality. The marginal effect is also large, showing that a spike in the country's spread by 10 bps beyond the trend increases the NPL ratio by about 1.1 percent.

Box Table 2. Panel Satellite Model: Macroeconomic Impacts of NPL Ratio

	Δ NPL
\widehat{Spread}	0.108*** (0.011)
L. Δ Credit to private sector	0.123 (0.134)
\widehat{SACU}	0.016 (0.042)
Crisis dummy	0.549** (0.080)
Constant	-0.035* (0.009)
Observations	63
Number of groups	3
R-square (within)	0.625
R-squared (between)	0.858
Country and quarter fixed effect	Y

Sources: IMF staff calculation, Central Bank of Swaziland.

Note: Dependent variable is the percentage point change in NPL ratio. \widehat{Spread} and \widehat{SACU} are the detrended sovereign spread (above South African T-bill rate) and SACU disbursement which remove the respective historical trends. The first-differenced credit to private sector indicates their growth rates. "L" denotes the one period lag of the variable. Robust standard errors are reported. Hausman test rejects the null hypothesis that random effect is more consistent, supporting our adoption of fixed effect model.

Significance level: *significant at 10 percent; ** significant at 5 percent, *** significant at 1 percent.

The financial stability unit of CBS has also been compiling the balance sheet and income statement of four individual banks. We run the satellite regression using the bank-level panel data of NPLs covering 2009–2014 in quarterly frequency. The bank-level satellite regression includes same macroeconomic variables as the cross-country regression, but it also allows us to control for the electricity consumption growth rate in Swaziland.

As summarized in Box Table 3 below, an increase in sovereign risk premium and electricity consumption significantly increases the NPL ratio at the individual-bank level. This supports the evidence that the risk premium is a key determinant of the Swazi bank's asset quality. It also demonstrates that the growth rate in the real economy matters for the change in NPLs.

Box 2. Satellite Model: Estimate on the Macroeconomic Shock on Credit Quality (concluded)**Box Table 3. Bank-level Satellite Model. Macroeconomic Impacts of NPL Ratio**

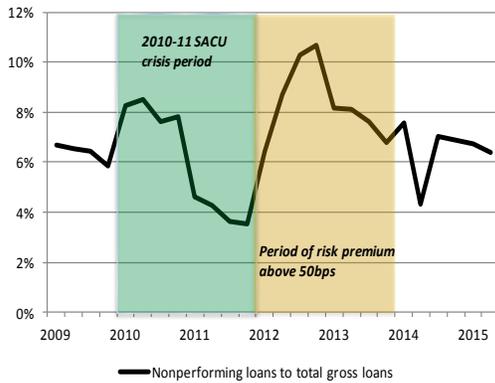
	Δ NPL
$\widehat{\text{Spread}}$	0.009** (0.002)
Δ electricity consumption	-0.695*** (0.093)
L. Δ Credit to private sector	0.371 (0.571)
$\widehat{\text{SACU}}$	-0.002 (0.051)
Crisis dummy	0.306** (0.082)
Constant	-0.079 (0.034)
Observations	86
Number of groups	4
R-square (within)	0.271
R-squared (between)	0.553
Bank and quarter fixed effect	Y

Sources: IMF staff calculation, Central Bank of Swaziland.

Significance level: *significant at 10 percent; ** significant at 5 percent, *** significant at 1 percent.

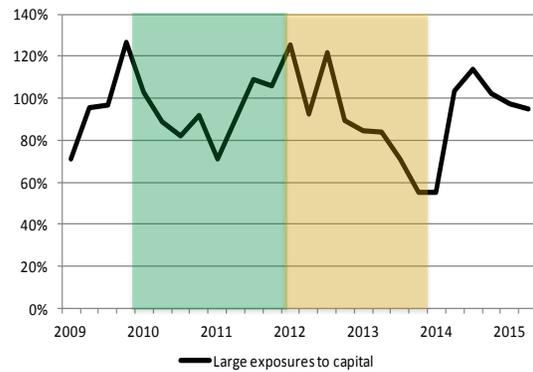
Figure 1. Banking System Performance

NPLs spiked during the 2010-11 fiscal crisis, followed by a spike in 2012 due to an increase in unsecured lending and riskier fiscal situation (i.e., risk premium remains above 50bps), which continued to decline since then.



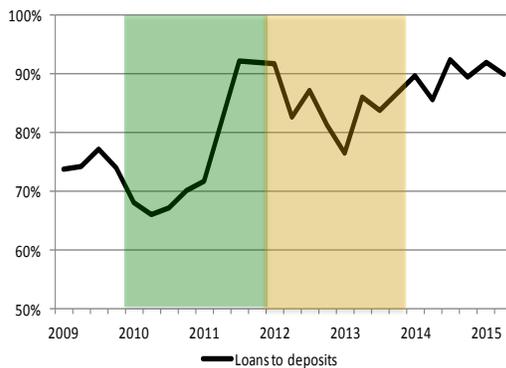
Source: Central Bank of Swaziland.

An increase in NPLs was accompanied by a drop in large exposure to capital ratio both in the onset of 2010-11 fiscal crisis and in the first quarter of 2012 when NPL dramatically rose.



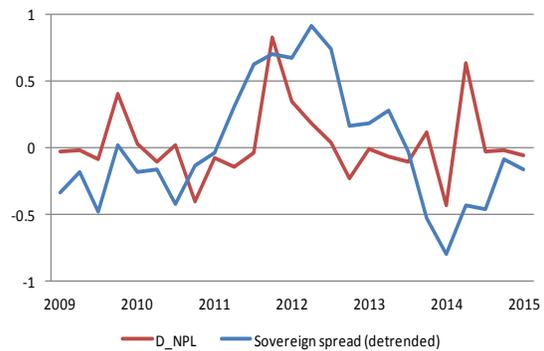
Source: Central Bank of Swaziland.

Credit intermediation declined and was slow during the 2010-11 crisis period, followed by lower credit growth in 2012, which has recently recovered.



Source: Central Bank of Swaziland.

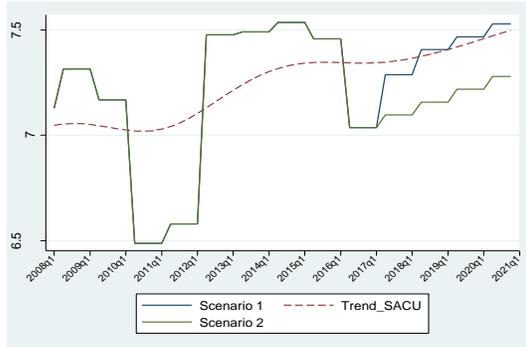
The evolution of sovereign spread is positively correlated with the change in NPLs.



Source: Central Bank of Swaziland.

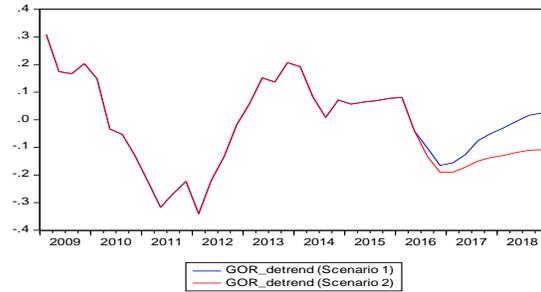
Figure 2. Stress Test Calibration—Macroeconomic Assumptions

Baseline scenario assumes a reduction in SACU as assumed in the staff's baseline framework, while scenario 2 puts assumes prolonged SACU decline from the trend.



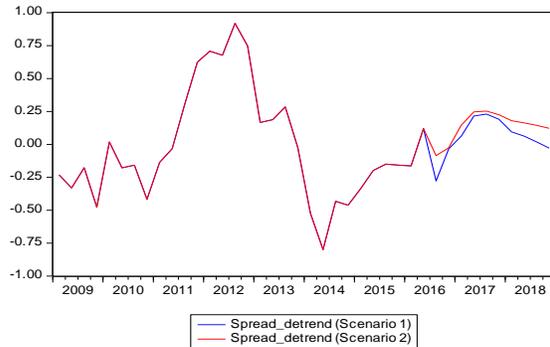
Sources: South African treasury and IMF staff calculation.

Gross official reserve (GOR) is expected to drop as observed in the previous crisis in scenario 1, while the reduction is larger under scenario 2.



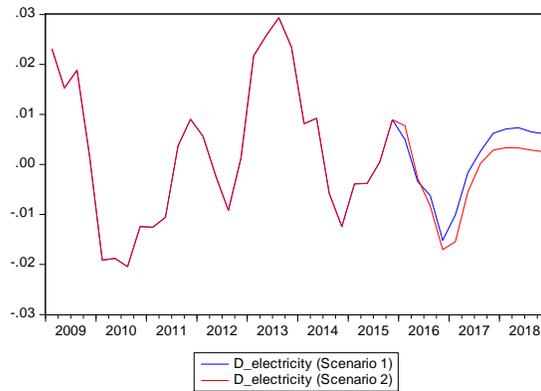
Source: IMF staff calculation.

Spread will continue to rise and be peaked in 2017 under the baseline, while remains elevated under scenario 2.



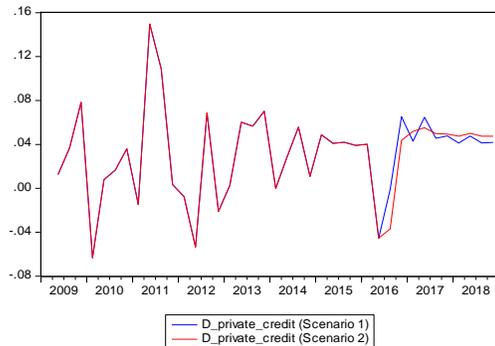
Source: IMF staff calculation.

Growth will be slower in the aftermath of SACU shock which will recover in following years.



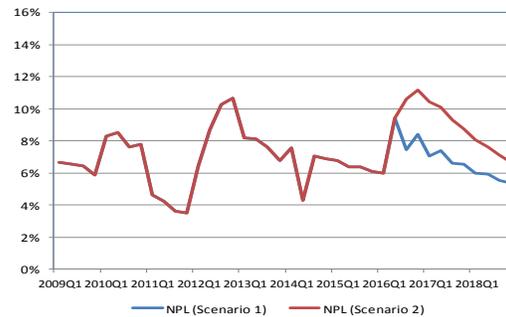
Source: IMF staff calculation.

Private credit will also be slower immediately after the SACU shock.



Source: IMF staff calculation.

NPL ratio will spike after the prospective SACU crisis. The shock will be prolonged in case of scenario 2.



Source: IMF staff calculation

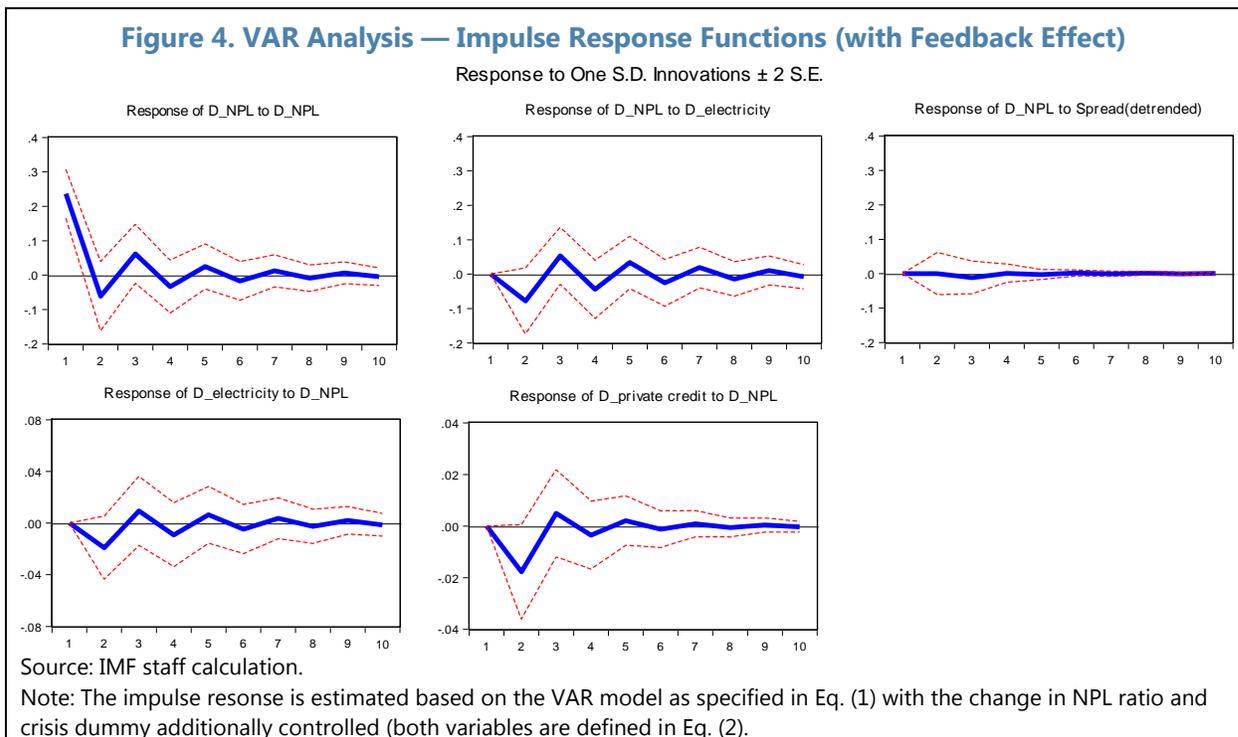
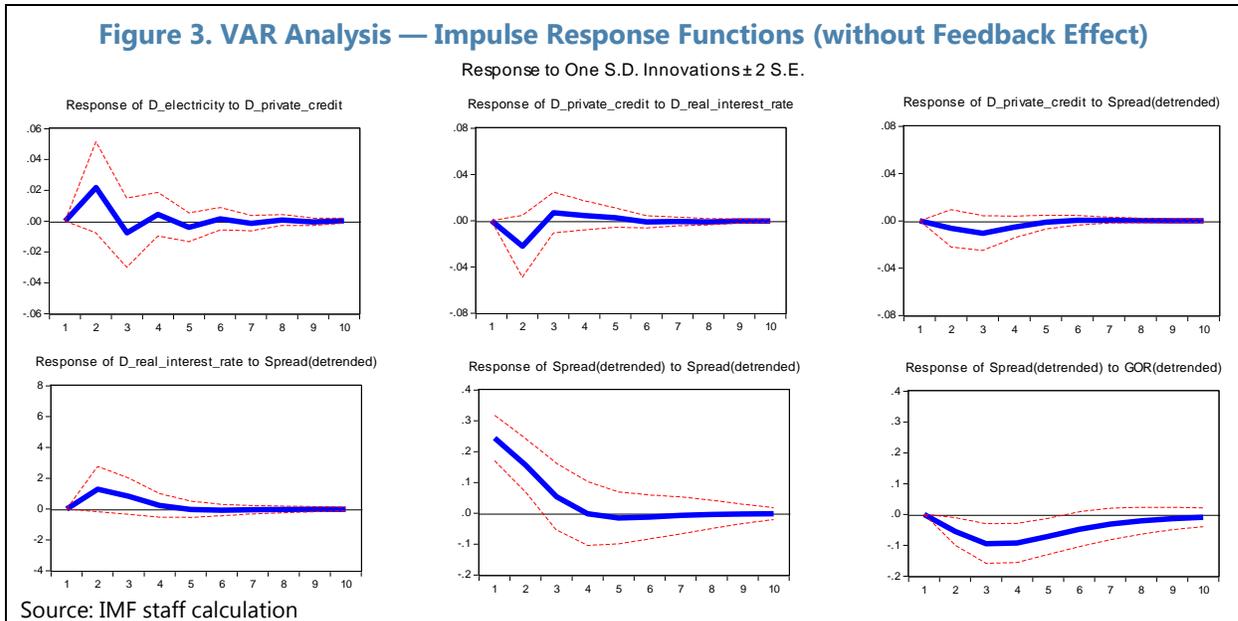


Table 1. Kingdom of Swaziland Stress-Testing Scenario

Scenario 1. Decline in SACU revenues		
<u>Expected impact on the economy</u>	<u>Expected impact on banks</u>	<u>Expected indirect impact</u>
<p>Lower SACU revenues worsen fiscal position and external balance, that causes:</p> <ul style="list-style-type: none"> - Reduced fiscal spending - Increase in government's debt, arrears, and contingent liabilities - Higher risk premium - Subdued economic activity 	Higher credit risk (an increase in NPLs)	The reduction in lending to the private sector which could trigger further deceleration in economic activities and credit intermediation
Scenario 2: Prolonged decline in SACU revenues + Increase in Real Interest Rates		
<u>Expected impact on the economy</u>	<u>Expected impact on banks</u>	<u>Expected indirect impact</u>
<p><i>Prolonged</i> decline in SACU revenues worsen fiscal and external positions, that causes:</p> <ul style="list-style-type: none"> - Reduced fiscal spending - Increase in government's debt, arrears, and contingent liabilities - Higher risk premium - Subdued economic activity 	<p>Higher credit risk (an increase in NPLs; effect stronger than scenario 1)</p> <p>Higher interest rate risk (through changes in spread between interest earning assets and interest bearing liabilities)</p>	An increase in real interest rate and the sharper reduction in lending to the private sector which could trigger further deceleration in economic activities and credit intermediation (effect stronger than in scenario 1)
Scenario 3: Prolonged decline in SACU revenues + Concentration risk (a default of major borrowers)		
<u>Expected impact on the economy</u>	<u>Expected impact on banks</u>	<u>Expected indirect impact</u>
<p><i>Prolonged</i> decline in SACU revenues worsen fiscal and external positions, that causes:</p> <ul style="list-style-type: none"> - Reduced fiscal spending - Increase in government's debt, arrears, and contingent liabilities - Higher risk premium - Subdued economic activity - Cut in subsidy to SOEs 	<p>Higher credit risk (an increase in NPLs; effect stronger than scenario 1 and 2 due to a default of large exposures)</p> <p>Higher concentration risk (a default of the single largest exposure or other major borrowers)</p>	An increase in real interest rate and the sharper reduction in lending to the private sector which could trigger further deceleration in economic activities and credit intermediation (effect much stronger than in scenario 1 and 2)

References

- Čihák M. (2007) "Introduction to Applied Stress Testing", *IMF WP/07/59*.
- Fofack H. (2005) "Nonperforming Loans in Sub-Saharan Africa: Causal Analysis and Macroeconomic Implications.", *World Bank Policy Research Working Paper #3769*.
- Hardy D. and Schmieder C. (2013) "Rules of Thumb for Bank Solvency Stress Testing", *IMF WP/13/232*.
- Henderson V., Storeygard A., and Weil D. (2012) "Measuring Economic Growth from Outer Space", *American Economic Review*, vol. 102(2), pp. 994-1028.
- International Monetary Fund. (2015). Swaziland TA report on "Baseline Financial Stability Assessment and Enhancing Capacity for Financial Stability Analysis and Reporting."
- _____ (2013). "Restoring Sustainability in a Global Environment: Options for Swaziland", *African Department Paper No. 13/1*
- _____ (2006). "Spain: Financial Sector Assessment Program – Technical Note – Stress Testing Methodology and Results", *IMF Country Report No. 06/216*
- Klein N (2013) "Non-Performing Loans in CESEE: Determinants and Impact on Macroeconomic Performance", *IMF WP/13/72*.
- Laeven L. and Valencia F. (2013). "Systemic Banking Crisis Database", *IMF Economic Review*, vol. 61, pp. 225–270.
- Mecagni M., Marchettini D., and Maino R (2015). "Evolving Banking Trends in Sub-Saharan Africa: Key Features and Challenges", *IMF African Department Paper*.