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ECUADOR

SELECTED ISSUES AND ANALYTICAL NOTES

March 2019

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March 1, 2019

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CONTENTS

POTENTIAL OUTPUT, GDP NOWCASTING AND FORECASTING[1]

This selected issues paper estimates Ecuador's potential growth in the range of 1¾ to 3 percent. The lower estimate corresponds to an extrapolation of recent trends while the higher estimate could be achievable through the implementation of a reform agenda that addresses fiscal and competitiveness challenges of Ecuador. The paper also develops models to nowcast and forecast GDP to improve the accuracy of growth projections.

A. Introduction

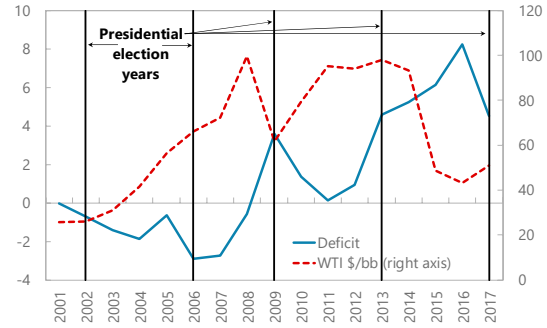
1. This selected issues paper explores different aspects of the real economy of Ecuador. The first section presents relevant stylized facts of Ecuador's economy setting the stage for the analysis of long-run potential growth (section two), and the development of nowcasting (section three) and forecasting (section four) models to underpin growth projections.

B. Stylized Facts

This section documents stylized facts about the economic activity in Ecuador over the past 50 years.

2. Economic activity has expanded at an average pace of 3.9 percent per year since 1965. While private consumption has remained a stabilizing force over the period with an average share of about 64 percent of GDP, there have been large decadal swings between private and public investment (Figure 1). In the 1990s and early 2000s public sector investment was pulled back and the private sector thrived. Around 2007 the public sector once again started to grow faster than the rest of the economy. The combined increase in public consumption and investment, financed both by high oil revenues and progressively higher fiscal deficit, supported growth temporarily while crowding out the private sector's contribution to growth, and exposing the country to vulnerabilities associated with lower oil prices (fiscal imbalances, weak private sector, low long-term growth).

Fiscal Deficits, Elections and Oil Price
(In percent of GDP)



Sources: BCE; Ministry of Finance; and IMF staff calculations

3. The oil sector remains an important driver of economic activity; however, it is not as important as it once was. There have been two peaks of oil as an engine of growth in Ecuador; one in 1973 when the oil sector was being developed, and the other one in 2004. In both cases the oil sector as a percent of real GDP reached about 15 percent. On average, the oil sector has contributed

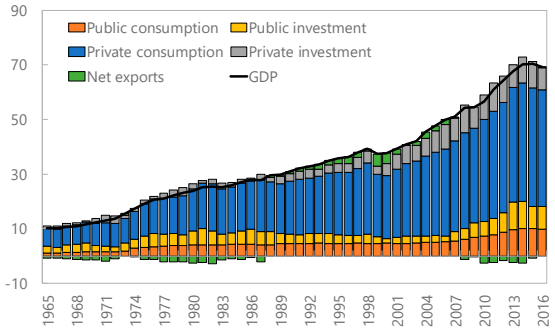
[1] Prepared by Sebastian Acevedo (WHD).

about 12 percent of real output between 1973 and 2004. Since then, the oil sector has suffered a secular decline, with its lowest point in 2015 when it just contributed 9.9 percent of real output. The decline in the sector started well before the collapse in oil prices in late 2014, as Ecuador did not take advantage of the recent years of high oil prices, as its production and exploration efforts lagged behind some of its neighbors that have oil sectors more open to foreign investors (Figure 1).

Figure 1. Real GDP and Oil Sector

Public investment and consumption increased over the last decade…

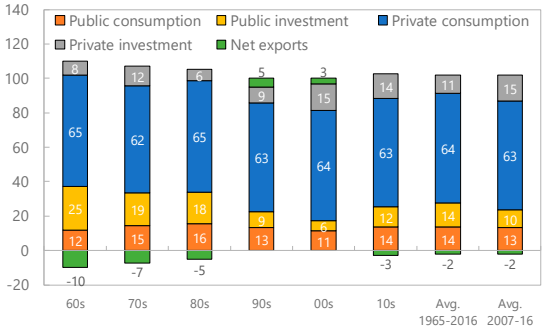
Real GDP by Expenditure
(In billions)



Sources: BCE; and IMF staff calculations.

… reverting the decline in public expenditure that happened in the 90s and early 2000s.

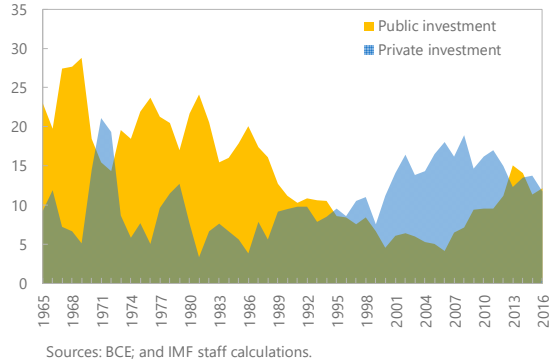
Real GDP
(In percent of real GDP)



Sources: BCE; and IMF staff calculations.

Since 2007 private investment has been crowded out by the public sector.

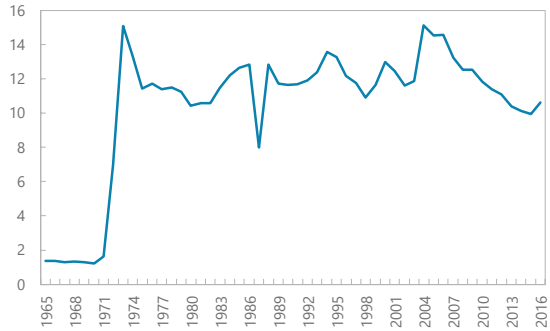
Investment
(In percent of real GDP)



Sources: BCE; and IMF staff calculations.

Oil sector GDP has declined considerable in the last decade…

Oil GDP
(In percent of real GDP)

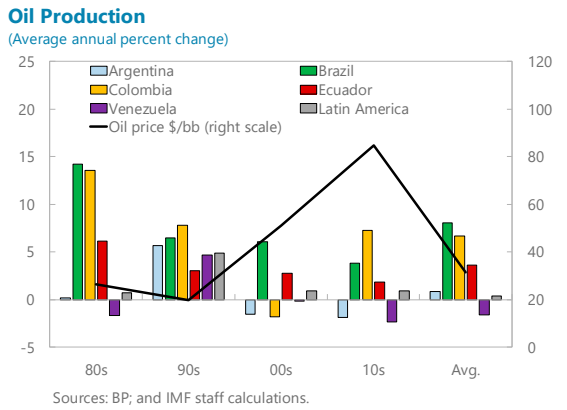


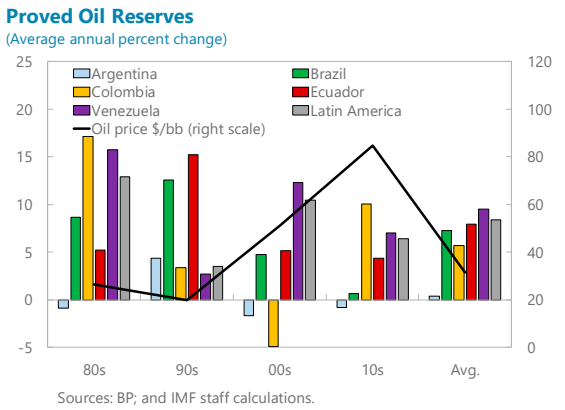
Sources: BCE; and IMF staff calculations.

…as oil production did not take advantage of the boom in oil prices in the 2010s as it did in other LAC countries.

Since the 2000s, Ecuador also lagged some of its neighbors in oil exploration.

Figure 1. Real GDP and Oil Sector (Concluded)





C. Potential Growth

This section studies long-term trends in Ecuador's GDP growth to quantify the main contributors to growth and estimate the long-run potential growth.

Growth Accounting

4. In this section, a simple growth accounting exercise is used to decompose Ecuador's growth between production factors accumulation; capital and labor (adjusted for quality, i.e. human capital), and total factor productivity (TFP). A standard Cobb-Douglas production function is assumed:

$$Y_t = A_t K_t^{\alpha} (L_t h_t)^{(1-\alpha)} \quad (1)$$

where Y_t is total output in period t, A_t is total factor productivity, K_t is the stock of physical capital, L_t is employment, h_t is human capital per worker, and α is the share of capital. The initial capital stock is calculated following Ferreira et al (2013), and Sosa et al (2013) as:

$$K_0 = \frac{I_0}{(1+g)(1+n) - (1-\delta)} \quad (2)$$

where the initial investment (I_0) is the average investment over the first five years (1960–64), g is the technological progress rate, n is the population growth rate, and δ is the capital depreciation rate.[2] The capital stock series is constructed using the perpetual inventory method, starting in 1965:

$$K_t = K_{t-1}(1-\delta) + I_t \quad (3)$$

[2] The technological progress rate (g = 1.53) is taken from Ferreira et al (2013), the population growth rate of $n = 2.4$ is calculated over the period 1950-2015 from UN and Penn World Tables data version 9.0 (PWTv9), and $\delta = 4.5$ is the average depreciation rate for Ecuador for the period 1950-2014.

The quality of human capital is constructed as a function of the average years of schooling s_t, following Bils and Klenow (2000) as:[3]

$$h_t = exp\left(\frac{\theta}{1-\psi} s_t^{(1-\psi)}\right) \quad (4)$$

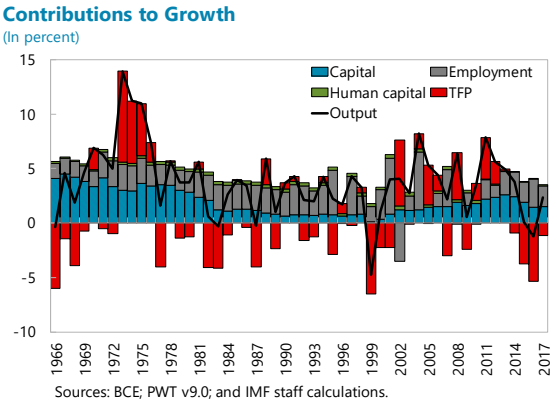
The growth rate of TFP is then calculated as:

$$\hat{A}_t = \hat{Y}_t - \alpha\hat{K}_t - (1-\alpha)\hat{L}_t - (1-\alpha)\hat{h}_t \quad (5)$$

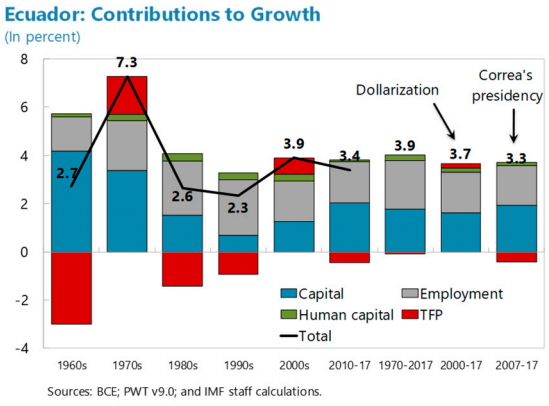
where the ^ denotes the growth rate of the variables.

5. Low total factor productivity is the culprit behind Ecuador's recent economic decline, and has been a negative contributor to long-term growth (Figure 2 and Table 1). Between 1970 and 2017 the economy grew at an average pace of 4 percent per year; with TFP contributing -0.1 percentage points. Apart from a spell of rapid TFP growth in the early 70s that started with the oil boom in 1973, TFP's contribution to growth has been negligible, if not damaging. Over the past 46 years' growth in Ecuador was due mostly to factor accumulation, equally divided between growth in the stock of physical capital, and labor (2 percentage points each). Human capital improvements have helped somewhat (0.2 percentage points on average).

Figure 2. Growth Accounting: Contributions to Real GDP Growth
(In percent)



Sources: BCE; PWT v9.0; and IMF staff calculations.



Sources: BCE; PWT v9.0; and IMF staff calculations.

6. Physical capital accumulation has been the key growth engine over the past decade. The growth in the capital stock had a boom in the 70s along with the nascent oil industry (see top-left chart in Figure 3), but there was a steady decline in capital's contribution to growth in the 80s and 90s, which started to revert in the 2000s. Over the past 10 years capital accumulation came back as the key engine of economic growth, reflecting, in part, large public-sector investments in infrastructure (e.g. roads, hydroelectric plants, etc.).

[3] The data on years of schooling comes from PWTv9, and we set $\psi = 0.58$ and $\theta = 0.32$ as in Blis and Klenow (2000).

Table 1. Growth Accounting: Contributions to Real GDP Growth
(In percent)

	1960s	1970s	1980s	1990s	2000s	2010-17	1970-2017
Capital	4.2	3.4	1.5	0.7	1.3	2.0	1.8
Employment	1.4	2.1	2.3	2.3	1.7	1.7	2.0
Human capital	0.1	0.2	0.3	0.3	0.3	0.1	0.2
TFP	-3.0	1.6	-1.4	-1.0	0.7	-0.4	-0.1
Total	**2.7**	**7.3**	**2.6**	**2.3**	**3.9**	**3.4**	**3.9**

Sources: BCE; PWT v9.0; and IMF staff calculations.

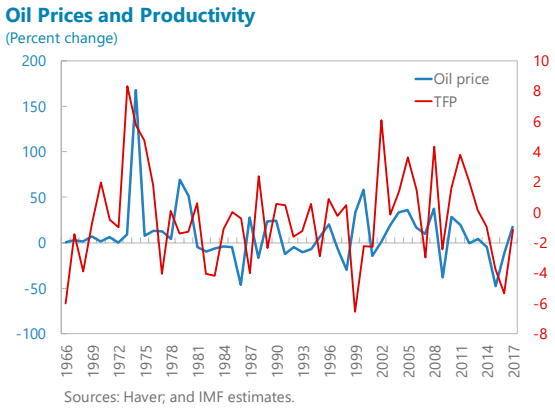
7. The oil price in Ecuador drives economic activity through both capital investment and productivity (Figure 3). Changes in the oil prices affect contemporaneously, and with a one-year lag, the total factor productivity in the economy. Similarly, real investments in the capital stock are affected, after one year, by changes in the oil price. These results help explain the large impact that the 2014–15 decline in the oil price had on Ecuador's economy. The effect was not only felt through lower investment in the oil sector, but also through lower government revenues that reduced investments in other sectors. In addition, the decline in oil prices also dried up liquidity in Ecuador as exports declined, spilling over into the rest of the economy and resulting in lower productivity growth. As oil prices are not expected to go back to their previous peak, Ecuador's economy needs to adjust to the new equilibrium and search for new engines of productivity growth and means to stimulate private investment growth.

Oil Price Correlation with Productivity and Investment

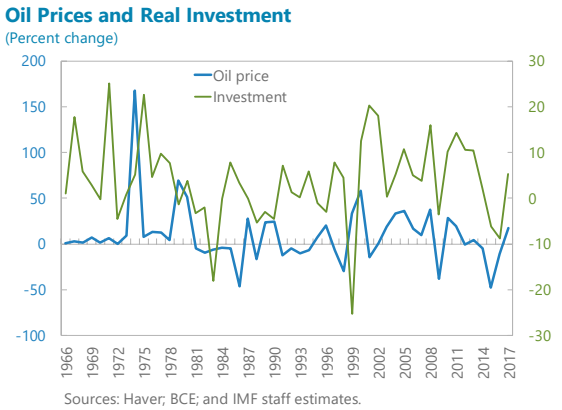
Variables	(1) TFP	(2) Investment
Oil price	0.024*	
	(0.012)	
Oil price$_{t-1}$	0.030**	0.115***
	(0.012)	(0.038)
Constant	-0.723	2.767**
	(0.431)	(1.273)
Observations	50	50
R-squared	0.179	0.161

Note: Standard errors in parentheses. All the variables are in percent changes.
Statistical significance at the: *** 1 percent, ** 5 percent, and * 10 percent levels.

Figure 3. Ecuador: Oil Prices, Productivity and Investment



Sources: Haver; and IMF estimates.



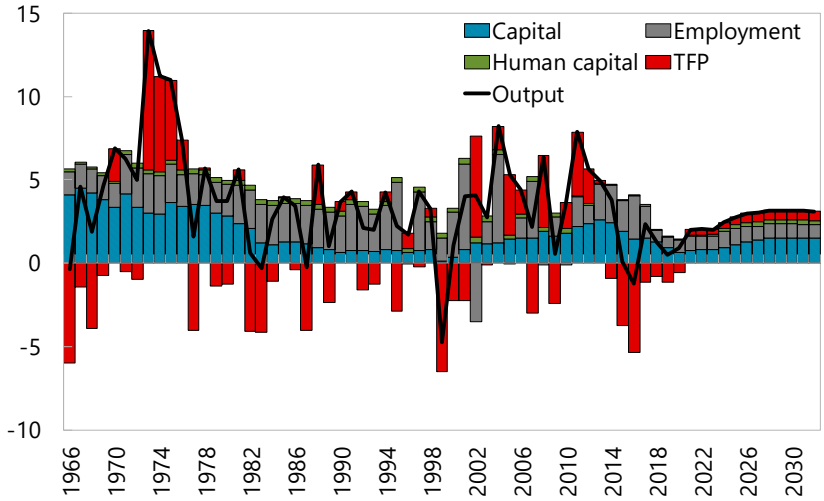
Sources: Haver; BCE; and IMF staff estimates.

D. Scenarios of Long-run Potential Growth

8. The growth accounting framework is also useful for prospective policy scenarios of long-run growth. In a scenario where capital expenditure cuts are the main tool to close the fiscal deficit, and TFP follows a similar pattern to the recent past and grows at an average rate of 0.1 percent, where human capital improvements are expected to continue at the same rate experienced over the past few years, and labor growth is kept in line with demographic projections and with the sluggish performance in the labor market, long-run growth potential would be about 1.8 percent per year. In this case, more than half of growth would come from labor (including improvements in human capital), and about 32 percent from physical capital accumulation and 15 percent from TFP.

9. A well-crafted reform agenda can guide the economy towards a higher growth path. If Ecuador were to implement policies to increase competitiveness, improve the quality of education, and create fiscal space to maintain public investment at a higher level, the economy's growth potential would improve considerably to about 3 percent per year (Figure 4). Improvements in educational attainment would not only increase human capital, but also enhance TFP growth (Kilic et al, 2018). Improving the business environment, easing regulations and maintaining a stable regulatory environment would help attract private investment (including FDI), both increasing productivity and the capital stock. In this scenario growth potential is estimated at about 3 percent, with TFP accounting for 17 percent of long-run growth, while labor (including human capital) would contribute with 38 percent, and capital accumulation with 45 percent. If additionally, women's participation in the labor force (currently at 55.6 percent, 25 points below that of men) were to increase, this would provide a further boost to potential growth.[4]

Figure 4. Ecuador: Contributions to Real GDP Growth Under a Reform Scenario



Sources: BCE; PWT v9.0; and IMF staff calculations.

[4] For a discussion of policies that improve female labor force participation see Novta and Wong (2017).

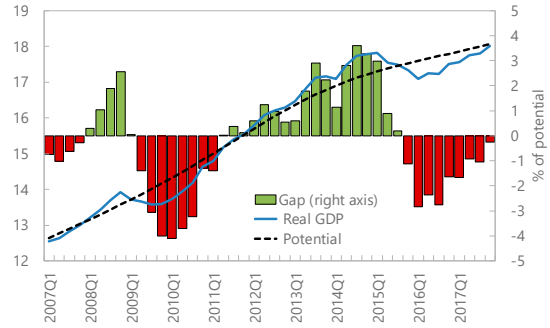
E. Business Cycle and GDP Nowcasting

This section looks at the business cycle in Ecuador to identify leading and coincident indicators of economic activity, and build a model to nowcast real GDP using monthly frequency variables.

Business Cycles and Correlations

10. Ecuador's business cycle shows that the economy is returning to its potential. In the last quarter of 2016 the economy experienced the first quarter of year-on-year growth after five consecutive quarters in negative territory. The peak of the expansion took place in 2015Q1, and the trough exactly one year later, resulting in a total decline of 4 percent in output. While the economy has started to recover, it was still below potential, -0.2 percent in 2017Q4, and given the overvaluation, the structural rigidities in the economy, and that the fiscal adjustment is likely to contain capital expenditure cuts, the gap is not expected to close over the medium-term.[5]

Real GDP and Potential Output
(Billions of US$)



Sources: Haver; BCE; and IMF staff calculations.

11. The best leading indicators of economic activity are exports and private sector deposits. To better understand the business cycle dynamics, and identify possible leading indicators of economic activity we calculate the correlation of real GDP with its components both on the expenditure and the supply side, with price and trade variables and with fiscal indicators. Table A2 in the Appendix shows the correlations, significant at the 5 percent level, between quarter-on-quarter real GDP growth and the quarterly growth rates of the different variables, both for the contemporaneous effect and for four lags and forwards. The table shows that exports (merchandise, oil and non-oil) and private sector deposits are the best leading indicators giving two quarters of advance warning. International oil prices, and imports of merchandise and fuel are also useful in gauging economic activity, but offer only a one quarter lead. Most sectors of production (e.g. agriculture, oil, communications, etc.) serve as coincident indicators; that is, they only serve to understand the current state of the economy but offer no guidance going forward, while some sectors such as construction, communications and agriculture tend to lag economic activity. Private consumption, gross fixed capital formation, and credit to the private sector also tend to lag real GDP growth.

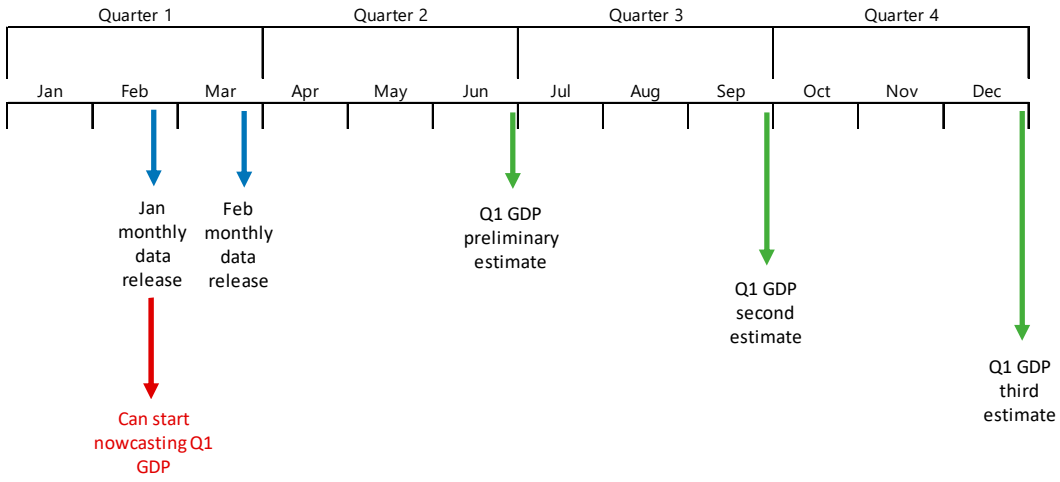
F. Nowcasting GDP

12. Quarterly GDP numbers in Ecuador are released with a considerable lag of one quarter (see Figure 5). To have a better sense of how the economy is performing it is important to have

[5] The potential output in this case was computed on a simple Hodrick-Prescott filter for the period 2000Q1–2023Q4.

preliminary estimates of GDP or "nowcasts". To obtain a GDP nowcast as early as possible we use only data available at a monthly frequency, so that by the end of the second month of each quarter we can have a preliminary nowcast that can be updated with each monthly data release until the official GDP estimate is announced.

Figure 5. Timeline of GDP Data Releases



The Nowcast Model

13. To identify the best nowcast model for the Ecuadorian economy we use 15 variables.[6] We create all possible combinations of these variables from univariate models to models with up to 12 covariates.[7] The general form of the estimated OLS models is:

$$Y_t = \alpha + \beta_1 Y_{t-1} + \boldsymbol{\beta_2 X_t} + \boldsymbol{\beta_3 X_{t-1}} + \boldsymbol{\beta_3 Q} + \varepsilon_t \qquad (6)$$

where Y_t is the quarter-on-quarter growth rate of real GDP, $\boldsymbol{X_t}$ is a vector of q-o-q growth rates for the different combinations of 15 economic indicators, and $\boldsymbol{Q}$ is a vector of seasonal quarterly dummy variables. Four versions of equation (6) are estimated, one without $\boldsymbol{Q}$, one without $\boldsymbol{X_{t-1}}$, another one without $\boldsymbol{Q}$ and $\boldsymbol{X_{t-1}}$, and finally one just as presented in (6). With the four different versions of equation (6) and the different combinations of $\boldsymbol{X}$ for the 15 variables a total of 38,396 models were estimated.

14. The model selection included a little over 3.5 million regressions. The data covers the period 2000Q1 to 2016Q3, and the in-sample nowcasts are calculated for each quarter between 2009Q1 and 2016Q3 estimating the models on a rolling window. Additionally, three nowcasts are calculated for each quarter, and each model, using the three monthly data releases for each

[6] The variables used are the ones listed in tables A1 and A4 under the headings "Prices and Trade" and "Public Sector Revenue and Expenditure", except for CPI which was not used.

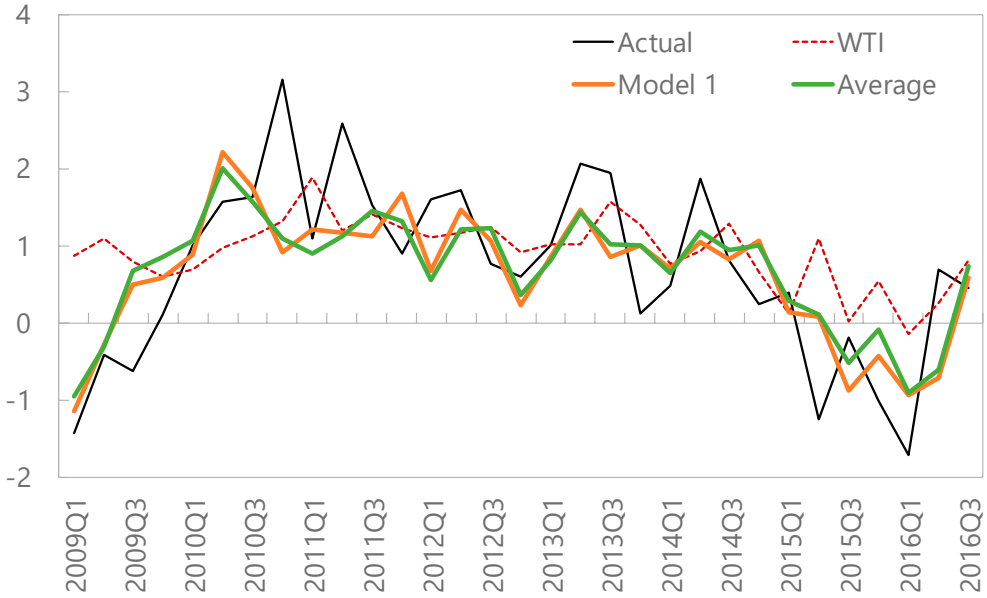
[7] Some of the variables combinations were excluded to avoid perfect collinearity.

quarter.[8] That is, each model produces 93 in-sample nowcasts that serve to evaluate the nowcasting qualities of the models. The best models are selected choosing the ones with the lowest root mean square error (RMSE) for the 93 in-sample nowcasts.

15. The best model includes as explanatory variables the imports of fuel, imports of capital goods, and income tax collection (see model 1 in Table A3). This model, compared to a "naïve" one that only considers the WTI oil price as an explanatory variable reduces the RMSE of the nowcasts by 19.1 percent (see Figure 6 and Table A3). However, model 1 does not outperform all other models in each year, quarter or month of the in-sample nowcasts. Table A3 displays in bold numbers the best model in each period among the top-four performing models, illustrating the need to use a combination of models to improve the nowcast of economic activity at any given time. For example, the average nowcast of the best four models further reduces the RMSE by 2.5 percent compared to model 1 (Figure 6), and it is the best nowcast on average when there is already data for months 2 and 3 of each quarter (Table A3).[9] Figure 7, shows the performance of each model, and the average, compared to the observed GDP growth rate.

Figure 6. Nowcasts of Real GDP Growth

(In percent, q-o-q growth rate)

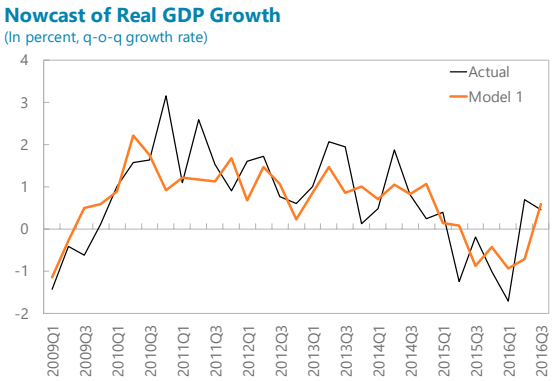


Sources: Haver; SRI; and IMF staff estimations.

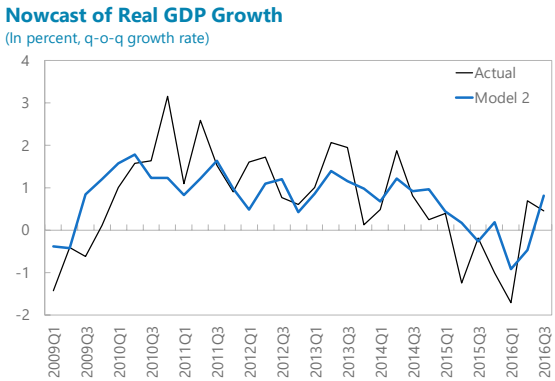
[8] The q-o-q growth rates of the explanatory variables are calculated based on the quarterly average of the information set available for each nowcast.

[9] Table A3 indicates the best models and the variables used in each model for the case of Ecuador.

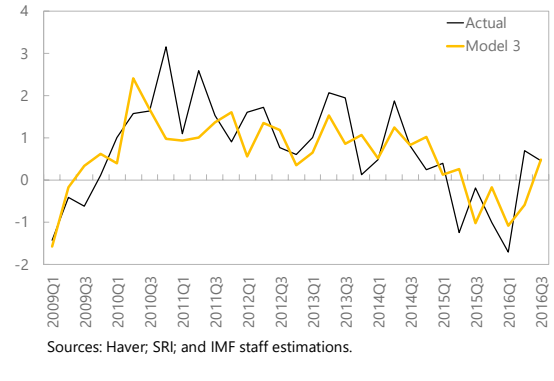
Figure 7. Nowcasts of Real GDP Growth



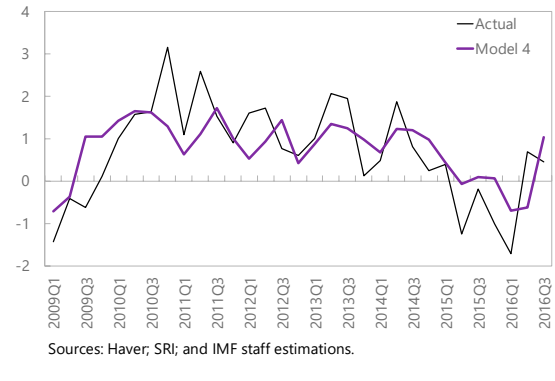
Sources: Haver; SRI; and IMF staff estimations.



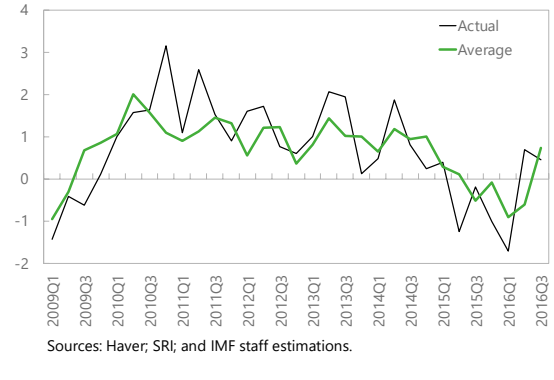
Sources: Haver; SRI; and IMF staff estimations.



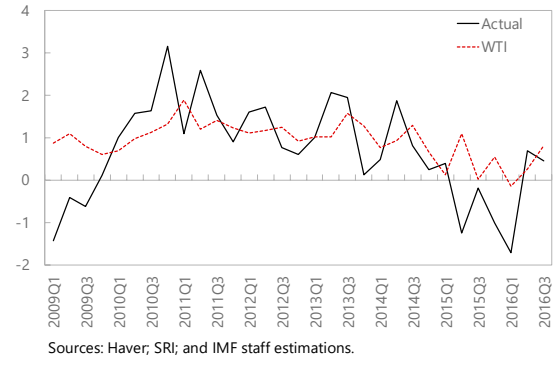
Sources: Haver; SRI; and IMF staff estimations.



Sources: Haver; SRI; and IMF staff estimations.



Sources: Haver; SRI; and IMF staff estimations.



Sources: Haver; SRI; and IMF staff estimations.

16. To provide more robustness to the GDP nowcasts, it is also important to consider the models that performed best in the recent past (2015–16). One issue is that many of these models depend on the availability of fiscal data, such as oil revenues, or non-financial public-sector capital expenditure, etc. In 2017, the publication of this information was delayed for more than 6 months and with continued delays after that; so, we also consider the models with the lowest RMSE

in the last seven quarters that do not include fiscal variables in them (models 5b-8b in Table A3). All these models are listed in Table A3.

17. In summary, the best nowcast model for Ecuador is the average nowcast of models one through four. Yet, models five through eight are also included in the average nowcast, given that these are the best performing models in the more recent past (2015–16). However, because of the delays and unreliability in the reporting of fiscal variables that are key for models 5a–8a, another set of models 5b–8b is considered for periods when fiscal data is not available for the quarter to be nowcast.

G. Forecasting GDP

This section explores different vector autoregression (VAR) models to identify the best one to forecast real GDP in Ecuador.

18. The more general structural VAR model used for forecasting is:

$$\boldsymbol{y}_t = \alpha + \boldsymbol{\beta}_1 \boldsymbol{y}_{t-1} + \cdots + \boldsymbol{\beta}_p \boldsymbol{y}_{t-p} + \varepsilon_t \qquad (7)$$

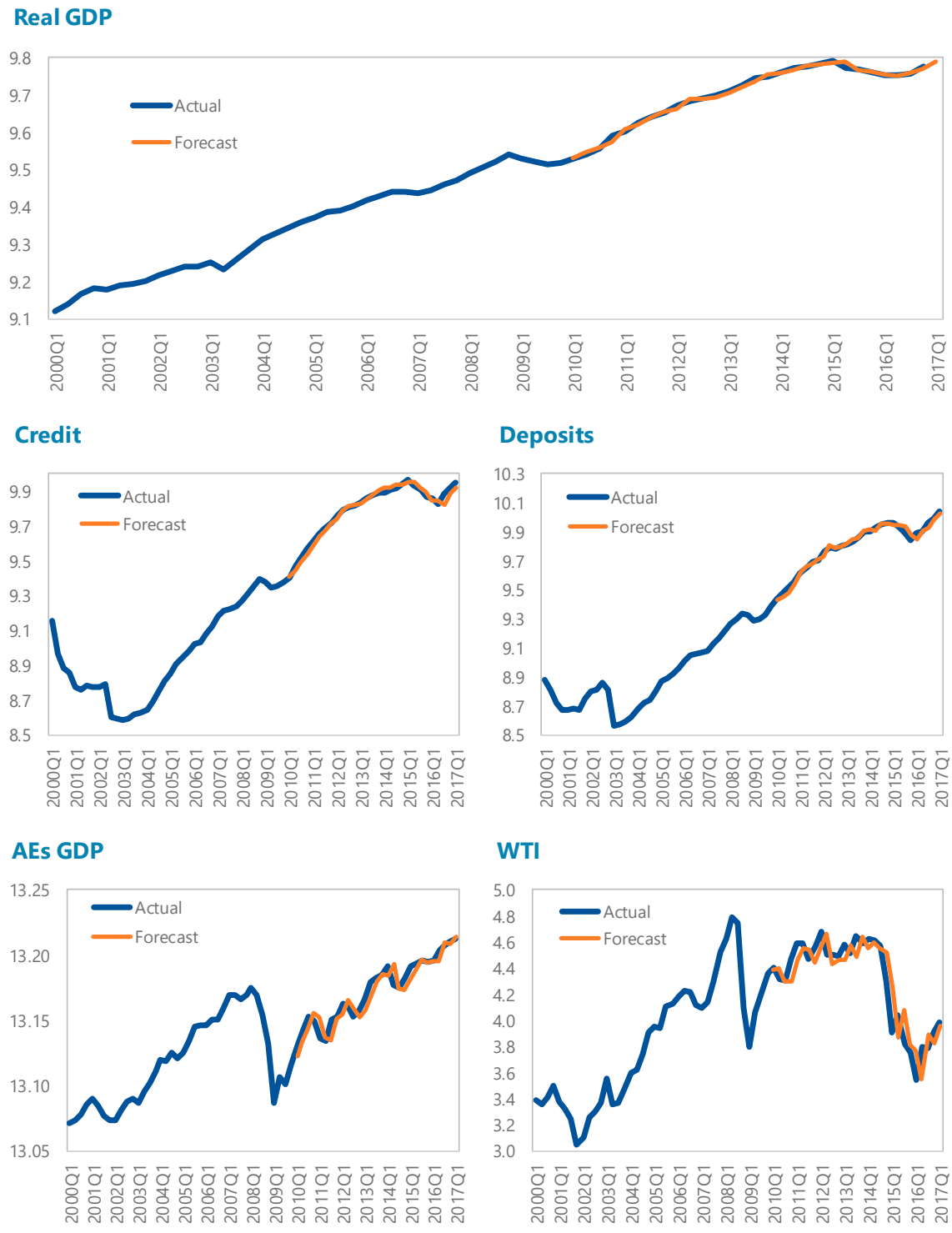
where $\boldsymbol{y}_t$ is a vector of endogenous variables that includes real GDP, real credit to the private sector, real deposits in the banking system, real public gross fixed capital formation, real GDP of advanced economies, and the oil spot price for WTI.[10] All variables enter the model in logs. In addition to the structural identification of the shocks through a Cholesky decomposition, we impose block exogeneity restrictions where the domestic variables have no effect (contemporaneous nor lagged) over the external variables (oil price and advanced economies GDP).[11] The ordering of the variables assumes that external shocks propagate through the economy via the financial system (deposits and credit) or via government's ability to finance and implement capital investment projects.

19. Seven different models are explored to select the model with the best GDP forecast capabilities. All the models included the external variables (oil price and AEs GDP) and Ecuador's GDP, but each model included different combinations of the other domestic variables (see Table A5 in the Appendix). The model with the best GDP forecast at different forecast horizons was model 4, which includes real deposits and credit along with the external variables and GDP in the VAR (Table 3). Model 4 includes two lags as chosen from the order selection tests presented in Table A6. The selected model does a very good job at forecasting 1-step ahead, not only of real GDP, but also of the other variables in the model, as can be seen in Figure 8.

[10] The real GDP of advanced economies includes the US, Germany, France, Italy, Spain, Japan, the U.K., and Canada.

[11] The ordering of the variables is similar to the one used by Grigoli, Mansilla and Saldias (2016), where GDP is contemporaneously affected by all the other variables but only has a lagged effect on the rest of domestic variables, credit is contemporaneously affected by deposits and public capital investment, and deposits are contemporaneously affected by public capital investments, which are only affected by the other domestic variables with a lag. Finally, all the domestic variables are affected contemporaneously by the external variables.

Figure 8. One-Step Ahead Forecasts



Sources: Haver; BCE; and IMF staff calculations.
Note: Variables in logs.

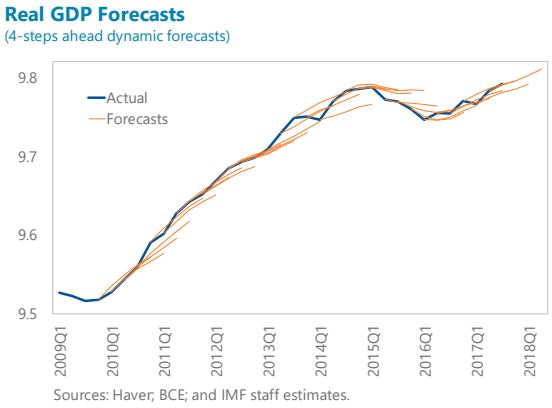
20. Longer horizon forecasts are also sensibly behaved. In the case of longer horizons, the dynamic forecasts are conditional on the available information on oil prices and advanced economies growth. The 4-steps ahead dynamic forecasts do not show a systematic bias, and more importantly as early as 2014Q3 the forecasts were indicating signs of the future economic decline that started in 2015Q2, and as early as 2015Q4 the model was suggesting that the recovery would start in 2016Q3, although it actually started a quarter earlier (Figure 9, left chart). While longer forecasts are surrounded by larger uncertainty (see right chart in Figure 9), the model did a relatively good job in the end-of-sample forecast, and the actual GDP realization always fell within the 90 percent confidence interval.

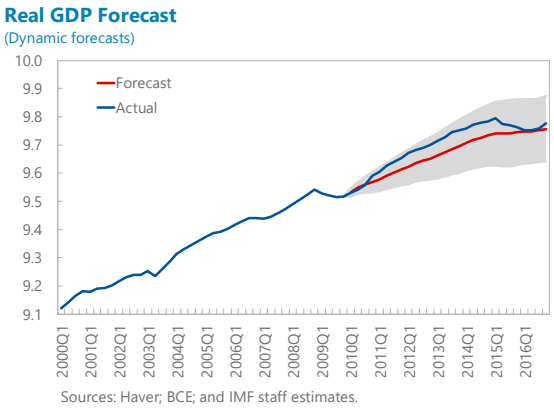
Table 2. Root Mean Square Errors (RMSE) of Real GDP Forecasts, 2010Q1–2016Q4

Model	1-step	2-steps	3-steps	4-steps	Average
1	0.0066	0.0032	0.0049	0.0065	0.0049
2	0.0078	0.0037	0.0055	0.0074	0.0056
3	0.0067	0.0032	0.0050	0.0068	0.0050
4	**0.0065**	**0.0029**	**0.0044**	**0.0060**	**0.0045**
5	0.0079	0.0038	0.0058	0.0078	0.0058
6	0.0081	0.0036	0.0055	0.0073	0.0055
7	0.0067	0.0030	0.0045	0.0062	0.0046
Average	0.0072	0.0034	0.0051	0.0069	0.0051

Notes: RMSE of static (1-step) and h-step ahead forecasts. Numbers in bold indicate the model with the lowest RMSE for each horizon.

Figure 9. In-Sample Conditional Dynamic Forecasts of Real GDP
(In logarithms)

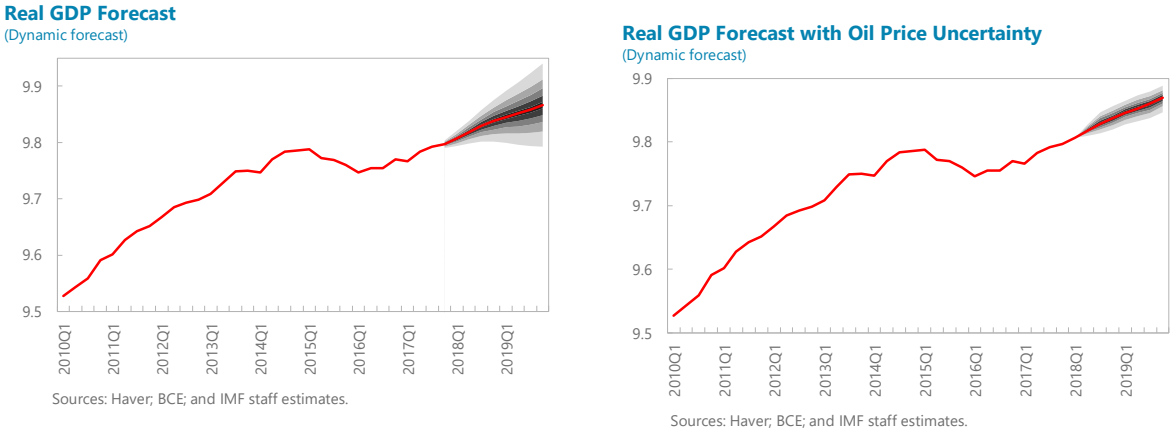




Note: The forecasts are conditional on the actual oil price and advance economies growth. The gray area shows the 90 percent confidence interval accounting for parameters uncertainty and random errors using 1,000 repetitions.

21. Uncertainty around the forecasts is also examined. Fan charts indicating the probability that the growth projections will materialize given different type of uncertainties was constructed (Figure 10). One type of uncertainty stems from the estimation of the parameters, and the possibility of random shocks to the projections (left chart). While the sensitivity of the forecasts to changes in oil prices was also explored (right chart). The historical deviations in oil price changes were used to measure uncertainty around the WEO projections for oil prices, and then estimate the impact on Ecuador's growth forecasts. The chart indicates that the uncertainty stemming from oil prices is lower than the one emanating from parameter and random error uncertainties. Nonetheless, large drops in oil prices would pose a significant downside risk to growth.

Figure 10. Fan Charts of Real GDP Forecasts
(In logarithms)



Note: The forecasts in both charts are conditional on the WEO projections of oil price and advance economies growth. The forecast in the left shows the 90 percent confidence interval accounting for parameters uncertainty and random errors with 1,000 repetitions. The chart on the right shows the 90 percent confidence interval of oil price shocks with 1,000 repetitions.

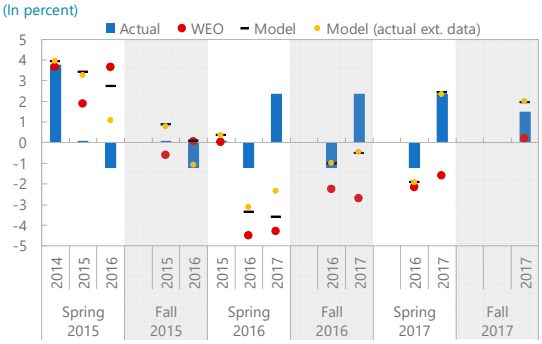
22. In summary, model four does a good job in forecasting real GDP. The model is not only a useful tool to inform growth projections in the short-term, but also to provide useful guidance on 1–2 year ahead turning points in economic activity. Additionally, the fan charts provide an assessment about the uncertainties embedded in the forecasts.

Box 1. Recent Past Performance of Growth Forecasts

The IMF's growth forecast for Ecuador is predicated on the assumptions about external factors, primarily external fiscal financing. The WEO projections for the years 2016–17 since the 2016 Spring WEO have been fairly pessimistic. A combination of factors explains the faster-than-anticipated economic recovery; in particular, the higher access to external financing secured by the government due to higher-than-anticipated oil prices and favorable global liquidity conditions. Given the drying up of external financing in the second half of 2015, the IMF forecast for 2016–17 was predicated on the assumption that Ecuador would have little access to external financing, which would have forced an abrupt adjustment in the fiscal balance through cuts in capital spending. Hence, the projections showed a much lower fiscal deficit and debt accumulation, and a bleaker growth outlook than the actual realizations. As borrowing costs declined with recovering oil prices, global liquidity conditions remained favorable, and investors continued buying Ecuador's bonds, staff's projections for Ecuador changed from a financing-constrained state to a setting with higher fiscal deficits and rising debt in the near-term, but with higher growth prospects.[1]

To improve the macroeconomic forecasting for Ecuador staff has developed a VAR model. The model uses quarterly data since 2000 and includes external factors such as the WTI oil price, and advanced economies (AEs) growth, as well as domestic variables such as real deposits, and credit in the financial system. A comparison of the WEO projections and the model for each vintage (that is using the data available at the time of the projections) shows that using the model would have considerably reduced the WEO forecast errors since the Spring 2016 WEO projections. Using the actual external data on oil price and AEs growth would have also helped improved the forecasts by 23 percent (reduction in the root mean square error). That is, the forecast errors for Ecuador are partly explained by the pessimistic assumptions about future external conditions.

IMF Growth Forecasts
(In percent)



Sources: BCE; WEO; and IMF staff estimates.

[1] For example, at the beginning of 2017 we were projecting growth of -1.6 percent, but with a relatively small fiscal deficit of -2.1 percent of GDP which implied a large consolidation of 4.6 percent of GDP relative to 2016. By the end of 2017, our growth forecast showed growth of 2.7 percent in 2017, with a smaller reduction in the fiscal deficit of 1.8 percent of GDP (excluding the one-off payment to Occidental Petroleum in 2016) to -5 percent of GDP.

Appendix I. Forecasting and Nowcasting GDP Growth

Table A1. Summary Statistics Growth Rates

(q-o-q)

Variable	Obs	Mean	Std. Dev.	Min	Max
Real GDP by Expenditure					
GDP	66	0.97	1.1	-1.9	3.3
Private Final Consumption	66	0.97	1.4	-3.0	5.8
General Government Final Consumption	66	1.15	2.4	-7.4	10.3
Gross Fixed Capital Formation	66	1.69	4.3	-9.6	14.0
Change in Inventories	66	0.58	96.2	-474.9	523.3
Exports	66	0.83	2.7	-4.4	7.9
Imports	66	1.55	5.5	-10.6	16.0
Real GDP by Sector					
Agriculture and Fishing	66	0.91	1.5	-2.7	3.5
Petroleum (incl. refining) and Mining	66	0.65	4.3	-7.7	16.2
Manufacturing (excl. petroleum refining)	66	0.92	1.2	-2.5	4.8
Electricity & Water	66	2.06	7.8	-23.1	39.4
Construction	66	1.72	3.2	-5.2	12.0
Trade	66	0.82	2.0	-3.8	5.9
Accomodations & Restaurants	66	0.96	1.5	-2.6	5.0
Transportation	66	0.84	1.4	-3.1	4.1
Post and Communications	66	2.32	3.0	-6.1	12.5
Financial Services Activities	66	1.78	4.3	-17.0	11.9
Administrative, Tech & Prof Activities	66	1.20	1.9	-5.9	5.5
Education and Social & Health Services	66	0.98	2.6	-8.7	8.1
Public Administration, Defense	66	1.02	2.6	-6.3	10.1
Domestic Services	66	0.43	5.0	-21.0	10.5
All Other Service Activities	66	0.36	1.2	-4.9	4.0
Net Taxes & Other Elements of GDP	66	0.52	7.5	-20.5	18.1
GDP Oil	66	0.63	4.4	-7.8	16.6
GDP Non-Oil	66	1.03	0.9	-2.0	3.0
Index of Economic Activity	38	1.05	4.2	-7.8	11.8
Prices and Trade					
Consumer Price Index	66	1.90	3.2	-0.1	21.2
Oil price (WTI spot price)	66	0.67	16.5	-70.1	32.3
Terms of Trade Index	66	0.45	9.9	-47.3	22.6
Merchandise Exports	66	1.84	11.1	-46.7	21.2
Total Petroleum Exports	50	1.18	22.9	-80.4	50.5
Total Non-Petroleum Exports	50	2.31	5.5	-10.2	16.6
Merchandise Imports	66	2.73	10.3	-32.4	36.0
Imports of Fuel and Lubricants	50	2.79	23.1	-51.8	44.1
Imports of Capital Goods	50	1.58	11.5	-28.4	22.9
Public Sector Revenue and Expenditure					
Oil Exports Revenue	66	0.98	31.8	-113.9	74.9
Value Added Tax (SRI)	66	3.16	6.6	-15.7	22.3
Income Tax (SRI)	66	5.32	48.2	-75.3	122.0
Capital Expenditure	66	4.88	37.4	-97.8	87.9
Gross Fix Capital Formation	66	5.76	55.0	-130.6	102.3
Credit to the private sector	42	3.07	2.8	-3.5	7.6
Deposits of the private sector	42	3.21	2.7	-3.1	7.8

Sources: Haver; SRI; and IMF staff estimations.

Note: Growth rates calculated as log differences.

Table A2. Correlations of Cyclical Real GDP Growth

(q-o-q, 5% significance level)

	t-4	t-3	t-2	t-1	t-0	t+1	t+2	t+3	t+4
Real GDP by Expenditure									
GDP				0.30	1.00	0.30			
Private Final Consumption					0.51	0.25		-0.26	
General Government Final Consumption									
Gross Fixed Capital Formation					0.46	0.36			
Change in Inventories									
Exports			0.27		0.36				
Imports					0.30				
Real GDP by Sector									
Agriculture and Fishing								0.37	
Petroleum (incl. refining) and Mining					0.55				-0.28
Manufacturing (excl. petroleum refining)				0.40	0.51				
Electricity & Water									-0.40
Construction		-0.35			0.43	0.51	0.26		
Trade					0.56				
Accomodations & Restaurants					0.38				
Transportation					0.30				0.33
Post and Communications					0.39	0.35			
Financial Services Activities									
Administrative, Tech & Prof Activities					0.31				
Education and Social & Health Services	-0.32								
Public Administration, Defense									0.26
Domestic Services									
All Other Service Activities					0.51				
Net Taxes & Other Elements of GDP					0.62				
GDP Oil					0.53				-0.28
GDP Non-Oil				0.29	0.77	0.36			
Index of Economic Activity									
Prices and Trade									
Consumer Price Index							0.26		
Oil price (WTI spot price)				0.27					
Terms of Trade Index				0.27					
Merchandise Exports			0.30	0.26					
Total Petroleum Exports			0.33	0.39					
Total Non-Petroleum Exports			0.38						
Merchandise Imports				0.33	0.45				
Imports of Fuel and Lubricants				0.33					
Imports of Capital Goods					0.52				
Public Sector Revenue and Expenditure									
Oil Exports Revenue				0.26		-0.28			
Value Added Tax (SRI)					0.32				
Income Tax (SRI)									
Capital Expenditure									
Gross Fix Capital Formation									
Credit to the private sector					0.59	0.65			
Deposits of the private sector			0.45	0.60	0.52				

Sources: Haver; SRI; and IMF staff estimations.

Table A3. Root Mean Square Errors (RMSE) of Selected Models

(1-step ahead nowcast)

Predictors	Model #	Lag	Seasonal dummy	Total	Year								Quarter				Month		
					2009	2010	2011	2012	2013	2014	2015	2016	1	2	3	4	1	2	
Models with lowest RMSE overall																			
Mo Mk Inc_sri	1	1	No	**0.0082**	0.0064	0.0121	0.0084	**0.0056**	0.0078	0.0061	0.0085	0.0095	**0.0052**	0.0097	0.0065	0.0106	**0.0087**	0.0079	0.0
Mn Rev_o Gov_cap	2	1	No	0.0083	0.0106	0.0104	**0.0071**	0.0069	**0.0069**	0.0053	0.0094	0.0086	0.0069	**0.0092**	0.0064	0.0105	0.0092	**0.0079**	**0.0**
Mo Mk Gov_gfcf Inc_sri	3	1	No	0.0084	**0.0057**	0.0124	0.0088	0.0061	0.0080	**0.0052**	0.0100	**0.0084**	0.0056	0.0102	**0.0062**	0.0106	0.0088	0.0082	0.0
Mn Rev_o Gov_cap VAT_sri	4	1	No	0.0085	0.0105	**0.0097**	0.0079	0.0076	0.0069	0.0056	**0.0084**	0.0104	0.0069	0.0094	0.0075	**0.0099**	0.0094	0.0080	0.0
Average model				**0.0080**	0.0080	0.0107	0.0077	0.0064	0.0073	0.0055	0.0087	0.0091	0.0056	0.0094	0.0062	0.0102	0.0087	**0.0077**	**0.0**
Models with lowest RMSE in 2015-2016																			
Xn Mk Gov_gfcf TOT Cre	5a	No	Yes	0.0112															
Xn Mk Rev_o Gov_gfcf TOT Cre	6a	No	Yes	0.0170															
Xn Mk Rev_o Gov_cap TOT Inc_sri Cre	7a	No	Yes	0.0217															
Xn Mo Mk Gov_gfcf TOT Cre	8a	No	Yes	0.0129															
Models with lowest RMSE that do not include fiscal variables																			
Xo Mo Mk WTI Cre	5b	No	No	0.0101															
Xo Mk WTI Cre	6b	No	No	0.0100															
Xo Mk TOT VAT_sri Cre	7b	No	No	0.0102															
Xo Mo Mk WTI Cre Dep	8b	No	No	0.0099															
Models with lowest RMSE in each year																			
Xo Xno Mo Mk		1	Yes	0.0097	0.0037														
Xo Xno Mk Rev_o Gov_gfcf WTI Dep		1	Yes	0.0146		0.0039													
Mn Inc_sri Cre Dep		1	Yes	0.0433			0.0032												
Xn Mk Rev_o WTI Inc_sri Cre		1	Yes	0.0385				0.0012											
Xno Mo Mk Gov_cap WTI Inc_sri		1	Yes	0.0104					0.0030										
Xo Mo WTI Inc_sri		1	Yes	0.0105						0.0015									
Xn Mn Rev_o Gov_gfcf TOT VAT_sri Cre		No	No	0.0109							0.0049								
Xn Rev_o WTI TOT Inc_sri Dep		1	Yes	0.1085								0.0017							
Models with lowest RMSE in each quarter																			
Xo Mk Dep		1	No	0.0095									0.0043						
Xn Gov_gfcf WTI TOT Cre		No	Yes	0.0234										0.0030					
Gov_gfcf WTI TOT VAT_sri Cre Dep		No	Yes	0.0109											0.0079				
Xo Rev_o WTI TOT VAT_sri Cre		1	No	0.0205												0.0038			
Models with lowest RMSE in each month																			
Xo Mk TOT VAT_sri Inc_sri		No	No	0.0092													0.0073		
Mn Rev_o Gov_cap	2	1	No	0.0083														0.0079	
Xo Mn Inc_sri Dep		1	Yes	0.0103															0.0
Model with just the oil price																			
WTI		No	No	0.0102	0.0157	0.0101	0.0082	0.0047	0.0080	0.0059	0.0141	0.0096	0.0105	0.0125	0.0061	0.0105	0.0101	0.0101	0.0

Sources: IMF staff estimates.
Note: Numbers in bold for models 1-4 indicate the model with the lowest RMSE in each period.

Table A4. Variables and Codes

Variables	Code
Real GDP by Expenditure	
GDP	GDP
Private Final Consumption	Cpri
General Government Final Consumption	Cpub
Gross Fixed Capital Formation	GFCF
Change in Inventories	Inv
Exports	Xr
Imports	Mr
Real GDP by Sector	
Agriculture and Fishing	Agri
Petroleum (incl. refining) and Mining	Oil
Manufacturing (excl. petroleum refining)	Man
Electricity & Water	Elec
Construction	Const
Trade	Trade
Accomodations & Restaurants	Tour
Transportation	Trans
Post and Communications	Comm
Financial Services Activities	Fin
Administrative, Tech & Prof Activities	Admin
Education and Social & Health Services	Edu
Public Administration, Defense	PubAd
Domestic Services	Dom
All Other Service Activities	Other
Net Taxes & Other Elements of GDP	NetT
GDP Oil	GDP_oil
GDP Non-Oil	GDP_noil
Index of Economic Activity	IEA
Prices and Trade	
Consumer Price Index	CPI
Oil price (WTI spot price)	WTI
Terms of Trade Index	TOT
Merchandise Exports	Xn
Total Petroleum Exports	Xo
Total Non-Petroleum Exports	Xno
Merchandise Imports	Mn
Imports of Fuel and Lubricants	Mo
Imports of Capital Goods	Mk
Public Sector Revenue and Expenditure	
Oil Exports Revenue	Rev_o
Value Added Tax (SRI)	VAT
Income Tax (SRI)	Inc
Capital Expenditure	Gov_cap
Gross Fix Capital Formation	Gov_gfcf
Credit to the private sector	Cre
Deposits of the private sector	Dep

Table A5. VAR Models

Model	Variables	Lags
1	WTI AEgdp Gov_cap Dep Cred GDP	2
2	WTI AEgdp Gov_cap Cred GDP	1
3	WTI AEgdp Gov_cap Dep GDP	2
4	WTI AEgdp Dep Cred GDP	2
5	WTI AEgdp Gov_cap GDP	1
6	WTI AEgdp Cred GDP	1
7	WTI AEgdp Dep GDP	2

Note: Variables in each model are listed in their Cholesky order with the most exogenous variables listed first. The variables are included in the model in logs.

Table A6. VAR Models Order Selection Tests

Model	Lag	Likelihood Ratio Test				FPE	Information Criteria		
		LL	LR	df	p-value		AIC	HQIC	SBIC
1	1	535.557	505.240	16	0.000	4.80E-12	-26.4111	**-26.2056**	**-25.8931**
	2	554.181	**37.246**	16	0.002	**4.50E-12**	**-26.4872**	-26.0761	-25.4511
2	**1**	402.524	**449.100**	9	0.000	**2.90E-09**	**-19.9201**	**-19.8045**	**-19.6287**
	2	408.858	12.668	9	0.178	3.10E-09	-19.8429	-19.6116	-19.26
3	1	383.580	392.100	9	0.000	5.00E-09	-19.371	**-19.2554**	**-19.0796**
	2	396.314	**25.467**	9	0.002	**4.50E-09**	**-19.4792**	-19.248	-18.8964
4	1	500.527	477.260	9	0.000	1.70E-10	-22.7608	-22.6452	**-22.4694**
	2	515.598	**30.142**	9	0.000	**1.40E-10**	**-22.9368**	**-22.7055**	-22.354
5	**1**	253.515	**277.980**	4	0.000	**3.00E-06**	**-12.9081**	**-12.8567**	**-12.7786**
	2	257.082	7.134	4	0.129	3.00E-06	-12.8955	-12.7928	-12.6365
6	**1**	368.424	**421.010**	4	0.000	**1.10E-07**	**-16.2388**	**-16.1874**	**-16.1093**
	2	370.994	5.139	4	0.273	1.10E-07	-16.1973	-16.0945	-15.9383
7	1	350.049	366.560	4	0.000	1.80E-07	-15.7062	-15.6548	-15.5766
	2	360.730	**21.362**	4	0.000	**1.50E-07**	**-15.8998**	**-15.797**	**-15.6408**

Note: Lag order selection, treating WTI oil price and AE GDP as exogenous variables, and using the Lutkepohl version of the information criteria. Numbers in bold indicate the lag order selected. For the information criteria and for FPE, the lag with the smallest value is the order selected. Final prediction error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and the Hannan and Quinn information criterion (HQIC).

References

Bils, Mark, and Peter Klenow, 2000, "Does Schooling Cause Growth?", *American Economic Review*, Vol. 90, p. 1160–183.

Feenstra, Robert, Robert Inklaar, and Marcel Timmer, 2015, "The Next Generation of the Penn World Table," *American Economic Review*, Vol. 105, pp. 3150–82. Available for download at www.ggdc.net/pwt.

Ferreira, Pedro, Samuel Pessoa, and Fernando Veloso, 2013, "On the Evolution of Total Factor Productivity in Latin America," *Economic Inquiry*, Vol. 51, pp. 16–30.

Grigoli, Francesco, Mario Mansilla, and Martin Saldias, 2016, "Macro-Financial Linkages and Heterogeneous Non-Performing Loans Projections: An Application to Ecuador," IMF Working Paper No. 16/236 (Washington: International Monetary Fund).

Klenow, Peter, and Andres Rodriguez-Clare, 1997, "The Neoclassical Revival in Growth Economics: Has it Gone too far?" in NBER Macroeconomics Annual, edited by B. Bernanke and J. Rotemberg, p. 73–103. (Cambridge, Massachusetts: MIT Press).

Novta, Natalija, and Joyce Wong, 2017, "Women at Work in Latin America and the Caribbean," IMF Working Paper No. 17/34 (Washington: International Monetary Fund).

Sosa, Sebastian, Evridiki Tsounta, and Hye Sun Kim, 2013, "Is the Growth Momentum in Latin America Sustainable?" IMF Working Paper No. 13/109 (Washington: International Monetary Fund).

Kilic, Sinem, Ayhan Kose, Franziska Ohnsorge, and Yirbehogre Modeste, 2018, "Building Solid Foundations: How to Promote Potential Growth," in: Global Economic Prospects, World Bank.

EMBI SPREADS: EXTERNAL FACTORS, AND THE IMPACT OF FISCAL CONSOLIDATION[1]

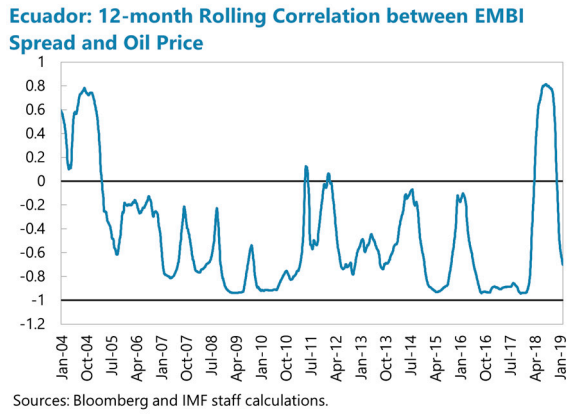
While Ecuador's borrowing costs have declined substantially since the 2015–16 peak, they have been on an increasing trend and remain elevated. Oil prices and global risk appetite have been identified as important drivers of Ecuador's EMBI spreads. With the recent decline in oil prices and given the risk of volatility in financial markets associated with the normalization of U.S. monetary policy as well as geopolitical tensions, unfavorable external market conditions are likely to persevere. However, domestic fiscal policy can have a notable impact on borrowing costs through both the reduction in fiscal deficit and in public debt stock over time. Hence, building fiscal buffers can help reduce the EMBI spread for Ecuador in the face of unfavorable global developments.

1. While Ecuador's borrowing costs have declined substantially since the 2015–16 peak, they have been on the rise since early 2018. Improving external conditions, characterized by a demand recovery, relatively high oil prices, and favorable international financing conditions contributed to lowering borrowing costs for Ecuador by end-2017. Since the end of 2015, Ecuador EMBI spreads declined by 819 bps, reaching a new low following the oil price collapse of 447bps in December 2017. While the reduction in borrowing costs over the past few years is a welcome development, this note shows that the gains can be reversed in the event of a fall in oil prices, an increase in global risk aversion by investors, or deterioration in the already weak fiscal position, among other domestic factors. Indeed, during the first half of 2018 the sovereign spread has shown an upward trend that has brought the EMBI spread back to the neighborhood of 700 basis points before the recent decline in the wake of announcement of program negotiations with the IMF.

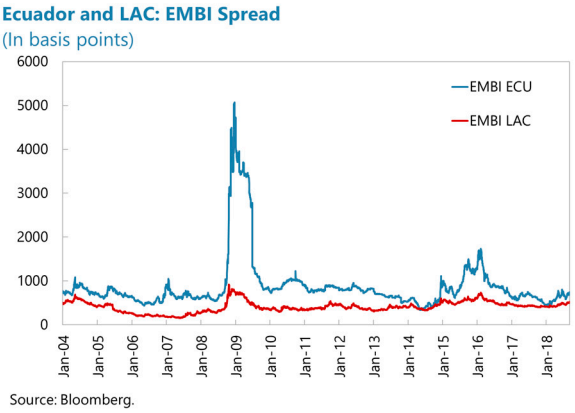
2. EMBI spreads in Ecuador have been historically correlated with the oil price except for a few episodes, including the one in early 2018. A twelve-month rolling correlation between the year-on-year change in the EMBI spread and the percentage change in oil prices based on daily data has been largely negative in most periods. It declined notably in 2011, 2013, 2015 and in early 2018. The first three events appear to coincide with the episodes of increased global risk-aversion (2011 – European crisis, 2013 – U.S. taper tantrum, 2015 – concerns about China growth and continued concerns about U.S. monetary policy normalization, early 2018 – concerns about the pace of normalization of U.S. monetary policy). Consequently, in order to understand the drivers of the Ecuadorian sovereign spread, the analysis needs to consider other external and domestic factors along with oil prices.

[1] Prepared by Nina Biljanovska (RES) and Martin Sasson (WHD).

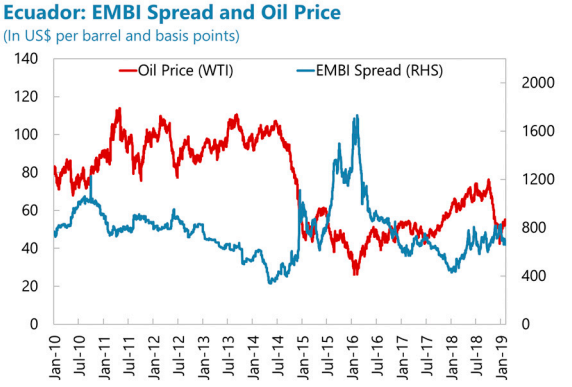
Figure 1. EMBI Spread and External Factors



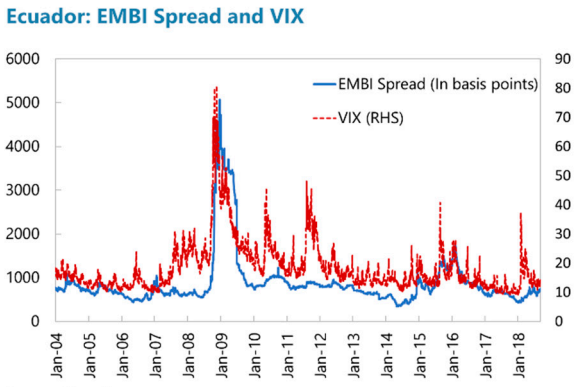
Sources: Bloomberg and IMF staff calculations.



Source: Bloomberg.



Source: Bloomberg.



Source: Bloomberg.

3. To shed light on how external and domestic factors affect movements in sovereign bond spreads, we employ the Local Projections (LP) method proposed by Jorda (2005).[2] The dependent variable in the model is the sovereign bond spreads, measured by the EMBI spreads, and the key explanatory domestic variable is fiscal policy, measured by the cyclically adjusted primary balance and the level of public debt as percent of GDP.[3] Other explanatory domestic determinants include the country's default history and the quality of institutions, while external variables include

[2] For a similar application of the LP method, see for example IMF Selected Issues Paper, Chapter 5 on Brazil (2017).

[3] See for example, Attinasi, Checheritta and Nickel (2009), who find that fiscal variables play a significant role in explaining government bond spreads in a sample of European countries. Jarmuzek and Miao (2013), show that the level of public debt can be one of the determinants of the probability of debt distress.

the oil price and a measure of investor risk appetite (VIX).[4] The dataset that we use consists of 60 emerging market (EM) economies[5] over the period 1990–2017 (unbalanced panel).

4. The LP method has several advantages to a standard VAR model. The local projections method, akin to a standard vector autoregression (VAR) model, can shed light to the dynamics of EMBI spreads following a shock to fiscal policy and other determinants. While the LP approach is similar to the standard VAR model, it has a number of advantages. Specifically, it generates estimates that are less vulnerable to misspecification of the data generating process because the impulse response is estimated separately for each horizon. Also, it allows controlling for a relatively large set of variables, which would be impractical in a regular VAR setting. Finally, it can easily accommodate non-linear specifications by introducing interaction of variables.

5. The baseline regression equation is specified as follows:

$$EMBI_{i,t+h} = \alpha_h + \beta_h CAPB_{i,t-1} + \mu_h DEBT_{i,t-1} + \theta_h INST_{i,t-1} + \lambda_h DHISTORY_{i,t-1} + \gamma_h VIX_t + \delta_h OIL_t + \rho_h OILX_i + \varphi_h Oil_{i,t}^P + \varepsilon_{i,t},$$

where $EMBI_{i,t+h}$ denotes the EMBI sovereign spread, $CAPB_{i,t-1}$ is the lagged cyclically adjusted primary balance,[6] $DEBT_{i,t-1}$ is the lagged gross public debt to GDP ratio, $INST_{i,t-1}$ is the lagged domestic variable that reflects the institutional quality, $DHISTORY_{i,t-1}$ is the lagged domestic variable that reflects the country's default history, VIX_t is the VIX index, used as a proxy for investors' risk appetite, OIL_t is the oil price, $OILX_i$ is a dummy for oil producing countries, and $Oil_{i,t}^P$ is an interaction term between the dummy for oil producing countries and the oil price, and ε_{it} is the error term. The IRFs are then constructed by plotting the coefficient β_h for the set of *h* regressions (with *h* ranging from 0 to 3).

The institutional quality variable was calculated as the average of the annual value of the bureaucracy quality and law and order variables in the ICRG dataset. Default events used to construct the default history variable were proxied by a 500-bps increase in the average annual EMBI spread. The variable is equal to zero up to the year when the first event is identified, equal to one from that year until there is a second event, and so on.

The results of our estimations for *h* = 0 are reported in the table below.

[4] Lizarazo (2013), which shows that if investors have decreasing absolute risk aversion preferences, then the emerging economy's default risk, capital flows, and bond prices are a function not only of the fundamentals of the economy but also of the level of financial wealth and risk aversion of international investors. While VIX is not a perfect measure of risk appetite (see, for example, Shin 2016), it is often employed as a proxy (e.g. Remolona et. al., 2008) and is found to be correlated with two theoretical measures of risk appetite (Illing and Aaron, 2005). On the importance of oil prices as determinants of bond spreads, see for example Alexandre and de Benoist (2010) and (Morrison (2016) among others.

[5] The subsample of oil exporting emerging market economies includes 10 countries.

[6] Estimating the regression equation with the contemporaneous cyclically adjusted primary balance and the rest of the domestic variables suggested that the impact was significant with a one period delay (which is in line with the intuition).

Table 1. EMBI Spread Regression

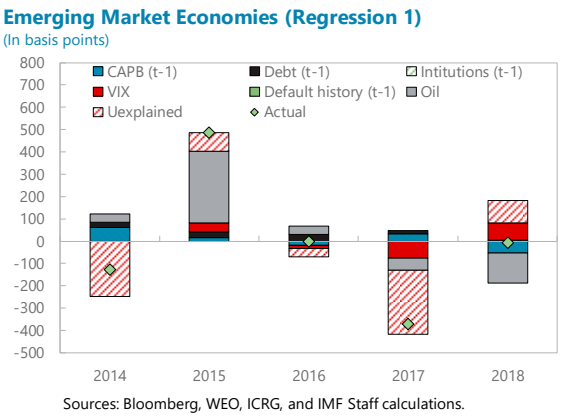
VARIABLES	(1) EMs	(2) Oil Exporting EMs	(3) EMs
L(1).CAPB	-16.82*	-33.55*	-35.84
	(8.964)	(16.48)	(23.74)
L(1).DEBT	4.818***	7.015**	4.467**
	(1.713)	(2.587)	(1.752)
L(1).INST	-108.7**	109.8	-151.2**
	(45.81)	(90.59)	(61.64)
VIX	15.92***	30.22***	5.550
	(2.979)	(8.937)	(12.81)
Oil	-2.836**	-5.437***	-2.883***
	(1.087)	(1.615)	(1.061)
Oil Exporters (Dummy)	400.9*		372.5*
	(205.6)		(206.7)
Oil x Oil Exporters	-4.445*		-4.170
	(2.581)		(2.608)
L(1).DHISTORY	229.2***	139.4**	109.2*
	(49.52)	(60.32)	(56.91)
VIX x L(1).CAPB			1.007
			(0.984)
VIX x L(1).DEBT			0.0198
			(0.0829)
VIX x L(1).INST			2.288
			(4.286)
VIX x L(1).DHISTORY			6.436*
			(3.647)
Constant	255.6*	-174.3	448.5**
	(141.6)	(348.1)	(190.0)
Observations	843	146	843
R-squared	0.376	0.471	0.380

Clustered-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

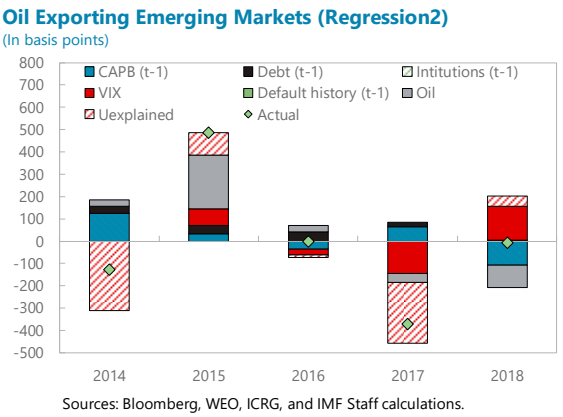
6. While oil prices were important drivers of the EMBI spreads in Ecuador historically, the reduction in global risk appetite has become an important factor more recently. Using the estimated coefficients, we can decompose the changes in the EMBI spread over the past few years into the contribution of various external and domestic factors. While the model explains changes in the EMBI spreads in 2015, 2016, and 2018 relatively well, there are large unexplained residuals in the changes in 2014 and 2017, suggesting that there were other factors, not accounted for in the model, that drove changes in the EMBI spread. In 2014, the appreciation of the U.S. dollar and the associated deterioration in external competitiveness of Ecuador may be a candidate explanation. In 2017 the changing political landscape with the new administration coming into power have likely played a role in reducing the borrowing costs. However, in 2018 the negative contribution from recovering oil prices and the remnants from the improvement in the fiscal balance in 2017 were

counteracted by the increase in the global risk aversion and the factors outside of the model that led to a very minor decrease in the EMBI spread. The unfavorable external conditions are likely to persevere given the risk of volatility in the financial markets associated with the normalization of the U.S. monetary policy as well as geopolitical tensions. In this environment, Ecuador remains vulnerable to the reduction in risk appetite globally and, therefore, an increase in the borrowing costs.

Figure 2. Ecuador: Changes in the EMBI Spread



Sources: Bloomberg, WEO, ICRG, and IMF Staff calculations.



Sources: Bloomberg, WEO, ICRG, and IMF Staff calculations.

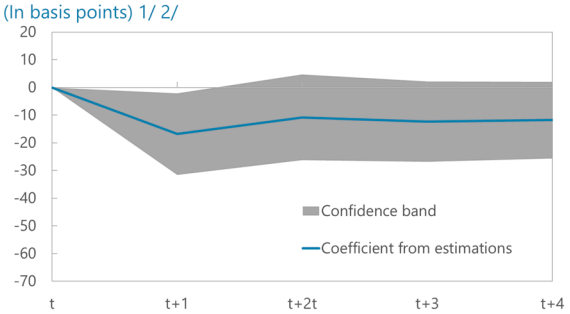
7. Building fiscal buffers can help reduce EMBI spreads in Ecuador and mitigate the impact of unfavorable global external conditions. Based on our pooled OLS estimates,[7] an improvement in the cyclically adjusted primary balance of 1 percent of GDP is associated with a decrease in the EMBI spreads on impact of about 17 to 34bps (Figure 3). This result suggests that, based on the experience of other countries, a fiscal consolidation could further reduce borrowing costs. However, the benefits of fiscal discipline implied by our model do not end there. A reduction of 1 percent of the debt to GDP ratio would help reduce the spread on impact by 4 to 7bps.

8. An improvement in the CAPB has a stronger impact on EMBI spreads for oil exporters than for other countries. The reported lower bound estimate refers to the impact of the CAPB on EMBI spreads for all EMs in the sample, whereas the upper bound corresponds to the specification that includes only the oil exporting EMs. Our calculations below are based on the latter specification, given that it is more appropriate for an oil producing economy such as Ecuador.

[7] We use clustered-robust standard errors to allow for heterogeneity across countries and correct for possible violations of the classic Gauss-Markov assumptions.

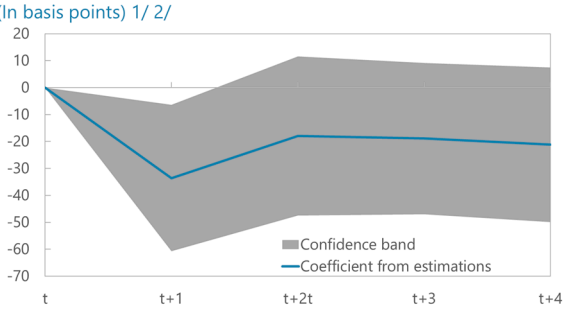
Figure 3. Impact of Fiscal Consolidation on EMBI Spreads

Impact on EMBI Spread of a 1 Percent Reduction in CAPB
(In basis points) 1/ 2/



Sources: Bloomberg, WEO, ICRG, and IMF Staff calculations.
1/ CAPB refers to the Cyclically-Adjusted Primary Balance.
2/ Estimated on a sample of emerging market economies.

Impact on EMBI Spread of a 1 Percent Reduction in CAPB
(In basis points) 1/ 2/

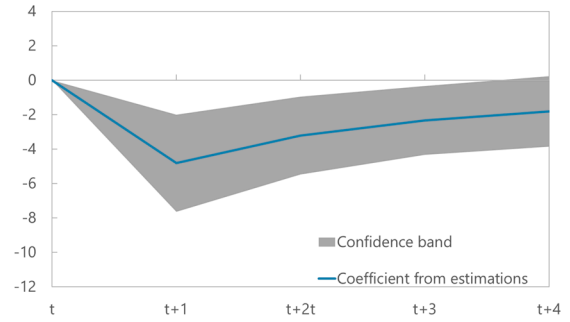


Sources: Bloomberg, WEO, ICRG, and IMF Staff calculations.
1/ CAPB refers to the Cyclically-Adjusted Primary Balance.
2/ Estimated on a sample of oil-exporting emerging market economies.

9. A country's default history also matters. A country that had at most one period of severe debt distress during the sample period has on average 140 to 230 higher EMBI spread, with the lower estimate for oil exporters. Our estimates confirm that there is some evidence that bad external conditions (e.g. periods of higher risk aversion) tend to be more pronounced for those countries that have experienced defaults in the past. Although a country cannot change its history, it can take precautionary measures, including a credible and prudent fiscal framework that minimizes the probability of occurrence of such negative credit events.

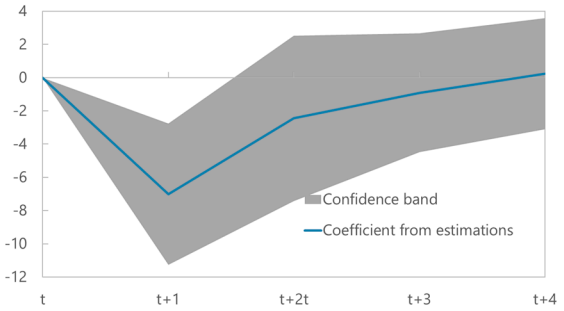
Figure 4. Impact of Debt Level Reduction on EMBI Spreads

Impact on EMBI Spread of a 1 Percent Reduction in Debt-to-GDP
(In basis points) 1/



Sources: Bloomberg, WEO, ICRG, and IMF Staff calculations.
1/ Estimated on a sample of emerging market economies.

Impact on EMBI Spread of a 1 Percent Reduction in Debt-to-GDP
(In basis points) 1/



Sources: Bloomberg, WEO, ICRG, and IMF Staff calculations.
1/ Estimated on a sample of oil-exporting emerging market economies.

10. The adoption of the package of fiscal measures of 5 percent of GDP would help reduce Ecuador's sovereign spread significantly. In a scenario of fiscal consolidation, which entails discretionary fiscal measures of 5 percentage points of GDP with a corresponding reduction in public debt-to-GDP ratio by 1 percentage points of GDP the EMBI spread for an oil-producing economy of Ecuador could be permanently lowered by close to 175 basis points. Albeit changing at a slower pace and subject to the power balance between political forces, an improvement of the strength of institutions could help reduce the sovereign spread as well. These decreases of the cost of financing could help cushion possible other external shocks, including heightened global risk aversion and lower oil prices.

References

Attinasi, Maria Grazia and Checherita-Westphal, Cristina D. and Nickel, Christiane. 2009. "What Explains the Surge in Euro Area Sovereign Spreads During the Financial Crisis of 2007-09?" ECB Working Paper No. 1131.

Alexandre, H., & de Benoist, A., 2010, "Oil Prices and Government Bond Risk Premiums." *Lahore Journal of Business*, Vol. 1(1): pp. 1–21.

Herve Alexandre, Benoist Antonin De. 2010. "Oil prices and government bond risk premiums." Lahore Journal of Business, Vol. 1(1): pp. 1-21.

Illing, Mark and M. Aaron, 2005, "A Brief Survey of Risk-Appetite Indexes." Bank of Canada Financial System Review June, pp. 37-43.

IMF Selected Issues Paper, Chapter 5 on Brazil (2017)

Jarmuzek, M., and Y. Miao, 2013, "A Primer on Public Debt Thresholds." (mimeo; Washington: International Monetary Fund)

Jordà, Òscar, 2005, "Estimation and Inference of Impulse Responses by Local Projections." *American Economic Review*, Vol. 95(1): pp. 161–82.

Lizarazo, Sandra V. 2013. "Default Risk and Risk Averse International Investors." Journal of International Economics, Vol. 89(2): pp. 317–30.

Morrison, Eleanor J., 2016, "Energy Price Implications for Emerging Market Bond Returns." Mimeo SOAS University of London.

Remolona, Eli, M. Scatigna, and E. Wu, 2008, "The Dynamic Pricing of Sovereign Risk in Emerging Markets: Fundamentals and Risk Aversion," *Journal of Fixed Income*, Vol. Spring.

Shin, Hyun S., 2016, "The Bank/Capital Markets Nexus Goes Global," speech at the London School of Economics and Political Science, 15 November. The speech can be found at https://www.bis.org/speeches/sp161115.pdf.

RESERVE ADEQUACY[1]

This note presents an assessment of Ecuador's reserve adequacy, both under traditional tools and metrics and under additional criteria in view of full dollarization. The Liquidity Fund is one of the main buffers in place; however, in recent years, the holdings of international reserves by the BCE have dropped to a level that could be insufficient to confront significant shocks and preserve financial stability. This situation is a consequence of the severe terms of trade deterioration in recent years, which have now reverted partially, as well as the fiscal dominance typical of dollarized economies.

A. Motivation for Reserve Holdings in Dollarized Economies

1. Establishing an adequate level of reserves for a fully dollarized economy requires consideration of some non-standard elements. While all assets in the BCE's balance sheet are denominated in U.S. dollars, reserves only correspond to those dollars that represent claims on foreign sources, i.e. dollar claims on domestic agents (including the government) are not part of reserves. Nevertheless, any dollar in the economy could in principle be used for international trade or for cross-border financial transactions, and any dollar on the asset side of the BCE balance sheet could be used to support liquidity in the banking system or to finance government activities—provided those were liquid. This might suggest that dollarized economies do not need significant reserve buffers, as they do not need reserves to smooth exchange rate fluctuations or as a buffer against currency mismatches. However, liquidity buffers in foreign currency may still be needed to fund the domestic financial sector or the public sector in cases of unexpected fluctuations in government revenue or spending (e.g. due to natural disasters), or if external financial support is not available. At the same time, reserve accumulation by the central bank is constrained in dollarized economies, because money cannot be printed to exchange for foreign currency (IMF, 2013; IMF, 2015).

2. Reserve adequacy in dollarized economies requires a consideration of additional risks, especially in relation to banking sector pressures. The experience of hard peg regimes and dollarized economies in recent crises indicates that buffers are needed for three broad reasons: (i) Balance of Payments shock-absorption, (ii) lender of last resort reasons, and (iii) prudential coverage. The standard methodology for the assessment of reserve adequacy for emerging economies (ARA- EM) metric fundamentally addresses (i) and partly (ii), which relate to risks that can impair non-reserve currency economies with all types of exchange rate regimes. However, financial sector shocks in fully dollarized economies—for instance those derived from deposit runs—translate immediately into pressure on foreign reserves, even if volatility is temporary or cyclical, because the Central Bank does not issue the legal tender (reason iii). This risk also includes liquidity shortages. For instance, in Ecuador, even the expected higher demand for cash during end-of-year holidays has a negative impact on liquid reserves at the BCE.

[1] Prepared by Mario Mansilla (MCM).

3. The structure of the BCE balance sheet calls for establishing a prudent reserve policy to cover private sector claims. On the liability side of the BCE's balance sheet, the main private sector funding source are banks' deposits (both mandatory and voluntary). On the asset side, credit to the government, an illiquid asset given the underdeveloped debt market, has become the main use of funds. Since banks' deposits at the BCE are part of the banks' liquidity buffers, a prudential reserve coverage of those deposits (reason iii above) should entail a liquid reserve floor . Under normal circumstances, voluntary bank deposits move with the volume of deposits/liquidity in the system and therefore are more volatile than the mandatory tranche, but in a crisis scenario all banks' deposits should be accessible and thus need to be properly covered with liquid reserves.[2] Deposit-receiving public banks (i.e. Banco Pacifico) should also be included in a precautionary reserve floor, as their deposits come from the public. In addition, to the extent the BCE issues dollar coins, electronic money (until recently), and securities (TBCs), these will also require explicit reserve backing.

4. In addition, a prudent reserve level should encompass buffers to mitigate fiscal shocks, especially if external financing is not fluid. Since the BCE holds the key central government accounts, even seasonal demands from the public sector for short-term financing require a buffer. While there is no standard benchmark of how to account for these factors, a measure of volatility of the credit needs of the government or, for instance, one month of government spending could be appropriate benchmarks for adequacy.

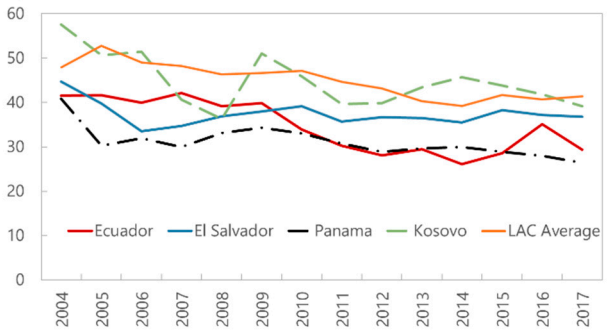
5. Under Ecuador's monetary framework, the LOLR function rests in principle on the Liquidity Fund. The Liquidity Fund (LF) was established in 2009 and has accumulated significant resources on the basis of contributions from the banking system.[3] The balance of the LF stood at US$2.6 billion at end-2018 (about 2.5 percent of GDP), which represents 9.3 percent of deposits while the target is 10 percent. The LF is fully invested abroad (mainly on assets issued by BIS and FLAR) and has a rule to treat 30 percent of the contribution of each bank as part of a pooled fund to support small entities while the remaining 70 percent is reserved for the contributing bank's potential liquidity needs. This fund has not been tapped in any significant way since its creation and is an important buffer for banking liquidity support (for very short term and up-to-one-year needs); it follows strict withdrawal rules (which may affect accesibility) and in principle could play the role of an ELA window for institutions in distress. While the fund has accumulated considerable resources, it could be insufficient in a scenario of severe system-wide deposit runs.

[2] Mandatory reserve requirements are in principle less accessible to banks than voluntary deposits, but in cases of acute liquidity issues they should be available for withdrawal.
[3] See 2015 Article IV SIP for a description of the LF and liquidity regulations.

B. Peer Comparison

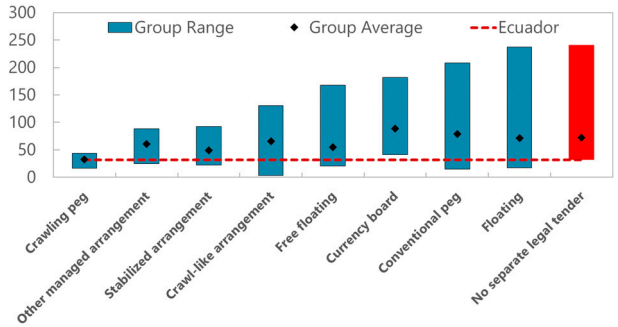
6. The calibration of reserve adequacy in a dollarized economy must also consider the liquidity buffers in the system. Commercial banks in dollarized jurisdictions generally should hold high liquidity levels as self insurance. During the last decade, Ecuadorian banks' liquidity ratio (measured as liquid assets to short term liabilities) initially compared well with its dollarized peers, reflecting a prudent risk management. However, beginning in the crisis years the average liquid assets ratio gradually fell below other dollarized economies' levels. More recently, banks' liquidity was severely affected by the sudden drop in oil prices and the concurrent fiscal deterioration, but it has recovered somewhat. Nevertheless, comparing across all types of exchange rate regimes, Ecuador's liquidity ratio was near the lower bound not only for dollarized economies but for all. This situation highlights the need for effective liquidity assistance tools.[4]

Selected Dollarized Economies: Banking Sector Liquid Assets to ST Liabilities
(In percent)



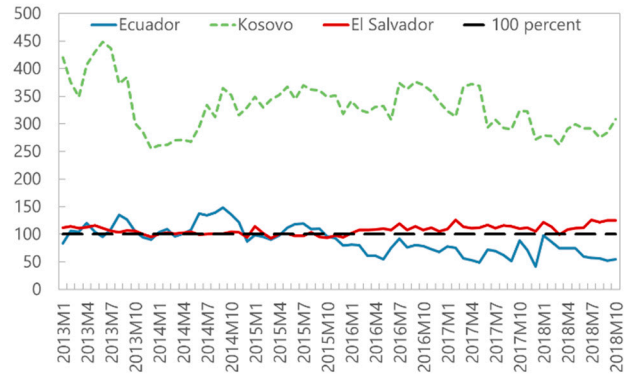
Source: IMF Monetary and Financial Statistics.

Liquid Assets to Short-term Liabilities by Exchange Rate Regime
(Average across countries following AREAER, in percent)



Sources: Financial Soundness Indicators (FSI), 2016 Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) survey, and Fund staff calculations.
Note: Liquidity Ratios are as of end-2017 for most countries (83), and for the latest available date for the rest (45).

Reserve Coverage of Banks' Deposits at the Central Bank
(In percent)



Sources: National authorities and IMF staff calculations.

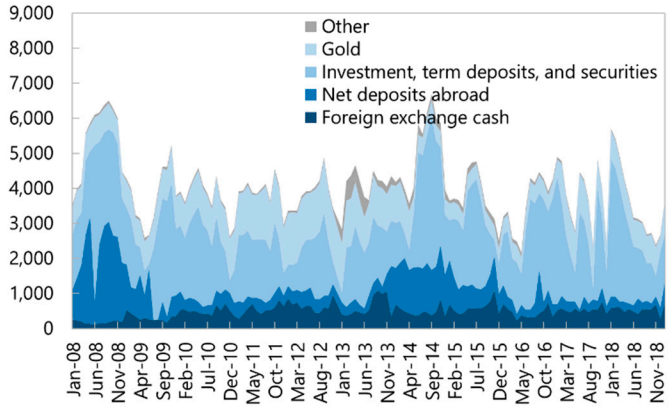
7. Compared to the BCE, central banks in economies subject to similar constraints tend to hold better reserve coverage of banks' deposits. This comparison has to account for the relative size of the government, its financing sources, and the importance of banks' deposits in their central banks funding structure. For instance central banks of El Salvador and Kosovo maintain their coverage ratios above 100 percent. In El Salvador banks are the main source of deposits, and the government is a net borrower but on a limited scale. In contrast the Kosovar central bank receives net deposits from the government which is by far the main net funding source.

[4] Banking regulation in recent times has forcefully led banks to build liquid buffers (IMF (2015)), which are to a great extent invested in government and public entities' securities or deposited at the BCE, which also lends to the government. This strengthened the sovereign-financial linkage while hindering the liquid nature of the buffers.

C. Reserve Accumulation Trends and Structure of the BCE Balance Sheet

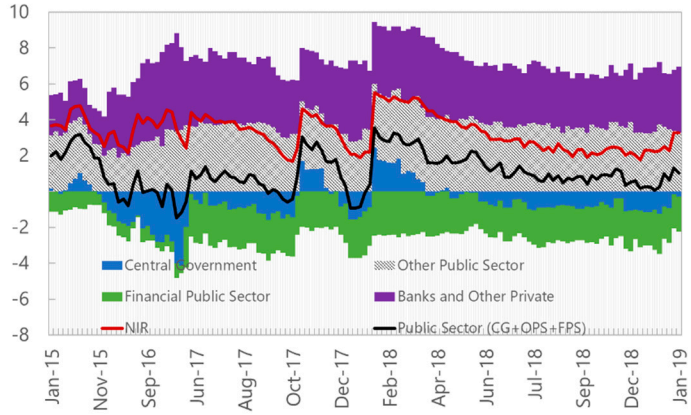
8. Ecuador's international reserves position has weakened since the terms of trade shock of 2014, reflecting a strong fiscal dominance.[5] The volatility in the stock of reserves has been heavily influenced by BCE financing of the central government and the occasional access to foreign financing. All assets, including reserves, in the BCE balance sheet are funded by deposits of banks, nonbanks, and public institutions (mainly the central government, local governments, SOEs, and the social security). Partly determined by legal requirements[6] and the positive commodity cycle that lasted until 2014, most depositing entities at the BCE maintained fairly stable or increasing net-depositor positions. This led, to a significant international reserve buildup that lasted until September 2014 (US$6.7 billion). The BCE position changed significantly in 2015 when the fiscal deterioration and dwindling external financing turned the central government into a net borrower from the central bank. Meanwhile, banking regulation on liquidity and reserve requirements, a sluggish economy, and continued taxation on capital flows[7] led to an increase in bank deposit accumulation at the BCE, and a sharp contraction of private sector credit. At the same time, international reserves fell to critical lows (2 billion at end-December 2017, 52 percent of banks deposits at the BCE) recovering only with each international loan disbursement. More recently, the oil price upturn and general economic recovery , allowed banks to draw down their BCE deposits to fund credit to the private sector, while foreign financing allowed the government to improve its position with the central bank (though it remained negative).

Ecuador: Liquid NIR
(US$ million)



Source: Central Bank of Ecuador and IMF staff calculations.

Ecuador: Net Position with the BCE
(Billions of U.S. dollars)



Source: Central Bank of Ecuador and IMF staff calculations.

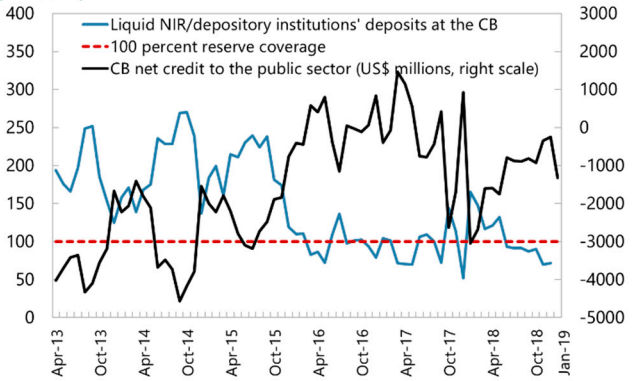
[5] For the purpose of assessing adequacy, gross reserves include: cash, deposits in foreign banks, investments, gold, SDRs, reserve position at the IMF; and liquid net reserves include: cash, deposits abroad, investments, and gold.

[6] Until the latest reform of the monetary framework in 2014 the BCE had an accounting system that avoided the comingling of public and private funds.

[7] Taxation of capital flows was partially eliminated in 2016.

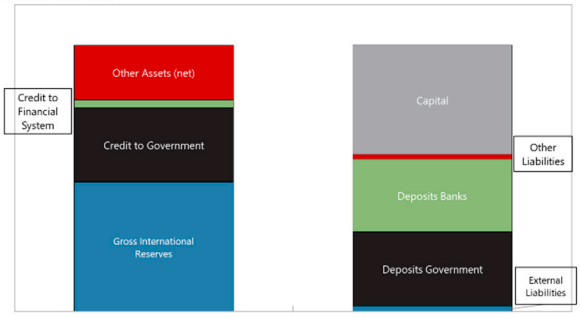
9. Reflecting those trends, the composition of the BCE's balance sheet shifted towards domestic assets. Since late in the last decade Ecuador chose not to accumulate significant reserves, in part due to a robust public investment plan that directed proceeds from the positive commodity cycle to investment projects. At the same time, the strong trade balance allowed international liquidity of the BCE to remain above minimum prudential levels. After 2014 , the mounting financing needs of the government and the drying external financing resulted in significant pressures on the BCE balance sheet. This led to a shift in the composition towards domestic assets (e.g. lending to the central government) and, correspondingly, to lower coverage of banks' deposits with reserves. Furthermore, in comparison with the BCE balance sheet in 2006, the structure of the liability side of the balance sheet shows that banks have become the main funding source of the central bank.[8]

Ecuador: Liquid NIR and Net Credit to the Public Sector
(Percent)



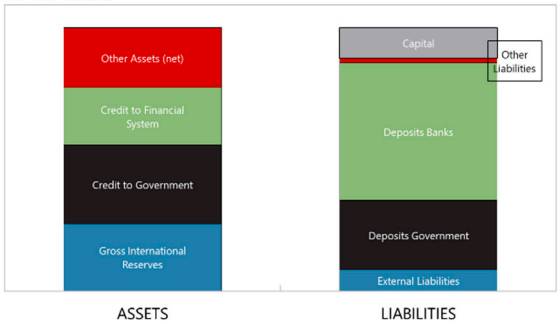
Sources: Central Bank of Ecuador; and IMF staff calculations and projections.

Ecuador: Central Bank Balance Sheet, 2006
(US$ 4.2 billion)



Source: IMF Monetary and Financial Statistics.

Ecuador: Central Bank Balance Sheet, 2018 1/
(US$ 10.0 billion)



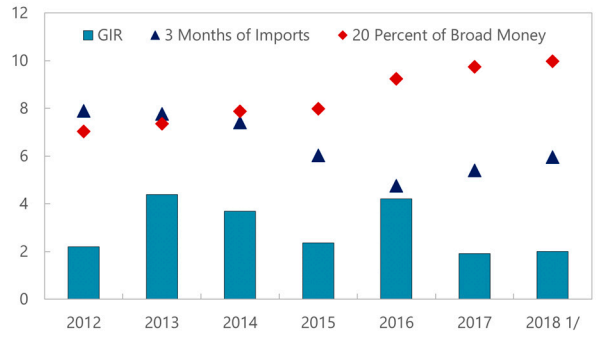
Source: IMF Monetary and Financial Statistics.
1/ As at end-October.

[8] The central bank has been issuing paper (TBCs) on a limited basis (less than US$200 million), which are given to the government and used for payments to suppliers. The public can use those assets only for restricted transactions (including paying taxes).

D. Reserve Adequacy Metrics

10. The Fund's current operational methodology for the assessment of reserve adequacy was developed in 2011.[9] Traditional measures of reserve adequacy (e.g. in months of imports or as percentage of broad money) are useful yardsticks, but richer indicators have been developed. The objective of the ARA metrics is to provide a tool that is sufficiently general, easily implementable and interpretable, and that allows a consistent analysis of reserves issues in IMF bilateral and multilateral surveillance.[10] The methodology for the emerging economies' ARA metric (ARA-EM) incorporates a measure of *relative* risk from potential sources of BoP pressure, estimated on the basis of episodes of exchange market stress, and an estimate of the reserve cover that would be needed relative to the risk-weighted measure.[11] The standard ARA-EM metric contemplates as possible factors of balance of payment pressures: i) losses in export earnings, ii) rollover risk of short-term debt obligations, iii) portfolio outflows, and iv) changes in broad money as a proxy for resident outflows.[12] The table below shows the metric's risk weights for fixed exchange rate regimes. A reserve coverage of 100–150 percent of the metric is regarded as adequate. The level of BCE reserves has been significantly below most of the ARA-EM metrics and traditional benchmarks, except for the period 2005–08 when they approached the 3 months of imports benchmark and were above the 20 percent of M2 level. Currently the reserve level in Ecuador is about one-fifth of the ARA metric.

Ecuador: Traditional Metrics
(US$ millions)



Sources: Central Bank of Ecuador and IMF staff calculations.
1/ Estimated.

[9] See International Monetary Fund documents: Assessing Reserve Adequacy (2011), Assessing Reserve Adequacy—Further Considerations (2013) (hence after ARA 2013), Assessing Reserve Adequacy—Specific Proposals (2015), and Guidance Note on the Assessment of Reserve Adequacy and Related Considerations (2016).

[10] A reserve adequacy metric is a measure of a country's potential foreign exchange liquidity needs as a precautionary buffer against adverse circumstances.

[11] The approach is analogous to that used for bank capital requirements, where needs are assessed as a percentage of a risk-weighted asset stock.

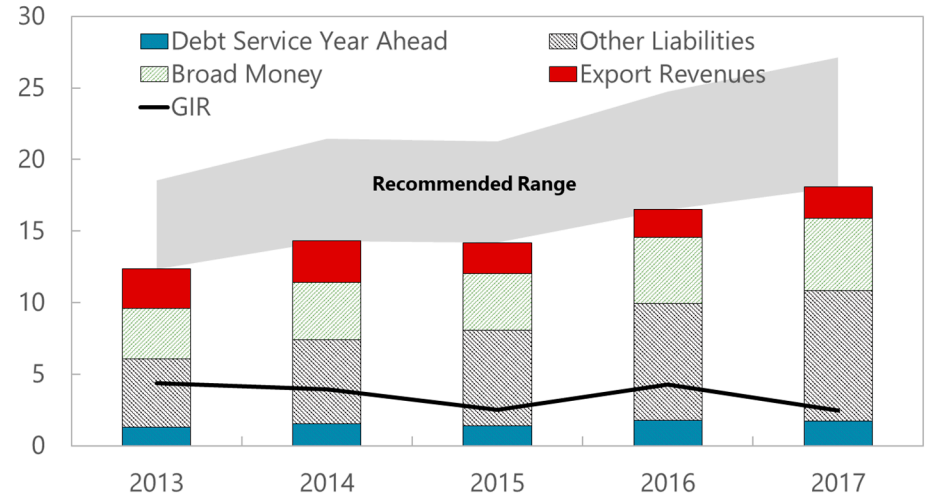
[12] Despite the notional differentiation of the different risk factors under the ARA framework and the additional analysis, potential shocks could be highly correlated (e.g. TOT, fiscal, and liquidity shocks), so reserve drains could mount quickly, weakening the BCE external position.

Risk Weights in the ARA-EM Metric

	Exchange Rate Regimes	Short-term Debt	Other Liabilities	Broad Money	Exports
Weights (in percent)	Fixed	30	20	10	10
	Floating	30	15	5	5

Source: IMF (2016)

Ecuador: Reserve Adequacy to Risk-Weighted Metric 1/
(US$ billions)



Source: Fund staff calculations and estimates.
1/ Defined as 30% of external debt service for the year ahead, 20% of other portfolio liabilities, 10% of broad money, and 10% of exports of goods and services.

11. The Fund has evaluated the relevance of the ARA metric for fully and partially dollarized economies. IMF, 2013 and IMF, 2015 found that, in assessing the performance of the ARA metric for dollarized economies versus other emerging economies, dollarized economies do not seem to be statistically more vulnerable than others to balance of payments crises. Moreover, IMF (2016) also states that "the ARA EM metric may provide a conservative starting point as an adequate liquidity buffer to support domestic financial institutions in a fully dollarized economy". Therefore, the standard ARA metric would in principle apply for these economies, however, it is expected that specific circumstances of each case are taken into account when discussing reserve adequacy.[13]

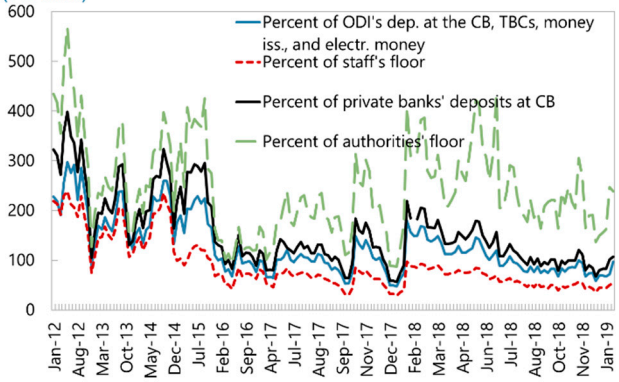
[13] Notably, the three dollarized economies referred in this note (Ecuador, Kosovo and El Salvador) do not compare well with the LA6 average in terms of the standard ARA metric. Also, all three countries fall well below the recommended ranges, with Ecuador showing the biggest drop since the international financial crisis.

12. In the case of Ecuador, the interpretation of the ARA metric is further complicated by poor external sector statistics, particularly those related to the financial account. The largest component of the ARA-metric for Ecuador is the 20 percent of "Other Liabilities". This component is designed to cover the risk of non-resident equity and medium and long-term capital outflows (IMF, 2016), and is based on IIP data for portfolio and other investment. Ecuador's IIP is calculated based on an initial stock plus the cumulative flow from the balance of payments. However, there are significant shortcomings both on the determination of the initial stock as well as the methodology for compiling "Other Investment" in the balance of payments statistics, which is used mainly as a counter-entry for other BoP items.

13. Given the considerations above, the ARA metric could be supplemented by a measure of an absolute reserve floor that comprises the minimum liquidity buffers needed to confront potential reserve drains from the banking and fiscal sectors. Under this criterion, reserves should be sufficient at least to cover (i) all deposits of the banking system at the central bank; (ii) money issuance (e.g. coins) and issuance of TBCs; (iii) electronic money;[14] (iv) a measure of volatility of public credit; and (v) contingent liabilities. Note that this metric does not include a buffer to supplement the ability of the liquidity fund to supply emergency liquidity assistance to banks.[15] In the chart below the dashed red line reflects such metric. Up until 2015 all those potential claims were comfortably covered by NIR, including a fiscal buffer based on the volatility of credit to the public sector. After that, as public financing needs ballooned and external financing to the government became more scarce, the margin of coverage for these concepts faded while NDA turned positive, crowding out NFA in the BCE's balance sheet. At end-2018, liquid reserves amounted to less than 50 percent of staff's supplemental metric, although it has recovered since then on the basis of sovereign debt issuance. While the authorities have adopted an operational concept akin to this proposed floor, their metric does not cover required reserves of private banks (only excess deposits), or any amount for fiscal buffers.

Ecuador: Liquid NIR Ratios, 2012-2018

(Percent)



Sources: Central Bank of Ecuador and IMF staff calculations.

E. Conclusion

14. The difficult macroeconomic situation of the last five years in Ecuador significantly weakened its NIR position leaving buffers well below prudent levels. Considering a set of standard and non-standard criteria, the current stock of reserves is insufficient to mitigate potential shocks to the economy. Looking forward, policy objectives and actions should incorporate the need

[14] While in the BCE balance sheet, once fully transferred to the private sector this item would not be necessary.
[15] Any encumbrance on liquid reserves should also be subtracted to obtain a better measure of NIR.

to rebuild reserves and consider creating fiscal mechanisms to protect NIR management and the BCE balance sheet from the fiscal cycle. Of fundamental importance for the confidence in the banking system and the dollarized regime in general, will be to maintain adequate reserve cover of private sector claims on the BCE. In this sense, restablishing the central bank independence and reinstating the four balance sheet accounts at the BCE or an equivalent tool, which imposed a transparent rule to manage reserves, will be instrumental for that objective.

IS ECUADOR EXPERIENCING DEPOSIT OUTFLOWS? INTERPRETING DATA FROM THE BALANCE OF PAYMENTS[1]

In recent years, Ecuador's financial account of the balance of payments has shown a significant accumulation of currency and deposits abroad by residents, leading some commentators and analysts to express concern about "deposit outflows". This note investigates some of the statistical recording issues around the currency and deposits category in the BOP, and concludes that non-BOP data sources (monetary and tax data) do not point to large deposit outflows from the private sector as the cause of this accumulation. Detailed balance of payments data from the IMF's Balance of Payments Statistics database are used to examine these issues over the period 2008 to 2017.

1. Ecuador's financial account appears to show a significant net accumulation of currency and deposits abroad by residents in recent years.[2] This trend (in Other Investment, Net Acquisition of Assets, Currency and Deposits) has been particularly pronounced since 2014 (Figure 1 and Table 1). According to Ecuador's BOP statistics, between the period 2008 and 2017, residents accumulated US$19 billion in currency and deposits abroad. At the same time, international reserves have fallen well below the standard metrics and exhibit high volatility, while deposits in the domestic banking system increased from 15 to 34 percent of GDP between 2008 and 2017. The large magnitude of this apparent accumulation of savings abroad therefore warrants investigation.

2. In a typical BOP framework, the currency and deposits category captures changes in residents' holdings of foreign currency plus deposits held abroad. For example, if a domestic company imports raw materials and pays for the imports by drawing down its deposits at a foreign bank, the BOP will reflect a debit on the current account and a reduction in currency and deposits on the financial account. Typically, a country's banking statistics, as well as complementary information sources such as the BIS locational banking statistics, would be used to determine these flows on the financial account.

3. The Ecuadorian context is somewhat unique and therefore merits a brief explanation. Although Ecuador is an officially dollarized economy, the central bank operates as the payment agent for external transactions, which in practice means that both private and public sector

[1] Prepared by Rosalind Mowatt (WHD). This note benefited significantly from discussions with Alicia Hierro of the IMF's Statistics Department, Luis Paez Vallejo at the BCE, and Juan Pablo Erraez at the Ecuadorian Association of Banks (Asobanca).

[2] The financial account of the balance of payments reflects the net acquisition of financial assets and the net incurrence of liabilities, and measures how the net lending to or borrowing from nonresidents is financed. While the current and capital accounts show transactions in gross terms, the financial account shows transactions in net terms (i.e. net transactions in financial assets shows acquisition of assets less disposal of assets).

transactions with the rest of the world have an impact on reserves. On the other hand, although transactions between the domestic public and private sector take place in U.S. dollars, they should not affect the balance of payments, with the important exception of transactions that involve a change in cash holdings. This is because bank notes represent a claim on the issuing entity, which in Ecuador's case would be a non-resident, the U.S. Treasury.[3] An increase in physical currency circulating in Ecuador—even if primarily due to domestic transactions—should be therefore reflected in the balance of payments as an accumulation of currency and deposits.

4. The Central Bank of Ecuador (BCE) does not use a standard methodology to compile currency and deposits for the BOP. The currency and deposits category is not based on observed flows on the financial system, but is instead used to register the contra-entry of transactions which do not have a counterpart elsewhere in the BOP.[4] In practice, this means that the currency and deposits category is a residual category in Ecuador's case, reflecting the discrepancy between other BOP flows and the change in reserve assets. As a result, errors and omissions—where such discrepancies would usually be registered—appears artificially low, averaging 0.26 percent of GDP per year in absolute terms between 2008 and 2017.[5]

5. The currency and deposits category could indicate a "leakage" of dollars from the economy. Given that in Ecuador's case, the accumulation of currency and deposits has been positive every year between 2008 and 2017, except for 2010, this suggests that there are "missing dollars" which potentially could have contributed to reserve accumulation but did not. One part of the explanation is the increase in cash in circulation in Ecuador, which, as explained above, represents an accumulation of foreign currency assets. According to BCE estimates, cash in circulation increased by US$11.6 billion over the period 2008 to 2017. Another part of the explanation could be that not all exports earnings are repatriated, contributing to an increase in deposits abroad rather than boosting reserve assets at home. Finally, flows which are difficult to measure, such as those related to tourism, remittances, or illicit activities, and which would typically be part of errors and omissions, might instead by captured in currency and deposits. These explanations will be explored in more detail below.

[3] The IMF's 6th Balance of Payments Manual states that "*… an economy that uses as its legal tender a currency issued by a monetary authority of another economy—such as U.S. dollars—or of a common currency area to which it does not belong should classify the currency as a foreign currency, even if domestic transactions are settled in this currency.*" (BPM6 Manual, page 44)

[4] See Banco Central de Ecuador (2017). *Metodología Información Estadística Mensual, 4TA Edición Revisada.* For currency and deposits it states: "This category reflects the entry and exit of foreign currency to and from the Ecuadorian economy due to foreign transactions, which do not have a counterpart in net international reserves."

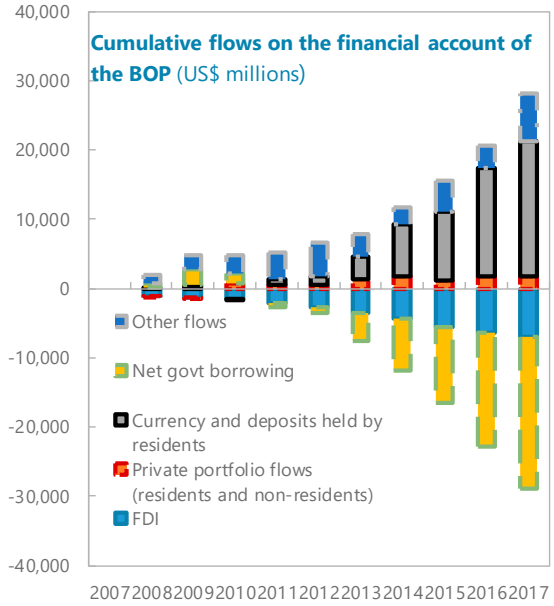
[5] Comparable figures for El Salvador and Panama, for example, are 1.3 and 2.3 percent of GDP respectively.

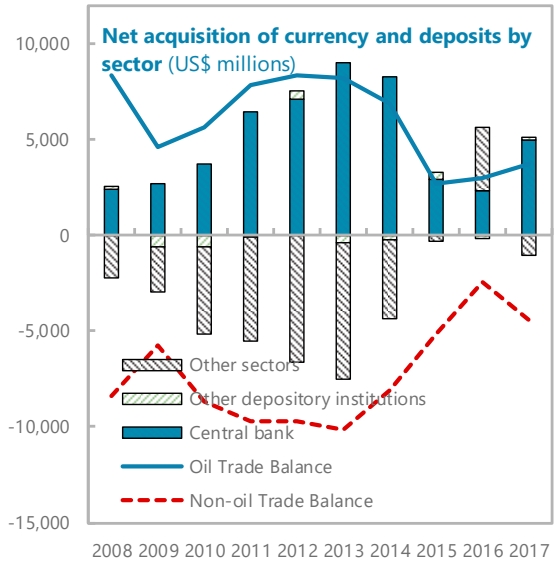
Table 1. Ecuador: Balance of Payments 2008–17

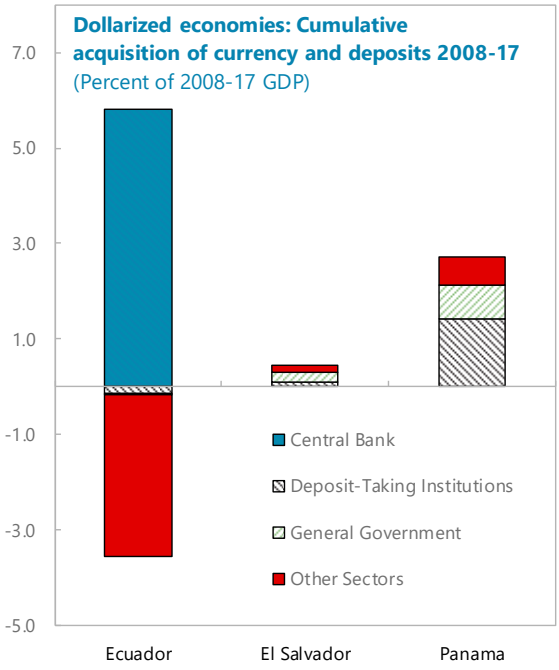
(US$ millions)

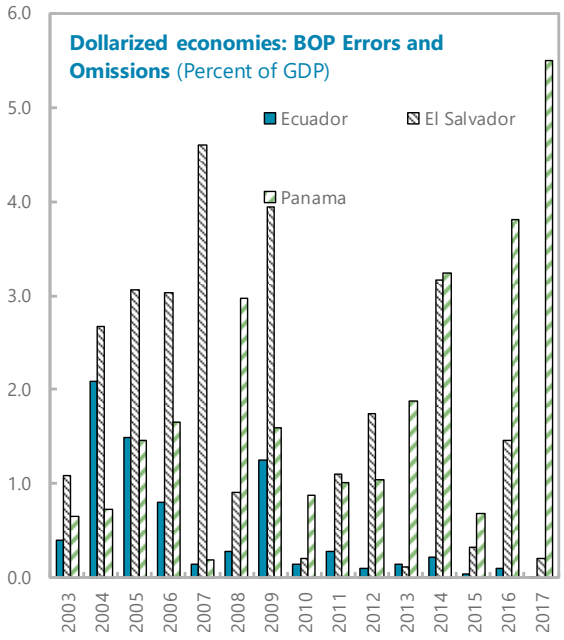
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Current Account	**1,769**	**313**	**-1,583**	**-400**	**-152**	**-921**	**-522**	**-2,112**	**1,441**	**-349**
Goods and services	-23	-1,138	-3,026	-1,865	-1,344	-1,948	-1,234	-2,455	513	-683
Credit	20,902	15,749	19,609	24,670	26,373	27,628	28,943	21,440	19,565	21,918
Debit	20,925	16,887	22,636	26,535	27,717	29,576	30,177	23,895	19,052	22,601
Primary income	-1,429	-1,271	-1,037	-1,257	-1,288	-1,372	-1,552	-1,735	-1,852	-2,331
Credit	334	199	78	84	105	113	121	140	162	187
Debit	1,762	1,470	1,115	1,342	1,393	1,484	1,673	1,875	2,014	2,518
Secondary income	3,221	2,722	2,481	2,722	2,480	2,399	2,264	2,078	2,780	2,665
Credit	3,383	3,033	2,928	2,985	2,757	2,703	2,727	2,644	3,461	3,358
Debit	162	312	447	262	276	304	463	566	681	693
Capital account	**106**	**2,046**	**86**	**82**	**138**	**85**	**87**	**-49**	**-794**	**69**
Financial Account	**742**	**2665**	**-412**	**-417**	**548**	**-2883**	**-404**	**-787**	**-1343**	**1534**
Direct Investment	**-1057**	**-309**	**-166**	**-644**	**-567**	**-727**	**-772**	**-1322**	**-756**	**-612**
Net Incurrence of Liabilities	1057	309	166	644	567	727	772	1322	756	612
Equity and investment fund shares	527	534	478	580	528	734	1162	1272	879	682
Debt instruments	530	-225	-312	64	40	-7	-390	51	-123	-70
Portfolio Investment	**-213**	**3,142**	**731**	**-41**	**-67**	**910**	**-1,500**	**-1,473**	**-2,201**	**-6,490**
Net Acquisition of Financial Assets	-217	152	721	-48	-139	903	492	-626	555	-16
Equity and Investment Fund Shares	-5	110	534	141	460	483	409	-1,414	66	168
Deposit-taking corporations, except central bank	-5	110	534	141	460	483	409	-1,414	66	168
Debt Securities	-212	42	187	-189	-599	421	82	788	489	-184
Deposit-taking corporations, except central bank	-212	42	187	-189	-599	421	82	788	489	-184
Net Incurrence of Liabilities	-4	-2,989	-10	-7	-72	-6	1,992	848	2,756	6,475
Equity and Investment Fund Shares	1	2	0	2	5	2	1	2	6	4
Other sectors	1	2	0	2	5	2	1	2	6	4
Debt Securities	-5	-2,992	-11	-9	-77	-9	1,991	846	2,750	6,471
General Government	-5	-2,992	-11	-9	-77	-9	1,991	846	2,750	6471
Other Investment	**2,012**	**-168**	**-978**	**268**	**1,182**	**-3,065**	**1,868**	**2,009**	**1,613**	**8,636**
Net Acquisition of Financial Assets	1,776	1,319	-243	2,401	1,597	1,097	5,381	5,244	6,041	7,049
Currency and Deposits	184	242	-771	1,008	425	1,871	4,178	2,554	5,085	4,147
Central banks	2,382	2,718	3,988	6,425	7,130	9,014	8,278	2,890	2,359	4,992
Deposit-taking corporations, except central bank	117	-632	-640	-83	462	-394	-257	381	-142	89
General government	14	0	-268	0	-45	0	0	0	0	0
Other sectors	-2,329	-1,844	-3,851	-5,333	-7,121	-6,748	-3,843	-717	2,867	-934
Loans	0	0	0	0	0	0	0	0	0	0
Trade credits and advances	537	552	618	711	779	1,486	1,576	1,529	1,395	1,537
General government	34	283	203	284	154	0	0	0	0	0
Other sectors	503	269	416	427	625	1,486	1,576	1,529	1,395	1,537
Other accounts receivable/payable	1,055	525	-91	681	393	-2,260	-372	1,161	-439	1,364
Central banks	356	-196	35	343	646	-1,390	-248	-121	59	960
Deposit-taking corporations, except central bank	148	391	-87	112	-316	-466	-196	216	-436	-83
General government	-14	0	268	0	45	0	0	0	0	0
Other sectors	565	329	-307	227	18	-405	72	1,067	-62	487
Net Incurrence of Liabilities	-236	1,487	735	2,133	415	4,162	3,513	3,235	4,428	-1,588
Currency and Deposits	65	-67	-24	-1	73	-24	27	-53	-54	28
Central banks	17	22	-18	18	66	-67	-11	-24	-31	38
Deposit-taking corporations, except central bank	48	-89	-6	-19	8	43	39	-29	-22	-10
Loans	-1,078	119	735	1,502	679	2,760	2,829	3,054	4,069	-614
Central banks	-1	-1	-1	0	0	0	0	0	366	0
Deposit-taking corporations, except central bank	-2	-2	88	-65	30	-75	-19	-10	-2	-2
General government	-588	683	1,176	1,405	795	2,130	1,746	2,073	2,279	-235
Other sectors	-487	-562	-528	163	-145	706	1,101	991	1,425	-378
Trade credits and advances	782	1,311	0	585	-428	1,412	664	219	398	-1,034
General government	-3	799	-499	532	-495	1,363	-330	436	615	-816
Other sectors	786	512	500	52	67	50	994	-217	-217	-217
Other accounts receivable/payable	-6	125	23	47	90	13	-7	15	15	32
General government	-6	125	23	47	90	13	-7	15	15	32
Reserve assets	**954**	**-686**	**-1,169**	**336**	**-475**	**1,878**	**-407**	**-1,450**	**1,765**	**-1,811**
Net Errors and Omissions	**-180**	**-375**	**-105**	**220**	**85**	**-146**	**-225**	**35**	**-101**	**-16**

Figure 1. Net Acquisition of Currency and Deposits









Sources: IMF Balance of Payments Statistics, BCE, and IMF Staff Calculations

A. Sectoral Decomposition of Currency and Deposits

6. A sectoral decomposition shows that the asset accumulation emanates from the "central bank" sector rather than the private sector (Figure 1 and Table 1). As with other items on the financial account, currency and deposits can be disaggregated into four sectors—central bank, other deposit-taking corporations, general government and other sectors. The central bank category, which is used by the BCE to reflect *government* transactions, is the component which shows a large acquisition of currency and deposits abroad, while general government is mostly zero and other sectors have tended to show a drawing down of currency and deposits abroad, with the exception of 2016. Also, net acquisition of currency and deposits by the central bank mirrors closely the oil trade balance (a proxy for the public sector trade balance), while private sector currency and deposits tracks the non-oil trade balance. This is consistent with use of the currency and deposits category as a contra-entry for other BOP transactions. It is also consistent with analysis done by the BCE that shows that the public sector was a net contributor to international reserves in 2017 and 2018, while the private sector was a net drain (BCE, 2019). This casts doubt on the argument that *private* outflows are the primary reason for the apparent accumulation of currency and deposits abroad.

7. These sectoral patterns are unusual, including compared with other dollarized economies. In most countries, major movements in currency and deposits tend to occur between deposit-taking corporations and/or in other sectors, with very little movement registered under "central bank". This is true for other dollarized countries such as El Salvador and Panama too. The magnitudes recorded in this category in Ecuador are unusually high relative to other economies, possibly reflecting idiosyncrasies in Ecuador's compilation methodology and/or the role of the central bank as the payment agent for private external transactions.

B. Currency and Deposits from the Monetary Side

8. Monetary data can provide an alternative source for understanding developments in currency and deposits held abroad. An estimate of net accumulation of currency and deposits abroad can be constructed using monetary statistics, supervisory data, and locational banking statistics from the Bank for International Settlements (BIS).[6] From this data, one can get an idea of the movements in foreign deposits of different sectors. In addition to this, changes in foreign currency holdings by residents should be included; this is estimated by the BCE and published in the monetary statistics.

9. The results of this exercise suggest that, in Ecuador's case, currency flows are much more significant than deposit flows (Figure 2). The data shows an accumulation of deposits held abroad by the private sector of about US$1.7 billion between 2008 and 2017; not insignificant, but much lower than total accumulation of currency and deposits recorded in the BOP (US$19 billion). Banks, on the other hand, have experienced a net decline in their deposits abroad of US$0.6 billion,

[6] The BIS's locational banking statistics report deposits held in reporting banks by the residency of counterparty.

but have added about US$1.1 billion to their vaults.[7] More significant is the increase in U.S. dollars in circulation over the same period (close to US$12 billion), which, as noted above, should be registered as a net acquisition of currency and deposits, even though the cash is held by Ecuadorian residents in Ecuador.

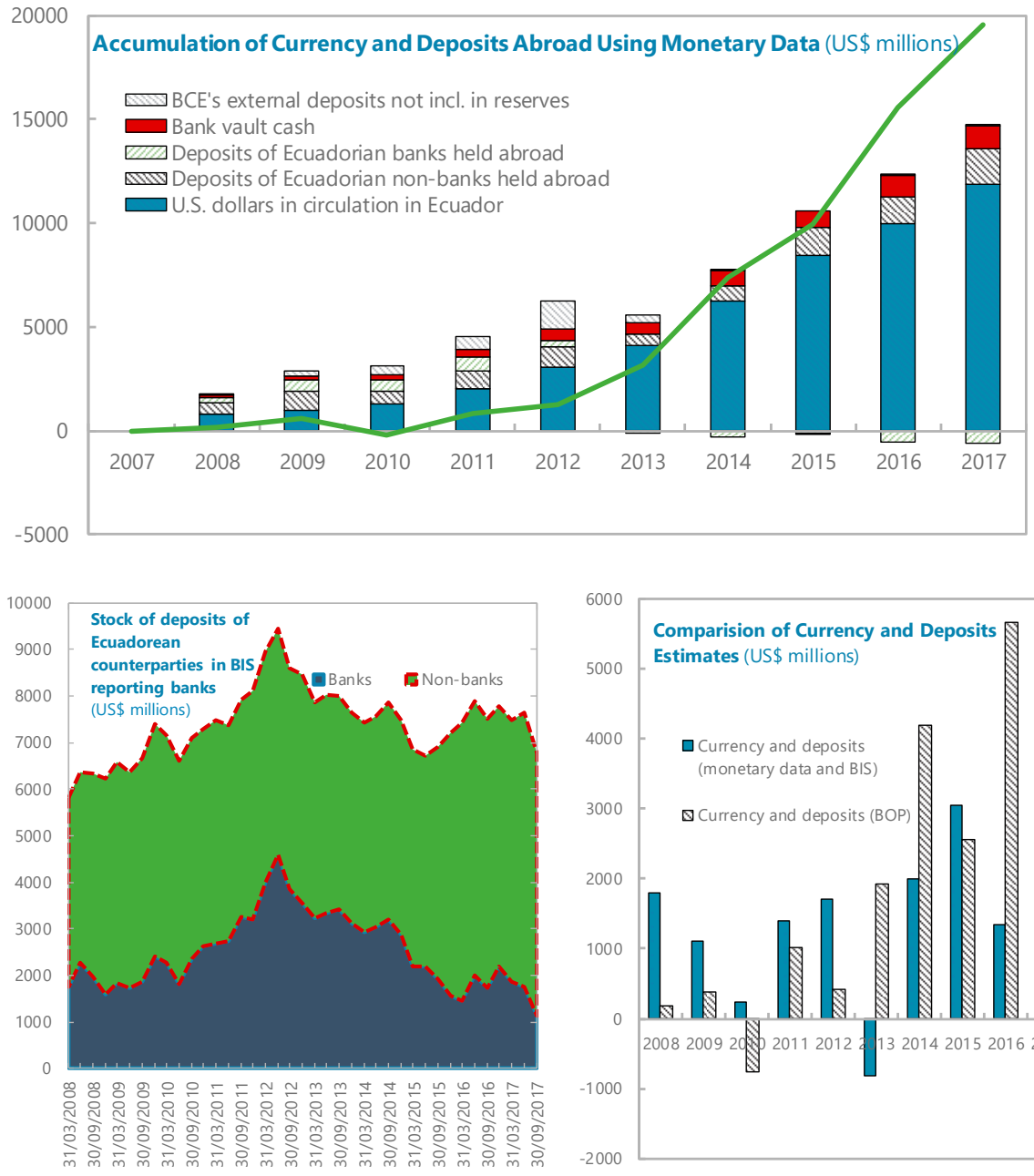
10. However, these estimates of net acquisition of currency and deposit from the monetary side are very different from those in the BOP in many years. In this context, two potential sources of data gaps in the monetary estimations are worth mentioning:

a. *Incomplete coverage of BIS data.* It is possible that locations that do not report to the BIS may have significant deposits from Ecuadorian residents. BIS locational banking statistics cover banks in most major financial centers, including the United States. Coverage in Latin America is however limited to Brazil, Chile, Mexico and Panama; some important trade and investment partners of Ecuador are not covered, including China, Vietnam, Colombia and Peru. Surveys of private companies can help to remedy these coverage gaps.

b. *An under- or over-estimation of U.S. dollars in circulation.* The BCE uses the flow of physical banknotes between the central bank and the rest of the financial system as the basis for its estimations of currency in circulation (Vera, 2007). However, some sources of currency flows might not pass through the financial system and are therefore more difficult to track, such as those arising from remittances, tourism and illicit activities. A note by the Ecuadorian Association of Banks (2016) posits that the BCE's estimate of notes and coin in circulation is inflated, because it assumes that cash dollars which leave the financial system, will eventually return to the financial system. This will not be the case, however, if the cash is spent abroad. Estimates of currency in circulation increased from 6.4 percent of GDP at end-2007 to 14.2 percent of GDP at the end-2017, with much of the increase occurring in the period since 2014. This corresponds to the oil price shock and consequent liquidity crunch, which resulted in falling deposits in the financial system and an increased preference for cash. However, it is not clear how much of this additional cash stayed in Ecuador or was spent abroad; certainly it did not return to the financial system as the situation stabilized. Moreover, there were strong incentives for Ecuadorian consumers to use cash to buy goods abroad at that time, given the overvalued exchange rate at that time and the fact it was a way to avoid the five percent ISD tax (which was levied on credit card transactions).

[7] In 2016, the government introduced regulations for banks to encourage the repatriation of funds held abroad.

Figure 2. Net Acquisition of Currency and Deposits Abroad from the Monetary Side



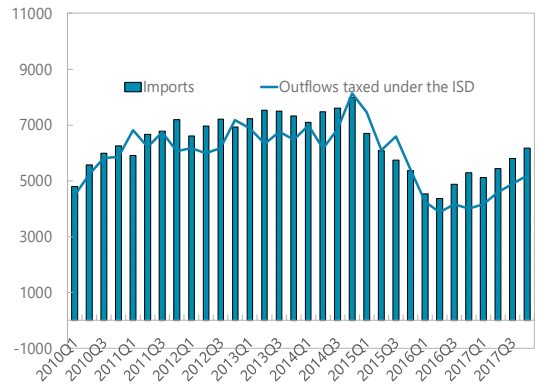
Sources: Bank for International Settlements (BIS), IMF Balance of Payments Statistics, Superintendency of Banks, BCE, and IMF staff calculations.

11. On the BOP side, the magnitude of accumulation of currency and deposits could be distorted by inaccurate trade data. As noted above, in Ecuador the currency and deposits

category is used to register the counter-entries of other BOP transactions. Inaccurate reporting of other components of the BOP can therefore cause distortions in the measurement of currency and deposits. The largest component of Ecuador's BOP is trade transactions and exports and imports may be over- or under-estimated. For example, reports in the press suggest that smuggling (resulting in an underestimation of imports) may be a problem for Ecuador, because of high trade barriers and production costs; this was particularly so from 2014 through mid-2017, due to an overvalued real exchange rate and punitive "safeguard" tariffs. The customs administration has also highlighted under-invoicing to reduce the tax burden of imports as a problem.[8]

12. Tax data provides an additional source of information on gross outflows. The ISD is levied on all outward foreign transactions, including payments for imports of goods and services. While there are a few exemptions and exporters are eligible for a rebate, the ISD's tax base of gross outflows can be approximated using the tax rate and total ISD collections. Figure 7 shows that the tax base of gross outflows corresponds closely to imports. If outflows were (legally) occurring on a large scale, one would expect the inferred tax base to be much larger than imports.

Figure 3. ISD Tax Base and Imports
(US$ millions)



Sources: Central Bank of Ecuador and IMF Staff Calculations

C. Conclusions

13. Based on the evidence presented above, the accumulation of currency and deposits over the period in question does *not* appear to indicate private capital flight—at least not at material levels. The sectoral disaggregation suggests that it is not the private sector but rather the public sector which has been (apparently) accumulating currency and deposits abroad, as the oil trade balance is typically in surplus and external loan disbursements have thus far exceeded debt service payments.

14. However, it is difficult to draw any definitive conclusions about what the data *does* show. The magnitude of deposit accumulation abroad by Ecuadorian residents is much lower than might be suggested from the BOP figures in currency and deposits, but the BIS data on which this calculation is based has only partial coverage. Second, acquisition of foreign currency seems likely to have been an important component of currency and deposits, but it is difficult to get an accurate measure of currency in circulation in a dollarized economy, and there are indications that the current measure may be an over-estimate. Third, illicit activities such as smuggling and under-invoicing also contribute to BOP measurement difficulties and affect the estimates of currency and deposits under the current methodology.

[8] See, for example, "El fin de la salvaguardia, golpe al contrabando," Expreso, May 31, 2017.

15. With the current data and methodology for compilation, is unclear to what extent the "missing dollars" can be explained by each of these—and possibly other—factors. Untangling these factors would be important for devising policy implications, which will differ depending on whether the large movements in currency and deposits can be explained mostly by an accumulation of a pool of savings abroad by corporations, for example, or a hoarding of cash under the mattress by Ecuadorian households, or if most of the "missing" dollars have in fact already been spent on imports rather than saved.

16. A revision of the authorities' methodology in line with recommendations of an IMF technical assistance mission on BOP statistics would be appropriate. Although this would likely result in higher net errors and omissions, an improvement of this aspect of the balance of payments statistics would provide a clearer picture of the challenges facing the economy and would avoid the misleading appearance of large deposit outflows.

References

Asociación de Bancos del Ecuador, 2016, "Las especies monetarias en circulación o como usted en este momento debería revisar su billetera y encontrar USD 750", Boletín Macroecónomico (November).

Banco Central de Ecuador, 2017, *Metodología información estadística mensual, 4TA Edición Revisada* (Quito).

Banco Central de Ecuador, 2019, *Boletín de reservas internacionales (Dic. 2018)*(Quito).

International Monetary Fund, 2005, Balance of Payments Manual, Fifth Edition (Washington).

_____, 2013, Balance of Payments Manual, Sixth Edition (Washington).

Vera L., Wilson, 2007, "Medición del circulante en dolarización: Ecuador 2000−07", *Cuestiones Económicas*, Vol. 23(2), pp. 133-61.

Zambrano, Lina, 2017, "El fin de la salvaguardia, golpe al contrabando," Expreso, May 31.

THE COOPERATIVE SECTOR IN ECUADOR[1]

The cooperative sector is relatively important in Ecuador; however, based on published data, there are no signs that the risks associated with the coops could be systemic. Regulation and supervision could be tightened to avoid arbitrage and align the sector with best practices. The ongoing consolidation of the sector is welcome.

1. Relative to other countries, Ecuador has a sizeable cooperative sector,[2] representing around 16 percent of assets and 23 percent of deposits in the consolidated financial system. The total assets of the cooperative sector constitute around 12 percent of GDP, slightly more than the assets of Ecuador's largest private bank, Banco Pichincha. There are currently 618 COACs, down from a peak of almost 1000 in 2012. Although the number of institutions has decreased (mostly due to an ongoing consolidation process) the number of members (depositors/shareholders) has more than doubled since 2013, and now stands at about 7.7 million.[3] Lending is concentrated in the consumer and microfinance sectors. For reporting and regulatory purposes, coops are divided into 5 "segments" according to asset size, with the strictest requirements applying to the largest coops. For instance, provisioning requirements are toughest for Segment 1 (the largest coops) and then become progressively looser. Mandatory publication requirements for financial statements have been relaxed for those in the lower segments.

2. Regulations resemble those of banks (e.g. in relation to capital, risk classification of loans, etc.) but with less strict rules, **lower requirements, or more extensive periods for the coops' compliance.** Cooperatives are regulated by a different entity to the private banks, namely the Superintendent of the Popular and Solidarity Economy (SEPS). A healthier evolution of the sector will require the continuation of consolidation efforts, the SEPS is appropriately focused on guiding/enforcing the process. At the same time, further efforts are needed to align the quality of regulation and supervision which those of banks to avoid regulatory arbitrage.

3. Reported data suggest that weaknesses are non-systemic. Segment 1, with US$9.4 billion in assets (representing 69 percent of assets in the coop system) had an average level of NPLs of 3.6 percent in September 2018, close to the average for private banks.[4] Segment 1 experienced rapid growth in the year to September 2018 with deposit and credit growth outpacing that of the private banking system. This may be at least partly due to the consolidation process, whereby smaller institutions have been merging with larger ones.

[1] Prepared by Mario Mansilla (MCM) and Rosalind Mowatt (WHD).

[2] Figures exclude "mutualistas", which are cooperatives that providing housing finance.

[3] Including mutualistas.

[4] An important caveat is that loans are typically classified as non-performing after 30 days in the cooperative sector, rather than 15 days in the private banking system, so NPLs are not strictly comparable between the two systems.

4. Interconnectedness with the rest of the financial system is mainly linked to common safety net funds (see below), and access to liquidity financing from the BCE and from a tier 2 bank (Conafips), which also borrows from the BCE. Some cooperatives are structurally linked to the banking system through their own operations, but there is no recent network analysis to quantify such linkages. Funds from the private bank's deposit insurance scheme may be lent to coops to facilitate the consolidation process, at 20 years maturity with a two-year grace period.

5. There is a deposit insurance scheme for the COACs; currently it has about US$331 million available, which, at five percent of insured deposits[5] in the sector, is still insufficient. Between April 2014 and December 2018, the deposit insurance had paid out US$47.5 million due to 166 liquidations, benefiting 443,114 members.

6. The liquidity fund for cooperatives is in its infancy. The Organic Financial and Monetary Code of 2014 mandated the creation of two separate liquidity funds, one for the private banking sector and another for cooperatives (previously there was one fund for the whole system). The liquidity fund for cooperatives was established in 2016 with an initial capital of US$40 million. As of end-September 2018, it had US$155 million available, which covers about 1.5 percent of deposits in the coop system. Additionally, the central bank may provide liquidity credits to cooperatives in Segment 1.

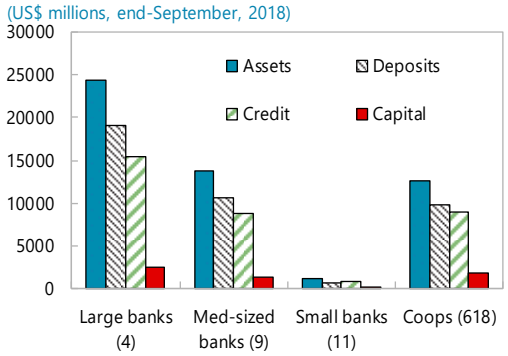
7. Coops operate mostly in rural areas, with a relative concentration on personal credit and SMEs. Thus, their healthy development and consolidation, combined with a better alignment with best practices in supervision of this type of institutions, would benefit rural employment, financial deepening, and financial inclusion in Ecuador.

[5] Thresholds for deposit insurance differ by segment: US$32,000 (Segment 1); US$11,290 (Segment 2); US$5,000 (Segment 3); US$1,000 (Segments 4 and 5).

Figure 1. Ecuador: Cooperatives

Coops are an important part of Ecuador's financial system...

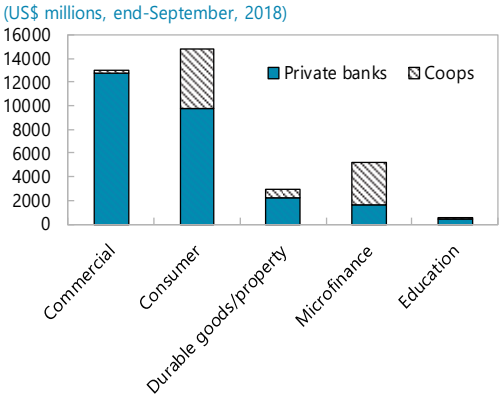
Banks vs. Coops: Assets, Deposits, Credit, Capital
(US$ millions, end-September, 2018)



Numbers in parentheses refer to the number of entities in each group.

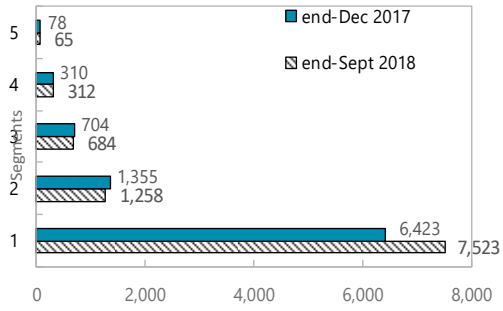
...particularly for consumer and microfinance lending.

Banks vs. Coops: Loan Portfolios
(US$ millions, end-September, 2018)



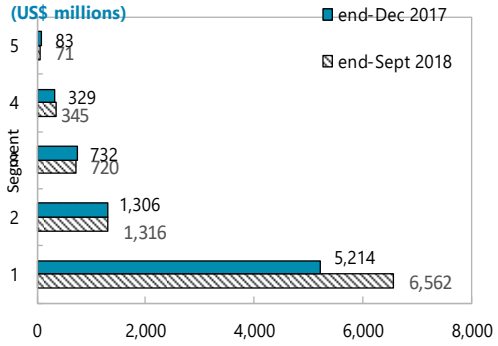
Deposits and credit grew rapidly in 2018...

Coops: Deposit Stock by Segment
(US$ millions)



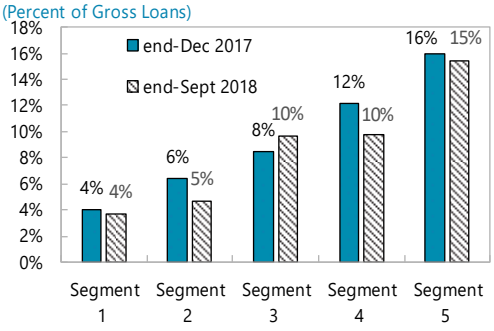
.... driven by growth in segment 1

Cooperatives: Credit Stock by Segment
(US$ millions)



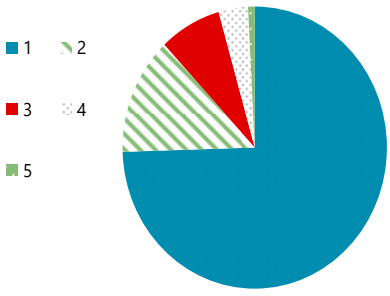
NPLs declined on average in 2018 but remain high in segments 3-5...

Coops: Non-Performing Loans by Segment 1/
(Percent of Gross Loans)



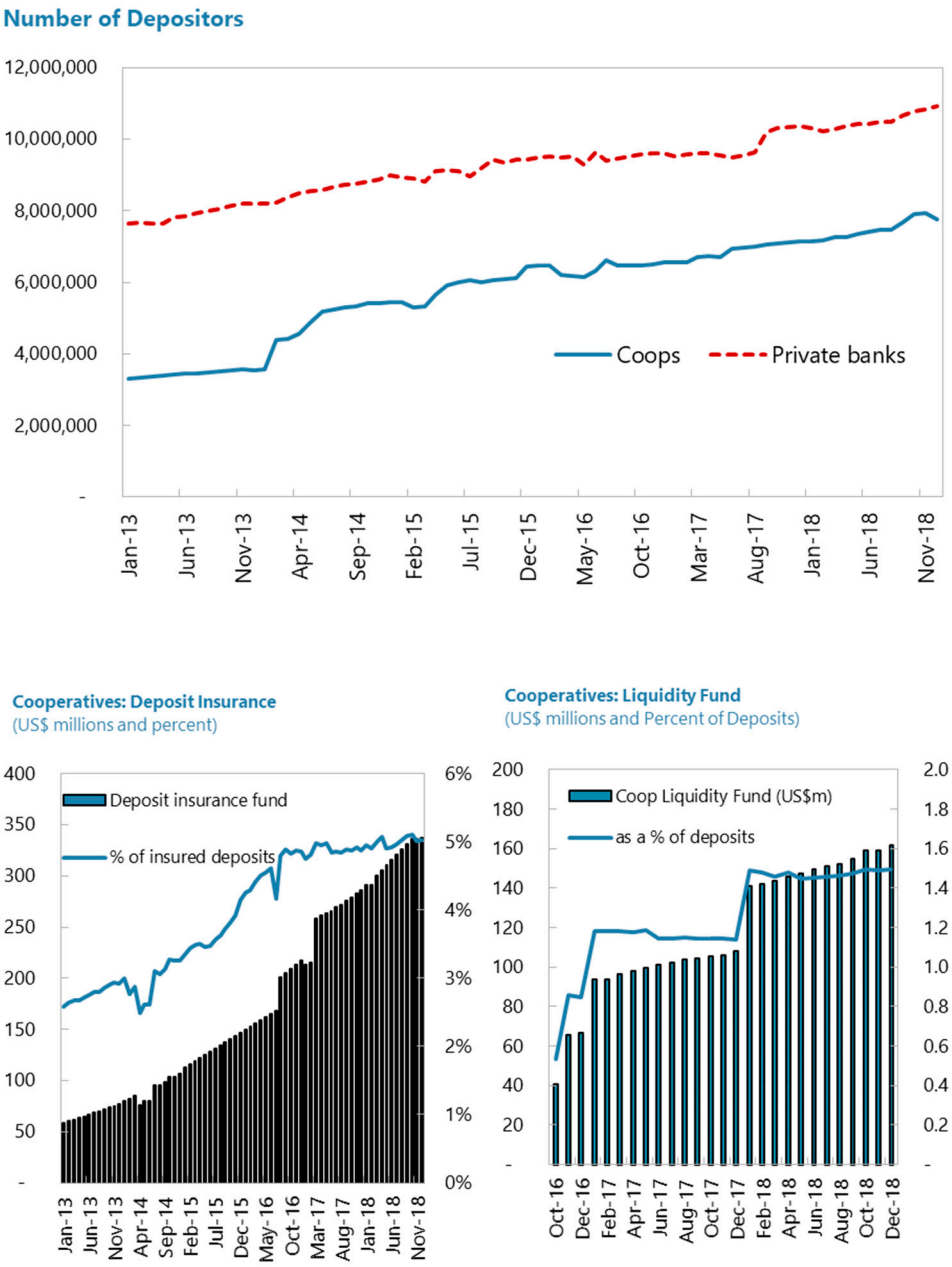
.... which account for only a small portion of total assets of cooperatives

Cooperatives: Assets by Segment, end-September, 2018
(US$ millions)



Sources: SEPS and IMF staff calculations.
1/ NPLs for coops are not directly comparable to those of banks; some loans are only classified as non-performing after 30 days whereas for banks the standard is 15.

Figure 2. Ecuador: Cooperatives' Safety Net



Sources: COSEDE and IMF staff calculations.

ELECTRONIC MONEY IN ECUADOR[1]

Ecuador was the first country in the world to introduce an electronic money system managed by its central bank. Although electronic money has important benefits in terms of financial inclusion and reduced transaction costs, it failed to take off in Ecuador. The location of the electronic money system at the central bank may have contributed to its limited diffusion. The decision by the Moreno administration to transfer the electronic money system to the private sector should contribute towards a greater uptake of the new technology.

1. Electronic money (EM) is fundamentally different from virtual currencies (VCs). VCs are digital representations of value, issued by private developers, and denominated in their own unit of account.[2] EM is a digital payment mechanism for (and denominated in) fiat currency. However, the term EM is sometimes used inaccurately as it commonly refers to a portable storage device for electronic currency (that can be carried like cash and used in place of cash). As a result, today the term EM refers more broadly to any material, device, or system that conducts payment via the transfer of electromagnetically stored information. In other words, EM is akin to national physical currency that can be stored in a physical wallet like a smart card, a credit card, or token, but it generally exists as account data on some electronic storage device, like smart phones and computers. EM originates within the banking system, and it is generally regulated by the central bank and other government agencies. In this sense, it is no different than government money.

2. EM bears some advantages and disadvantages. The main ones include**:**

- *Convenience*, as electronic transfers can be performed at anytime and anywhere and solve the "exact change" problem
- *Time savings*, as money transfers take generally a very short time
- *Money savings*, as fee and commissions are generally lower than for regular wire transfers
- *Transparency*, as anyone can check expenses in real time

[1] Prepared by Francesco Grigoli (RES) and Rosalind Mowatt (WHD).

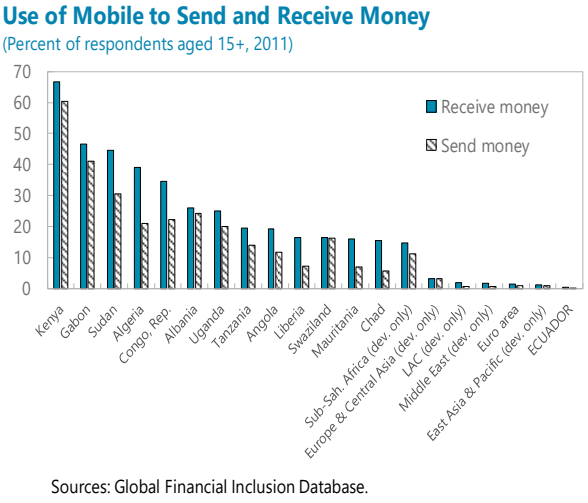
[2] Instead of relying on the central bank payment system and a master ledger to keep track of transactions, VCs use distributed ledgers across the nodes of the payment system network. Transactions are often validated through the so-called blockchain technology, which consists of an inerasable and incorruptible consensus-based process where each transaction has to be approved by the supermajority of the peers to be added to the block and eventually to the ledger.

Disadvantages include:

- *Safety*, as physical electronic wallets can be lost, stolen or damaged as traditional money.[3] In addition, there exists the risk of being hacked
- *Privacy*, as transactions cannot be anonymous and the information is stored in the ledger of the payment system
- *Need for internet access*

3. From a macroeconomic perspective, the evidence suggests that EM may increase money demand and monetary policy effectiveness. By providing easier access to interest-bearing assets with reduced transaction costs, EM could increase the opportunity cost of holding physical cash. Moreover, it can facilitate the conduct of monetary policy. Since EM provides a costless and safer medium of exchange on which central banks pay the same nominal interest rate, it would also help to avoid the limitations of the lower bound on the nominal interest rate typical of physical cash. Assuming that EM becomes the only currency in circulation (for illustrative purposes), costs associated with money paper printing and substitution as well as seigniorage revenue would be zero.

4. EM is widely seen as an effective way to provide access to finance to people living in places lacking financial structures. Financial access is often limited in poor countries with a challenging geography, as people living in remote areas have difficulties reaching banks' branches. Since in these countries many people own a mobile phone (but do not have bank accounts), EM can effectively extend financial services to these excluded cohorts of the population. This has been the case of many African economies, where the percentage of people using mobiles to send and receive money is the highest in the world. In the countries where EM is widespread, the services are generally still limited to money transfers, but a lot is to be gained by widening the range of financial services to include, for example, savings, credit, and insurance.



Sources: Global Financial Inclusion Database.

5. In December 2014, Ecuador introduced its public EM system.[4] Under the law, EM was defined as an electronic payment means managed and regulated by the central bank, denominated

[3] Recent EM systems use biometric identification (e.g., thumbprints and retina images), providing an additional layer of security

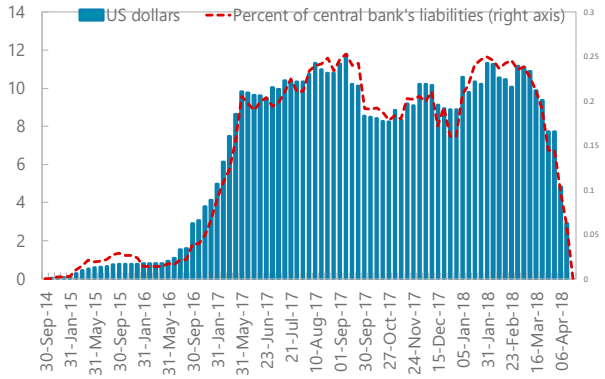
[4] Resolution N. 005-2014-M and Resolution N. 109-2015-M.

in U.S. dollars. Opening EM accounts was voluntary, free of charge, and bore zero maintenance cost. Account holders could easily move funds between their bank accounts and their electronic wallets through electronic devices, including mobiles, smart cards, and computers. Also, they could send money orders to people or entities without EM accounts and receive money orders from abroad, make and receive transfers to and from other bank accounts, pay taxes, or send payments to other EM accounts. Some services, however, required the payment of fees and commissions set by the law.

6. The law also stated that at any point in time, holders of EM could request physical money in exchange for EM. Account holders could request physical U.S. dollars from the so-called macro agents, which were entities supervised by the central bank that satisfied the following criteria: used EM in their business, had been operating in Ecuador for a minimum of two years, had a minimum capital of US$100,000, and provided customer service, among others. The law specified that every day the amount of EM in the system was to be registered in the liabilities of the central bank's balance sheet, and that the amount had to be backed by U.S. dollar assets.

7. The stock of EM as a percentage of the central bank's liabilities was small. At its peak, the EM in the financial system amounted to US$11.8 million in approximately 400,000 registered accounts. The government introduced tax incentives to boost the diffusion of EM, including a VAT refund of two percent of purchases using EM. Also, the law ruled that revenue, costs, and expenses incurred with EM could be excluded from the calculation of the tax base for the income tax during 2017–19. The government also announced that users could pay taxi services with EM. However, its slow diffusion was likely due to the private sector's perception that EM was a first step to de-dollarize the system and a general concern about privacy.

Electronic Money in Ecuador



Sources: Central Bank of Ecuador

8. The Moreno administration took a decision to shift the EM system to the private sector. The stated purpose of this move was to increase the use of e-money, and thereby reduce the use of dollar bills—which are costly—and promote financial inclusion. The Economic Reactivation Law, passed in December 2017, decreed that the central bank EM system would be phased out; by mid-April, the balance on the EM accounts was down to zero.

9. Private banks have decided to adopt a different platform, which would facilitate mobile payments. As of February 2019, the system was still awaiting regulatory approval.

10. Looking forward, EM could benefit Ecuador. A wider diffusion of EM could reduce transaction costs, enhance transparency, spur financial inclusion, and increase financial services availability.

ANALYTICAL NOTE 6. IMF DEFINITION OF PUBLIC DEBT[1]

The composition of public debt and the treatment of intra-governmental debt in public debt statistics have been subjects of recent debate in Ecuador. This note clarifies IMF guidelines on compiling public debt statistics, including in the specific case of Ecuador.

In compiling statistics on public debt, the IMF is guided by the Government Finance Statistics Manual 2014 and Public Sector Debt Guide for compilers and users, which are available on-line at

https://www.imf.org/external/Pubs/FT/GFS/Manual/2014/GFSM_2014_SPA.pdf

http://www.tffs.org/pdf/method/2013/spanish/psdss.pdf

1. According to the Public Sector Debt Guide for compilers and users (PSDG) the total gross debt consists of all liabilities that are debt instruments. A debt instrument is defined as a financial claim that requires payment(s) of interest and/or principal by the debtor to the creditor at a date, or dates, in the future.

The following instruments are considered debt instruments:

- Special drawing rights (SDRs);
- Currency and deposits;
- Debt securities;
- Loans;
- Insurance, pension, and standardized guarantee schemes; and
- Other accounts payable.

2. All liabilities included in the Government Finance Statistics Manual (GFSM) balance sheet are considered debt, except for liabilities in the form of equity and investment fund shares and financial derivatives and employee stock options. Equity and investment fund shares are not debt instruments because they do not require the payment of principal or interest. For the same reason, financial derivatives are not considered debt liabilities because no principal is advanced that is required to be repaid, and no interest accrues on any financial derivative instrument.

3. In terms of coverage, the PSDG manual suggests that the debt should be compiled at the level of consolidated Public Sector or consolidated General Government, to make the statistics comparable across countries and avoid the differences in the administrative and legal arrangements. The description of the definition by countries included in the IMF WEO

[1] Prepared by Mariana Sabates (STA).

database is available at http://www.imf.org/external/pubs/ft/weo/data/assump.htm and the description of coverage by country is available in the 2018 April Fiscal Monitor (p. 104-106). https://www.imf.org/~/media/Files/Publications/fiscal-monitor/2018/April/pdf/fm1801.ashx?la=en

4. The consolidation is a method of presenting statistics for a set of units (or entities) as if they constituted a single unit. A consolidated set of accounts for a unit, or group of units, is produced by, first, an aggregation of all flows and stock positions within an agreed analytical framework, followed by the elimination, of all flows and stock positions that represent relationships among the units or entities being consolidated. IMF debt statistics is usually presented on a consolidated basis.

5. In the case of Ecuador, the fiscal analytical framework utilized by the IMF team is done at the level of the Non-Financial Public Sector. In order to be able to do the reconciliation between the stocks and flows it is necessary that the debt is measured on the same basis i.e. consolidated Non-Financial Public Sector.

6. The Non-Financial Public Sector includes the General Government plus the Non-Financial Public Corporations. The subsectors of General Government are central, state, and local governments, budgetary and extrabudgetary, and social security funds.

Following the above manuals, Ecuador's debt should include the following instruments:

Debt Securities

(hold by nonresidents, and by residents non-included in the Non-Financial Public-Sector entities)

- Bonds
- Treasury certificates

Loans

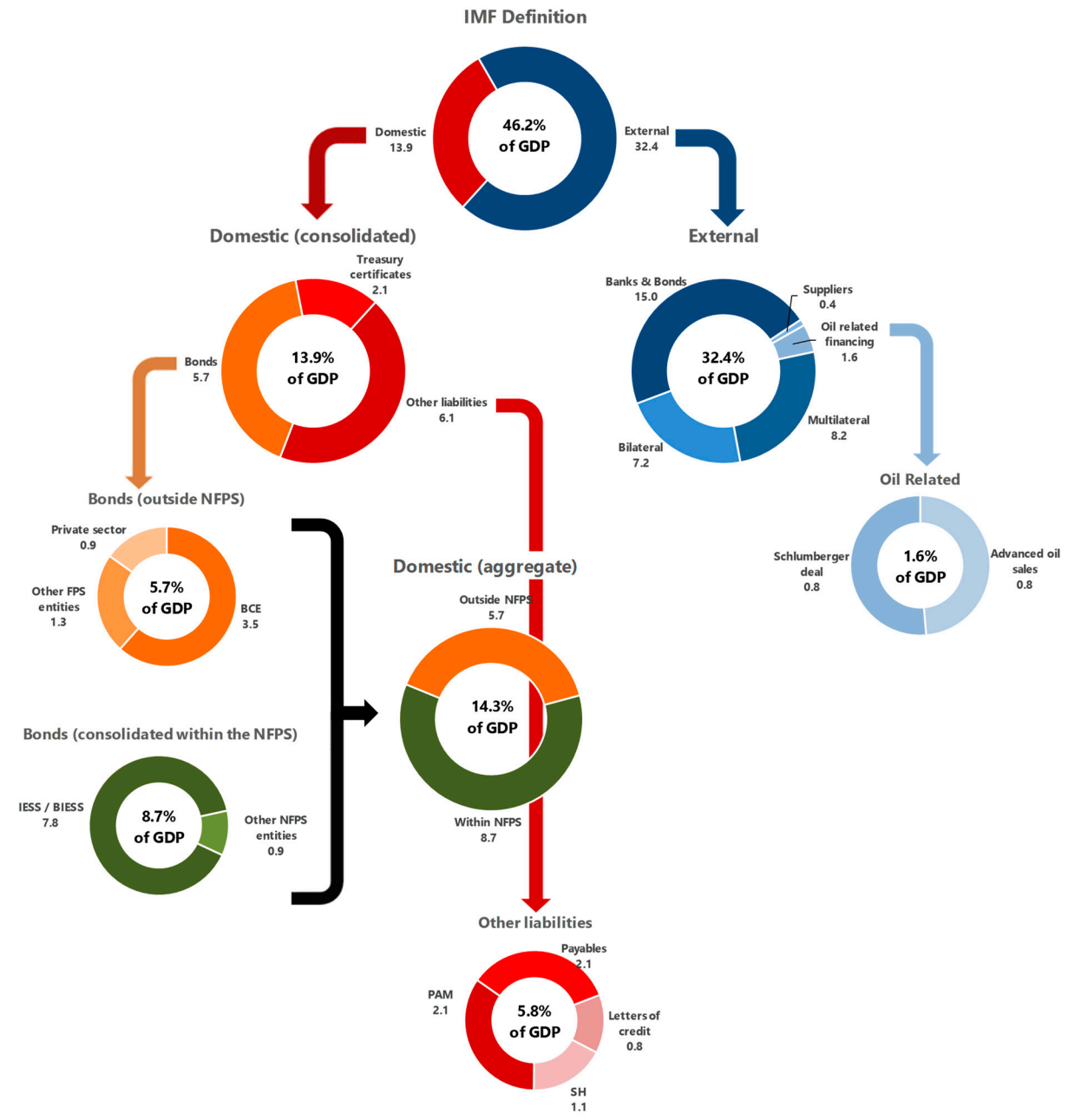
Other Accounts Payables

- Advanced oil sales
- Schlumberger deal
- Arrears with resident suppliers

Any liabilities issued by entities of the NFPS, hold as an asset by other entity of the NFPS should be eliminated.

Figure 1 below presents the IMF compilation of the public debt statistics as of end-2017.

Figure 1. Ecuador: Gross Public Debt Consolidated at the Non-Financial Public Sector Level, End-2018



Source: Ministry of Finance, and IMF staff estimates.
Note: The domestic bonds held within the NFPS are consolidated, and thus do not add to the NFPS debt. PAM is Petroamazonas, and SH is the Hydrocarbons Secretary.

CALIBRATING ECUADOR'S DEBT CEILING[1]

This note performs a calibration exercise to identify prudent debt ceilings for Ecuador. It does so by first estimating Ecuador's maximum debt limit (MDL), defined as the level beyond which a debt distress episode will occur with heightened probability. It then uses calibration tecniques to assess what range of numerical ceilings for Ecuador's debt rule could be deemed prudent. To be deemed prudent, the ceiling under the debt rule should be set low enough to ensure with high probability that this MDL will not be breached. The note concludes that a prudent ceiling for Ecuador's debt rule could be 30 percent of GDP or less. However, the current 40 percent debt ceiling could still be appropriate if fiscal policy breaks aways from its past behaviour and reacts with stronger adjustments to debt increases. Recent changes in Ecuador's fiscal framework, coupled with the proposed reforms, would help engineer such changes.

1. The credibility of Ecuador's debt rule as a fiscal anchor has been recently questioned. Ecuador's debt rule anchors the country's fiscal framework since the adoption of the 2002 fiscal responsibility legistaltion.[2] This numerical fiscal rule caps the gross public debt-to-GDP ratio at 40 percent. Revisions in 2016 have changed the methodology used to measure and monitor the public debt. An audit of Ecuador's public debt operations conducted in 2018 by Ecuador's General Comptroller concluded that the debt rule had been breached and questioned the 2016 revisions.

2. Recent reforms have started to strengthen the framework and the debt rule credibility. Legal changes to the framework were adopted in 2018 to address the audit recommendations.[3] The debt rule was suspended until 2021 and a convergence plan introduced. The instrument coverage of the debt rule was brough closer to international standards. Expenditure and primary balanced budget rules were adopted to ensure governemnt budgets keep public debt within its limit. The debt ceiling has been mantained at 40 percent of GDP.

3. The framework may still benefit from additional reforms, including an assessment on whether the debt rule is properly calibrated. Recent IMF technical assistance (TA) has identified a number of areas to enhance the framework and ensure compliance with Ecuador's debt rule.[4] Critical areas include setting the institutional coverage of the debt and remaining fiscal rules at the non-financial public sector (NFPS) level, ensuring public debt is measured on a consolidated basis, and

[1] Prepared by Victor Lledó (FAD) based on Lledó, Sasson, and Acevedo (forthcoming).

[2] See Lledó, Sasson, and Acevedo (forthcoming) for a detailed account of Ecuador's fiscal framework history.

[3] See IMF (2019) and Lledó, Sasson and Acevedo (forthcoming) for details.

[4] See Verdugo-Yepes (forthcoming) and IMF (2019) for details on the recommendations.

introducing hard annual targets for the NFPS non-oil primary balance. The IMF TA assessment has also called for an assessment of whether the debt rule is properly calibrated.

4. Against this backgrond, this note performs an initial calibration exercise to identify a range of debt limits that could be deemed prudent. The calibration exercise follows the methodology developed by Debrun, Jarmuzek, and Shabunina (2017), which is summarized in IMF (2018). This methodology assumes that there is a *maximum debt limit* (MDL) beyond which a debt distress episode will occur with heightened probability. To be deemed appropriate, the ceiling under the debt rule should be set low enough to ensure with high probability that, given Ecuador's typical shock distribution and expected fiscal policy responses to such shocks, this MDL will not be breached.

5. The calibration exercise consists of three steps:

- Estimate MDLs
- Simulate the effects of the past distribution of macroeconomic variables on debt
- Identify debt rule ceilings

Estimating Maximum Debt Limits

6. MDLs are estimated using a probit model. A pooled probit regression model links the probability of debt distress to the level of public debt. Debt distress events were identified as events when the EMBI spread exceeded 1,000 basis point. Such events are expected to cause significant growth losses (Figure 1).[5] This model is estimated for a sample of oil exporting emerging markets controlling for external factors (VIX, oil price), the cyclically-adjusted fiscal balance, the history of default (cumulative number of defaults in the sample), the quality of domestic institutions (an average of 2 subcomponents of the ICRG, namely quality of government bureaucracy and law and order).[6] In line with Ecuador's debt definition, public debt is defined on a gross and consolidated basis. MDLs can be computed on the basis of different probability of debt distress using the probit regression estimates for each of the controls and with controls set at their median values following (1). Specific MDLs were estimated for probabilities of 5, 10, and 15 percent: 32, 47, and 57 percent of GDP, respectively.

[5] The distributions were calculated for an annual data panel database (unbalanced) consisting of 63 emerging market economies over the 1993–2017 period. GDP per capita growth rates are contemporaneous to the country-year debt distress (or nonevent) observations.

[6] See Analytical Note I for a description of the sample and control variables.

$$MDL = \frac{\phi^{-1}(P(\text{debt distress})) - \Theta''X}{\beta'_1} \quad (1)$$

Where

$P(\text{debt distress}) = \beta_1 Dt\text{-}1 + \Theta X + \mu$ (probit model)

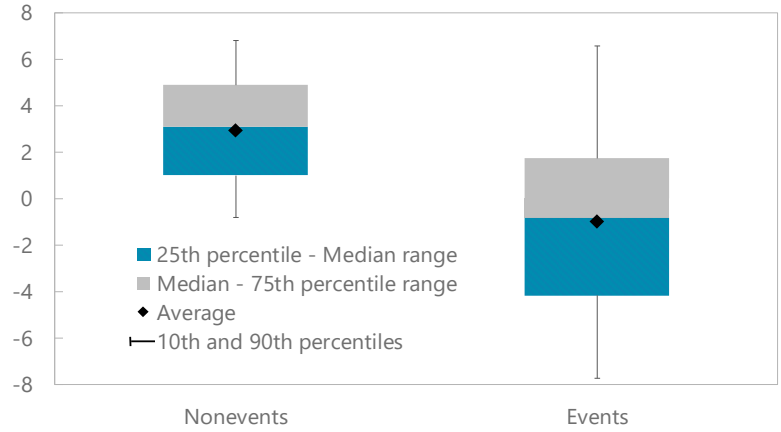
ϕ^{-1} is the normal distribution inverse (probit score)

X and Θ are vectors for the controls and their coefficients, respectively.

Figure 1. Economic Losses from Debt Distress

Emerging Markets: Distribution of Contemporaneous Real GDP per Capita Growth

(In percent)



Sources: Bloomberg, WEO, and IMF Staff calculations.

Simulating the Effects of Macroeconomic and Fiscal Shocks on Debt

7. The second step is to simulate a distribution of future debt outcomes based on the past distribution of key macroeconomic variables This, in turn, can be done in two steps:

i. Estimating the joint distribution of macroeconomic variables.
ii. Simulating the medium-term debt trajectories.

- ***Estimating the joint distribution of macroeconomic variables.*** This step consists of estimating the joint distribution of macroeconomic variables. Each simulation produces a path for macroeconomic variables over a medium-term projection horizon, where the variables have been subject to shocks in each period. Data on real GDP growth, real effective interest rates, and real exchange rates in Ecuador's post-dollarization period (2002–17) was used to estimate the averages and variance-covariance matrix of a multivariate T

distribution. Forecasts for each of these variables over a six-year projection horizon were then drawn 1,000 times from this calibrated multivariate distribution.

- ***Simulating the medium-term debt trajectories.*** Consistent with each simulated path of macroeconomic variables, medium-term debt trajectories are then obtained from the system of simultaneous equations (2–3) formed by the debt accumulation equation—the government budget constraint—and a fiscal reaction function (FRF) in which the level of the primary balance responds to the level of debt and realization of macroeconomic variables. The solution to this system will provide empirical distributions for the primary balance and debt from which alternative primary balance and debt trajectories could be drawn. Debt trajectories produced using stochastic simulations can be summarized in a fan chart.

$$d_t = \left(1 + \left(\frac{r_t - g_t}{1+g_t}\right)\right) d_{t-1} - pb_t + SFA_t \qquad (2)$$

$$pb_t = \alpha pb_{t-1} + \Psi \mathrm{x} \qquad (3)$$

- ***Fiscal reaction function specification.*** Solving this system above requires the specification of the FRF in (3), which can be done in two ways: a) estimated based on past behavior or b) by setting an ad-hock primary balance path.[7] Both options have been pursued and can be summarized as follows:

a) Estimated based on past behavior. A FRF was estimated for a sample of commodity exporting emerging markets. Alternative FRF specifications including lagged primary balance, lagged debt, terms of trade and output gaps, and external disbursements have been estimated by System GMM (Blundell and Bond, 1998).[8, 9] A long to short regression strategy was adopted to arrive at the final specification (i.e. final specification with all explanatory variables

[7] A third option is to estimate a normative fiscal reaction function that captures the fiscal behavior necessary to stabilize debt at long-term target levels after shocks dissipated. See IMF (2018) for additional details on this approach.

[8] Lagged primary balance and debt set in percent of GDP. Terms of trade gap defined as the percentage difference between the actual level of terms of trade and the Hodrick-Prescott filtered trend level. External disbursements defined as the gross external disbursements of public and publicly-guaranteed debt as a ratio of nominal GDP.

[9] This estimator allows for fixed effects while addressing the inconsistency introduced by the inclusion of a lagged dependent variable in a dynamic panel data set (Nickell, 1981). To prevent the proliferation of instruments leading to concerns of overfitting, and given the modest size of our sample, the set of internal instruments was truncated to include lagged values of the right- hand side variables dated from t-3 and t-4. Instruments were also collapsed to create one instrument for each variable and lag distance, rather than one for each time period, variable, making the instrument count linear in the time dimension of the sample.

statistically significant at 5 percent confidence level).[10] The final FRF specification excluded lagged debt but included lagged primary balance, terms of trade gap, and external disbursements.

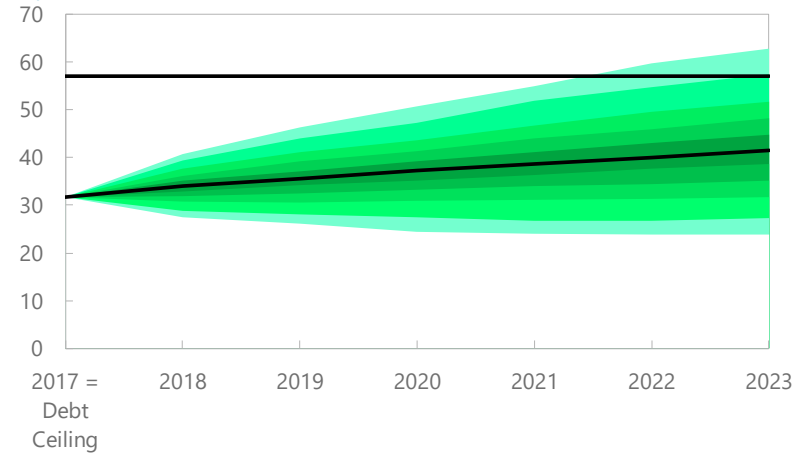
b) *Setting an ad-hoc primary balance path.* A mean value for the primary balance is chosen in each period over the medium-term horizon. This may correspond to a baseline forecast. A fiscal shock can be added to this mean value each period to capture uncertainty about fiscal behavior. A six-year forecast for the primary balance was prepared to reflect financial markets expected adjustment, that is the necessary fiscal adjustment to close any gaps left after expected market financing during the period.

Identifying the Debt Rule Ceiling

8. The final step is to identify a prudent debt rule ceiling. This is done by choosing an initial level of debt (in the first projection year) so that debt remains below the MDL with a chosen probability over the medium term, despite the occurrence of negative shocks. Changing the starting debt level would shift the distribution of future debt outcomes and tilt the entire fan chart. The tolerated probability of breaching the debt limit can be chosen based on the level of risk a government is willing to accept. A probability of 10 percent is used as a baseline. Given the choice of MDL and the risk tolerance level, the initial level of debt will be the debt ceiling if the probability that the empirical distribution of debt trajectories generated in step 2 breaching the MDL is below the risk tolerance for each of the projection years. Otherwise, the starting level of debt will be decreased and the stochastic simulation repeated until the previous conditions are met. Figure 2 shows an example for Ecuador assuming that a MDL of 57 percent of GDP, a risk tolerance of 10 percent of GDP with a safety margin below the maximum debt limit. At about 32 percent, the debt-to-GDP level in 2017 can be considered a debt ceiling given that during the forecast period between 2018–23, the probability of the debt distribution breaching 57 percent is always less than the 10 percent risk tolerance level.

[10] The chosen specification also passed serial correlation tests of order 1 and 2 (m1 and m2) as well as a Hansen test of overidentifying restrictions to ensure the validity of the internal instruments used by the System GMM estimator.

Figure 2. Ecuador: Debt Calibration Illustrative Scenario



Sources: IMF Staff calculations.

9. The debt ceiling and the size of the safety margin will be sensitive to a number of key parameters. The debt ceiling will be smaller and the safety margin will be larger (i) the smaller the MDL and risk tolerance level (as the initial debt must be lower to reduce the probability of breaching the limit, (ii) the higher is the volatility of macroeconomic economic shocks (because larger shocks can generate larger increases in debt, a larger safety margin is required); (iii) the weaker is the response of the primary balance to changes in debt following negative shocks, as reflected in the parameters of the FRF (a larger safety margin is required when the government is not acting strongly enough to offset the impact on debt of negative shocks).

10. A prudent debt ceiling for Ecuador would be at most 30 percent of GDP. A sensitivity analysis of the debt ceiling to the amount of risk tolerance and the fiscal policy response is performed for different levels of debt distress and thus different MDLs. The analysis looked in particular for the MDL range estimate above (32, 47, and 57 percent of GDP) and risk tolerance levels ranging from 5 to 15. It also looked at two alternative fiscal reaction functions described above (past fiscal behavior and market-led adjustment). Results are summarized in Tables 1 (past fiscal behavior) and 2 (market-led adjustment) below. Ceilings are lower in Table 1 than 2 because they are based on a historical FRF among commodity-exporters EMs that has been quite insensitive to debt and quite procyclical with respect to commodity prices. Fiscal policy on Table 2, on the other hand, is expected to adjust more strongly to debt increases, particularly in periods when oil price

declines, as market financing is expected to be more costly.[11] Such analysis shows that a prudent debt ceiling would be 30 percent of GDP or less under reasonable risk tolerance levels and debt distress probabilities. At 40 percent, Ecuador's current debt ceiling could be deemed prudent only under risk tolerance levels and debt distress probabilities above 10 percent and only if fiscal policy allows for a greater adjustment of primary balances in response to debt increases than those observed in the past. Recent changes in Ecuador's fiscal framework coupled with the proposed options to further enhance the framework should help engineer this shift in fiscal policy behaviour. They will do, to a large extent, by promoting fiscal savings in good times that would be used to to help close market financing gaps in bad times.

Table 1. Debt Ceiling—Estimated Past Behavior

Probability of Debt Distress (percent)	Maximum Debt Limit (percent of GDP)	Debt Ceiling (percent of GDP) Risk Tolerance (percent)		
		5	10	15
5	32	4.4	7.7	10.7
10	47	17.3	22.4	25.1
15	57	26.3	31.7	34.7

Note: Debt ceiling obtained on the basis of estimated fiscal reaction function (FRF) for a sample of commodity-exporting emerging markets, where primary balance (t) =.335* primary balance (t-1) + 0.324 terms of trade gap (t) -.313*external disbursements +2.194

Table 2. Debt Ceiling—Market-led Fiscal Consolidation

Probability of Debt Distress (percent)	Maximum Debt Limit (percent of GDP)	Debt Ceiling (percent of GDP) Risk Tolerance (percent)		
		5	10	15
5	32	25.1	26.3	27.2
10	47	38.9	41	41.6
15	57	47.3	49.7	50.6

Note: Debt ceiling obtained on the basis of primary balance forecast path necessary to implement a fiscal adjustment capable of closing market financing gaps.

[11] See Analytical Note 1 for evidence of the strong correlation between oil prices and market financing costs proxied by EMBI spreads.

References

Debrun, X., M. Jarmuzek, and A. Shabunina, forthcoming, "Public Debt: Not Safe at Any Speed," IMF Working Paper (Washington: International Monetary Fund).

International Monetary Fund, 2018, "How to Calibrate Fiscal Rules. A Primer" IMF How-To-Note, https://www.imf.org/en/Publications/SPROLLs/How -To -Notes (Washington).

_____, 2019, Ecuador—Staff Report for the 2019 Article IV Consultation and Request for an Extended Fund Facility, International Monetary Fund (Washington).

Lledó, Victor; M. Sasson, and S. Acevedo, forthcoming, "Enhancing Ecuador's Fiscal Framework: Lessons from Second-Generation Rule-based Systems," IMF Working Paper (Washington: International Monetary Fund).

Verdugo Yepes, C., V, Lledó, K. Vasquez, J. Baldrich, and F. Moreno, forthcoming, "Ecuador: Identificacion de oportunidades para mejorar el sistema de administracion de finanzas publicas," Informe de Assistencia Tecnica, Fondo Monetario Internacional (Washington).