



GUATEMALA

SELECTED ISSUES AND ANALYTICAL NOTES

September 2014

This Selected Issues and Analytical Notes paper on Guatemala was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on August 26, 2014.

Copies of this report are available to the public from

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

International Monetary Fund
Washington, D.C.



GUATEMALA

August 26, 2014

SELECTED ISSUES AND ANALYTICAL NOTES

Approved By:

**The Western Hemisphere
Department**Prepared by Lennart Erickson, Ewa Gradzka,
Anna Ivanova, Rodrigo Mariscal, Jaume Puig-Forné,
Iulia Teodoru (WHD); and Patrick Blagrove,
Eugenio Cerutti, and Keiko Honjo (RES)

CONTENTS

ASSESSING POTENTIAL OUTPUT	2
Figures	
1. Potential Output and Output Gap 1991–2019	8
2. Potential Output and Output Gap	9
References	10
CROSS-BORDER LINKAGES AND SPILLOVERS.	11
A. Trade Linkages	11
B. Real Growth Spillovers	12
C. Fiscal Spillovers	15
D. Financial Spillovers	17
Figures	
1. Guatemala: Trade Linkages	20
2. Central America and Selected Trading Partners: Correlations of Annual Real GDP Growth, 1975–2013	21
3. Guatemala, Costa Rica, and Selected Trading Partners: Real Growth Spillovers	22
References	23
THE EFFECT OF U.S. TAPERING	24
A. Empirical Approach	24
B. General Equilibrium Model Simulations	27
Table	
1. Vulnerability Indicators	30
Figures	
1. United States: Three Scenarios of Tapering Off (FSGM simulations)	31
2. Guatemala: The Impact of U.S. Tapering Off (FSGM simulations)	33
References	36
FISCAL SUSTAINABILITY ASSESSMENT	37
A. Assessing Debt Dynamics and Fiscal Sustainability	38
Figure	
1. Guatemala: Long-Term Fiscal Sustainability	42
References	43
MONETARY POLICY STANCE	44

ASSESSING POTENTIAL OUTPUT¹

This note estimates Guatemala's potential output and output gap using the production function approach, univariate statistical filters, and multivariate models based on the Kalman filter method. Results are fairly robust to different methodologies and suggest that its potential output growth is about 3.5 percent and the output gap is on average closed. Structural breaks in potential output were identified in 1994, 2003, and 2008, which coincide to the Mexican tequila crisis, the free trade agreement with the U.S., and the financial crisis. Going forward, it is critical to undertake structural reforms to strengthen capital, labor, and TFP growth in order to accelerate potential growth.

1. **Potential output is a critical concept for formulating accurate macroeconomic policy advice.** Estimates of the magnitude of potential output and the output gap help assess the appropriateness of the fiscal stance and the necessary changes in fiscal policy in the short and long terms. Under inflation targeting regimes in particular, the output gap helps determine the necessary monetary policy adjustments to keep inflation under control. However, given the unobservable nature of these two variables, their measurement is subject to uncertainty. In addition, it is difficult to find reliable labor market data as well as data on the capital stock.
2. **This analytical note provides estimates of both potential output and output gap for Guatemala using conventional methods and a multivariate Kalman filter method.** The methods used include a production function approach, several well-known univariate time series filters—the Hodrick-Prescott (HP), Butterworth, Christiano-Fitzgerald, and Baxter-King—and two versions of a state-space model applying the multivariate Kalman filter. Additionally, a test for structural breaks in the series of potential output is presented.
3. **In the production function approach, potential output is modeled as a function of potential labor and capital inputs, and total factor productivity (TFP).** More specifically, a Cobb-Douglas function is posited:

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha}$$

where Y_t is output, K_t and L_t are capital and labor inputs, while A_t is the contribution of technology or TFP. Output elasticities (α is the capital-output elasticity and is set at 0.35, based on a number of studies, including Johnson (2013) and Sosa et al. (2013) sum up to one. Data on the labor force is obtained from Penn World Table 7.1 (PWT) up to 2010 and assumed to grow at the 2000-10 average annual rate thereafter. The capital stock series is constructed using a perpetual inventory method:

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

¹ Prepared by Iulia Teodoru.

where the depreciation rate δ is set as 0.05, while the initial capital stock is computed as $K_0 = I^*/(g + \delta)$. I^* is the benchmark investment (average share of investment in GDP) and g is the average economic growth over 1990-2013.

Since TFP is not observable, $A_t = Y_t / K_t^\alpha L_t^{1-\alpha}$, namely it is estimated as a residual.

4. **Univariate statistical methods provide a simple measure of potential output.** For example, the HP filter estimates potential output by minimizing the sum of squared distances between actual and potential output at each point in time, subject to a restriction on the variation of potential output. The restriction parameter λ captures the importance of cyclical shocks to output relative to trend output shocks. A smaller value of λ indicates a smaller importance of cyclical shocks (λ was set as 6.25). However, univariate statistical methods have several shortcomings, including difficulty in identifying the appropriate value of the detrending parameter and inability to capture structural changes in the economy.

5. **To overcome some of the shortcomings of univariate statistical methods, two multivariate state-space models are used.**

To estimate the unobservable state variables of potential output and the output gap, a multivariate Kalman filter is applied to the following two systems of equations:

Deterministic Drift Model

$$y_t = y_t^p + ygap_t$$

$$y_t^p = \bar{\mu} + y_{t-1}^p$$

$$ygap_t = \rho_1 ygap_{t-1} + \rho_2 ygap_{t-2} + \varepsilon_t^{ygap}$$

$$\varepsilon_t^{ygap} \sim N(0, \sigma_{ygap}^2)$$

where y_t is output, y_t^p is potential output, $ygap_t$ is the output gap, $\bar{\mu}$ is the long-term steady state growth rate, $ygap_{t-1}$ and $ygap_{t-2}$ are the lagged output gaps over two periods, and ε_t^{ygap} is the error term which is normally distributed.

In this first specification, potential output follows a random walk with deterministic drift (or trend) and the output gap is represented by a stable autoregressive process AR(2) (the second and third equations). The parameters to estimate in this model are $\{\rho_1, \rho_2, \bar{\mu}, \sigma_{ygap}^2\}$.

Drift with Mean Reversion Model

The second specification adds dynamics to the drift allowing for mean reversion, and potential output follows a random walk with drift (or trend) where the process governing the drift follows a mean reversion dynamics with long-term steady state and with an adjustment coefficient $\beta \in (0, 1)$. The larger the value of β , the more persistent is the impact of shocks on the potential output growth rate.

$$y_t = y_t^p + ygap_t$$

$$y_t^p = \bar{\mu} + y_{t-1}^p$$

$$ygap_t = \rho_1 ygap_{t-1} + \rho_2 ygap_{t-2} + \varepsilon_t^{ygap}$$

$$\varepsilon_t^{ygap} \sim N(0, \sigma_{ygap}^2)$$

$$\mu_t = (1 - \beta)\bar{\mu} + \beta\mu_{t-1}$$

The parameters to estimate are now $\{\rho_1, \rho_2, \bar{\mu}, \beta, \sigma_{ygap}^2\}$.

In both models, the underlying parameters are estimated with maximum likelihood.

6. **Our analysis suggests that on average Guatemala’s potential output growth is about 3.5 percent and the output gap is almost closed.** Results are fairly robust among different methodologies. For the period 1990–2013, Guatemala’s potential output grew at an average rate of 3.55 percent; the forecast for potential output from 2014 to 2019 shows an average pace of growth of 3.57 percent. On average, we conclude that the output gap at the end of 2013 is closed at -0.33 percent of potential output.

Potential Output Growth and Output Gap Estimates								
Production Function Approach	Potential GDP growth rate					Output Gap		
	1991-2013	1991-2019	2012	2013	2014	2012	2013	2014
	3.53	3.53	3.28	3.41	3.49	-0.30	-0.03	0.07
Cycle Extraction Filters	Potential GDP growth rate					Output Gap		
	1991-2013	1991-2019	2012	2013	2014	2012	2013	2014
Hodrick-Prescott	3.54	3.53	3.29	3.41	3.48	-0.30	-0.02	0.09
Butterworth	3.53	3.52	3.29	3.46	3.55	-0.16	0.05	0.10
Christiano-Fitzgerald	3.43	3.43	2.43	3.71	3.54	0.47	0.45	0.51
Baxter-King	3.49	3.50	3.34	3.51	3.55	-0.34	-0.17	-0.10
State-Space Models	Potential GDP growth rate					Output Gap		
	1991-2013	1991-2019	2012	2013	2014	2012	2013	2014
Deterministic Drift	3.56	3.56	3.56	3.56	3.56	-1.15	-1.03	-0.99
Mean Reversion	3.75	3.74	3.72	3.72	3.72	-1.50	-1.53	-1.65
Average of All Models	3.55	3.55	3.27	3.54	3.56	-0.47	-0.33	-0.28

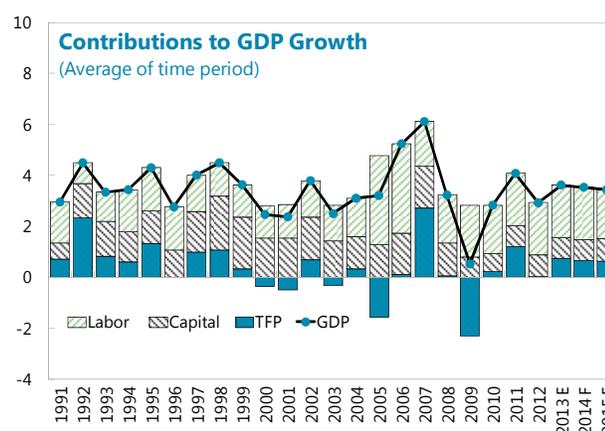
A test for equality of means between the estimates for potential output growth from all the methods and the estimate produced by the HP filter shows that the null hypothesis: $\mu_{HP} = \mu_{All\ Methods}$ cannot be rejected ($p=0.79$). This test is only illustrative in purpose, and is not meant to replace a Bayesian analysis which would propose a coherent procedure for taking into account of specification uncertainty by averaging results from a variety of different model specification.

Test for Equality of Means Between Series				
Method	df	Value	Probability	
t-test	56	-0.265564	0.7916	
Satterthwaite-Welch t-test	54.69547	-0.265564	0.7916	
Anova F-test	(1, 56)	0.070524	0.7916	
Welch F-test*	(1, 54.6955)	0.070524	0.7916	
Variable	Count	Mean	Std. Dev.	Std. Err. of Mean
HP	29	3.526851	0.285468	0.05301
AVG All Methods	29	3.545381	0.244313	0.045368
Total	58	3.536116	0.263513	0.034601

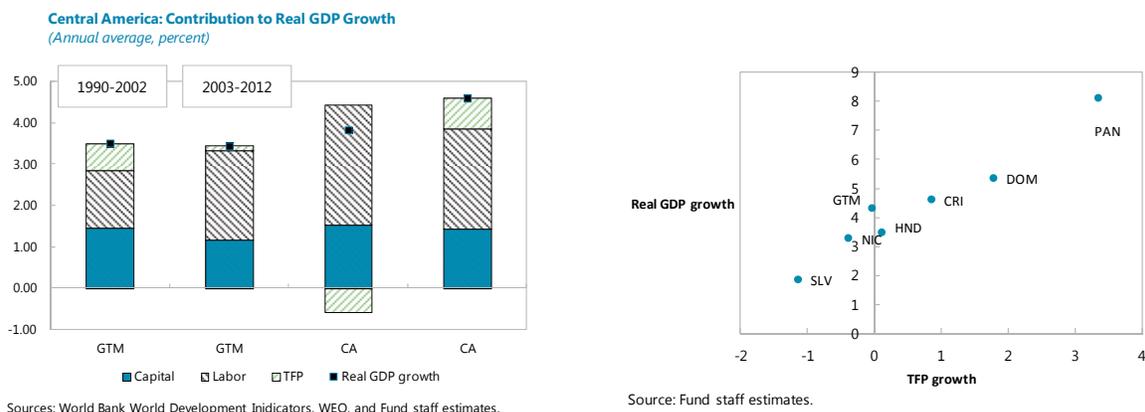
In the following paragraphs, we elaborate on some specific findings from the different methods.

7. **The production function approach also indicates that the absence of productivity growth is a significant barrier to potential output growth.** Results show that potential output grew at a rate of 3.53 percent between 1990 and 2013. However, in the same period, factor

accumulation remains the main driver of output growth and total factor productivity (TFP) has barely added to output growth—on average only about 0.4 percentage points (first chart). The lack of productivity growth is explained by low rates of investment in physical and human capital. Swiston and Barrot (2011) estimated that raising investment in physical and human capital to the average level of Brazil, México, and Peru would raise economic growth by more than 1 percent a year. Guatemala is lagging



behind other countries in Central America which exhibit a significant increase in the TFP contribution to growth comparing the period of 1990–2002 with 2003–2012 (second chart). Over the more recent period 2003–12, higher TFP accounts for most of the growth pickup in the latter years in Panama, Dominican Republic, and Costa Rica (third chart). The cross-country comparison follows the methodology of Sosa et al. (2013) and uses data from PWT for the period of 1980 until 2010 and WEO for 2011–12, includes quality-adjusted labor data, following Bils and Klenow (2000) and Ferreira et al. (2013), and models human capital as a function of the average years of schooling.



8. **A few caveats about the estimation of TFP, however, imply that the results should be interpreted with caution.** The TFP measure is by definition a residual—the difference between output growth and that in the quantity (and quality) of inputs. Thus, any measurement errors in the labor and capital series are automatically imputed to TFP. For instance, employment shifts from the informal to the formal sector, changes in the quality of the capital and labor stocks which are not correctly accounted for, and changes in the level of capital utilization and the use of land would be reflected in TFP.

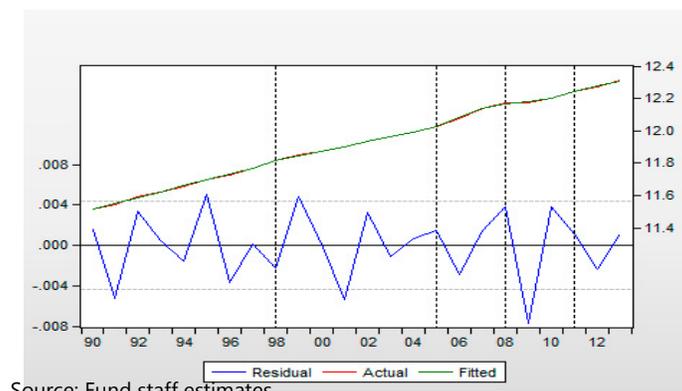
9. **Estimates with the cycle extraction filters suggest that potential output growth is 3.5 percent but with a slightly positive output gap.** During 2007 and 2008, the output gap was positive, most likely given overheating pressures coming from strong global growth, high commodity prices, and easy external financing conditions. In contrast, during the financial crisis the output gap turned significantly negative. In recent years, Guatemala’s economy has recovered and observed growth seems close to its long-term potential, with very moderate overheating signs.

10. **Potential output growth rates estimated by the state-space models are broadly in line with the results from simpler methodologies, but suggest some slack.** Maximum likelihood estimators conclude that there is robust statistical evidence to conclude that potential output in Guatemala grows at a rate close to 3.5 percent a year. Nonetheless, state-space models’ estimates suggest that the observed level of output is below potential output. In both state-space models, the output gap in 2013 was, at least, 1 percent of potential output.

Guatemala: Coefficients									
Model I: Deterministic Drift				Model II: Mean Reversion					
$\bar{\mu}$	σ^2_{ygap}	ρ_1	ρ_2	$\bar{\mu}$	β	σ^2_{ygap}	ρ_1	ρ_2	
3.4995	0.8991	0.8504	-0.5197	3.6461	-0.1744	1.1520	1.1250	-0.3033	

11. **Between 1990 and 2013, the potential output in Guatemala suffered several structural changes.** Three different structural breakpoints were identified using an algorithm based on Bai (1997) and Bai & Perron (1998) to test for existence of multiple unknown structural breaks. The breakpoints were in 1998, 2005, 2008, and 2011. Although this exercise does not allow to deduce any

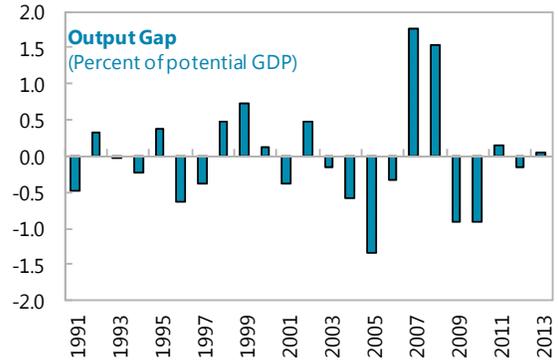
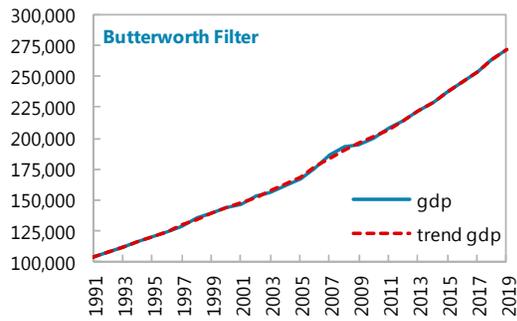
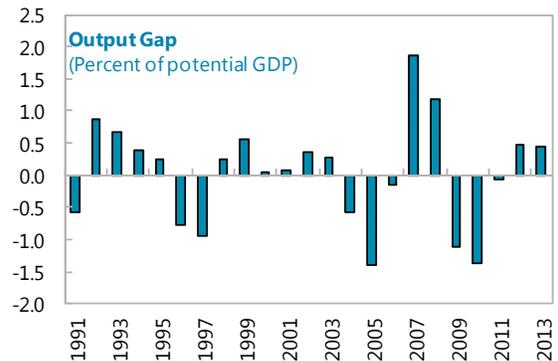
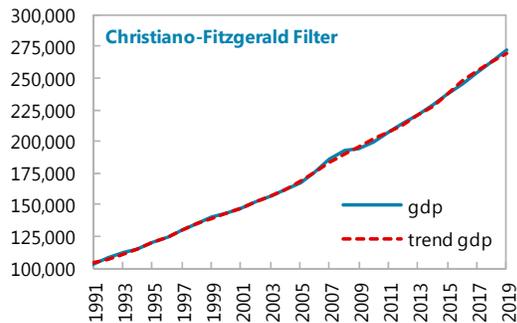
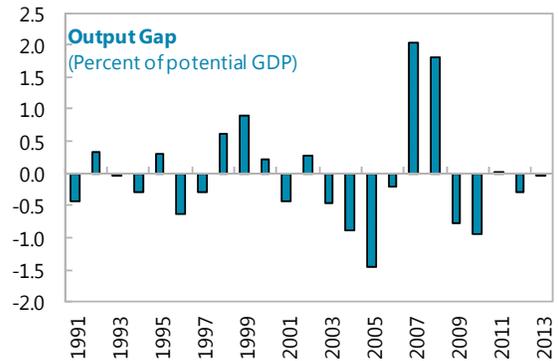
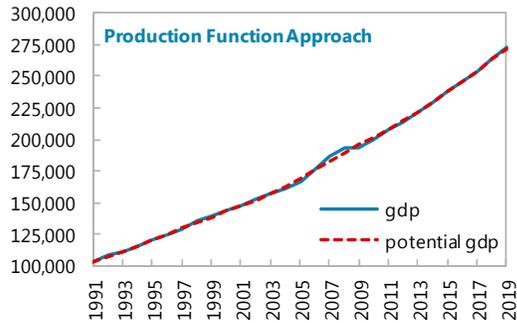
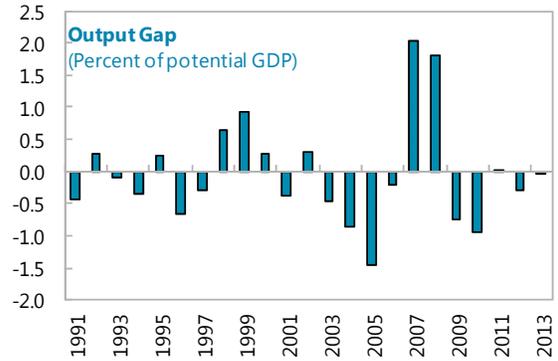
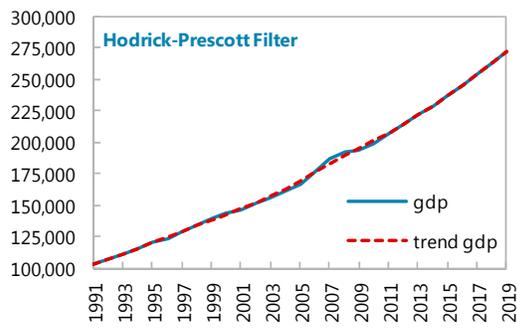
formal causal inference, these years correspond to the turmoil in international markets and declining terms-of-trade; the free trade agreement with U.S.; the global financial crisis; and the global slowdown and lower world commodity prices. The signs of the structural change are in line with the expected intuition given these events. After 1998, potential output grew slower than in the previous period. The opposite happened after 2005. Finally, after 2008, potential output decelerated again.



Source: Fund staff estimates.

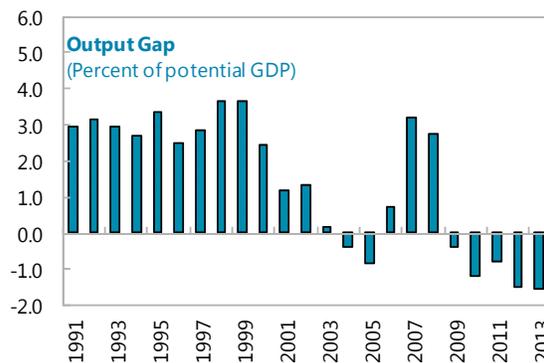
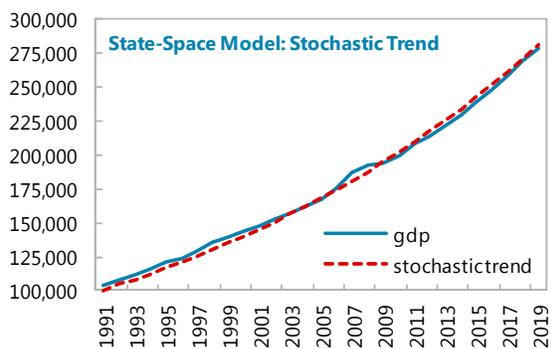
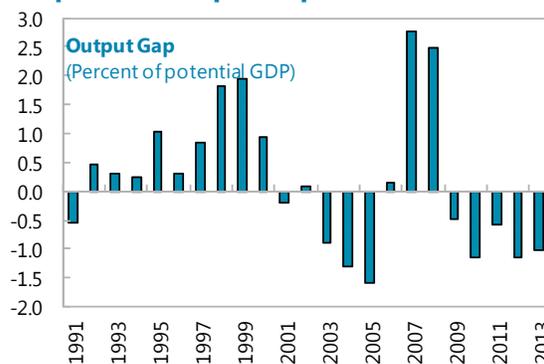
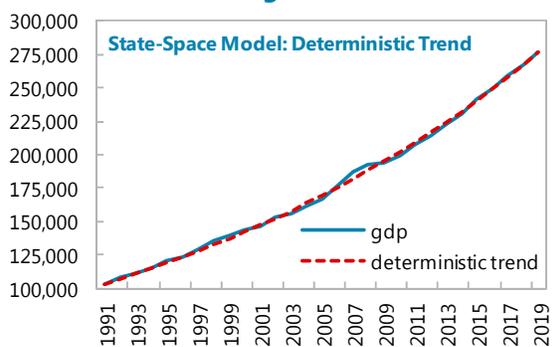
12. **Strengthening capital, labor, and TFP growth going forward is critical to accelerate potential growth.** For example, higher domestic saving, and thus investment, could enhance the contribution of capital to long-term growth. TFP performance could be raised by improving the business climate, enhancing competition in product and labor markets, designing entry and exit regulations to facilitate the reallocation of resources to new and high-productivity sectors, improving infrastructure, promoting deeper and more efficient financial markets, enhancing R&D, and strengthening institutions to secure property rights and combat corruption. Improving the education performance can both positively affect the labor input as well as TFP growth. Tax reforms to raise revenues are essential to support spending on high-quality investment and infrastructure, as well as education.

Figure 1. Guatemala: Potential Output and Output Gap 1991–2019



Source: Fund staff estimates.

Figure 2. Guatemala: Potential Output and Output Gap



Source: Fund staff estimates.

References

- Bai, J., 1997. Estimating Multiple Breaks One at a Time. *Econometric Theory* 13, 315-52.
- Bai, J., Perron, P., 1998. Estimating and Testing Linear Models with Multiple Structural Changes. *Econometrica* 66, 47-78.
- Cerra, V. and S. Chaman Saxena, 2000, "Alternative Methods of Estimating Potential Output and the Output Gap: An Application to Sweden." IMF Working Paper 00/59 (Washington: International Monetary Fund).
- Hamilton, J., 1989, "A New Approach to the Economic Analysis of Nonstationary Time Series and the Business Cycle", *Econometrica* 57(2): 357-84.
- Hamilton, J., 1990, "Analysis of Time Series Subject to Changes in Regime", *Journal of Econometrics* 45: 39-70.
- , 1991, "A Quasi-Bayesian Approach to Estimating Parameters for Mixtures of Normal Distributions", *Journal of Business and Economic Statistics* vol. 9: 27-39.
- , 1993, "Estimation, Inference, and Forecasting of Time Series Subject to Changes in Regime", in Eds. G. D. Maddala, C. R. Rao, and H. D. Vinod, *Handbook of Statistics*, Vol. 11: 231-59, New York.
- , 1994, *Time Series Analysis*. Princeton University Press.
- Johnson, C., 2013. Potential Output and Output Gap in Central America, Panama and Dominican Republic, IMF Working Paper 13/145, June (Washington: International Monetary Fund).
- Konuki, T., 2008, "Estimating Potential Output and the Output Gap in Slovakia." IMF Working Paper 08/275 (Washington: International Monetary Fund).
- Sosa, S., Tsounta, E. and Kim, H., 2013. Is the Growth Momentum in Latin America Sustainable? IMF Working Paper 13/109, May (Washington: International Monetary Fund).
- Swiston, A., Barrot, L. 2011. "The Role of Structural Reforms in Raising Economic Growth in Central America." IMF Working Paper 11/248, October (Washington: International Monetary Fund).

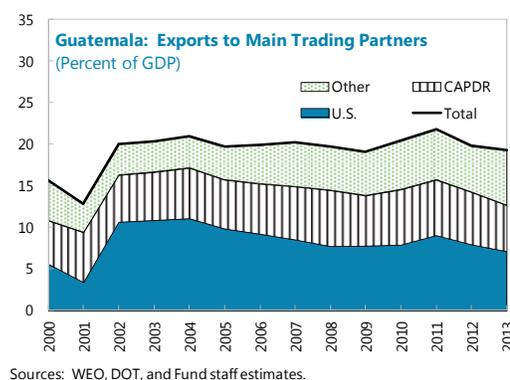
CROSS-BORDER LINKAGES AND SPILLOVERS.¹

This note assesses cross-country linkages of Guatemala and the potential spillovers from growth, fiscal, and financial shocks originating abroad. In regards to growth spillovers, we find that Guatemala is generally less sensitive to external growth shocks than some other countries in the region but shocks originating in the U.S. and other Central American countries have a material impact on growth in line with strong trade ties. Somewhat surprisingly, spillovers from Germany also appear important, possibly reflecting linkages with countries not included in the model. In regards to fiscal spillovers, we find that Guatemala overall is less sensitive to fiscal shocks in the Americas than most other CAPDR countries, and U.S. fiscal policy has the largest impact. Current fiscal plans as well as IMF recommended fiscal adjustments in the region for 2014–2015 are likely to have a limited impact on Guatemala growth. In regards to financial spillovers, we find that stress in international banks is likely to have only a moderate impact on Guatemala, but financial integration in the region plays an important role in the transmission of financial shocks, in particular from Europe.

1. **Economic and financial integration opens new opportunities for Guatemala though presents some risks.** While close trade and financial ties with other countries can allow Guatemala to reap the benefits of global growth, they also expose the country to a range of global shocks. This note analyzes the effect of growth, fiscal, and financial shocks, originating in other countries, on Guatemala using three different models.

A. Trade Linkages

2. **Guatemala has substantial trade linkages with other countries in the region as well as with the United States.** In 2013, 37 percent of Guatemala exports (or 7 percent of GDP) were destined to the United States and another 28 percent (or 5 percent of GDP) were headed to other CAPDR countries, including major export markets in El Salvador, Honduras, and Nicaragua.² Mexico is another important trading partner accounting for 5 percent of total Guatemala exports or 1 percent of GDP. Imports from the U.S. are also large, comprising 36 percent of the total (or 11 percent of GDP), but combined imports from CAPDR and Mexico—24 percent of the total (7 percent of GDP)—are less important. In addition, a substantial share of imports comes from outside the Americas and Europe, mostly from Asia, (22 percent of total or 7 percent of GDP).



¹ Prepared by Eugenio Cerutti, Ewa Gradzka, Anna Ivanova, Rodrigo Mariscal, and Jaime Puig.

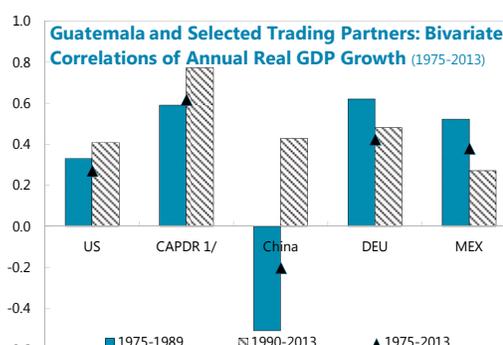
² CAPDR countries include Costa Rica, Nicaragua, Honduras, El Salvador, the Dominican Republic, Panama, and Guatemala.

3. **Guatemala exports to the U.S. are relatively unsophisticated but its exports to the region have a larger share of knowledge-intensive products.** Exports to the U.S. are dominated by vegetables, food, and textiles, in which Guatemala has a revealed comparative advantage (Figure 1). Exports to other CAPDR countries include a larger share of knowledge-intensive products, such as chemicals, though food, textiles, and other goods are still important. While Guatemala has maintained its comparative advantage in raw materials over time, its comparative advantage in consumer goods has been declining and the country has only started gaining some advantage in intermediate goods with capital goods remaining outside of Guatemala expertise. Not surprisingly, imports from the U.S. and Asia are dominated by relatively sophisticated products, such as, knowledge-intensive machinery and equipment, and transportation, as well as fuels.

B. Real Growth Spillovers

4. **Simple correlations reveal strong association between Guatemala GDP growth and that of other CAPDR countries but less so with the U.S.**

The correlation coefficient of Guatemala annual growth with that in other CAPDR countries is around 0.6 for the period 1975–2013. However, the correlation has increased over time and approached 0.8 during the period 1990–2013. In contrast, correlation with the U.S. growth, while statistically significant, is relatively weak (0.3 for the whole period). The correlation with German growth (0.4 for the whole period), though it declined over time, is larger than that with the U.S., despite the weak trade connection with this country and with Europe more generally. Correlation with Mexico growth (0.4 for the whole period) is also less pronounced than that with other CAPDR countries. While there is no statistically significant association with China for the period as a whole, the correlation has risen substantially over time and has become positive and statistically significant in the past decade.



Sources: WEO and Fund staff estimates.
1/ PPP-weighted average.

5. **Increased correlations with the rest of the region and China are a common pattern but changes in correlations with the U.S., Mexico, and Europe are country-specific.**

Correlations with other CAPDR countries are pronounced for most countries in the region. Correlation with the U.S. is stronger for Costa Rica than for other countries in the region. Larger growth correlations with other CAPDR countries and China over time (Figure 2) could reflect a higher degree of regional and global trade integration. However, correlation of U.S. growth with Costa Rica and Honduras has declined over time while that with Guatemala, the Dominican Republic and Nicaragua has risen. No common pattern also emerged in relation to Europe, proxied by Germany, or Mexico. While interpreting correlations is difficult, differences over time could reflect structural changes, including a growing role of non-traded services in the U.S., changes in trade composition of CAPDR countries as well as changes in migration patterns that determine remittances flows. Swiston (2010),



Sources: WEO and Fund staff estimates.
1/ PPP-weighted average.

for example, finds stronger correlations of CAPDR countries' growth with U.S. industrial production, which incorporates a larger component of tradable goods, than that with the overall U.S. GDP. The difference is somewhat more pronounced for Guatemala than for other countries in the region, suggesting that a more nuanced approach to growth spillovers may be warranted.

6. **A multi-country VAR model was used to assess the impact of growth spillovers in Guatemala, while taking into account multilateral linkages.** The model described in Poirson and Weber (2011) assesses sensitivity of Guatemala GDP growth to growth shocks originating in its main trading partners while taking into account growth spillovers between all countries in the sample. It employs a structural VAR with the following reduced form specification

$$B(L)y_t = D(L)x_t + e_t$$

where y is obtained by stacking each country's GDP growth rate at time t $y_{i,t}$ in a vector $y_t = (y_{1,t}, \dots, y_{i,t}, \dots, y_{i,t})$ and the control vector x includes a dummy variable for global crises (oil crisis of 1979, Gulf war crisis of 1990, EMU crisis of 1991, and global financial crisis of 2008–2009), and a dummy for Guatemala's civil war (1960–1996) as well as a constant term. The VAR was estimated on quarterly growth rates of real seasonally-adjusted GDP series for the period 1977Q1 to 2013Q4 in a sample of 6 countries/regions, namely, the United States, China, Germany, Mexico, an PPP-weighted average of 6 Central American countries (Costa Rica, Nicaragua, the Dominican Republic, Panama, Honduras, and El Salvador) and Guatemala. The VAR included one lag—the optimal lag-length according to most lag-selection criteria, including the Akaike, Schwartz, and Hannan-Quinn information criteria.

7. **The model was identified through the Cholesky ordering of the countries.** This approach assumes that the growth rate of any country i does not depend contemporaneously on the growth rate of a country j ordered after country i . The ordering was chosen based on the results of the previous work on spillovers, including, Bayoumi and Swiston (2009) and Swiston (2010) with the U.S. ordered first and other countries' according to their relative size, namely, China, Germany, Mexico, an average of 6 Central American countries and Guatemala. For comparison the model was also estimated for Costa Rica, El Salvador, and Honduras with the Central America averages being replaced accordingly to exclude the country of interest. We have experimented with other orderings but the results for Central America proved robust to ordering variations. The approach allows computing structural errors and coefficients that are used in the calculation of the impulse response functions. It also allows decomposing historical real GDP growth rate into the long-run, dynamic domestic and dynamic foreign components. The dynamic contributions were derived from the moving average representation of the entire history of each country's growth rate and the structural errors, which allowed computing the contribution of the respective country's shocks to the quarterly growth rate of GDP of the country under consideration. The long-run growth component is estimated by the constant term.

8. **Two types of data interpolations were used.** Since there were gaps in real GDP data for many Central American countries, we had to interpolate from annual to quarterly data to fill in those gaps. We employed two different interpolation methods to check the robustness of the results. First,

we used a linear interpolation method, which involves linear projection between annual data points to substitute for the quarterly missing values. Second, we employed the method of Deeset et al. (2007), which utilizes the pattern of persistence derived from the available quarterly data to interpolate the annual series and thus generate the missing quarterly data.

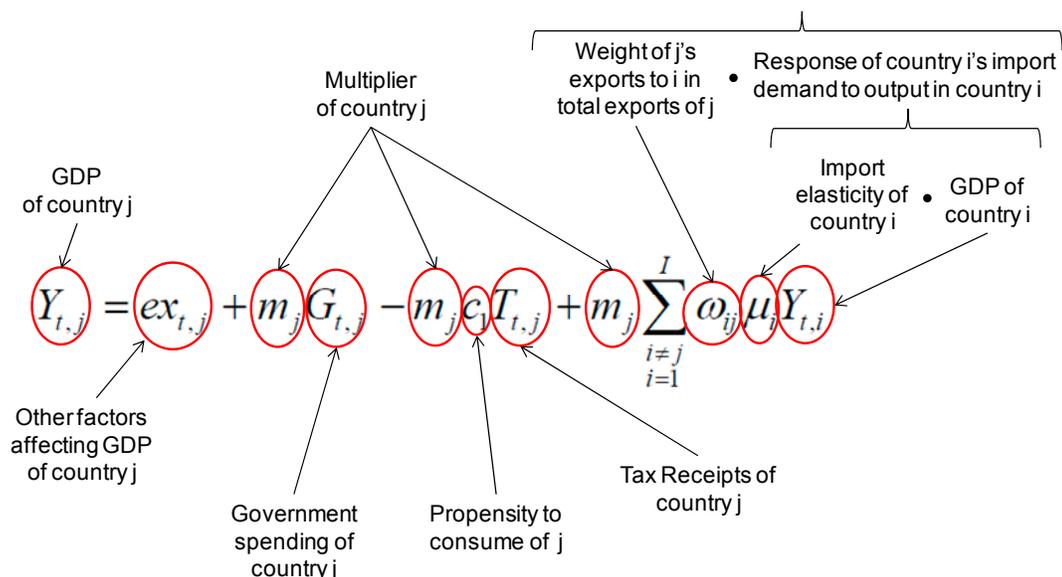
9. **The results suggest that shocks originating in the U.S., Central America, and Germany have a material, albeit contained, impact on Guatemala.** A 1 percentage point reduction in domestic demand growth in the U.S. over a year leads to a maximum reduction in growth in Guatemala by 0.4 percentage points (Figure 3). Similarly, a 1 percentage point reduction in growth in other Central American countries over a year would lower Guatemala growth by at most 0.4 percentage points and the shock to German domestic demand growth would have a similar impact. The shock to Chinese domestic demand growth would be felt less (a reduction of at most 0.2 percentage points). The increased importance of the shocks from the U.S. and the decreased importance of the shocks from the rest of the region in VAR estimates compared to simple correlations may be explained by the fact that all CAPDR countries are linked to the U.S. and regional linkages amplify the shocks originating in the U.S. As a result, simple correlations capture not only “authentic” CAPDR shocks but also the amplification of the U.S. shocks through regional connections. The VAR, in contrast, allows tracing the shocks down to their origin, in this case to the U.S and CAPDR countries. Nonetheless, the estimates also confirm the importance of the “authentic” regional shocks for Guatemala. Finally, the results imply that the “external growth locomotive,” captured by the dynamic foreign component, has slowed since the 2008 financial crisis and Guatemala may have to rely more on domestic growth sources going forward (Figure 3).

10. **The relatively large magnitude of Germany’s impact is puzzling.** While the importance of U.S. and CAPDR shocks is consistent with the preeminence of these countries as the main destinations of Guatemala exports, the size of the effect of German shocks is at odds with the comparatively small share of exports to Germany. This result could point to indirect linkages with Europe through third countries. Alternatively, it could reflect linkages with third countries not included in the model through Germany given Germany’s role as a transmitter and amplifier of growth shocks originating in other countries emphasized by Poirson and Weber (2011). Finally, it could capture some other shocks important for Central America, which happen to be correlated with shocks in Germany (as a proxy for Europe).

11. **Guatemala is generally less sensitive to external growth shocks than some other countries in the region.** Figure 3 demonstrates the impact on Guatemala and Costa Rica of a 1 percent shock over a year (four quarter shock) to the dynamic domestic growth component in 2014 in the U.S., Germany, China and other CAPDR countries. Costa Rica is generally more sensitive to external growth shocks than Guatemala, particularly to the shock from the U.S. with elasticity exceeding unity. Guatemala appears also less sensitive to external shocks than Honduras (the results are not shown).

C. Fiscal Spillovers

12. **To assess the impact of fiscal spillovers from other countries to Guatemala, a multi-country demand model was employed.** The model described in Ivanova and Weber (2011) is based on the representation of the national accounts and behavioral assumptions for government spending, taxes, consumption, investment, exports and imports:



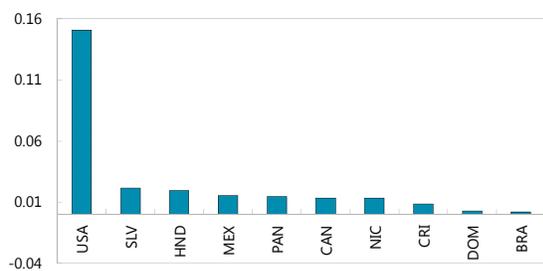
It allows simulating the impact on growth from domestic and foreign fiscal policy changes in a number of countries linked by trade. Consistent with empirical findings in the literature, fiscal measures are assumed to have an impact on GDP not only in the period, in which they are enacted, but also in the following period. The model was solved simultaneously for 20 countries, including those in CAPDR, which together account for 70 percent of the world GDP.³ The solution reflects third-country linkages among the countries in the sample as well as feedback loops between foreign and domestic fiscal policies. The approach, however, quantifies only the direct demand impact and does not reflect credibility or other non-demand driven effects to the extent that they are not embedded in the underlying multiplier estimates. Moreover, it focuses on a short-term impact (two years) and may not fully capture the effects of exchange rate and price adjustments, which are likely to reduce fiscal spillovers in the longer-term.

13. **Guatemala is less sensitive to fiscal shocks in the Americas than most CAPDR countries, with U.S. fiscal policy having the largest impact.** A uniform fiscal expenditure impulse of a 1 percentage point of GDP in all countries in the sample from the Americas (the U.S., CAPDR,

³ The full list of countries included the UK, Germany, France, Italy, Russia, Japan, China, India, South Korea, the U.S., Canada, Brazil, Mexico, Honduras, Guatemala, El Salvador, the Dominican Republic, Costa Rica, Nicaragua, and Panama.

Mexico, Canada and Brazil) would reduce Guatemala growth by just over 0.2 percentage points over two years.⁴ This is significantly lower than the impact of a similar shock on some other CAPDR countries, in particular Costa Rica (close to 0.6 percentage points). Each percentage point of GDP reduction in government spending in the U.S. would reduce Guatemala growth by about 0.15 percentage points over 2 years. Fiscal spillovers from other Central and Latin America countries would have only a marginal impact.

Guatemala: Fiscal Spillovers from a Uniform Fiscal Impulse in the Americas by Country
(Cumulative effect on growth over two years) 1/



Sources: WEO, DOT, and Fund staff estimates.
1/ Fiscal impulse is an increase in expenditure of 1 percent of GDP in all Central American countries, the U.S., Canada, Mexico and Brazil.

Central America: Total Fiscal Spillovers from a Uniform Fiscal Impulse in the Americas
(Cumulative effect on growth over two years) 1/



Sources: WEO, DOT, and Fund staff estimates.
1/ Fiscal impulse is an increase in expenditure of 1 percent of GDP in all Central American countries, the U.S., Canada, Mexico and Brazil.

14. Fiscal policy under the WEO baseline or that recommended by the IMF staff for 2014–15 in the Americas would have limited impact on Guatemala growth. Under the baseline WEO scenario, the impact of fiscal policy changes in other countries on Guatemala growth in 2014–15 is close to zero. A small domestic fiscal relaxation in Guatemala in 2014 is offset by the lingering effect of the small fiscal tightening in 2013. With almost no expected change in domestic fiscal policy in 2015, a small positive carry over from 2014 is offset by the negative fiscal spillovers from trading partners as consolidation in Honduras, Nicaragua, Panama, and the U.S. accelerates in 2014–15 compared to 2013–14. An alternative scenario incorporating IMF staff advice for 2014–15 featuring fiscal adjustments of about 2 percentage points of GDP in Costa Rica, the Dominican Republic and El Salvador and an adjustment of about 0.3 percentage points of GDP in Guatemala over two years—all assumed to be made through expenditure reductions, which have larger fiscal multipliers—would have no material impact on growth in Guatemala in 2014 and would reduce growth by 0.2 percentage points in 2015, largely on the account of domestic consolidation.

⁴ The assumptions on fiscal multipliers for larger countries come from the empirical literature (see Ivanova and Weber 2011 for detail), for Central American countries multipliers were assumed in line with those for the U.S. with average revenue/expenditure multiplier in the first year of about 0.4.

Fiscal Contribution to Growth Under the Baseline

(In percentage points)

	2014				2015			
	Change in the Fiscal Balance	Total Growth Impact	Of which:		Change in the Fiscal Balance	Total Growth Impact	Of which:	
			Domestic Effect	Spillover Effect			Domestic Effect	Spillover Effect
Guatemala	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	-0.1
<i>of which:</i>								
- current year		0.1	0.2	-0.1		-0.1	0.0	-0.1
- carry over prev. year		-0.1	-0.1	0.0		0.0	0.1	-0.1
PPP weighted average	0.4	-0.4	-0.3	-0.1	0.5	-0.5	-0.4	-0.1

Source: Fund staff estimates.

Fiscal Contribution to Growth Under the Recommended Fiscal Path

(In percentage points)

	2014				2015			
	Change in the Fiscal Balance	Total Growth Impact	Of which:		Change in the Fiscal Balance	Total Growth Impact	Of which:	
			Domestic Effect	Spillover Effect			Domestic Effect	Spillover Effect
Guatemala	-0.1	0.0	0.0	-0.1	0.3	-0.2	-0.1	-0.1
<i>of which:</i>								
- current year		0.1	0.2	-0.1		-0.2	-0.2	-0.1
- carry over prev. year		-0.1	-0.1	0.0		0.0	0.1	-0.1
PPP weighted average	0.4	-0.4	-0.3	-0.1	0.5	-0.5	-0.4	-0.1

Source: Fund staff estimates.

D. Financial Spillovers

15. **To assess the impact of financial spillovers to Guatemala from stress in international banks, the IMF Bank Contagion Module was used.**⁵ This module, based on BIS banking statistics and bank-level data, estimates potential rollover risks for Guatemala stemming from both foreign banks' affiliates operating in Guatemala and foreign banks' direct cross-border lending to Guatemala borrowers. Rollover risks were triggered in the scenarios analyzed here by assuming bank losses in the value of private and public sector assets in certain countries and/or regions. If the banks do not have sufficient capital buffers to cover the losses triggered in a given scenario, they have to deleverage (reduce their foreign and domestic assets) to restore their capital-to-asset ratios,⁶ thus squeezing credit lines to Guatemala and other countries. The estimated impact on

⁵ For methodological details see Cerutti, Eugenio, Stijn Claessens, and Patrick McGuire, 2012, "Systemic Risks in Global Banking: What can Available Data Tell Us and What More Dare are Needed?" BIS Working Paper 376, Bank for International Settlements.

⁶ Bank recapitalizations as well as other remedial policy actions (e.g., ring fencing, monetary policy, etc.) at the host and/or home country level are not assumed.

losses in cross-border credit availability for Guatemala also incorporates the transmission of shocks through Panama, given its central financial role in the region. The assumption is that cross-border lending from Panama to Guatemala declines proportionally to the decline in cross-border lending from the banking systems where the shocks originate to Panama.⁷

16. Spillovers to Guatemala from stress in international banks are moderate. The impact on foreign credit availability in Guatemala of the severe stress scenarios in asset values of BIS reporting banks presented in the table below would be much more limited than in other countries in the region with larger upstream exposures. Indeed, data on upstream exposures of Guatemala to international banks⁸ suggests that the upper limit of rollover risks on external credit is about 5 percent of GDP, or 10 percent of total domestic and cross-border credit to the public and private sectors in Guatemala, as of September 2013.⁹ This upper limit would correspond to a worst case scenario without any replacement, either domestic or external, of the loss of credit by BIS reporting banks to Guatemalan borrowers.

17. Spillovers from U.S. banks are even more moderate, but financial regional integration is important in the transmission of shocks.

Despite the large share of U.S. banks in total foreign bank claims on Guatemala, the impact of U.S. asset losses in U.S. and international banks on cross-border credit availability in Guatemala—0.3 percent of GDP in response to a 10 percent loss in U.S. asset values—is limited. This effect has declined in recent years reflecting both the strengthening in international banks’ capital buffers and the cross-border deleveraging of assets after the global financial crisis. As of September 2013, the most sizable impact on claims on Guatemalan borrowers would stem from shocks in Europe. A 10 percent loss on European assets would result in a reduction in credit availability to Guatemala of almost 2 percent of GDP. This result is also driven by the increasing importance of financial integration with other countries in the region. Almost one third of the estimated credit losses in Guatemala resulting from a shock originating in Europe would be transmitted through cross-border lending from Panama, which is more dependent on European banks’ funding.

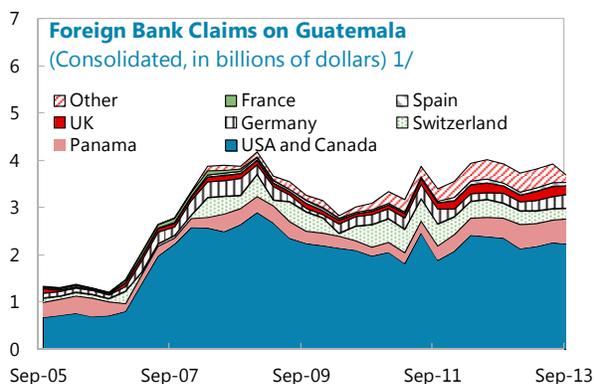


Sources: BIS and Fund staff estimates.
1/ In Panama, the loss of credit includes credit by banks in the off-shore center with minimal links to the domestic economy.

⁷ Panamanian banks have a more limited integration in the network analysis as they merely transmit the stress in international banks, rather than also being subjected to stress scenarios of losses in their asset values.

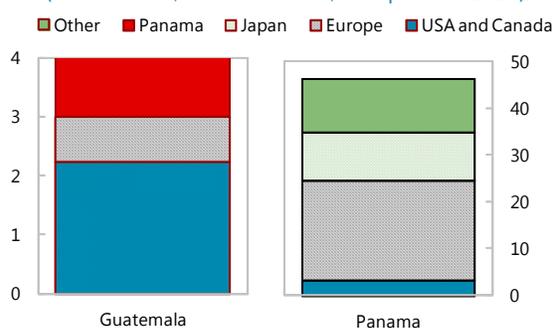
⁸ Based on consolidated claims on Guatemala of BIS reporting banks—excluding domestic deposits of subsidiaries of these banks in Guatemala.

⁹ Total credit to the non-bank sectors in Guatemala is calculated by adding IFS local (both domestic and foreign owned) banks’ claims on non-bank borrowers and BIS reporting banks’ direct cross-border claims on non-bank sectors (BIS Locational Banking Statistics Table 6B).



Sources: BIS and Fund staff estimates.
1/ Claims on ultimate risk basis, except for claims of Panamanian banks which are on immediate risk basis.

Foreign Bank Claims on Guatemala and Panama (Consolidated, in billion dollars, as September 2013)



Source: BIS.
1/ Claims on ultimate risk basis, except for claims of Panamanian banks on Guatemala, which are on immediate risk basis.

Spillovers to Guatemala from International Banks' Exposures as of September 2013^{1/}

	Shock Originating From Magnitude 2/	Impact on claims on GTM borrowers (percent of GDP) 3/
USA	10	-0.25
Canada	10	-0.22
USA and Canada	10	-0.57
UK	10	-0.52
Switzerland	10	-0.15
Germany	10	-0.77
France	10	-0.14
Spain	10	-0.19
Netherlands	10	-0.16
Italy	10	-0.02
Greece	10	-0.03
Portugal	10	-0.01
GIP 4/	10	-0.05
Japan	10	-0.27
Korea	10	0.00
Taiwan	10	0.00
European Countries 5/	10	-1.89

Sources: RES/MFU Bank Contagion Module based on BIS, ECB, and IFS data.

1/ In addition to shocks and spillovers through core banking systems, Fund staff analyzed spillovers through Panama.

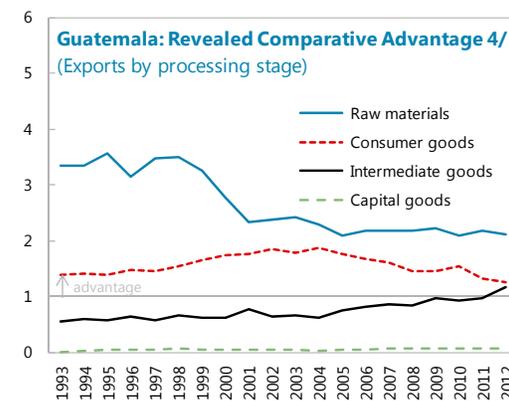
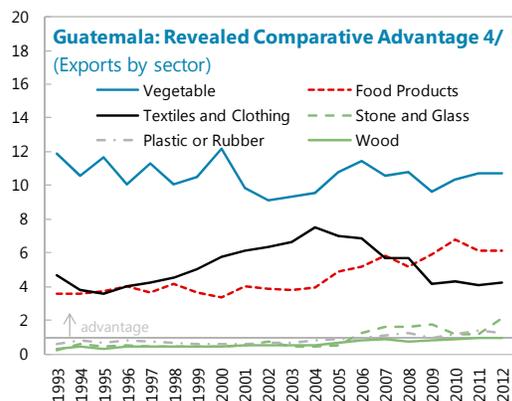
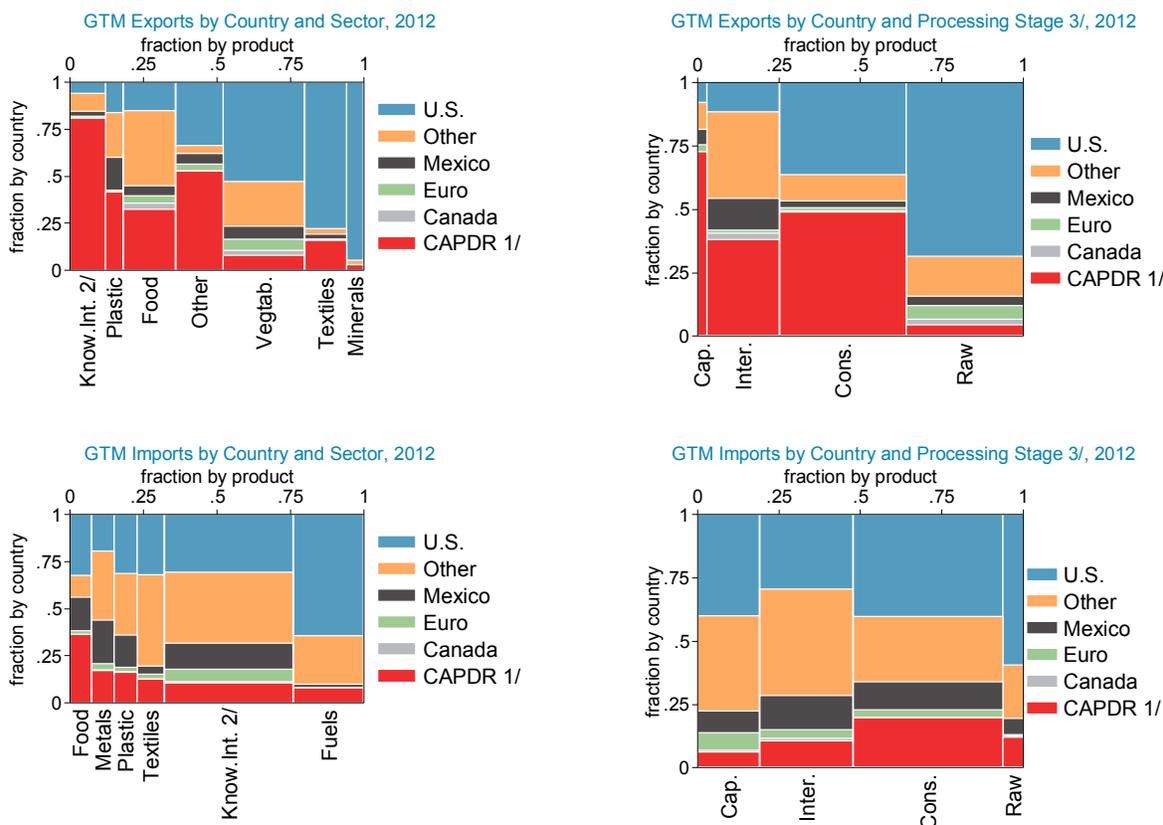
2/ Magnitude denotes the percent of on-balance sheet claims (all borrowing sectors) that default.

3/ Reduction in foreign banks credit to Guatemala due to the impact of the analyzed shock on their balance sheets, assuming a uniform deleveraging across domestic and external claims.

4/ Greece, Ireland, and Portugal.

5/ Greece, Ireland, Portugal, Italy, Spain, France, Germany, Netherlands, and UK.

Figure 1. Guatemala: Trade Linkages



Sources: WITS World Bank, UNSD Comtrade, and Fund staff estimates.

^{1/} Other CAPDR includes Costa Rica, Honduras, Nicaragua, El Salvador, Panama and the Dominican Republic.

^{2/} Knowledge Intensive products include transport, electrical equipment, machinery and chemicals.

^{3/} The stages of processing include capital goods, consumer goods, intermediate goods and raw materials.

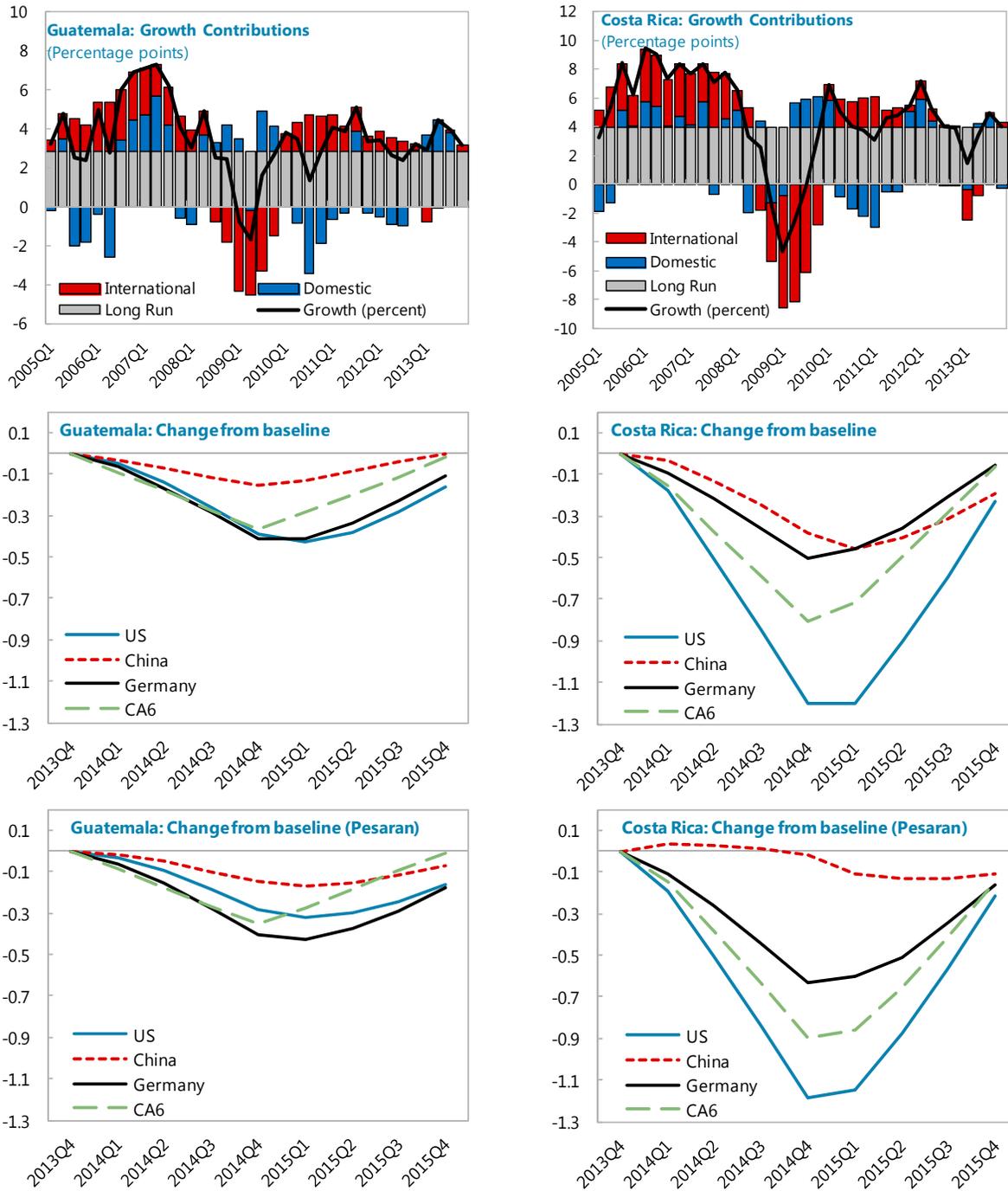
^{4/} The Revealed Comparative Advantage index of country *i* for product *j* is measured by the product's share in the country's exports in relation to its share in world trade: $RCA_{ij} = (x_{ij} / X_{it}) / (x_{wj} / X_{wt})$ Where x_{ij} and x_{wj} are the values of country *i*'s exports of product *j* and world exports of product *j* and where X_{it} and X_{wt} refer to the country's total exports and world total exports. A value that exceeds unity implies that the country has a revealed comparative advantage in the product.

Figure 2. Central America and Selected Trading Partners: Bivariate Correlations of Annual Real GDP Growth, 1975-2013



Sources: WEO and Fund staff estimates.
1/ PPP weighted average.

Figure 3. Guatemala, Costa Rica, and Selected Trading Partners: Real Growth Spillovers



Source: Fund Staff estimates.

References

- Bayoumi, Tamim., and Andrew Swiston, 2009, "Foreign Entanglements: Estimating the Source and Size of Spillovers Across Industrial Countries." *IMF Staff Papers*, Vol. 56 (June), pp. 353–83.
- Cerutti, Eugenio, Stijn Claessens, and Patrick McGuire, 2012, "Systemic Risks in Global Banking: What can Available Data Tell Us and What More Dare are Needed?" BIS Working Paper 376, Bank for International Settlements.
- Dees, S., F. di Mauro, M. H. Pesaran and L. V. Smith (2007) "Exploring the International Linkages of the Euro Area: A Global VAR Analysis", *Journal of Applied Econometrics*, 22, pp. 1-38
- Ivanova, Anna and Sebastian Weber, 2011, "Do Fiscal Spillovers Matter?" IMF Working Paper 11/211, Washington: International Monetary Fund.
- Poirson Hélène, and Sebastian Weber (2011) "Growth Spillover Dynamics from Crisis to recovery", IMF Working Paper 11/218. Washington: International Monetary Fund.
- Swiston, Andrew (2010). Spillovers to Central America in Light of the Crisis: What a Difference a Year Makes. IMF Working Paper 10/35.

THE EFFECT OF U.S. TAPERING¹

This note assesses the potential impact of normalization of monetary policy in the U.S. on Guatemala. The results indicate that substantial trade ties with the U.S. and relatively robust macroeconomic fundamentals will help Guatemala to weather this global transition well, at least, in the short run.

1. **An exit from U.S. unconventional monetary policy presents new challenges for Guatemala.** While faster-than-expected growth in the U.S. would help stimulate exports and remittances, the withdrawal of the monetary stimulus by the Federal Reserve could lead to a faster tightening of global financial conditions and, possibly, higher market volatility as the global risk appetite declines. Tighter financial conditions would imply higher financing costs for the government and the private sector with negative implications for domestic investment and consumption.
2. **These developments may be particularly relevant because Guatemala has substantial economic ties with the U.S.** About 40 percent of total Guatemala exports are heading to the U.S. and almost 40 percent of total exports to other Central American countries and Mexico, which are linked to the U.S. through trade. However, a simple correlation of Guatemala real exports growth with that of U.S. real GDP growth, while statistically significant, is relatively low (0.3). The link through remittances, which comprise almost 10 percent of Guatemala GDP, on the other hand, is much stronger with a simple correlation of 0.9. A VAR approach that takes into account demand shocks outside the U.S. and allows tracing down the shocks to their origin (Analytical Note II: Cross-Border Linkages and Spillovers) suggests an elasticity of Guatemala real GDP growth to a U.S. real domestic demand shock of about 0.4.
3. **The note employs two approaches to analyzing the impact of U.S. tapering on the economy of Guatemala.** First, we use an empirical approach to assess the effect of changes in U.S. monetary policy on external government financing costs and GDP growth in Guatemala. Second, we employ a system of general equilibrium models to simulate the impact of faster growth in the U.S., accompanied by tighter global financial conditions, on Guatemala GDP, inflation, current account and other macroeconomic variables under various scenarios.

A. Empirical Approach

4. **A regression-based approach was used to assess the effects of U.S. tapering on external government financing costs.** The model was inspired by Evan Papageorgiou's work in Chapter 1 of the April 2013 Global Financial Stability Report. Specifically, a random effects panel regression model was estimated linking the spread between the yield on foreign currency

¹ Prepared by Patrick Blagrove, Anna Ivanova, Keiko Honjo, and Jaume Puig.

government bonds and U.S. bonds (EMBI spread) to domestic and external conditions at monthly frequency in a sample of Latin American countries,² namely,

$$EMBI_{it} = \alpha * INT_t^{US} + \beta * VULN_i + \gamma * INT_t^{US} * VULN_i + \eta * ICRG_{it} + \delta_i + \varepsilon_{it}$$

where $EMBI_{it}$ is EMBI spread of country i at time t , INT_t^{US} is the level of U.S. real interest rate (the yield on U.S. Treasury Inflation-Protected Securities, TIPS), which captures global financial conditions; $VULN_i$ is a time-invariant index of domestic vulnerabilities constructed by the team, which captures domestic economic fundamentals that are not changing substantially from month-to-month (see below); $ICRG_{it}$ is a time-varying index of domestic political, financial and economic risk from International Country Risk Guide (ICRG),³ which captures short-term movements in domestic conditions. δ_i is a country's random effect, which is assumed to be uncorrelated with the other regressors.

5. **An important explanatory variable in the empirical model is a measure of domestic vulnerabilities.** The latter is captured by the time-invariant index, the values of which are summarized below in the text table. The index is based on 21 economic indicators (Table 1) that were found important in predicting the risk of capital flow reversal as well as movements in asset prices.⁴ The indicators were grouped in 7 major categories, including a measure of the size of the recent capital inflows, external balance and debt, the amount of local debt securities held by foreigners, reserve cushion, fiscal position as well as banking system and private sector leverage. Each indicator was compared to two thresholds either found important in earlier studies or based on the standard deviations in the sample to assign a score of 0, 1 or 2 with 0 capturing less vulnerability. Then the index was constructed based on the weighted average of these scores with 55 percent weight put on indicators of external vulnerability, which were found particularly important in the literature, 20 percent weight on the fiscal position, 15 percent weight on banking vulnerabilities and 10 percent weight on the share of local debt securities held by foreigners.

² The sample covers the period from January 2013 to January 2014 in eleven Latin American countries, including six from Central America (Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras and Panama), as well as Brazil, Chile, Colombia, Mexico, and Peru.

³ The International Country Risk Guide (ICRG) database maintained by the PRS Group provides a monthly composite country risk index that summarizes political, financial and economic conditions in a range of developed and emerging market countries. Sub-components of the index include GDP growth, inflation, fiscal and current account balances, external debt, official reserves, exchange rate volatility, as well as other measures of socioeconomic conditions, law and order, and democratic accountability.

⁴ Milesi-Feretti and Razin (1996, 1997a, 1997b), Razin (1998), Barclays Research Note (2013), Bowman D., H. Londono, and H. Sapriza (2014).

6. **Guatemala enjoys a relatively favorable position compared to other Central American countries in terms of domestic vulnerabilities.** This reflects its low external debt, relatively robust fiscal position, sufficient reserve cushion, and subdued capital inflows during 2010–2012 (text table and Table 1). While there are no “red flags”, Guatemala’s current account deficit of 3 percent of GDP in 2013 indicates some dependence on external funding, though the large share of relatively stable FDI mitigates the risk. In addition, the recent expansion of private credit with an increased reliance on bank foreign funding is a source of vulnerability.

	Weight in total indicator	Central America							LA5 (PPP-weighted average)
		CRI	DR	GTM	HND	NIC	PAN	SLV	
Size of recent capital inflows	0.10	1	1	0	1	2	2	0	0.8
External balance	0.15	1	1	1	1	2	1	1	1.1
External Debt	0.10	1	0	0	0	1	2	1	0.4
Debt securities held by foreigners	0.10	0	0	0	0	0	0	0	0.8
Gross reserve cushion	0.20	0	2	0	2	0	1	1	0.0
Fiscal position	0.20	2	1	0	2	0	0	2	0.8
Banking system and private sector leverage	0.15	1	0	1	1	0	2	1	0.6
Overall	1.00	0.9	0.9	0.3	1.2	0.6	1.1	1.0	0.6

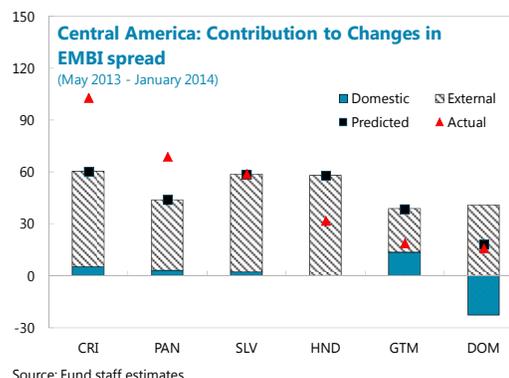
7. **Empirical model estimates suggest a differential response of bond spreads to the tightening of global financial conditions in Latin America, depending on the degree of domestic vulnerabilities.**

The increase in the EMBI spread in response to an increase in the U.S. real interest rate is more pronounced for countries that are more vulnerable to capital flow reversal. In particular, an increase in U.S. real interest rates by 100 basis points is associated with an increase in EMBI spread of about 20 basis points in a country that exhibits low vulnerability (vulnerability index=0). A similar increase in the U.S. real rates in a highly vulnerable country (vulnerability index=2) would be associated with an increase in EMBI spread of about 75 basis points. In addition, domestic vulnerabilities directly contribute to the level of the EMBI spread, with highly vulnerable countries having a spread of about 430 basis points higher than countries with low vulnerability. Moreover, a reduction in domestic risks, captured by the ICRG index, might help reduce the EMBI spread though this result was not robust across the different econometric specifications.

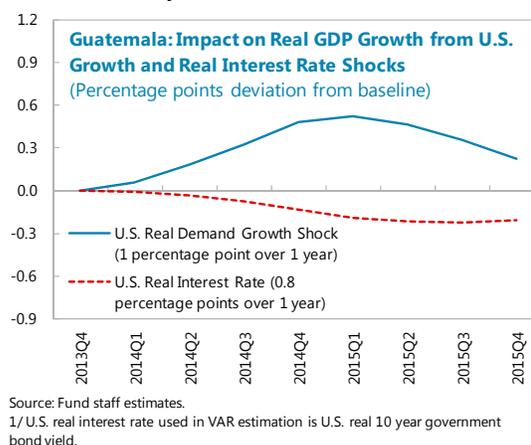
Dependent Variable= EMBI spread	Random effects	Fixed effects
ICRG	-10.3340*** [-4.01]	-4.2176 [-1.47]
INT ^{US}	0.1824** [2.23]	0.2146*** [2.83]
INT ^{US} *VULN	0.2882*** [2.99]	0.2753*** [3.09]
VULN	213.8781*** [5.88]	
Observations	140	140
Between R-squared	0.75	0.68
Number of countries	11	11

8. **Thus, Guatemala’s relatively solid macroeconomic fundamentals will help weather the global transition.** With the index of domestic vulnerability for Guatemala estimated at a low 0.25 on a scale from 0 to 2, the increase in real U.S. interest rates by about 100 basis points that occurred between May 2013 and January 2014, is estimated to have contributed to a widening of Guatemala EMBI spread by 25 basis points. In addition, the deterioration in domestic risk conditions during this period by about 1.3 points, likely related to the postponement of multilateral loans in 2013 and the lack of the newly approved budget for 2014, had the potential to widen the spread by 5 to 13 basis

points. Hence, according to the model, Guatemala EMBI spread should have increased by only 34 to 39 basis points since the start of the U.S. tapering “talk” in May 2013, mirroring the country’s relatively robust macro-economic fundamentals and limited financial integration. In fact,, Guatemala’s EMBI spread widened even less during this period (by 20 basis points), possibly, due to the even smaller weight placed by the markets on changes in domestic conditions. This increase was smaller than that in most other countries in the region.



9. **A VAR approach was used to analyze the impact of U.S. growth and real interest rate shocks on Guatemala GDP growth.** A VAR model described in Analytical Note II (Cross-Border Linkages and Spillovers) was augmented with the U.S. real 10 year government bond yield as an endogenous variable. The results suggest that an increase in U.S. real demand growth by 1 percentage point over 4 quarters would raise Guatemala GDP growth by at most 0.5 percentage points. An increase in U.S. real bond yield by about 0.8 percentage points over 4 quarters would reduce Guatemala GDP growth by 0.2 percentage points. Hence, on balance faster growth in the U.S. and accelerated monetary policy tapering is likely to have a small positive impact on GDP growth in Guatemala.



B. General Equilibrium Model Simulations

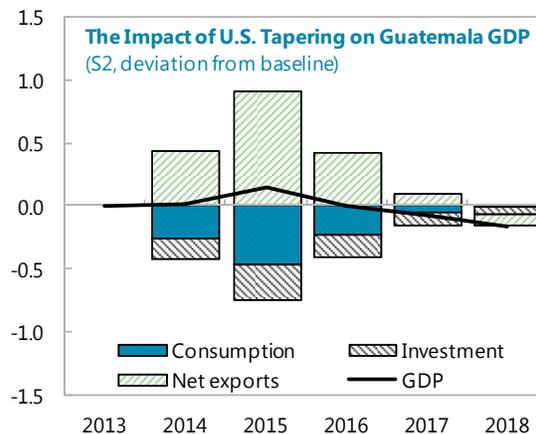
10. **A general equilibrium model was used to assess the impact of U.S. tapering on Guatemala’s GDP and other macroeconomic variables.** The full impact of the U.S. tapering on the Guatemalan economy was assessed using a module of the IMF’s Flexible System of Global Models (FSGM). It comprises a system of multi-region, general equilibrium models combining micro-founded and reduced-form relationships for various economic sectors. The model has a fully articulated demand side, and some supply side features. International linkages are modeled in aggregate for each country/region. The level of public debt in each country and the resulting implications for national savings determine the global real interest rate in the long run. The parameters of the model, except those determining the cost of adjustment in investment, have been estimated from the data using a range of empirical techniques. Real GDP in the model is determined by the sum of the components of demand in the short run and the level of potential output in the long run. The households’ consumption-savings decisions are explicitly micro founded as are firms’ investment decisions. Government absorption is determined exogenously, while imports and exports are specified with reduced-form models.

11. **The model incorporates endogenous rules governing the operation of fiscal and monetary policy.** In particular, the government sector, besides government absorption, encompasses additional spending by the fiscal authority in the form of lump-sum transfers to all households, or targeted exclusively to liquidity constrained households. The fiscal authority chooses a long-run level of debt relative to GDP. In order to meet its debt and deficit targets as well as spending obligations, the governments can employ the following tax instruments: consumption taxes, labor income taxes, corporate income taxes and lump-sum taxes. In the face of shocks to the economy, all tax rates remain fixed and spending on general lump-sum transfers adjusts to ensure that the public debt-to-GDP ratio is maintained in the medium term. Monetary policy is governed by an endogenous rule, which features interest rate smoothing and responds to the deviation of inflation from its target, the deviation of expected inflation from its target, as well as the output gap. Inflation is modeled via a reduced form Phillips' curve with inflation being a function of expected inflation (lag and model-consistent lead), as well as the output gap, and the change in the log of the real effective exchange rate. The exchange rate in the short run is determined via the uncovered interest parity, while in the long run it adjusts to ensure external stability given households desired holdings of net foreign assets.

12. **The simulations included 4 scenarios.** Scenario 1 (S1) features a U.S. growth surprise of about 1 percent by 2015 relative to the baseline (Panels 1 and 2). Scenario 2 (S2) includes faster U.S. growth as in Scenario 1 with U.S. interest rates rising by about 80 basis points, but this is accompanied by an increase in the risk premium outside the U.S., with market interest rates rising by about 1 standard deviation in each Latin America country. The risk-premium shock for Guatemala amounts to an increase of about 100 basis points. This scenario is clearly extreme given the findings of the empirical model above, in which an increase in U.S. interest rates of 80 basis points would be associated with an increase in Guatemala's EMBI spread—a proxy for risk premium—by about only 25 basis points. The simulated scenario is not based on recent developments but rather on a historical one standard deviation of the bond spread weekly changes since end-2011, annualized. Hence, it reflects historical volatility of the EMBI spread and could be viewed as an upper bound on the possible increase in risk premium. Scenario 3 (S3) incorporates, in addition to the assumptions in Scenario 2, an increase in the U.S. risk premium, with the rates rising by about 40 basis points at the peak. Finally, Scenario 4 (S4) incorporates, in addition to the assumptions in Scenario 2, a fiscal consolidation of about ½ percentage points of GDP in the next six years through an increase in consumption taxes. Fiscal consolidation is assumed to result in a smaller increase in risk premium for Guatemala during U.S. tapering of 85 basis points, compared to the 100 basis points in Scenario 2.

13. **The results indicate that the impact of U.S. tapering on Guatemala GDP is likely to be neutral or slightly positive.** In Scenario 1, a U.S. growth surprise of about 1 percent by 2015 relative to the baseline (Panel 1, S1) results in higher GDP in Guatemala by about 0.6 percent compared to the baseline (Panel 2, S1). Faster growth in the U.S. stimulates Guatemala exports while domestic consumption remains largely unchanged. The decline in investment due to higher domestic interest rates, raised in response to output exceeding its potential, is also relatively small. In contrast, in Scenario 2 the acceleration of the U.S. growth is accompanied by an increase in the risk premium, with a substantial increase in market interest rate for Guatemala. In this scenario,

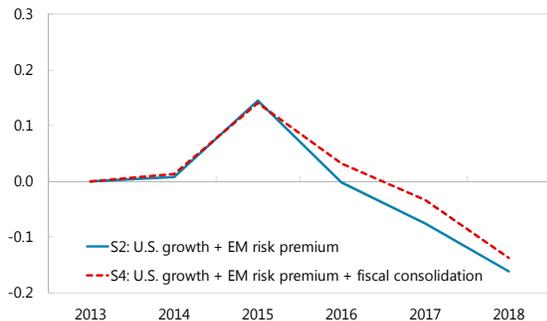
Guatemalan GDP remains essentially unaffected—an increase of only 0.1 percent compared to the baseline—as stronger demand for Guatemala exports from the U.S. is offset by weaker domestic investment and consumption due to tighter financial conditions (Panels 1 and 2, S2). Hence, even this rather severe scenario implies a relatively benign outcome for Guatemala. Finally, in Scenario 3 with the perception of a more “hawkish” U.S. Fed, which is modeled through an increase in the U.S. risk premium and, consequently, a somewhat weaker U.S. growth, the positive impact on Guatemalan GDP is reduced further, albeit only slightly (Panel 2, S3). All 3 scenarios suggest that the longer-term effect could be slightly negative as lower investment due to tighter financing conditions will lead to a temporarily lower potential GDP in Guatemala and the cyclical rise in U.S. imports dissipates as prices and exchange rates adjust and U.S. output returns to its potential.



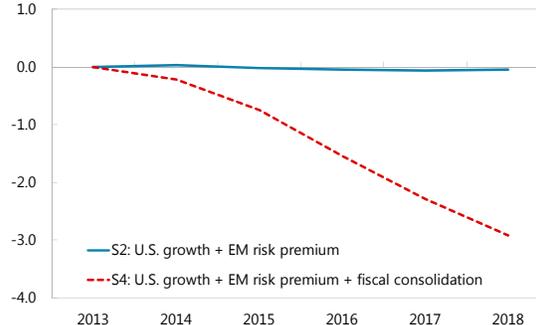
Source: Fund staff estimates.

14. **In addition, the results suggest that Guatemala’s fiscal sustainability objectives can be safely achieved in the context of U.S. tapering.** Specifically, in Scenario 4 with faster growth in the U.S. and accelerated monetary policy tapering accompanied by an increase in risk premium outside the U.S. while Guatemala pursues a modest fiscal tightening of about ½ percentage points of GDP, the country can lower the public debt-to-GDP ratio by about 1 percentage points by 2018 without a significant negative impact on growth. This is because while fiscal tightening has a direct negative impact on domestic demand it also reduces the risk premium, thereby supporting investment, while savings from lower interest payments allow the government to raise transfers, thereby supporting private consumption.

Guatemala: GDP
(Percent deviation from baseline)



Guatemala: Debt-to-GDP
(Percentage points of GDP deviation from baseline)



Source: Fund staff estimates.

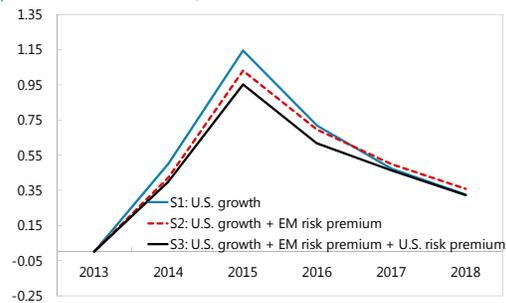
Table 1. Guatemala: Vulnerability Indicators

Category	Indicator	Period	Units	Thresholds	Less vulnerable if the indicator is
Size of recent capital inflows	Cumulative capital inflows proxied by the balance on the financial account	2010-12	% of 2012 GDP	14; 26	Lower
	Cumulative portfolio and other investment flows	2010-12	% of 2012 GDP	4:11	Lower
External balance	Current account balance	2012	% of GDP	-3; +2	Higher
	Change in the current account balance	2007-12	% of GDP	-3;0	Higher
	Current account balance plus FDI	2012	% of GDP	-3; +2	Higher
External debt	External Debt	2012	% of GDP	30; 70	Lower
	Change in external debt	2007-12	% of GDP	1; 9	Lower
	Short-term external debt	2012	% of GDP	5; 20	Lower
	Change in short-term external debt	2007-12	% of GDP	0; 5	Lower
Local debt securities held by non-residents	Proportion of domestic government securities held by foreigners	2012	%	20; 30	Lower
Gross reserve cushion	Reserve as percent of metric	2013	%	75; 100	Higher
Fiscal position	Primary balance	2012	% of GDP	-3; -1	Lower
	Government debt	2012	% of GDP	35; 60	Lower
	Change in government debt	2007-12	% of GDP	0; 5	Lower
	Expected change in government debt	2012-18	% of GDP	0; 5	Lower
Banking system and private sector leverage	Credit to the private sector	2012	% of GDP	40; 65	Lower
	Change in credit to the private sector	2007-12	% of GDP	3; 18	Lower
	Share of credit expansion financed by increase in bank liabilities to non-residents	January 2011 to April 2013	%	25; 50	Lower
	Correlation of changes in private credit and foreign liabilities	2010M1-2013M6	Units	0.7; 0.9	Lower
	Loan-to-deposit ratio	2012	%	80; 100	Lower
	Change in loan-to-deposit ratio	2007-12	%	0; 19	Lower

Figure 1. United States: Three Scenarios of Tapering Off (FSGM simulations)

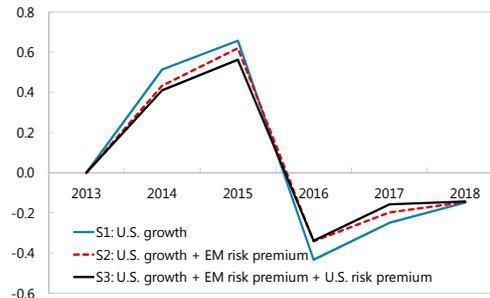
United States: GDP

(Percent deviation from baseline)



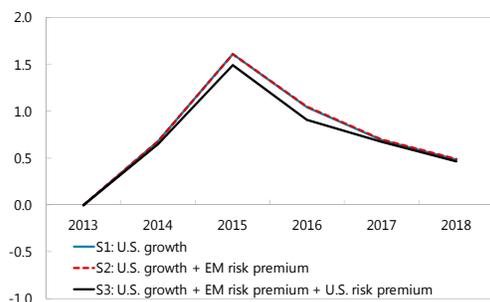
United States: GDP Growth

(Percentage points deviation from baseline)



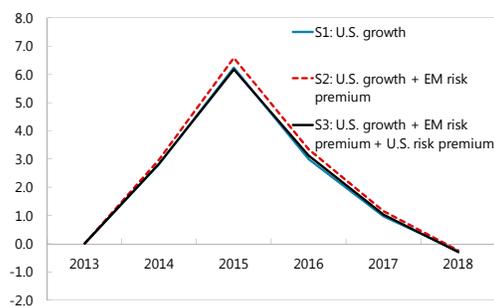
United States: Consumption

(Percent deviation from baseline)



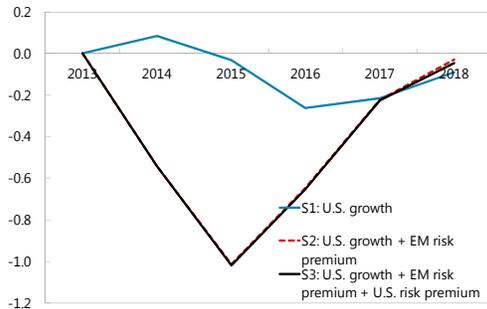
United States: Investment

(Percent deviation from baseline)



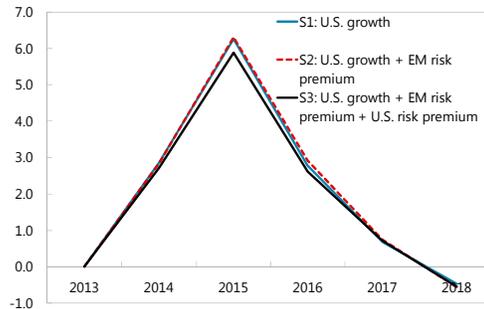
United States: Exports

(Percent deviation from baseline)



United States: Imports

(Percent deviation from baseline)

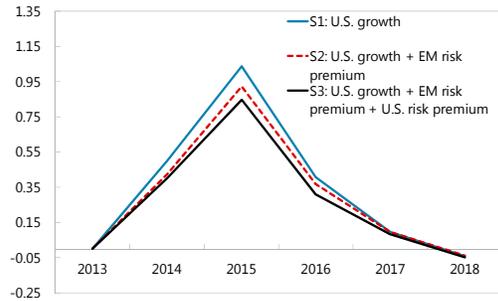


Source: Fund staff estimates.

Figure 1. United States: Three Scenarios of Tapering Off (FSGM simulations), concluded

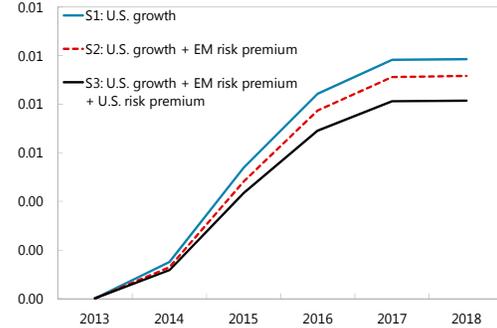
United States: Output Gap

(Percentage points deviation from baseline)



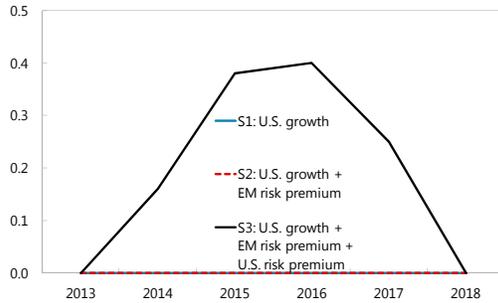
United States: Core Inflation

(Percentage points deviation from baseline)



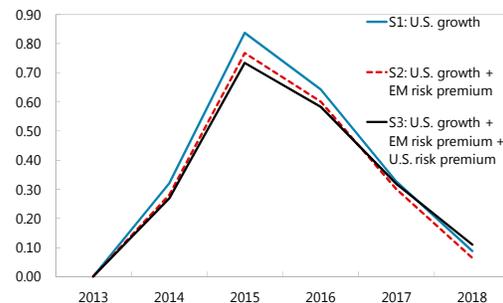
United States: Sovereign Risk Premium

(Percentage points deviation from baseline)



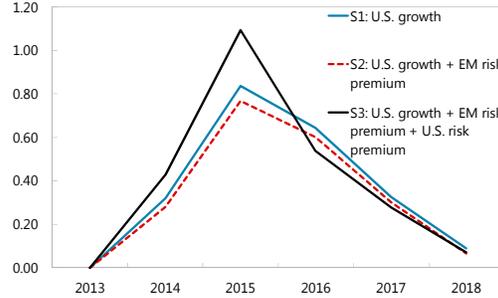
United States: Policy Interest Rate

(Percentage points deviation from baseline)



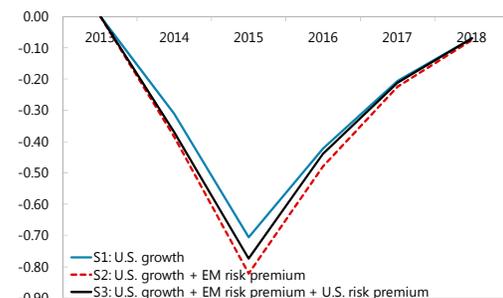
United States: Short-Term Interest Rate

(Percentage points deviation from baseline)



United States: Current Account

(Percentage points of GDP deviation from baseline)

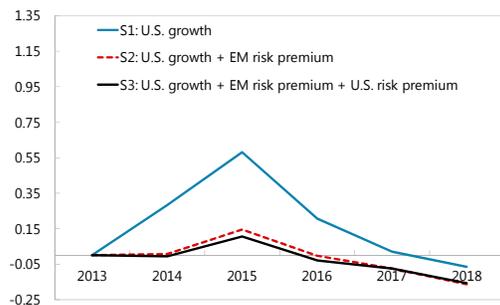


Source: Fund staff estimates.

Figure 2. Guatemala: The Impact of U.S. Tapering Off (FSGM simulations)

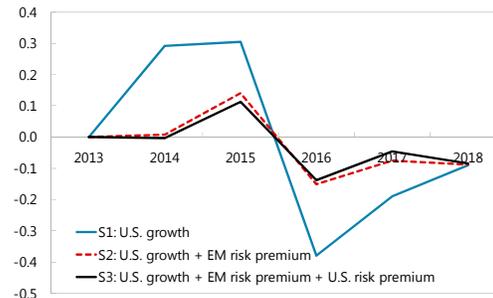
Guatemala: GDP

(Percent deviation from baseline)



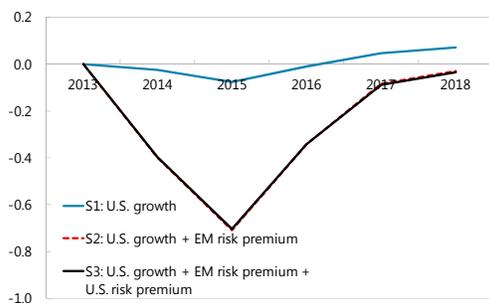
Guatemala: GDP Growth

(Percentage points deviation from baseline)



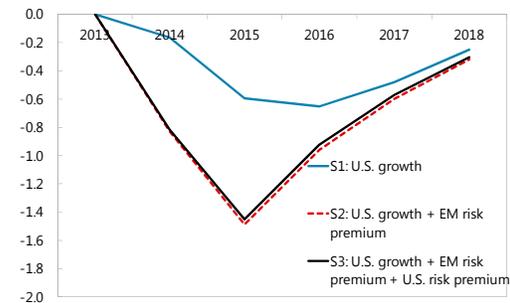
Guatemala: Consumption

(Percent deviation from baseline)



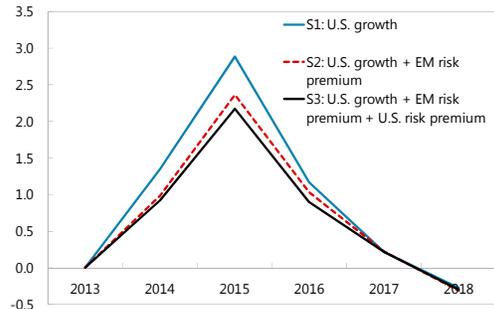
Guatemala: Investment

(Percent deviation from baseline)



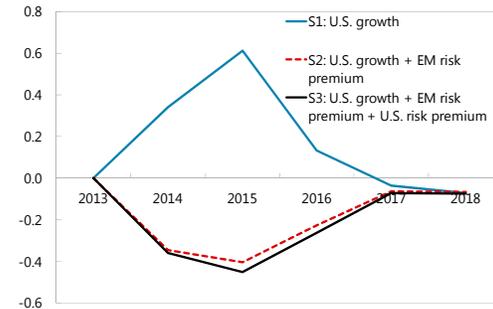
Guatemala: Exports

(Percent deviation from baseline)



Guatemala: Imports

(Percent deviation from baseline)

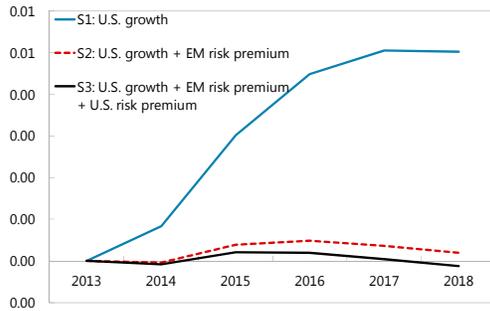


Source: Fund staff estimates.

Figure 2. Guatemala: The Impact of U.S. Tapering Off (FSGM simulations), continued

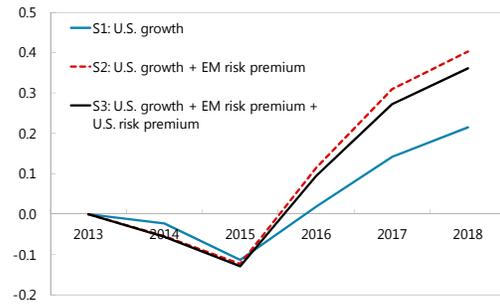
Guatemala: Core Inflation

(Percentage points deviation from baseline)



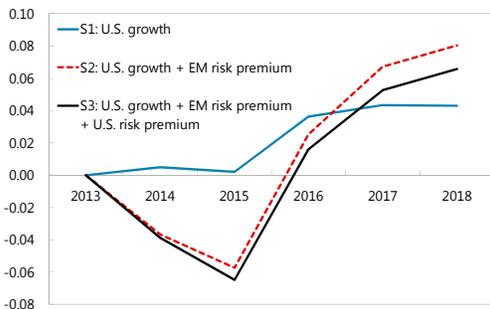
Guatemala: Nominal Effective Exchange Rate

(Percent deviation from baseline)



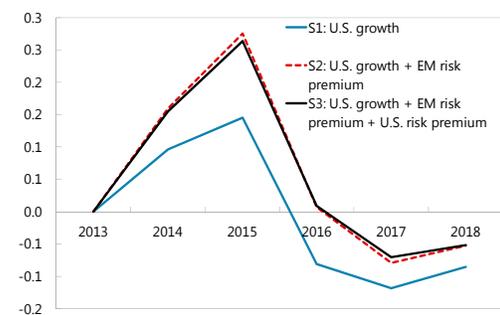
Guatemala: Real Competitiveness Index

(Percent deviation from baseline)



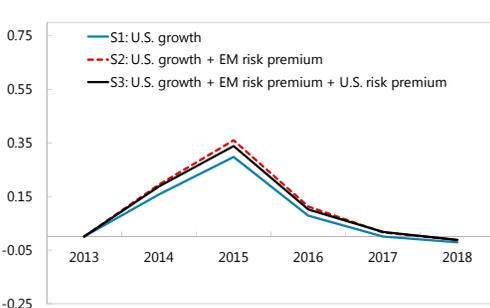
Guatemala: Private Savings

(Percentage points of GDP deviation from baseline)



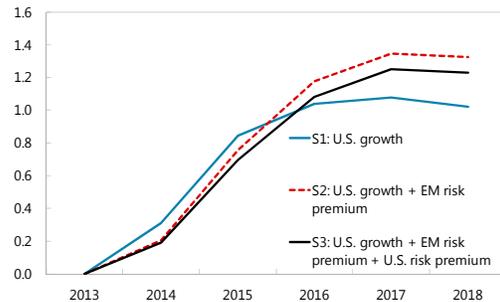
Guatemala: Current Account

(Percentage points of GDP deviation from baseline)



Guatemala: Net Foreign Assets

(Percentage points of GDP deviation from baseline)

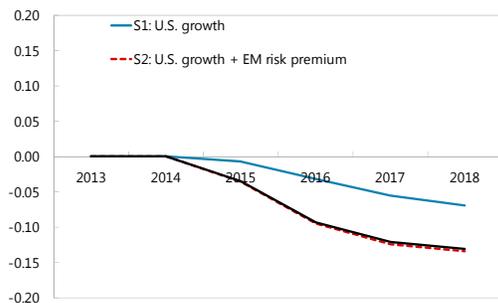


Source: Fund staff estimates.

Figure 2. Guatemala: The Impact of U.S. Tapering Off (FSGM simulations), concluded

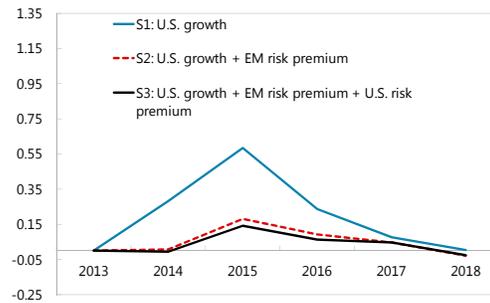
Guatemala: Potential GDP

(Percent deviation from baseline)



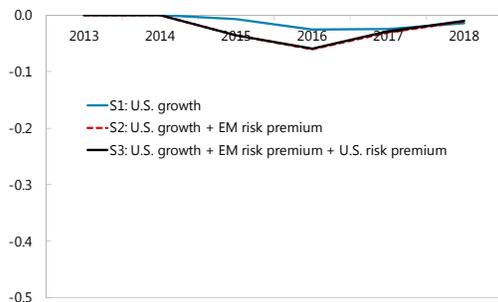
Guatemala: Output Gap

(Percentage points deviation from baseline)



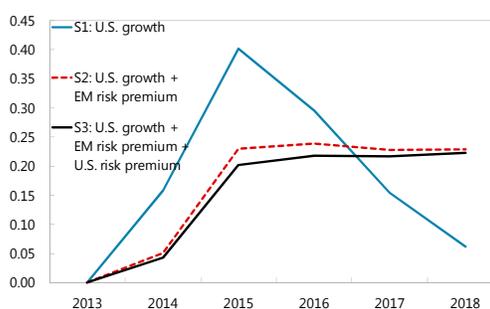
Guatemala: Potential GDP Growth

(Percentage points deviation from baseline)



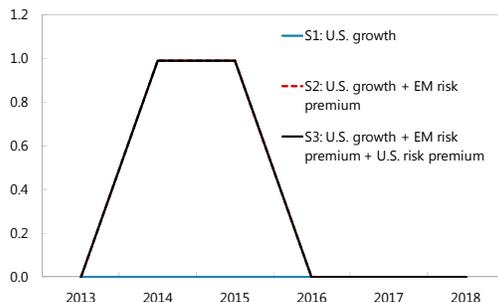
Guatemala: Policy Interest Rate

(Percentage points deviation from baseline)



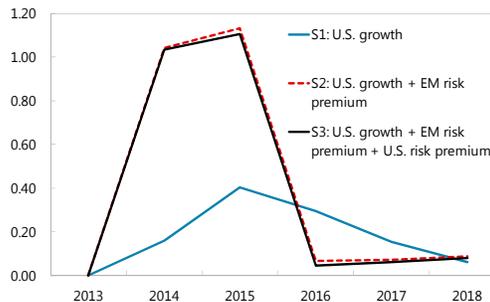
Guatemala: Sovereign Risk Premium

(Percentage points deviation from baseline)



Guatemala: Short-Term Interest Rate

(Percentage points deviation from baseline)



Source: Fund staff estimates.

References

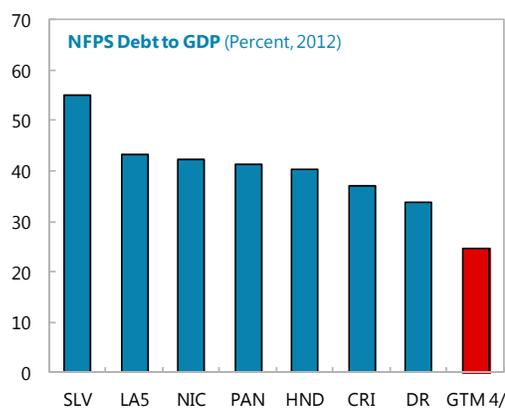
- Barclays Research Note, "How Resilient Is EM To The End Of QE – A Vulnerability Heatmap," can be found at <http://www.zerohedge.com/news/2013-06-23/how-resilient-em-end-qe-%E2%80%93-vulnerability-heatmap>, 2013.
- Bowman D., H. Londono, and H. Sapriza, "U.S. Unconventional Monetary Policy and Transmission to Emerging Market Economies", 2014.
- Milesi-Feretti, G. M., and A. Razin, "Sustainability of Persistent Current Account Deficits," NBER Reprint No. 2100, December, 1996.
- _____, "Current Account Sustainability: Selected East Asian and Latin American Experiences," NBER Reprint No. 2111, March, 1997a.
- _____, "Origins of Sharp Reductions in Current Account Deficits: An Empirical Study," IMRF Working Paper WP/97/168, 1997b.
- Razin, A., "International Capital Flows: Sustainability, Sudden Reversals, and Market Failures", NBER Reporter Online, Volume, 1998.

FISCAL SUSTAINABILITY ASSESSMENT¹

This note presents Guatemala's short-term fiscal position, as illustrated by the Debt Sustainability Analysis (DSA) methodology. It also considers the longer-term fiscal outlook, estimating the fiscal sustainability gap and examining the optimal pace of fiscal consolidation.

1. **Guatemala's fiscal deficit has returned to a declining path following the global financial crisis.** Guatemala's fiscal performance marginally deteriorated in the aftermath of the crisis of 2007–08. The fiscal deficit went up from near zero before the crisis to 3.3 percent of GDP by 2010, but declined to 2.4 percent of GDP in 2012. The fiscal position has improved since 2011 largely as a result of a recovery in tax revenues and a sharp decrease in primary expenditure as a share of GDP (mainly reduced government purchases of goods and services and phasing out of reconstruction spending). 2013 saw further retrenchment, with the deficit estimated at 2.1 percent of GDP. However, this was the result of a shortfall in execution driven by delays in the disbursement of multi-lateral loans. These delays, the result of political wrangling, led the deficit to fall markedly below the 2.5 percent of GDP envisaged in the budget.

2. **Guatemala's debt is low as a share of GDP, but is quite high when compared to fiscal revenue.** Owing to last year's shortfall in spending execution the public debt level grew only very moderately and now stands at 24½ percent. This level compares favorably both to other countries in the region and to countries of similar GDP size. However, Guatemala's position looks weaker when debt is compared to revenue. Moreover, once the current budget impasse and restrictions on multi-lateral loans are resolved, deficits could expand, particularly with elections looming in 2015, which would put additional upward pressure on debt.²



Source: Fund staff estimates.

3. **Additional effort to raise tax collections will be necessary to reduce the fiscal deficit to pre-crisis levels and to ensure adequate provision of public goods.** Improving tax performance requires strong and sustained political commitment at the highest levels. The 2012 tax reform provided more tools for the government to enforce tax controls and supervision, as well as eliminating VAT exemptions and reducing rates of the corporate income tax while broadening its tax base. The additional revenue for the reform was envisaged to be 1–1½ percent of GDP over the course of several years. However, the reform has been plagued by legal challenges and administrative problems. Most significantly, the customs agency has faced significant administrative

¹ Prepared by Lennart Erickson.

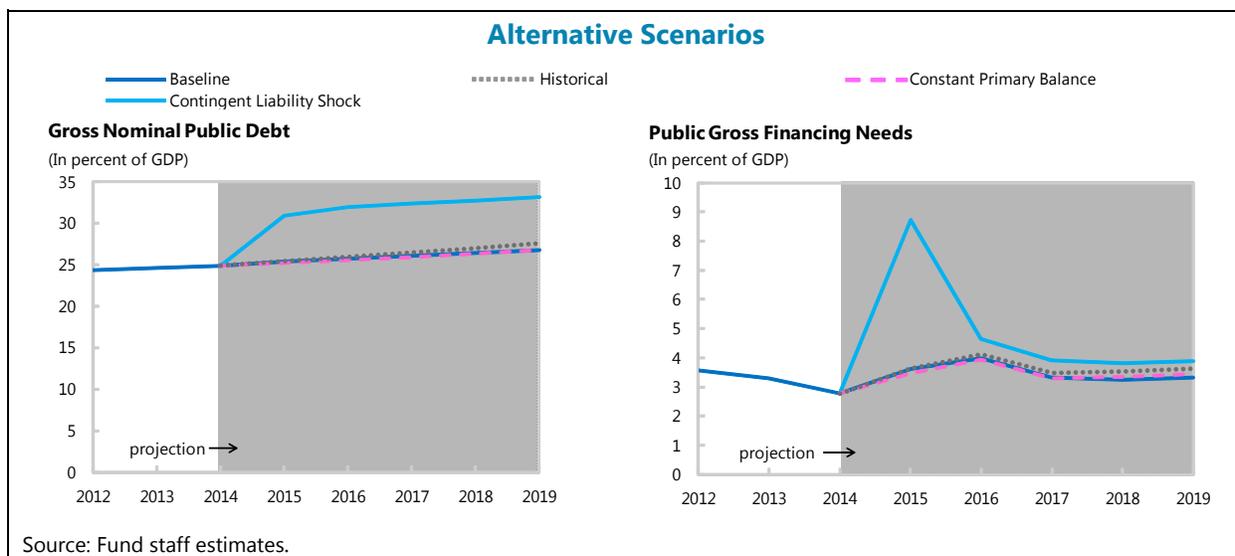
² Debt held by public sector government entities other than the central government is very small in Guatemala. For clarity, we thus focus on the central government debt throughout the rest of the debt sustainability analysis.

delays in implementing the reform, which have been exacerbated by high staff turn-over. As a result, staff estimates that the additional revenue from the reform thus far has been at most ¼ percent of GDP.

A. Assessing Debt Dynamics and Fiscal Sustainability

4. **Although short-term vulnerabilities are low, Guatemala is still short of long-term fiscal sustainability and remains subject to negative shocks.** To assess Guatemala’s medium- and long-term fiscal position, we first evaluate fiscal vulnerabilities to shocks by using the IMF’s debt sustainability analysis (DSA) framework and stochastic debt analysis.³ The sensitivity of central government debt to shocks captures how an adverse economic outlook would affect the evolution of the debt to GDP (or to revenue) ratio. Second, we assess the required fiscal effort needed to meet various policy targets concerning the public debt ratio. Last, we evaluate the long-term sustainability gap in Guatemala based on the government inter-temporal budget constraint, and use an inter-temporal model to shed light on the optimal fiscal consolidation path given quadratic preferences over the sustainability and output gaps.

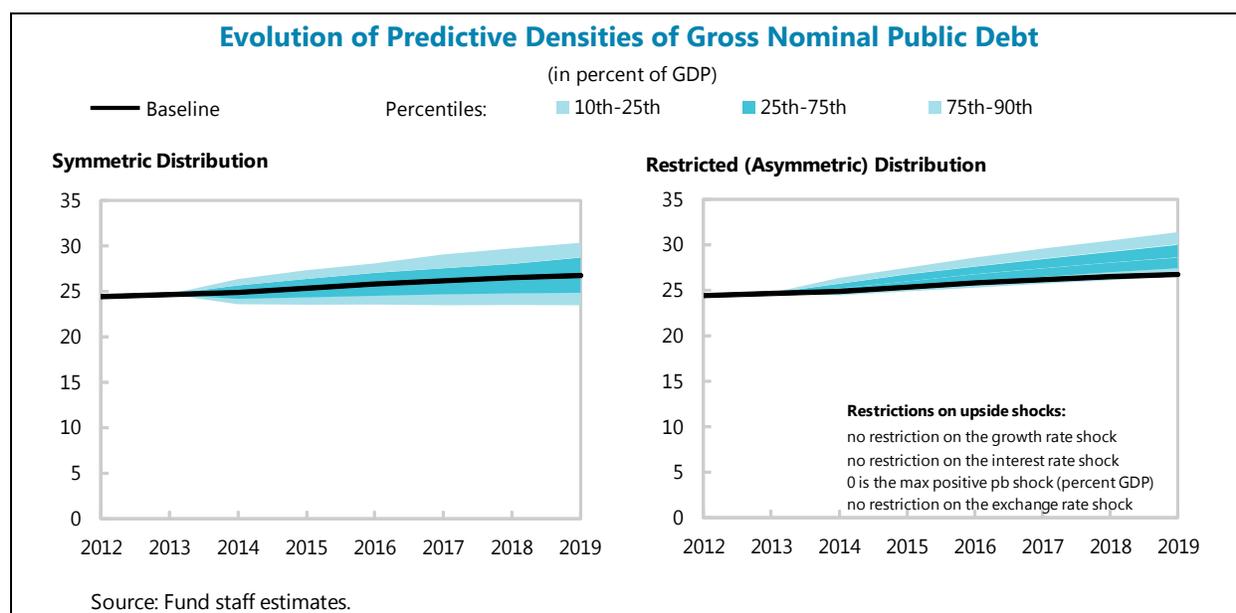
5. **Public debt dynamics are stable and in line with historical trends, though they would worsen in the face of shocks.** Simulations using the DSA framework suggest that maintaining the current primary balance into the future would yield essentially the same path for debt in the medium term as that presented in the baseline projection. Similar results are obtained when



³ Since the last Article IV consultation, a revised DSA methodology has been adopted which allows for more disaggregated analysis of debt-related flows and debt stocks.

assuming that all main macroeconomic variables remain at their historical levels. By contrast, the realization of a contingent liability of around 5 percent of GDP⁴ in 2015 would lead to a spike in financing needs and a permanent increase in the debt-to-GDP ratio of more than 6 percentage points.

6. **Results from a sensitivity exercise for public debt suggest low medium-term risks to public debt dynamics.** A stochastic simulation of the public debt path may be constructed by producing frequency distributions of debt paths under shocks to real GDP growth, effective real interest rate, primary balance and the change in real exchange rate based on historical variances. Simulations yield a slight upward trend in public debt-to-GDP ratio, with the median debt forecast to reach about 27 percent of GDP, almost identical to the baseline projection. The 95 percent upper confidence interval reaches 32 percent of GDP. A restricted simulation in which upside shocks are disregarded yields an only slightly-higher 95 percent upper confidence interval of 33 percent of GDP. The narrowness of these ranges reflects the historical stability of Guatemala's macro variables, which results in low estimates for the macroeconomic shocks employed.



7. **Under staff's baseline scenario, which envisages some medium-term fiscal consolidation,⁵ the estimated fiscal sustainability gap is very small.** The fiscal sustainability gap is the improvement in the primary balance in percent of GDP in 2013 that would be consistent with stabilizing the debt level in the very long run, in order to satisfy the inter-temporal budget

⁴ The magnitude of this shock is proxied by the growth in bank credit to the private sector in recent years.

⁵ This medium-term baseline scenario envisages some fiscal consolidation between 2015 and 2019 with the central government deficit approaching 2 percent of GDP, the primary deficit improving from -0.7 to -0.4 percent of GDP and central government debt rising slowly to around 27 percent of GDP by 2019.

constraint. It incorporates the projected path of the primary balance up to 2019. Thus, using staff's baseline assumption that some fiscal consolidation will take place over the course of the projection period, the fiscal sustainability gap is estimated to be very small for Guatemala- about 0.4 percent of GDP implying a primary surplus of 0.1 percent of GDP- based on the assumptions that the long-run growth rate and interest rate are consistent with the projected average in the next 5 years.⁶

8. Including the actuarial deficit of the public pension system would worsen the sustainability gap, though the system will be in cash surplus into the medium-term. Total revenue for the system is forecast to exceed expenditures until 2024 and a significant buffer of financial assets has already been accumulated. However, in coming years the growth-rate of expenses is expected to exceed that of revenue and after 2024 the system is projected to generate increasing deficits. Preliminary estimates by staff show a negative present value for the system, even taking into account the current stock of financial assets (mainly government bonds). Estimates vary significantly depending on the assumptions, notably those about the rate of increase in expenditures. In future consultations, a more detailed examination by staff and the authorities of macroeconomic and demographic assumptions will be needed to refine these estimates.

9. A model of the optimal fiscal consolidation path points to an upfront fiscal tightening in 2014 and a slower pace of adjustment thereafter. To reconcile the government's joint objectives of reducing both the output gap and the fiscal sustainability gap, and determine the optimal fiscal consolidation path, we resort to a model of quadratic preferences in which the size of the required fiscal adjustment and the size of the output gap enter into the objective function of the policy maker.⁷ Here, we base our analysis on the fiscal sustainability gap estimated as the additional fiscal effort needed to stabilize debt at its current level, with adjustment beginning in 2015. Quadratic preferences imply that the pressure to act to reduce output gap and sustainability gap increases in a nonlinear fashion with the size of that gap. A further assumption is made that long-run real interest rates are greater than the long-run growth rate of 3.5 percent.⁸ This assumption increases the estimated fiscal sustainability gap moderately to 0.6 percent of GDP. Since Guatemala's initial output gap is essentially closed in 2015, the model indicates a preference for a strong initial adjustment of 0.36 percent of GDP, even assuming the authorities' objective function puts greater weight on maintaining the output gap closed relative to closing the sustainability gap.⁹

⁶ The DSA methodology produces a somewhat higher estimate of the sustainability gap, as it stabilizes debt at 2019 levels rather than at 2013 levels. See Table 7A in the Staff Report.

⁷ For the detailed methodology, see Kanda (2011).

⁸ For the model to be dynamically consistent, it must be the case that the long-run real interest rate is greater than the long-run growth rate. This assumption is plausible for Guatemala. Although the overall real interest rate in recent years has lagged the growth rate, this is due more to anomalies of scheduled interest payments and is unlikely to persist into the long term.

⁹ The speed of self-correction of output gaps is calibrated to equal 0.5, implying that absent fiscal measures and ceteris paribus, an output gap of -0.01 percent of GDP is eliminated after ten years. The fiscal multiplier is taken to be 0.4, in line with the estimates provided by Estevão and Samake (2012). The real interest rate and real GDP growth rate are set at 3.6 percent and 3.5 percent respectively.

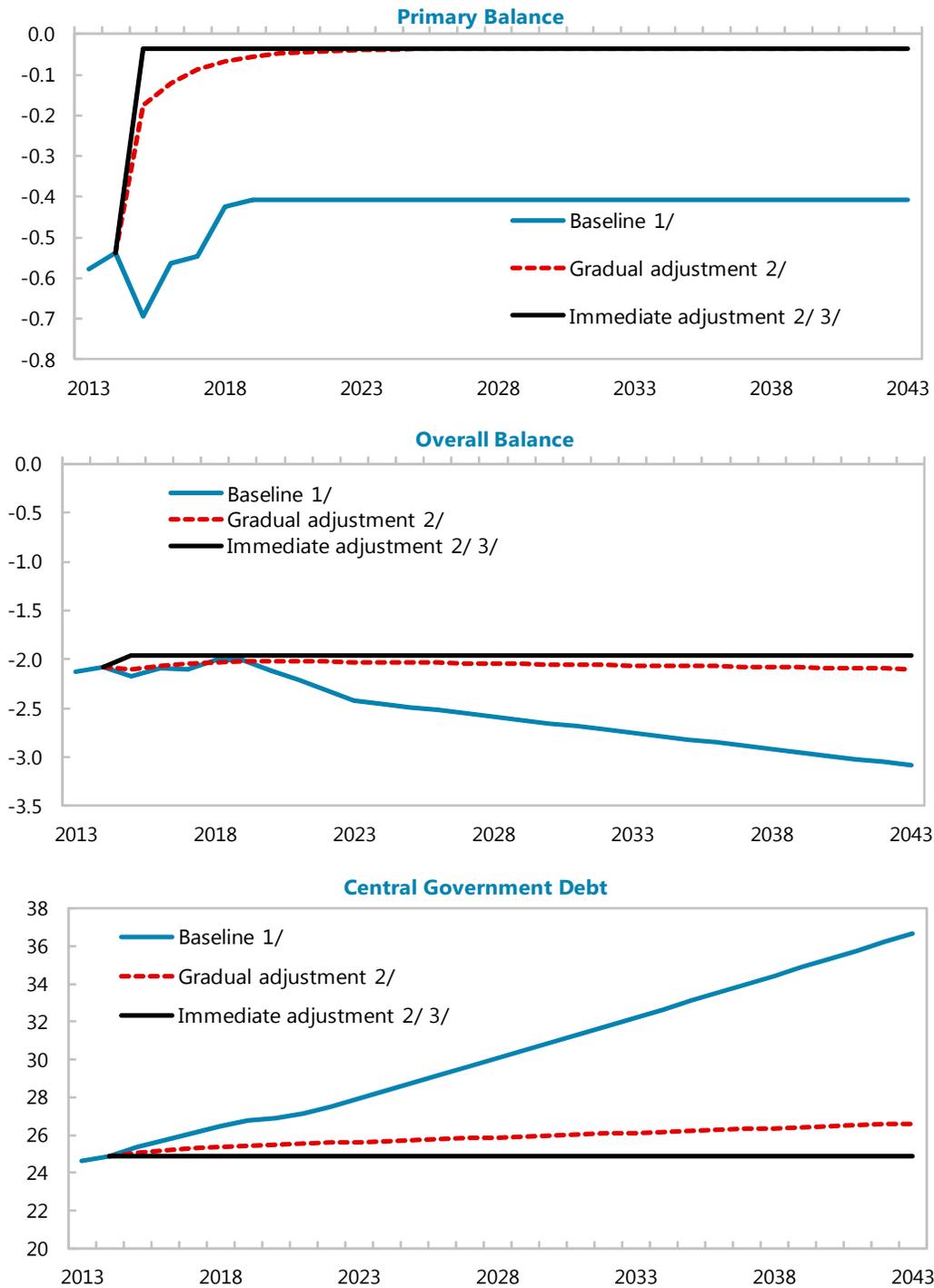
This initial adjustment slightly opens up the output gap in 2015 to -0.19, though the gap shrinks rapidly thereafter. Debt in 2019 reaches 25.4 percent of GDP, only slightly above the initial 2013 level of 24.4 percent of GDP.

Guatemala: Optimal Fiscal Consolidation Path under Model of Quadratic Preferences												
<i>(In percent of GDP, unless otherwise stated)</i>												
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Discretionary fiscal adjustment		0.36	0.05	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Fiscal sustainability gap	0.50	0.14	0.08	0.05	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00
Output gap (in percent of potential GDP)	-0.08	-0.19	-0.11	-0.07	-0.04	-0.03	-0.02	-0.01	-0.01	0.00	0.00	0.00

Source: Fund staff estimates.

Figure 1. Guatemala: Long-Term Fiscal Sustainability

(Percent of GDP)



1/ This path is the baseline through 2019, with a constant primary balance thereafter.

2/ Adjustment begins in 2015. Assumes a long-run real interest rate greater than the potential growth rate for the whole period.

3/ Assumes that the full fiscal adjustment takes place in 2015 and has no impact on growth.

References

- Estevão, Marcello, and Issouf Samake, 2012, "Fiscal Multipliers in Central America," IMF Working Paper.
- Kanda, Daniel, 2011, "Modeling Optimal Fiscal Consolidation Paths in a Selection of European Countries," IMF Working Paper 11/164, Washington: International Monetary Fund.

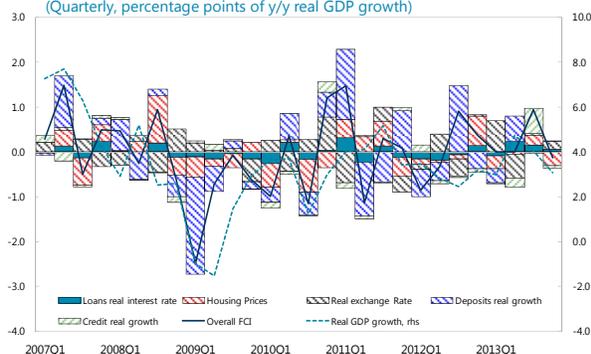
MONETARY POLICY STANCE¹

The monetary stance is assessed to be roughly neutral to slightly supportive after the central bank reacted to the recent easing of inflationary pressures with two consecutive small policy rate cuts. The results of the quantitative indicators presented in this note help inform this assessment. While some estimates of the neutral policy rate point to mildly expansionary conditions, financial conditions remained broadly stable in 2013 and credit growth has moderated fast since late 2013. Still, it is recommended that the authorities remain vigilant for any incipient signs of inflationary pressures.

1. **Inflation remains within the target band, but the authorities should remain vigilant for incipient inflationary pressures.** Inflation stayed within the target range in 2013 and declined toward the bottom of the range in early 2014. More specifically, inflationary pressures built up during the first half of 2013—driven by higher international food prices and incipient domestic demand pressures—but abated in the second semester. Inflation moved toward the bottom of the band in early 2014 reflecting deceleration in both regional food prices and core inflation, which has been on a declining trend since early 2013. While inflation expectations are also better anchored than before, they remain close to the upper end of the band, highlighting the need for continued vigilance.
2. **The objective of this note is to assess the current stance of monetary policy.** To do that, first, the monetary and financial conditions index (FCI) presented in the 2013 Article IV staff report is updated to assess the effects of current financial conditions on real GDP growth. Second, three different models of the neutral interest rate (NRIR) also presented in that report are updated to assess the adequacy of the monetary policy stance taking into account the current position of the economy in the cycle.
3. **The FCI summarizes information contained in key financial variables and captures the correlation with economic activity.** A VAR analysis was used to decompose the contribution of various financial indicators to real GDP growth. The FCI was built as the sum of the cumulative impulse responses of real GDP to each of the relevant financial variables. The financial variables included a summary measure of interest rates (the real interest rate of bank loans), the real effective exchange rate (REER), the real growth of deposits and of credit to the private sector, and a real housing price index (proxied by the housing component of the consumer price index). The model was estimated using quarterly data between 2001 and 2013.
4. **The estimated FCI points to broadly stable financial conditions in 2013.** The quarterly FCI shows that financial conditions loosened toward the middle of the year reflecting mostly the lagged effects of strong credit growth on real GDP growth (Chart 1). For the year as a whole, however, the average contribution of the FCI to real GDP growth was essentially flat, (Chart 2). Relatively underdeveloped financial markets in Guatemala may complicate the interpretation of the results of the model. More generally, the FCI does not only capture the impact of monetary policy, but also broader interactions between financial and real variables.

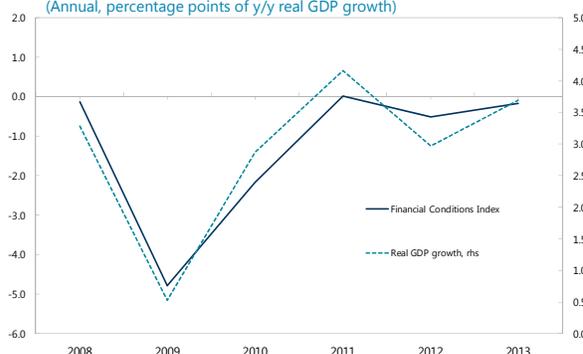
¹ Prepared by Jaume Puig-Forné.

Monetary and Financial Conditions Index (2007-13)
(Quarterly, percentage points of y/y real GDP growth)



Sources: National authorities and Fund staff estimates.

Monetary and Financial Conditions Index (2008 -13)
(Annual, percentage points of y/y real GDP growth)



Sources: National authorities and Fund staff estimates.

5. **Another approach to assess the monetary policy stance is to estimate the neutral real interest rate for Guatemala.** Following Magud and Tsounta (2012), a set of well known methodologies is used to estimate the neutral interest rate: the first takes advantage of the uncovered interest parity condition; the second uses a Taylor rule augmented for inflation expectations; and the third solves a general equilibrium model that focuses on aggregate demand-supply equilibrium.² The data used corresponds to the period between 2001 and 2013. Looking at the difference between the actual policy rate and the estimated neutral rate, an assessment of the monetary stance can be made taking into account the economy’s current position in the cycle.

6. **According to the average of the estimations, the neutral nominal interest rate is 5.2 percent.** With the output gap essentially closed and inflation projected to be close to target this year, the estimates below suggest that the current policy rate of 4.5 percent implies a moderately expansionary monetary stance (Table). However, these results need to be interpreted with caution, given the limitations of the data and the incipient nature of financial markets in Guatemala.

Neutral Real Interest Rate for Guatemala

		Expected Inflation Dec-2015	4.30
		Actual Monetary Policy Rate	4.50
	Method 1/	Neutral Real Interest Rate (NRIR)	Neutral Nominal Interest Rate (NNIR)
			Nominal Monetary Policy GAP (bps) 2/
	Uncovered Interest Parity	0.6	4.9
	Expected-Inflation Augmented Taylor Rule	0.6	4.9
	General Equilibrium Model	1.4	5.7
	Average	0.9	5.2

Sources: National authorities and Fund staff estimates.

1/ All units expressed as percent points unless otherwise stated. 2/ (bps): Basis points.

2/ (bps): Basis points.

² For more methodological details see Magud, N., and E. Tsounta, 2012, “To Cut or Not to Cut? That is the (Central Bank’s) Question: In Search of the Neutral Interest Rate in Latin America,” Working Paper 12/243 (Washington: International Monetary Fund).

- **The uncovered interest parity condition (UIPC) estimates the neutral nominal interest rate at 4.9 percent.** This value assumes an implicit annual nominal depreciation in line with the inflation differential with the U.S. to maintain the real exchange rate constant, and a country risk premium. The “model” comprises the following equations:

$$\begin{aligned} i_t &= i_t^* + \hat{E} + \rho \\ \hat{E} &= \overline{RER} + (\pi - \pi^*) \end{aligned}$$

where i_t is the neutral policy rate in Guatemala, i_t^* is the current policy rate in the U.S., \hat{E} is the expected nominal depreciation of the quetzal vis-à-vis the dollar, ρ is the risk premium as captured in the country’s external bond spreads, \overline{RER} is the real exchange rate, π is the inflation target in Guatemala, and π^* is the current inflation projection in the U.S.³

- **The expected-inflation augmented Taylor rule model estimates the neutral nominal interest rate at 4.9 percent.** The model incorporates information from the yield curve and inflation expectations, in addition to the standard output gap and deviations from inflation target in standard Taylor rule models. Results show that the real neutral level for the monetary policy rate under this model is 0.6 percent, which corresponds to a neutral nominal interest rate of 4.9 percent with the staff’s projected inflation of 4.3 percent in 2015. These results should again be interpreted with particular caution, however, given that the model relies on a certain degree of sophistication of a country’s financial markets. The model comprises in this case the following equations:

$$r_t = r_t^* + \pi_{t+1}^e + \beta(\pi_t - \pi_t^*) + \theta \tilde{y}_t + \varepsilon_t^1$$

$$R_t = r_t^* + \alpha_t + \pi_{t+1}^e + \varepsilon_t^2$$

where r_t is the short-term rate (rate on the central bank’s open-market operations), r_t^* is the neutral policy rate, π_{t+1}^e are one-year ahead inflation expectations, $\pi_t - \pi_t^*$ are deviations from the inflation target, y_t is the output gap, R_t is the long-term rate (10-year government bond yield at issuance), and α_t is the term premium. All disturbance terms (ε_t^1 and ε_t^2) are assumed to be zero mean variables with constant variances.

- **The general equilibrium model concludes that the nominal neutral rate is 5.7 percent.** This model relies on an Investment-Savings (IS) equation—that relates the output gap to its own lags and lags of deviations of the monetary policy rate from neutral levels—and a Phillips curve that relates inflation to the output gap. This model depends less than the previous one on the structure of financial markets; however, it still assumes that the monetary transmission channel works efficiently. The model consists of the following equations:

³ The inflation differential with the U.S. is based on current inflation projections for the U.S. and on Guatemala’s inflation target (i.e. four percent), in line with the definition of the neutral rate in Guatemala.

$$(y_t - y_t^*) = \sum_{s=1}^S \alpha_s^y (y_{t-s} - y_{t-s}^*) + \sum_{v=1}^V \alpha_v^r (r_{t-v} - r_{t-v}^*) + x_{1,t}' \alpha + \varepsilon_t^y$$

$$\hat{\pi}_t = \sum_{p=1}^P \beta_p^\pi \hat{\pi}_{t-p} + \sum_{q=1}^Q \beta_q^y (y_{t-q} - y_{t-q}^*) + x_{2,t}' \beta + \varepsilon_t^\pi$$

where $y_t - y_t^*$ is the output gap, $r_t - r_t^*$ is the deviation of the policy rate from the neutral policy rate, $\hat{\pi}_t$ is the deviation in core inflation from the inflation target, x_1 and x_2 are control variables for the output gap and inflation respectively, including cyclical deviations of the real effective exchange rate and of oil prices. All disturbance terms (ε_t^y and ε_t^π) are assumed to be zero mean variables with constant variances.

7. **To conclude, the monetary stance appears generally adequate, but the authorities should be vigilant for incipient inflationary pressures.** The FCI shows that financial conditions were largely neutral in 2013. Moreover, headline inflation is at the bottom of the target range, core inflation has fallen below the target band after a persistent declining trend, and credit growth has moderated fast since end-2013. At the same time, all estimates of the neutral interest rate are above the current level of the policy rate, inflation expectations are still in the upper half of the target range, and credit growth remains relatively elevated. Overall, this suggests that the authorities should refrain from additional cuts to the policy rate and should stand ready to increase the rate promptly if inflationary pressures emerge.