WP/BOG-2019/01



Working Paper

The Effect of External Conditions on the Economy of Ghana

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Research Department Bank of Ghana January 2019



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WP/BOG-2019/01

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Abstract

This paper examines the sensitivity of the Ghanaian economy to external demand, supply and financial conditions using a Bayesian Vector Autoregression (BVAR) model. The model is estimated on quarterly data from 2003q3 -2018q4. The results show that about 40 percent of the variation in Ghana's real GDP growth is accounted for by external influences. In addition, about 30 percent of the variation in inflation is accounted for by external influences. Conditional forecast for a slowdown in China and the U.S, the two largest economies in the world, show that these shocks will dampen GDP growth in Ghana, induce a significant deterioration in the exchange rate and increase the domestic inflation rate. Tighter financial conditions as captured by an increase in EMBI spread and an increase in US policy rate leads to a decline in GDP growth as expected. Domestic inflation remains relatively stable initially but picks up at the beginning of the third quarter. Exchange rate depreciates sharply as expected perhaps triggered by outflows and interest rate rise. The results thus imply that external factors play an important role in the Ghanaian economy. Domestic fundamentals may either act to amplify or dampen the impact of these external developments on the Ghanaian economy. Policymakers should therefore continue to improve the macro fundamentals to dampen the effects of external shocks on the Ghanaian economy.

Key words: External conditions, financial conditions, external demand, supply shocks, external shocks on Ghana

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Acknowledgement

The author(s) wish to thank the Management of Bank of Ghana and the Board sub-Committee on the Economy and Research for their helpful comments and suggestions.

The Bank of Ghana Working Papers describe research in progress by the author(s) and are published to solicit comments and encourage further debate. The views expressed in this paper are those of the author(s) and do not necessarily represent those of the Bank of Ghana.

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1. Introduction

Ghana's economy has increasingly become integrated into the global economy through the trade and financial markets¹ channels. Although this level of integration has the potential to open new opportunities for growth and poverty reduction, it may also expose the economy to external shocks with adverse spillover implications. A study by the IMF (2014) showed that external factors induced significant fluctuations in emerging market economies growth, explaining about half of the variance in their growth rates. A higher growth in advanced economies benefits emerging market economies even though it is accompanied by higher global interest rates. However, a tighter external financing environment, stemming from a higher risk premium on emerging markets' sovereign debt, reduces growth.

The latter outcome was evident in the recent tightening of external conditions driven by a combination of rising US policy rate, higher crude oil prices and a strengthening US dollar. These factors triggered outflows from emerging market and developing economies and led to widespread weakening of domestic currencies.

As the global recovery strengthens further and policy normalization gathers momentum, emerging market and frontier economies such as Ghana are likely to come under renewed pressure. In addition, the ongoing trade tensions and the uncertainty it generates may spook financial markets, slow investment and ultimately economic activity in the medium-term. To better understand how changing conditions can influence fluctuations in the domestic economy, this study attempts to investigate the impact of external conditions on key macroeconomic indicators of the Ghanaian economy. Specifically, we examine the dynamic impact of changes in external demand conditions, external supply conditions and financing conditions on domestic variables such as real GDP growth, inflation rate and the exchange rate. To achieve this, we estimate a standard Bayesian Vector Auto-regression (VAR) model which is then used to extract information about four aspects of the data:

• First, we identify the external shocks that have historically impacted the Ghanaian economy. Our identification scheme assumes that Ghana is a small open economy; therefore, innovations in the economy do not affect the advanced economies contemporaneously. However, external developments may impact the Ghanaian economy contemporaneously.

¹ See figure 5

- Second, we estimate impulse response functions and use them to analyze the business cycles implied by the identified shocks.
- Third, we measure the importance of the identified shocks in explaining movements in selected macroeconomic variables by performing a variance decomposition of the variables included in the empirical model.
- Finally, we conduct scenario analysis to assess the response of the Ghanaian economy to specific external shocks.

The rest of the paper is structured as follows: section 2 briefly reviews the related literature; section 3 discusses the recent developments in the global and domestic economies, while section 4 examines the impact of external factors on the Ghanaian economy. Finally, our conclusions and policy recommendations are summarized in section 5.

2. Literature Review

The literature on the impact of external factors on emerging market and developing economies is vast. An important insight from these studies is that the impact of external conditions on an emerging market economy largely depends on the internal characteristics of the economy such as trade openness, trade exposure to advanced economies, financial openness, exposure to capital flow volatility, commodity concentration, output volatility, external indebtedness and internal policy responses to the shocks. For instance, a study by the IMF (2014) on 'External conditions and emerging market growth' concluded that the payoffs from positive demand shocks are greater for emerging market economies that have strong trade ties with advanced economies and lesser for economies that are financially open. In addition, adverse external financial shocks hit economies that are financially open, as well as those with limited policy space. Ufuk (2008) also showed that the Turkish economy's responses to U.S interest rate shocks would be significantly less pronounced at lower levels of external debt.

Within the emerging market group, most studies were largely based on data from Latin American economies, Asian economies and more recently, a diverse group of emerging market and developing economies. For example, Ufuk (2008), Uribe and Yue (2003), Calvo, Leiderman, and Reinhart (1993), Canova (2005), Swiston and Bayoumi (2008), Osterholm and Zettlemeyer (2007) focused on Latin America, Utlaut and van Roye (2010) for Asia; and Adler and Tovar (2012), Erten (2012), and Mackowiak (2007) for a more diverse group of emerging market economies. However, case studies that delve deeper into the peculiar circumstances of emerging market and developing economies, and particularly on Ghana, is limited and virtually non-existent in the literature. This paper's focus on Ghana is timely and the findings would provide evidence-based research to support policymaker's efforts at designing policy responses to mitigate the effects of the external sector influences including the ongoing policy normalization in advanced economies on the Ghanaian economy.

3. Recent Developments in the Global Economy

In this section, we briefly discuss the various external factors relevant to the context of a developing economy such as Ghana. We focus on external demand conditions, external supply shocks and global financial conditions. In the next section, we discuss the implications of these factors on the Ghanaian economy.

3.1. **External demand conditions**

Global growth is estimated at 3.7 percent in 2018 and 3.5 percent in 2019 supported by domestic demand and recovery in the emerging oil producing economies². Although the ongoing global recovery was synchronized and broad based, it has become uneven with the United States growing faster than Europe, Japan and the U.K among advanced economies. This uneven growth led to policy divergence in favour of the U.S. The resulting dollar rally triggered outflows and sharp depreciation of currencies in emerging markets and developing economies (see figure 1).



² See World Economic Outlook, January 2019 Updates

Among emerging market economies, commodity exporters recovered steadily while commodity importers were relatively stable despite the surge in oil prices during much of 2017 and 2018. There are also signs that global external demand conditions may continue to improve in the near term supported by fiscal stimulus in the U.S and the continued recovery in emerging commodity exporting countries. However, the ongoing tariff tensions between the United States and China has the potential to create uncertainty in the financial markets, undermine investment and ultimately economic activity.



Figure 2: Real GDP growth Rates in advanced economies (percent, 2001q1 – 2018q1)

Figure 2a: Real GDP growth in China (percent, y-on-y)



China has continued to rebalance its economy with emphasis on a more sustainable consumption led growth rather than the previous exports and investment led growth. China has also implemented regulatory reforms in the financial sector to reduce risky lending practices in

the shadow banking sector. These measures along with trade policy uncertainty have contributed to the expected and gradual decline in China's growth rate in recent years. A slowdown in China has many adverse effects on developing economies and global economy. For instance, a slowdown in China can reduce exports to China and Chinese investments in developing economies. In addition, a slowdown in China can create uncertainty about the health of the global economy. This may weaken financial market sentiments and potentially lead to disorderly currency movements in developing economies including Ghana. It is therefore important to understand how a shock to growth in China may impact Ghana's economy.

3.2. Financial conditions

As the recovery gathered momentum and fears of inflation emerged, some advanced economies begun the process of policy normalization both in terms of policy rate hikes and scaling down their balance sheets. However, this process has proceeded at uneven levels reflecting the differences in economic performance. In December 2018, the US Fed raised its policy rate for the 9th time since December 2015 to a range of 2.25percent - 2.5percent. The European Central Bank (ECB) ended its assets purchase programme. However, the relatively subdued inflation forced the ECB to put off any policy rate hike until summer of 2019.

Recent quarterly growth estimates suggest that the momentum is moderating but still relatively stable with solid growth in the United States supported by domestic demand and the U.S fiscal stimulus. The strengthening of global growth and the associated narrowing of labor market slack may push wages and inflation up in the coming years. Thus, central banks may speed up the process of policy normalization in advanced economies. Figure 3 shows that markets expect a gradual increase in policy rate in the United States over the next three years.

3.3. Global supply shocks

Global oil prices surged from March -October 2018 supported by both demand and supply factors. Brent crude averaged about USD79 in early September 2018 (see Figure 4). In recent months, oil prices were buoyed by strong global oil demand, ongoing geopolitical tensions involving Iran, and political turmoil in Venezuela and Libya, according to Bank of England Inflation Report, Issue 5 2018. However, oil prices dropped sharply in the fourth quarter of 2018 weighed down by over production and concerns about the health of the global economy. The natural question is how this sharp drop will impact Ghana's economy.







Source: FRED Database, Bank of Ghana

The analysis above shows that global growth momentum is moderating but remains strong driven largely by the strength of the advanced economies. Oil prices have dropped sharply in recent months weighed down by supply factors and concerns about the health of the global economy, while financing conditions have tightened reflecting a combination of policy hike in the U.S and the strengthening dollar. In what follows, we examine the implications of these global developments on the Ghanaian economy.

3.4 How exposed is Ghana's economy to the global economy?

The spillover effects of external shocks on Ghana's economy depends on the nature of the triggers of the shock in the source country, the vulnerabilities and policy response in the destination country. Following IMF(2014), we assess Ghana's exposure to the global economy using four indicators: (a) trade openness (i.e. the sum of exports and imports as a ratio of GDP, (b) Ghana's exposure to the advanced economies measured as the sum of Ghana's exports and imports to U.S, UK, and the Euro area(our major trading partners) as a ratio of GDP, (c) Trade balance as a ratio of GDP, (d) financial openness measured as international investments (assets plus liabilities) as a ratio of GDP.

In terms of trade exposure, the evidence show that Ghana has become more exposed to the US, UK, and the Euro area, its major trading partners³. For instance, goods exported to the US, UK, and Euro area increased from 18.3percent of GDP in 2006 to 34.1percent of GDP in 2014, before declining to 26.1percent of GDP in 2016. Trade openness, defined as total trade as percent of GDP rose from 51percent of GDP in 2006 to 75.5percent of GDP in 2012, before falling to 56.4percent of GDP in 2016. Ghana's economy is also financially integrated in the global economy⁴. For example, international investment (assets plus liabilities) as percent of GDP rose from 57.8percent in 2006 to 102.5percent in 2016, indicating a significant increase in integration with global financial markets. The recent sharp depreciation of the cedi amid policy rate hike in the US, strengthening US dollar and higher crude oil prices indicates that external factors have become important determinants of key variables in the Ghanaian economy. In the subsequent sections, we will attempt to investigate the implications of the integration on the Ghanaian economy.



Figure 5: Selected Macroeconomic Indicators

Source: Bank of Ghana staff calculations





³ See figure 5

⁴ See figure 5 for details



Figure 5b Imports from major trading partners

China has overtaken the U.S and UK in terms of both exports and imports. Although, still small compared to the EU, adverse shocks to the economy of China may have severe implications for Sub-Saharan Africa in the form of lower exports and investment. The evidence in this section suggests that Ghana's economy has increasingly become integrated into the global economy. In the next section, we use a Bayesian Vector Autoregression model to assess the implications for the Ghanaian economy.

4. The impact of external factors on the Ghanaian economy

We employ Bayesian Vector Autoregression (BVAR) model to assess how external shocks may impact the Ghanaian economy. We rely on BVAR model because structural changes in the Ghanaian economy (i.e. increasing openness, liberalization, and institutional changes etc) imply that econometric estimation is limited to a short period of time. Utlaut and van Roye (2010) suggest that a classical VAR generally suffers from generous parameterization, causing a loss in estimation precision, particularly if the estimation is based on a short data sample. In standard BVAR, this problem is mitigated by imposing an informative prior on the dynamic coefficient of the model.

Our model include eleven variables grouped into external variables (U.S real GDP growth, China's GDP growth, U.S inflation rate, US effective policy rate, the EMBI global yield, and oil price) and internal variables (domestic real GDP growth, domestic inflation rate, rate of appreciation of the economy's real exchange rate vis-a'-vis the U.S. dollar and the domestic monetary policy rate or short-term interest rate).

Following IMF (2014), we quantify the growth effects of external conditions using a Bayesian auto-regression (BVAR) model. The model is estimated using quarterly data from the third quarter of 2003 to the first quarter of 2018. The base line model is of the form:

$$Y_t = c + B_1 Y_{t-1} + \dots + B_P Y_{t-p} + C_1 X_t^* + \dots + C_{k+1} X_{t-k}^* + \varepsilon_t$$
(1)

$$X_t^* = \delta_1 X_{t-1}^* + \dots + \delta_{k+1} X_{t-q}^* + \vartheta_t \tag{2}$$

where:

- Y represents a vector of endogenous variables
- X* represents a vector of foreign variables

We include ten variables in our baseline model as follows:

(oil,
$$\Delta y^*$$
, \prod^* , r^* , r^{EMBI^*} , ΔTOT , Δy , \prod , e, r) (3)

where:

- Δy* is U.S. real GDP growth. It captures advanced economy demand shocks. As a robustness test, we also control for world real GDP growth, real GDP growth in the Euro area and advanced economies.
- Oil is average global oil price. It captures advanced economy supply shocks. We also
 experimented with the trade weighted CPI for the U.S., U.K., and the Euro area (i.e. the
 weighted CPI of Ghana's major trade partners) and U.S inflation rate, ∏*.
- r* is the U.S. effective federal funds rate. It captures the stance of advanced economy monetary policy. Following this literature, we also controlled for the following variables in an alternative specification: (1) the nominal 10-year U.S. government bond rate. (2) the U.S term spread defined as 10-year U.S. Treasury bond rate minus the U.S. federal funds rate and (3) the US corporate high yield spread.
- r^{EMBI*} is the EMBI Global yield. This variable captures changes in emerging market financing conditions arising from factors other than external demand conditions. Other proxies for external financing conditions used include (1) the EMBI global spread (2) the U.S. high yield spread.
- ΔTOT is terms-of-trade growth. This variable captures factors other than changes in external demand or financial conditions.

The model was estimated using quarterly data from 2003Q3-2018Q1. The identification scheme assumes that Ghana is a small open economy. As such, the external variables are not affected by movements in the domestic variables. Within the external block, structural shocks are identified using a recursive scheme based on the ordering specified in equation (1) along the lines of IMF (2014). Our goal is to understand how shocks to the external variables affect the domestic variables.

4.1. Correlations between external factors and domestic factors

As a first step, we computed simple correlations between selected external variables and two domestic variables: real GDP growth rate and inflation rate. The external variables are grouped according to what they are designed to capture: external demand conditions, external supply shocks or global financial conditions. Tables 1-3 display the results (See appendix for tables). The conclusion from these tables is that both real GDP growth rate and inflation rate are weakly correlated with the proxies for external demand conditions, external supply shocks and financing conditions. However, simple correlations are only a first pass at understanding the

relationship between domestic variables and external factors. Therefore, in what follows, we employ advanced econometrics tools like impulse response functions, variance decomposition, and simulation methods to assess the dynamic impact of external conditions on the Ghanaian economy. We focus on Ghana's real GDP growth and inflation.

4.2. Impulse Responses and Variance Decomposition

To uncover the business cycles implied by the external shocks, we estimated the impulse response functions using our BVAR model. The results are shown in Figure 6. It can be seen from Figure 6 that a standard deviation shock to oil price has a temporary negative effect on Ghana's real GDP growth in the first quarter. However, the effect does not appear significant. A standard deviation shock to external demand conditions proxied by US GDP growth leads to a 0.015 percentage point increase in Ghana's real GDP growth for about two quarters before declining sharply thereafter. This may reflect the boost to both exports and remittance flows. A tightening of global financial conditions doesn't appear to have any significant impact on Ghana's real GDP growth. Changes in financial conditions tend to affect the economy through investors' expectations. Thus, how financing conditions impact growth may depend on Ghana's internal vulnerabilities such as the size of our external obligations.

The impulse response analysis so far suggests that real GDP growth in Ghana responds to external conditions. To understand how much these external shocks contribute to Ghana's real GDP growth, we computed variance decomposition. The results are shown in Figures 11 and 12 (see the appendix). Oil price shocks and external demand conditions account for about 40 percent of the forecast error variance in Ghana's real GDP growth. In terms of components, shocks to external conditions proxied by US GDP growth account for about 25 percent of the forecast error variance in real GDP growth while oil price shocks account for the remaining 15percent.



Figure 6: The Response of Domestic Real GDP Growth to External Shocks

4.3. Out-of-Sample Forecasts

In addition to impulse response functions and variance decompositions discussed above, we analysed the effects of external factors on the Ghanaian economy using conditional forecast. Conditional forecast is forecast based on assumptions about the future paths of some of the endogenous variables Osterholm and Zettlemeyer (2007), Waggoner and Zha (1999), Sims (1982), Leeper and Zha (2003), and Svesson (2005). We employ conditional forecast to examine how Ghana's GDP growth, inflation and exchange rate would respond to specific external events. Figure 7 shows the unconditional forecast of the model. The forecast period is from 2018Q1 -2020q4.

4.3.1 Conditional Forecast and Scenario Analysis:

In this section, we examine how the baseline forecast is affected by various scenarios that we believe represent potential risks to the outlook in Ghana. These scenarios are broadly in line with the expectations of the October 2018 Issue of the World Economic Outlook.

4.3.1.1 The effect of weaker external demand growth on the Ghanaian economy:

Global growth momentum has moderated over the last couple of months driven largely by deteriorating financial market sentiments, trade policy uncertainty and concerns about the health of the Chinese economy. There are indications that this slowdown may continue in the near-term and moderate by 2020 as output gaps become positive and inflation rise towards its target. A recent IMF and Consensus forecasts indicate that growth in advanced economies would slow to 2 percent in 2019 and 1.7 percent in 2020. Growth in the world's largest economy is also expected to slow from 2.9 percent in 2018 to 2.5 percent in 2019. China, the world's second largest economy is also expected to end the year 2019 at 6.2 percent, down by 0.4 percentage points from the figure in the previous year. These two largest economies make up about 34 percent of the global economy. Thus, a slowdown in these economies may have severe implications for the global economy.

In this section, we examine the effect of a slowdown in the United States and China on Ghana's GDP growth, inflation, the exchange rate, and interest rate. The results are shown in figures 8 and 9. The results show that a simultaneously slowdown in the world's two largest economies will dampen GDP growth in Ghana, induce a significant deterioration in the exchange rate and induce a marginal increase the domestic inflation rate and a sharp rise in interest rate.



Figure 8: The effects of a slowdown in China



Figure 9: The effects of a slowdown in the United States

4.3.1.2 The effect of tighter external financial conditions on the Ghanaian economy:

Financial conditions have tightened in recent months reflecting a combination of US policy rate hikes and strengthening dollar. It is conceivable that the on-going turbulence in the financial markets, reflecting in part, the tariff tensions between the United States and China, may escalate and lead to sharp increases in emerging market bond spreads. In addition, uncertainties regarding the Brexit negotiations may further lead to a deterioration in financial market sentiments. Specifically, we assume a gradual increase in EMBI spread of about 100 basis points to 120 basis points in our simulation. We assume that this tightness in the financial condition is independent of global demand growth. Hence, this scenario isolates a pure emerging market financing shock from factors such as increase in risk premium associated with perceived vulnerabilities in emerging market and developing economies. The results are shown in figure 10.

Tighter financing conditions as captured by an increase in EMBI spread leads to a decline in GDP growth as expected. Domestic inflation remains relatively stable initially but picks up at the beginning of the third quarter. Exchange rate depreciates sharply as expected perhaps triggered by outflows and interest rate rise.

Tighter financial conditions may also come from policy rate adjustments. The recent strong growth in the U.S relative to the other major economies led to a divergence in their monetary

policy. The associated dollar rally triggered outflows in emerging market economies with country specific vulnerabilities. Countries such as Argentina, Turkey and to some extent South Africa all experienced some disorderly currency movements that spread to other developing economies including Ghana



Figure 10: The effect of tighter external financial conditions

To investigate the effect of an unexpected policy rate hike on the Ghanaian economy, we use the forecast which expects a gradual increase in U.S policy rate in our simulation. The results are shown in figure 11.





Tighter financing conditions as captured by an increase in U.S policy rate leads to a decline in GDP growth as expected. Domestic inflation remains relatively stable initially but picks up at the beginning of the third quarter. Exchange rate depreciates sharply as expected perhaps triggered by outflows. Interest rate also rise sharply.

4.3.1.3 The effects of oil price shocks on the Ghanaian economy:

Global oil prices averaged about US\$75/bbl between March-October 2018 reflecting a combination of demand and supply factors. There were signs that oil prices may continue to rise in the near-medium term. This forecast rests on two key factors: OPEC and some non-OPEC producers ended production cuts and signalled their intention to step up production. However, supply constraints have made it difficult for these countries to step up their production levels.

At the same time, sanctions on Iran, Venezuela and Libya were expected to further reduce global supply of oil. The US had indicated that sanctions on Iran will resume in November 2018 and remain in place until Iran meets its demands. In addition, global demand growth had picked up significantly in recent years reflecting the global growth momentum.

These factors may push oil prices up in the near term-medium term. The impact on Ghana can go both ways: on the one hand, Ghana exports oil and should naturally benefit from oil price hikes. On the other hand, oil price hikes tend to feed into ex-pump prices and therefore inflation. However, this channel may be weak due to the administered nature of prices in Ghana. This section investigates the effect of oil price hike on the Ghanaian economy. The results are shown in figure in 18.

The results show that a surge in oil price leads to a relatively stable GDP growth. Inflation declines initially but picks up marginally after three quarters, while the exchange rate depreciates sharply. The sharp depreciation of the exchange rate may be due to several factors. First, U.S GDP is forecast to decline under this scenario and that could cause uncertainty about the performance of the global economy. As result, emerging market and developing economies may witness outflows. Second, the relatively elevated US policy rate in our scenario may have also contributed to differences in relative return in favour of the US and thus triggered some outflows.



Figure 12: Effect of oil price drop on the Ghanaian economy

Since October 2018, a combination of over production and concerns about the global economy weighed on oil price, dropping sharply to around \$50 per barrel in December 2018. Figure 12 shows the results of an analysis that assumes that the downward trend in oil price will continue and try to investigate the impact on the Ghanaian economy. Ghana exports and imports oil. Thus, a drop-in oil price while reducing prices at the pump, may also reduce government oil revenue. The results in figure 12 shows that growth and inflation remain stable, exchange rate depreciates to around 5percent, while interest rate rise over the forecast horizon.

5. Concluding Remarks

This paper analyzed the impact of external conditions (external demand, external supply, and financial conditions) on the Ghanaian economy using a Bayesian Vector Autoregression model. The model was used to uncover the underlying business cycle through the impulse response functions. We also examined the contribution of external conditions on the variance of some domestic variables such as real GDP growth, inflation rate and exchange rate. Finally, we examined the effects of strong external demand, a surge in oil price and tighter financing conditions on the Ghanaian economy.

The results show that about 40 percent of the variation in Ghana's real GDP growth is accounted for by external influences. In addition, about 30 percent of the variation in inflation is accounted for by external influences. Conditional forecast for a slowdown in China and the U.S, the two largest economies in the world, show that these shocks will dampen GDP growth in Ghana, induce a significant deterioration in the exchange rate and increase the domestic inflation rate. Tighter financial conditions as captured by an increase in EMBI spread and an increase in US policy rate leads to a decline in GDP growth as expected. Domestic inflation remains relatively stable initially but picks up at the beginning of the third quarter. Exchange rate depreciates sharply as expected perhaps triggered by outflows and interest rate is expected to rise.

Another scenario involving a rise in supply shocks proxied by a surge in oil prices revealed that higher oil price leads to a relatively stable GDP growth. Inflation declines initially but picks up marginally after three quarters, while the exchange rate depreciates sharply. The sharp depreciation of the exchange rate may be due to several factors. First, U.S GDP is forecast to decline under this scenario and that could cause uncertainty about the performance of the global economy. As result, emerging market and developing economies may witness outflows. Second, the relatively elevated US policy rate in our scenario may have also contributed to differences in relative return in favour of the US and thus triggered some outflows.

The results thus imply that external factors play an important role in the Ghanaian economy. Domestic fundamentals may either act to amplify or dampen the impact of these external developments on the Ghanaian economy. Policymakers should therefore continue to improve the macro fundamentals to dampen the effects of external shocks on the Ghanaian economy. Measures such as: fiscal discipline, reduction in external debt, building Forex buffers, continuing with the ongoing disinflation process, and taking appropriate monetary policy measures to stabilize the economy are critical. In addition, in the long term, promoting exports would help to reduce the pressure on the cedi.

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Appendices

	Ghana Real GDP Growth Rate	Euro Area Growth Rate	Growth Rate in Advanced Economies	U.S Real GDP Growth Rate	World Growth Rate	Inflation Rate
Ghana's GDP Growth Rate	1.00	0.10	0.12	0.10	0.22	-0.19
Euro Area Growth Rate	0.10	1.00	0.91	0.34	0.85	-0.09
Growth rate (Advanced						
Economies)	0.12	0.91	1.00	0.54	0.94	-0.16
U.S Real GDP Growth Rate	0.10	0.34	0.54	1.00	0.48	-0.21
World Growth Rate	0.22	0.85	0.94	0.48	1.00	-0.24
Inflation Rate	-0.19	-0.09	-0.16	-0.21	-0.24	1.00

Table 1: External Demand Conditions: Correlation Matrix

Source: BoG staff calculation

Table 2: External Supply Conditions: Correlation Matrix

	Ghana Real GDP Growth Rate	Inflation Rate	US Inflation Rate	Weighted CPI Inflation Rate	Oil Price Growth Rate	Terms of Trade Growth Rate
Ghana Real GDP Growth Rate	1.00	-0.20	-0.02	0.09	-0.09	-0.06
Inflation Rate	-0.20	1.00	0.12	0.06	0.20	-0.16
US Inflation Rate	-0.02	0.12	1.00	0.78	0.79	-0.11
Weighted CPI Inflation Rate	0.09	0.06	0.78	1.00	0.73	-0.03
Oil Price Growth Rate	-0.09	0.20	0.79	0.73	1.00	-0.13
Terms of Trade Growth Rate	-0.06	-0.16	-0.11	-0.03	-0.13	1.00

Table 3: Financial Conditions: Correlation Matrix

							Corporat	
	Ghana Real		Effective		10-Year US		e High	
	GDP Growth		Federal		Gov't Bond	U.S. Term	Yield	
	Rate	Inflation Rate	Funds Rate	EMBI Global	Yield	Spread	Spread	VIX
Ghana Real GDP Growth Rate	1.00	-0.19	-0.02	-0.13	-0.03	-0.01	0.00	0.04
Inflation Rate	-0.19	1.00	-0.04	0.14	0.00	0.10	0.10	0.02
Effective Federal Funds Rate	-0.02	-0.04	1.00	-0.59	0.77	-0.81	-0.89	-0.30
EMBI Global	-0.13	0.14	-0.59	1.00	-0.34	0.53	0.64	0.59
10-Year US Gov't Bond Yield	-0.03	0.00	0.77	-0.34	1.00	-0.27	-0.42	-0.05
U.S. Term Spread	-0.01	0.10	-0.81	0.53	-0.27	1.00	0.97	0.36
U.S. Corporate High Yield Spread	0.00	0.10	-0.89	0.64	-0.42	0.97	1.00	0.48
VIX	0.04	0.02	-0.30	0.59	-0.05	0.36	0.48	1.00



Variable names, data sources and unit root tests Table 4: ADF test with eight lags

Variable Name		Level	First Difference			
		Advanced Econo	omy Demand Shocks			
U.S real GDP growth rate		-0.685***	-1.727***			
Euro area real GDP growth		-0.242***	1.384***			
World real GDP growth rate		-0.223***	-0.722***			
Advanced economy real GDP	growth rate	-0.165**	-0.739***			
		Suppl	ly Shocks			
U.S Inflation rate		-1.046***	-4.108***			
Trade weighted inflation rate	e (U.S, U.K & Euro	-0.902***	-2.427***			
area)						
Terms of Trade growth		-1.367***	-10.998***			
Oil Price growth (percent, Av	verage)	-1.188***	-1.155***			
		External Financial Conditions				
10-year U.S government bon	d yield	-0.069	-1.160***			
Effective federal funds rate		-0.089**	-0.481***			
U.S 3- month Treasury Bill ra	te	-0.074*	-0.742***			
U.S Term Spread = 10-year U	S govt bond yield	-0.112	-0.841***			
 Federal funds rate 						
U.S high yield spread =		-0.162**	-0.616***			
Moody's Seasoned Aaa C	orporate Bond -					
Federal Funds Rate (perce	ent)					
Chicago Board Options Excha	ange Volatility	-1.594***	-1.377***			
Index (VIX)						
Emerging Markets Bond Inde	ex yield	-0.138	-1.278***			
Domestic Variables						
Inflation rate (INF_GH)		-0.536	-3.704***			
Ghana's real GDP growth rat	e (G_GH)	-0.579***	-2.561***			
Exchange rate (cedi-USD) (Ex	rate	-0.001	-0.617***			
Treasury Bill rate (3Months)	TBIL	-0.126**	-0.755***			









Figure 16: Unconditional forecast





Figure 17: Effects of stronger U.S growth and U.S policy rate hike on the Ghanaian economy



