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Egypt's Government Spending Multiplier: Its Size and Determinants

> *"If the Treasury were to fill old bottles with banknotes, bury them […], and leave it to private enterprise […] to dig the notes up again […], there need be no more unemployment and […] the real income of the community, […] would probably become a good deal greater than it actually is. It would, indeed, be more sensible to build houses and the like; but if there are political and practical difficulties in the way of this, the above would be better than nothing."*
>
> — John Maynard Keynes, The General Theory of Employment, Interest, and Money

1. Introduction

This research paper seeks to explore two questions: (1) To what extent has government spending been 'effective' in stimulating aggregate demand in Egypt? [1] And (2) how did the economic policy mix contribute to the effectiveness (or lack thereof) of fiscal policy in Egypt?

These questions come at an important juncture, as Egypt is embarking on an ambitious reform program under an International Monetary Fund (IMF) Extended-Fund Facility[2]; the cornerstones of which are: Fiscal consolidation, exchange rate liberalization, and structural reforms to boost growth and reduce unemployment. As such, it is important to quantify the impact of fiscal policy changes on real GDP, whilst taking into consideration the effect of the prevailing economic policy mix. That is, to better predict the effect of the fiscal consolidation on real GDP growth, and to better plan/design the policy actions and to set achievable fiscal and growth targets.

In this research paper, we focus on the period (FY2005—FY2016), for which quarterly data on fiscal indicators are available.[3] We analytically and empirically assess the relationship between government spending and real GDP growth, in light of the following factors: The state of the business cycle, the degree of accommodation of monetary policy to changes in fiscal policy, the exchange rate regime(s), and the performance of Egypt's goods and services balance. These factors have been identified in the literature as key determinants of the size of the fiscal multiplier.

To empirically estimate the size of the spending multiplier in Egypt, we first explore whether there is a long-run equilibrium relationship between the variables of interest. Thus, a cointegration test is run, using quarterly data for the period FY2005Q1—FY2016Q3[4]. Indeed the Johansen test finds one cointegrating equation between the following five variables: Real GDP, real government expenditure, Treasury bill rate, real exchange rate and the goods and services balance. Having detected a long-run relationship, we use the same dataset to estimate a Vector Error Correction Model, of which the size of the spending multiplier is obtained from the accumulated impulse responses that are generated from the model. For the full dataset, the cumulative spending multiplier is found to be '0.06' by the end of the first year, and increases to '0.32' in the long-run (after 20 quarters). Both the first-year as well as the long-run cumulative multipliers are considered "low", given the multiplier ranges/categories provided in the literature. The low spending multiplier is attributed to the originally high debt to GDP ratio, the non-accommodative behavior of monetary policy (which has generally been pro-cyclical; with interest rates rising during economic downturns); the real exchange rate appreciation which in turn led to a deteriorating goods and services balance (that is considered a leakage of the positive impact of a rise in government spending on GDP, through importation).

We then split the empirical analysis into two sub-periods and run the VECM over both: The first (FY2005Q1—FY2009Q4) and the second (FY2010Q1—FY2016Q3). The spending multiplier was estimated to be almost zero (negligible) during the first sub-period, and at 0.35 in the long-run during the second sub-period. The large variation between the two sub-sample findings are rationalized as follows: The first sub-period (FY2005Q1—FY2009Q4) had a negligible multiplier mainly because it was characterized by high growth, thus the economy was

[1] To what extent was GDP (or the 'denominator' in the 'deficit-to-GDP ratio') positively affected by an expansionary fiscal policy?
[2] The IMF's Executive Board approved the three-year Extended Fund Facility for Egypt in the amount of US$12 billion on November 11, 2016.
[3] No quarterly data were available prior to FY2005.
[4] As of mid—December 2016, the fiscal indicators for the fourth quarter of FY16 have not yet been published.

already above full-capacity; monetary policy was not accommodative, especially towards the end of this sub-period; and the relatively flexible exchange rate regime led to a substantial real appreciation which in turn leaked part of the government spending through more importation, and thus a deterioration in the net exports balance. The second sub-period (FY2010Q1—FY2016Q3) witnessed relatively lower growth (below potential), a somewhat accommodative monetary policy and much lower real appreciation of the exchange rate.

In light of the above, this paper has provided two key contributions: First, the paper provided a range of estimates for Egypt's spending multiplier (to the best of our knowledge, this has filled a gap in the literature on fiscal policy in Egypt). And second, the paper periodized Egypt's economic policy mix and assessed its impact on the effectiveness of fiscal policy.

This research paper is organized as follows: After the previous introduction, Section 2 is dedicated to the review of literature on the subject of fiscal multipliers, including the definitions, how they are estimated empirically and what factors affect the size of the multiplier. Section 3 turns to the analytical assessment of the Egyptian case, before embarking on the empirical analysis. In this analytical part, we give a brief history of the behavior of the main fiscal indicators during the period of interest (FY2005—FY2016), and then analyze the developments of the key factors that are later included in the empirical model as determinants of the size of the multiplier, including: monetary policy, the exchange rate and Egypt's trade openness. In doing so, we highlight the trends that characterized the two sub-period of interest. Section 4 presents the empirical tests' results (the cointegration as well as the three runs of the VECM), and Section 5 consludes.

2. Literature Review: What are fiscal multipliers? How are they estimated? And what are their determinants?

In this part, we start off by defining the various kinds of the fiscal multipliers, and their respective formulae. And then we review the common empirical and model-based methodologies that have been previously used in the literature to quantify multipliers. And finally, we cover the factors that may affect the size of the fiscal multiplier.

2.1. Definitions

Fiscal multipliers measure the impact on output of exogenous changes in fiscal aggregates; government expenditure, revenues or the deficit (Batini, Eyraud, Forni, and Weber, 2014). Following this definition, several formulae can be used to capture the multiplier, as follows:

Spending multiplier = $\frac{\Delta Y_t}{\Delta G_t}$ [Equation 1a]; Revenue multiplier = $\frac{\Delta Y_t}{\Delta Rev_t}$ [Equation 1b];

or Deficit multiplier = $\frac{\Delta Y_t}{\Delta Def_t}$ [Equation 1c].

Where:

'Y' is real GDP, 'G' represents real government expenditure, 'Rev' is real government revenue and 'Def' is the overall budget deficit in real terms.

Those are usually defined as the "impact" multipliers, whereas the "multiplier at horizon" can be represented as: $\frac{\Delta Y_{t+i}}{\Delta X_t}$ [Equation 2]; where 'i' is the horizon (number of years or quarters) after the initial discretionary change in the fiscal aggregate 'X' (Batini, Eyraud, Forni, and Weber, 2014).

Finally, the "cumulative multiplier", or long-run multiplier, is represented as: $\frac{\Sigma_{t=0}^{T}\ \Delta Y_t}{\Sigma_{t=o}^{T}\ \Delta X_t}$ [Equation 3]

It is defined as the cumulative change in real GDP 'Y' per unit of incremental change in the fiscal aggregate 'X', from the time of the impulse to the reported horizon (Ilzetzki, Mendoza and Végh, 2011).

2.2. How are fiscal multipliers estimated?

Fiscal multipliers are generally captured through empirical estimations, using either Dynamic Stochastic General Equilibrium (DSGE) models[5] or Vector Autoregression (VAR) models, or structural VAR (SVAR) models.

The empirical models that are used to estimate the fiscal multipliers usually include the following variables: government spending and/or revenues, GDP, the current account balance, and interest rates. The VAR methodology can be convenient to measure the fiscal multiplier as it allows all variables in the model to be 'endogenous'; a stipulation that bodes well with the reality of these variables. A more sophisticated form of VARs, namely SVARs attempts to identify "exogenous" fiscal shocks to estimate their impact on real GDP. But as the identification process in SVARs are difficult and suffer from shortcomings,[6] alternative methods have been introduced in order to ensure that the fiscal shocks are truly exogenous. The "narrative" approach or the "action-based" or "event-study" approach has been used to improve the identification of discretionary or exogenous fiscal shocks. This approach relies on existing knowledge of discretionary fiscal actions, obtained from budget documents, for example, or from information about a defined fiscal stimulus package or about military spending[7].

Blanchard and Perotti (2002) use a combination of two methodologies to estimate the effect of government spending and taxation on real GDP in post-war United States of America: The traditional Vector Autoregression (VAR) approach, as well as the "event-study" approach. First, a reduced form VAR is estimated using the following three variables: taxes, government spending and output; all in logarithms, and in real per capita terms. They then move to the estimation of a structural VAR (SVAR) through the identification of exogenous fiscal shocks. This is done through the "event-study approach"; relying on pre-existing information on the variables in the model that can help single-out exogenous fiscal shocks from the automatic response of taxes and spending to economic activity. Such information can be in the form of knowledge of the tax and transfer systems and the timing of tax collections; and all other information that can be considered as an automatic response, rather than a discretionary change in fiscal policy. Having identified the discretionary tax and spending shocks, their respective multipliers are then gauged from the impulse response functions that are generated from the estimated SVAR. In terms of the contemporaneous effect of exogenous fiscal shocks on output, Blanchard and Perotti find that a unit shock to spending increases GDP by 0.96 dollars, while a unit shock to taxes decreases GDP by 0.87 dollars.[8]

Ilzetzki, Mendoza and Végh (2011) also estimate the spending multipliers of a several country grouping using an SVAR model that consists of five endogenous variables: government expenditure variables, GDP, and other endogenous variables (the current account, the real exchange rate, and the policy interest rate set by the central bank). In their results, Ilzetzki, Mendoza and Végh report the "impact spending multiplier", as well as the "cumulative spending multiplier" as defined above. For high income countries, they find that the spending multiplier is 0.37 on impact, and increases (cumulatively) to 0.80 in the long-run (after 20 quarters). For developing countries, the impact multiplier was estimated at -0.21, and the long-run multiplier was 0.18. Besides the different multiplier estimates depending on the level of development of the country, the authors also report the multipliers to other country groupings, including those that maintain a pegged versus those that have flexible exchange rate regime, or those that enjoy more trade openness than others, or those that have high public debt to GDP ratios.

Those results will be discussed next with the determinants of the size of the fiscal multiplier.

[5] Fiscal multipliers are calculated using DSGE models that simulate the impact on growth of fiscal policy (Batini, Eyraud, Forni, and Weber, 2014). While DSGE models have the advantage of modelling the behavior of the economy as a whole (including microeconomic variables which are mostly absent in VARs), the results generated from such models are very sensitive to the assumptions made about the "parameters" included in the model (like labor market-related indicators, for example.

[6] For example, identification techniques fail to isolate the effect of commodity price shocks on fiscal variables and hence on output. Thus the "identified" "exogenous" shock is not purely exogenous in that case (Batini, Eyraud, Forni, and Weber, 2014, based on IMF, 2011).

[7] Military spending has been often used in the literature to capture exogenous fiscal shocks, as it is presumed to be independent of the business cycle (Barro, 1981).

[8] Their results were quite similar when they assumed either a deterministic or a stochastic trend.

2.3. Determinants of the Size of the Fiscal Multiplier

The size of the multiplier can vary widely. Batini, Eyraud, Forni, and Weber (2014) provide ranges for low, medium and high first year multipliers. Low multipliers range between 0.1 and 0.3, medium multipliers range between 0.4 and 0.6, and high multipliers range between 0.7 and 1.

The literature has identified several factors that affect the size of the fiscal multiplier (see Table 1). Those mainly include the following: (1) whether the economy is in a boom or bust, (2) trade openness; (3) capital mobility, (4) effectiveness of monetary policy and the degree of monetary accommodation to fiscal policy, (5) exchange rate regime, (6) public debt level.

Table 1: Literature review on the factors affecting the size of the fiscal multiplier

Factors affecting the size of the fiscal multiplier	**Rationale**	**Relevant literature and studies**
Business cycle (boom or bust)	Fiscal multipliers are generally larger during economic downturns. During a recession, a fiscal stimulus can be more effective as the economy is performing below capacity. On the other hand, a fiscal stimulus during a boom cycle can be ineffective in increasing output as the economy is already operating at or above potential, with little room to increase incomes further without pushing prices higher.	Batini, Eyraud, Forni, and Weber, (2014) based on Auerbach and Gorodnichenko (2012a and b) who assess spending multipliers in the US and OECD countries, respectively, during expansions and recessions. Batini, Eyraud, Forni, and Weber, (2014) provide a brief survey of empirical studies on fiscal multipliers over the business cycle.
Trade openness	A fiscal expansion is generally associated with higher importation. This in turn reduces net exports and dilutes the positive effect on output of the fiscal expansion. Thus the fiscal multiplier is expected to be smaller, the more open the trade regime of a country is and the higher its propensity to import is.	Seminal work by Fleming (1962). Ilzetzki, Mendoza and Végh (2011) divide countries by the tariff rates. Country groupings with average tariff rates higher than 4% had lower spending multipliers.
Capital mobility	A fiscal expansion is expected raise demand for money, as well as interest rates. Under higher capital mobility, the higher interest rates will induce capital inflows which may compensate for the deterioration in current account associated with the fiscal expansion. However, under lower capital mobility (if the capital and financial account of the balance of payments is relatively closed), then the lack of capital inflows will amplify the deterioration in the balance of payments that is associated with a fiscal expansion (due to the higher imports, thus lower net exports, in addition to the lack of capital inflows). Bottom-line: Fiscal policy is expected to be less effective if capital mobility is low, due to the further deterioration in the balance of payments, in tandem with the fiscal expansion.	Seminal work by Mundell (1963) and Fleming (1962).
The degree of monetary accommodation to the direction of fiscal policy… and the exchange rate regime	The fiscal multiplier is larger the more accommodative monetary policy is. By virtue of the "impossible trinity", under a pegged exchange rate regime, and perfect capital mobility, monetary policy becomes ineffective (loss of monetary autonomy). For example, a fiscal expansion will raise demand for money and thus interest rates, which will in turn induce capital	Seminal work by Mundell (1963) and Fleming (1962). Ilzetzki, Mendoza and Végh (2011) provide point estimates of spending multipliers for country groups that maintain pegged exchange rate regimes (which are found to have

Factors affecting the size of the fiscal multiplier	Rationale	Relevant literature and studies
	inflows. This will exert pressure on the exchange rate to appreciate. However, the monetary authorities will mop up the excess foreign exchange liquidity associated with capital inflows, but expanding domestic money supply in the process, and bringing down interest rates once again. This monetary expansion augments the positive effect on output of the fiscal multiplier. On the other hand, under a flexible exchange rate regime, monetary policy is effective. Thus, monetary authorities will not intervene to stem any real exchange rate appreciation associated with the fiscal expansion. The real appreciation will thus negatively impact net exports, and dilute the effect of the fiscal expansion on output.	higher multipliers) and flexible exchange rate regime (lower multipliers).
Level of public debt	Fiscal multipliers are generally lower in countries with high public debt levels. A fiscal stimulus for example in a highly indebted country will be diluted by the high interest rate and higher risk premia, as well as the lack of credibility, and thus is unlikely to have a positive impact on output.	Ilzetzki, Mendoza and Végh (2011) estimate 'negative' of spending multipliers for country groups that have central government debt to GDP ratios of above 60%. For such countries, the impact multiplier is -0.18 and the long-run cumulative multiplier is -2.3.

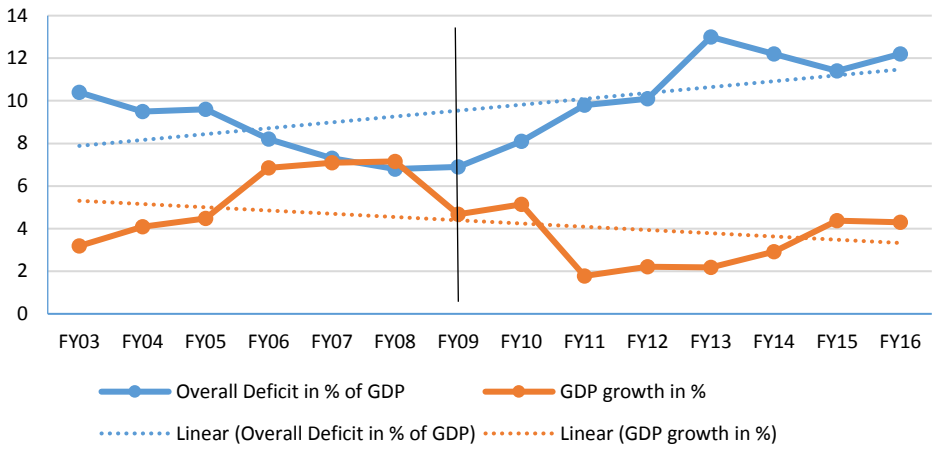
In the following part, we move to the assessment of the relevant economic conditions in Egypt that may have affected the size of the fiscal multiplier.

3. Has Egypt's Macroeconomic Policy Mix Undermined the Effectiveness of Fiscal Policy?

Egypt suffers from significant macro-fiscal imbalances. The overall budget deficit averaged 9.7% of GDP between FY2003 and FY2016; peaking at 13% of GDP in FY2013, and with an unhealthy structure where less than 7% of government expenditures were allocated to investment. The budget sector domestic debt averaged 80% of GDP during the same period (Ministry of Finance). Meanwhile, real GDP growth has been underperforming; averaging 4.3% during FY2003—FY2016[9] (Ministry of Planning, Monitoring and Administrative Reform). Thus, there does not seem to be a positive correlation between the episodes of fiscal expansion and improvements in economic activity (Figure 1). On the contrary: The simple correlation coefficient between real GDP growth and the previous year's overall budget deficit is recorded at -0.38 during this period; indicating that any rise in the budget deficit has been associated with worse economic performance during the following year and vice versa.[10]

[9] Egypt's population growth rate has averaged 2% during the same period, and has actually surged to 2.6% in FY15. Thus, such a modest growth performance seems even more dismal when assessed in per capita terms.
[10] The contemporaneous correlation coefficient was even worse; registered at -0.7.
Also, the contemporaneous correlation between government expenditures/GDP and real GDP growth was registered at 0.26.

Figure 1: Overall budget sector deficit and GDP growth



Source: Ministry of Finance and Ministry of Planning, Monitoring and Administrative Reform

In light of the above, we would like to explore the relationship between fiscal policy and economic performance (real GDP growth) in Egypt, while taking into consideration the prevailing economic policy mix that may have impacted this relationship. In doing so, we distinguish between two time periods: The first period is FY2003—FY2009; that is, the period of fiscal consolidation and rising economic growth. The second period is FY2010—FY2016 which was characterized by the economic downturn, and deterioration in Egypt's fiscal stance. Each separate period will be later assessed empirically, as well.

3.1. The first sub-period: Higher growth episode (FY2003—FY2009)

This period was characterized by fiscal consolidation efforts; where fiscal policy was "counter-cyclical" as the economy was also undergoing a rising growth spurt; with real GDP growing at an annual rate of 6%, on average. Growth was mainly driven by an uptick in private investments which were crowded in, following a step-up in the privatization program between 2005 and 2008. The fiscal consolidation program was mainly based on reforms to the tax system; a move that contributed to a surge in tax revenues; peaking at 15.8% of GDP in FY2006, 2.5 percentage points higher than its ratio in FY2003, prior to the tax reforms. Total revenues also increased more sharply, albeit due to one-off measures, such as the sale of Egypt's third mobile license in early-FY2007 (Figure 2a). The revenues side was the main driver of the fall in the deficit to GDP ratio from 10.4% in FY2003 to 6.9% in FY2009.

Total government expenditures were (on average) still rising in percent of GDP, despite some efforts to also contain them, including through capping civil servants' hiring (effective FY2003), and reforming the fuel subsidy in FY2007 after they had surged sharply in the previous year (Figure 2a).[11]

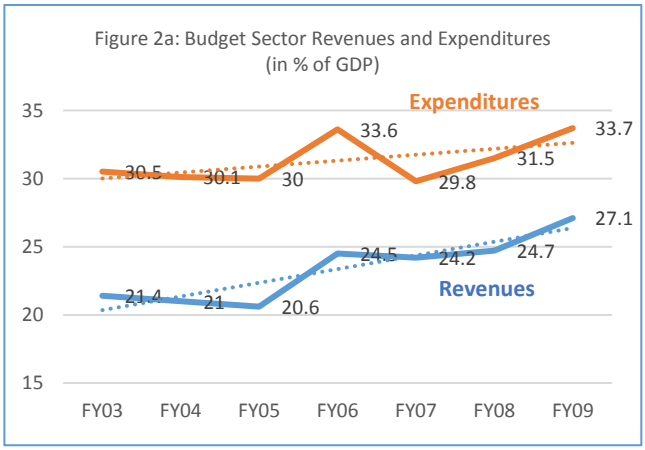
3.2. The second sub-period: Lower economic growth (FY2010—FY2016)

Growth declined to an average of 2.8% during FY2010—FY2014, before picking up somewhat to its historical average of 4.3% in FY2015—FY2016. The Egyptian economy was affected by a combination of global and domestic factors that have negatively impacted its performance. First, the global financial crisis that started in August 2008, and that triggered the government to undertake a fiscal stimulus package (worth 1.5% of GDP in FY2009).[12]

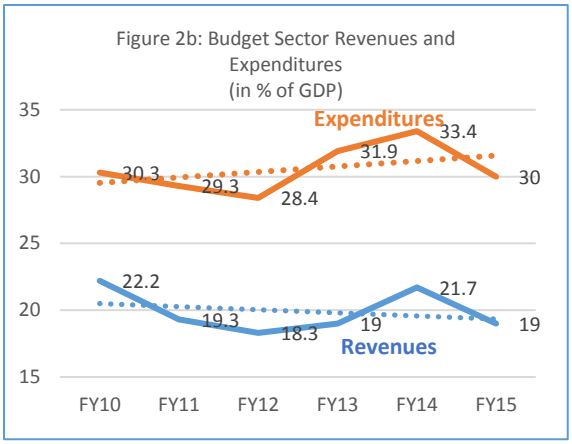
[11] The surge in expenditures in FY2006 was driven by the increase in subsidies due to the higher international oil prices. Also, the fuel subsidies were "explicitly" accounted for in the budget for the first time. This surge was again contained in the following year with the fuel subsidy reforms.
[12] However, it is worthy to note that the stimulus did not contribute to a surge in the deficit to GDP ratio.

Second, the January 2011 revolution – whilst ushering in a new era of political change in Egypt – has led to a sharp economic downturn, due to the uncertainty and the drop in investments that occurred since the second half of FY2010. On top of this negative domestic shock to the economic activity in Egypt, external factors have been also unfavorable: The Euro zone (Egypt's largest trading partner) has been experiencing a quite sluggish recovery since the global financial crisis, thus undermining Egypt's net exports balance. In addition, the lower international oil prices since early-2014 have negatively impacted the Gulf countries' economies, and thus remittances to Egypt which is an important supporter of Egyptian households' private consumption.

In tandem, Egypt's fiscal stance deteriorated further, with the overall deficit peaking at 13% of GDP in FY2013; close to double the ratio that was achieved during the fiscal consolidation period. The deterioration in the fiscal balance was driven by a combination of an increase in expenditures and a drop in revenues (Figure 2b). Expenditures increased following the January 2011 revolution due to a number of populist measures that the government undertook, including the lifting of the freeze on civil servants' employment, as the government changed the contracts of the temporary employees to make them permanent civil servants, in addition to raising the minimum wage to EGP1200/per month in FY2012. The energy subsidies (fuel + electricity) bill also surged; reaching 7% in FY2013. On the revenues side, tax revenues dropped sharply with the lower economic activity, decreasing from 14% of GDP in FY2010 to 12.4% of GDP in FY2015. Total revenues also declined as the government's property income decreased as well (especially from the oil sector that suffered a big hit following the 2011 revolution), however a surge in "official assistance/grants" in FY2014 boosted total revenues temporarily.



Source: Ministry of Finance



Note: Data here stop in FY15, because the last quarter of FY16 has not been published yet.

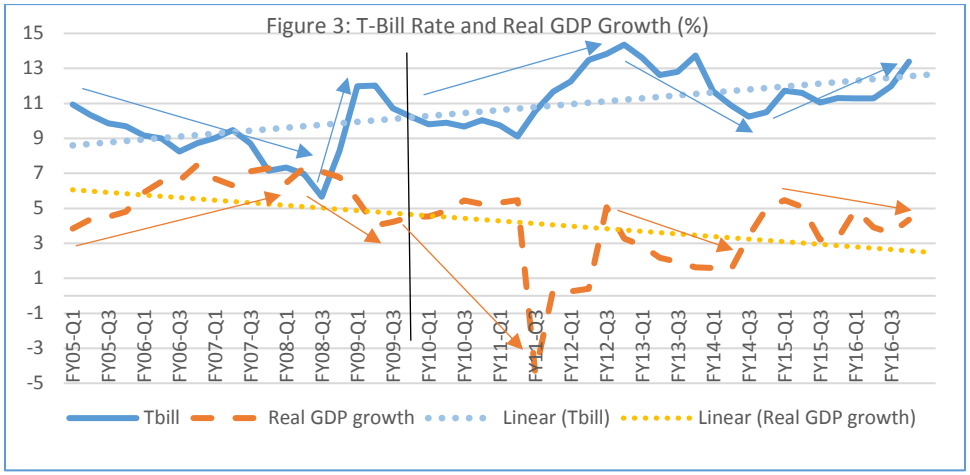
Notwithstanding the different trends in the direction of fiscal policy in the two sub-periods, government expenditures were generally on an upward trend in both periods. So how has this affected real GDP?

In order to answer this question, we turn now to explore the prevailing economic conditions that may have impacted this relationship. Towards this end, we assess the developments of the most relevant indicators, namely: the Treasury bill (T-Bill) rate in order to capture whether monetary policy has been accommodative to the direction of fiscal policy; the exchange rate to see to what extent it has been stable/volatile; as well as capital and trade openness indicators.

Monetary policy seems to have been pro-cyclical for the larger part of the whole period under investigation (FY2005—FY2016); with interest rates on a *general* rising trend, in tandem with the overall declining trend of GDP growth (see trend lines in Figure 3).

However, the cyclicality of monetary policy varied at various junctures throughout the two sub-periods of interest. During the first sub-period, FY2005—FY2009, accommodative at the beginning, but changed direction in towards

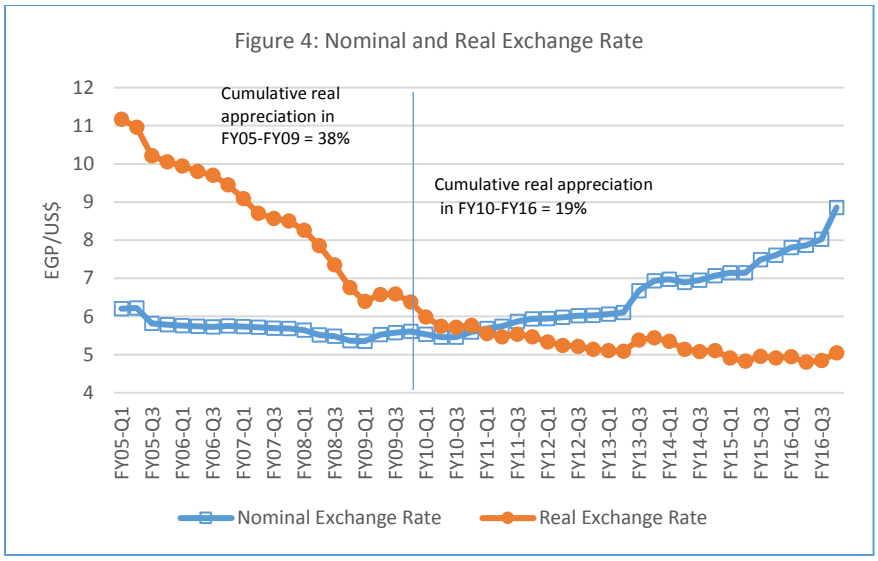
the end as the Central Bank of Egypt started to tighten monetary policy in response to the sharp jump in international food prices which fueled domestic inflationary pressures. This monetary tightening worked in opposite direction of fiscal policy during the same year (FY2009). Similarly, during the second sub-period, FY2010—FY2016, monetary policy was mostly pro-cyclical, but turned counter-cyclical (expansionary) between FY2012Q4 and FY2014Q4. This expansionary monetary policy could be considered supportive (accommodative) of the direction of the (expansionary) government expenditure at the time.



Source: Central Bank of Egypt and Ministry of Planning, Monitoring and Administrative Reform.

The direction and cyclicality of monetary policy has implications for the effectiveness of fiscal policy (size of the spending multiplier, in our case). The more accommodative monetary policy is, the larger the spending multiplier is. From the preliminary assessment above, monetary policy does not seem to have been accommodative of the direction of government spending (i.e., the performance of monetary policy may have undermined the spending multiplier)

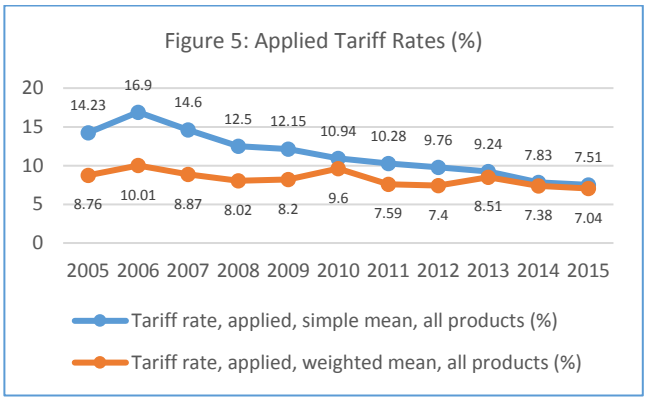
The exchange rate regime has also undergone a structural shift in the two sub-periods under investigation. The first sub-period (FY2005—FY2009) was characterized by a more flexible exchange rate regime, as Egypt abandoned the pegged exchange rate regime and announced its floatation in January 2003. By 2005, the parallel exchange rate that had emerged in 2001-2002 was eliminated, and the exchange rate regime was classified by the IMF as a "managed float with no pre-determined path". During the second sub-period (FY2010—FY2016), the Central Bank of Egypt started intervening in the foreign exchange market in order to stem a large depreciation of the currency, and towards end-2012, the CBE introduced a foreign exchange auctioning system whereby it "rationed" foreign currency to banks in regular auctions where the CBE undertook step devaluations at various junctures. The parallel market rate of exchange re-emerged in early-2013, due to the foreign currency shortages, and the exchange rate regime was classified by the IMF as a "stabilized arrangement" (IMF, 2015). In terms of the level of the exchange rate, the real exchange rate appreciated more sharply during the first sub-period (Figure 4).



Source: Central Bank of Egypt and International Financial Statistics.
Note: Real exchange rate was calculated as the nominal exchange rate divided by the consumer price index.

As discussed in the literature review section, more flexible exchange rate regimes are associated with ineffective fiscal policy. Thus, it seems that the exchange rate regime, especially during the first sub-period (FY2005—FY2009) may have undermined the spending multiplier.[13]

As for trade openness, Egypt's applied tariff rate has been decreasing rather steadily since 2006, albeit remaining high (above 7% in 2015)[14] (Figure 5). Nevertheless, Egypt's trade openness has deteriorated consistently since the global financial crisis in 2008 and with the economic downturn since 2011 (Figure 6). In principle, the more open trade is, the less effective fiscal policy is, as discussed in the literature review section. That is because of the leakage of the spending stimulus through importation. Thus, it is expected that Egypt's trade openness has negatively impacted the spending multiplier during the first sub-period (FY2005—FY2009), and less so during the second sub-period.



Source: World Development Indicators

[13] The goods and services balance has been deteriorating steadily throughout the whole period of interest. However the deterioration was sharper during the first sub-period.
[14] As noted in the literature review section, any country with an average tariff rate above 4% was considered "closed" by Ilzetzki, Mendoza and Végh (2011).

The preceding analysis points to a relatively "small" spending multiplier in Egypt. The correlation coefficient between government expenditure to GDP ratio and real GDP growth is 0.26 for the period FY2005-FY2015. Additionally, the economic policy mix may have affected the relationship between government spending and GDP growth, as discussed above regarding the pro-cyclicality of monetary policy which has generally been non-accommodative of the direction of fiscal policy, the exchange rate regime and the real appreciation of the exchange rate which have led to a deterioration of Egypt's goods and services balance; thus undermining the positive effect on real GDP of government spending. Against this preliminary analysis, we now turn to the empirical measurement of the effect of government spending on GDP.

4. The Empirics: Measuring Egypt's Spending Multiplier

This section presents the results of the empirical tests run in order to gauge the effect of government spending on GDP, whilst accounting for the prevailing economic conditions. We first run a cointegration test in order to see whether a long-run relationship exists between the variables of interest, namely: Real GDP, real government expenditures, the Treasury bill (T-Bill) rate, the real exchange rate and the balance of goods and services to GDP ratio. After establishing the long-run relationship, we estimate a Vector Error Correction Model (VECM). The VECM is a restricted version of the Vector Autoregression that accounts for the "error correction term" obtained from the cointegration relationship, and which captures the short-run deviations from the long-run equilibrium.

The VECM is run three times: Once for the full sample (FY2005Q1—FY2016Q3) and then for the two sub-samples (FY2005Q1—FY2009Q4) and (FY2010Q1—FY2016Q3).

Before embarking on the empirical estimations, all five variables were tested for stationarity using the Augmented Dickey-Fuller (ADF) test. All five variables were found to be I(1). The results of these tests will be furnished by the author upon request.

Data issues and sources are detailed in Annex 1.

4.1. Johansen cointegration test results

The Johansen test detected one cointegration equation (see Annex 2). Below are the results:

$$\boldsymbol{GDP_t = 5.55 + 0.29\, Gov.Exp_t - 0.12\, TBill_t - 0.37\, Ex.Rate_t - 0.24\, Goods \,\&\, Services\,/GDP_t} \quad \textbf{[Equation 4]}$$

(0.03)	(0.03)	(0.04)	(0.4)
[9.7]	[-3.67]	[-9.03]	[-0.6]

Using quarterly data for the period FY2005Q1—FY2016Q3, this equation captures the long-run relationship between the following variables: Real GDP, real government expenditures, the treasury bill (T-Bill) rate, the real exchange rate and the balance of goods and services to GDP ratio. All variables introduced in this cointegration test are in 'natural logs', except the goods and services balance as a percent of GDP, as the variable is predominantly negative throughout the time period under investigation. The standard errors are in () and the T-statistic are in [ ].

Equation 4 above says that: In the long run, a one percent increase in real government expenditure is associated with a 0.29% increase in real GDP, whereas as a one percent increase in the T-Bill rate (a monetary tightening) is associated with a 0.12% decrease in real GDP. The previous results are statistically significant and appear with the expected signs. However, the real exchange rate appears in the equation with the wrong sign; as a one percent real depreciation (increase in the real exchange rate), is associated with a decrease in real GDP by 0.37%. The unexpected sign that appears in this cointegration relationship might be attributed to the "rigid exchange rate management" throughout the period under investigation. Despite episodes of nominal depreciation between FY2005 and FY2016, those were outpaced by the rising domestic price level, which led to an overall "real

appreciation" of the exchange rate throughout this period. And this may help explain the 'wrong' sign on the goods and services balance to GDP ratio, which has been deteriorating consistently throughout the study period, in tandem with the appreciating real exchange rate. This variable also is statistically insignificant in this equation.

4.2. Vector Error Correction Model (VECM) results

In light of this cointegration relationship, we now use the same dataset to estimate the Vector Error Correction Model (VECM). The objective of estimating the VECM is to quantify the size of the government spending multiplier, using the cumulative impulse response functions generated from the VECM, whilst taking into consideration the macroeconomic factors that may impact the multiplier.

In the VECM, the ordering of the variables bears meaning and implications for the model and the test results: The ordering that is used in our empirical analysis is: First, real government expenditure, followed by real GDP, and then the treasury bill rate, the real exchange rate and finally the goods and services balance to GDP ratio. This ordering follows from the sequence that has been presented in the literature on "the effect of expansionary fiscal policy". Below is a citation taken verbatim from Mundell (1963, p. 478) and that supports the argument to order the endogenous variables of the VECM as chosen in this model.

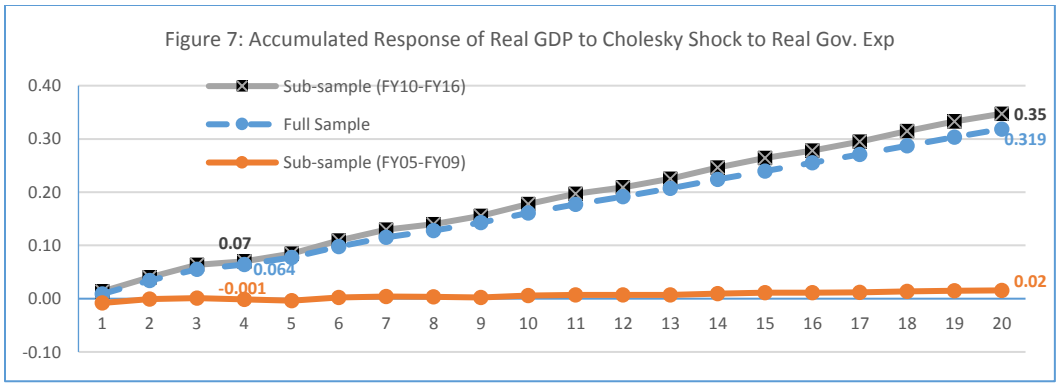
> *"Assume an increase in government spending financed by government borrowing. The increased spending creates an excess demand for goods and tends to raise income. But this would increase the demand for money, raise interest rates, attract a capital inflow, and appreciate the exchange rate."*

The lag structure of the VECM was chosen based on the Schwartz criterion. Please see Annex 3 for details.

We run the VECM three times: Over the full sample (FY2005Q1—FY2016Q3), and then we run it over two sub-periods: (FY2005Q1—FY2009Q4) and (FY2010Q1—FY2016Q3), in order to capture the "effectiveness of government expenditure"; that is, the spending multiplier, under the various surrounding macroeconomic conditions. The first sub-period (FY2005Q1—FY2009Q4) represents an episode of relatively higher growth, fiscal consolidation, a flexible exchange rate system (after the announced floatation of 2003 and the elimination of the parallel exchange rate), and enhanced openness to trade and capital flows. The second sub-period (FY2010Q1—FY2016Q3) witnessed slow growth especially with the economic downturn after January 2011, as well as a deterioration in Egypt's fiscal stance and less openness in terms of external trade and capital flows.

The results of the three VECM estimations, along with the full set of the impulse responses generated from the models are deferred to Annex 3 and Annexes 4 to 6, respectively. We single out the main impulse responses in the following part.

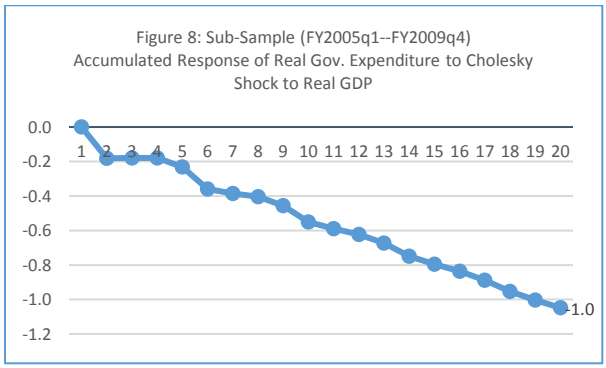
The spending multiplier that is estimated in the three models was 'low' (Figure 7), according to the literature categorizing such multipliers (as outlined in section 2.3 above). The full-sample estimate of the cumulative spending multiplier was 0.32 after 20 quarters; the spending multiplier estimated from the sub-sample (FY2005Q1—FY2009Q4) was almost negligible (0.02), whereas that from the other sub-sample (FY2010Q1—FY2016Q3) was estimated at 0.35.

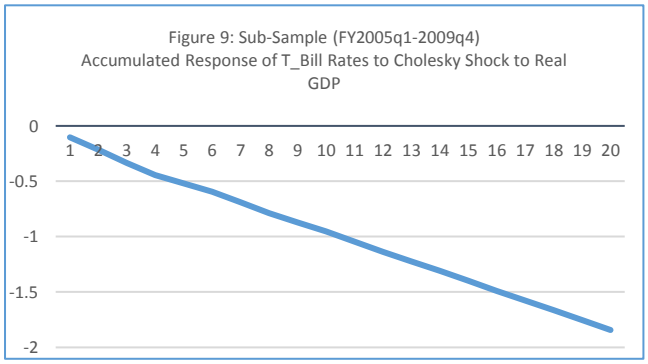


The large differences between the samples' results may be explained by the macroeconomic conditions prevailing during the respective sub-periods. These will be taken up next; highlighting the impulse responses generated from the three VECM estimations.

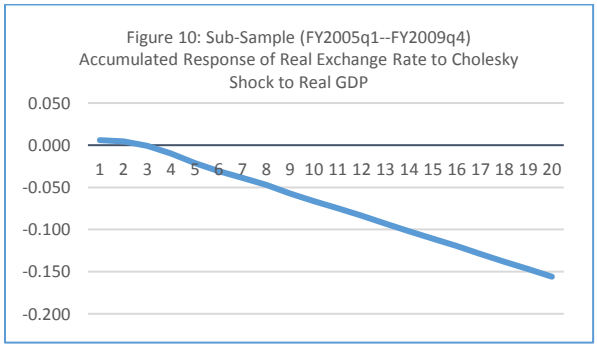
4.2.a. The first sub-sample VECM (FY2005Q1—FY2009Q4): What may explain the very small spending multiplier?

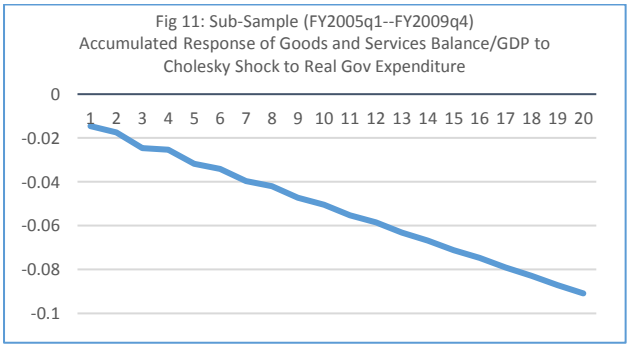
This period was characterized by a growth spurt; with real GDP growing at an annual rate of 6%, on average. Meanwhile, government expenditures seemed to be "counter-cyclical", as the government had embarked on a fiscal consolidation program, in tandem with the improving economic activity (Figure 8). On the other hand, monetary policy has generally been "pro-cyclical" during the sub-period (Figure 9).





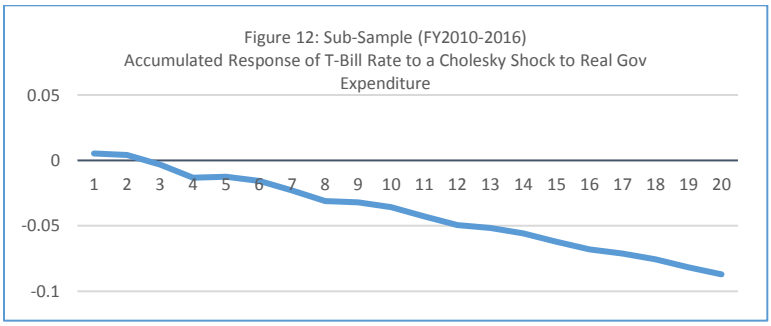
The expansionary monetary policy during this sub-period may have also contributed to the accelerating domestic prices, which led to a real appreciation of the exchange rate (Figure 10), and hence augmenting the deterioration in the goods and services balance; a chronically negative balance that widens in response to a shock to real government expenditure (Figure 11). The worsening external accounts thus dilutes the spending multiplier, as part of the positive shock of government expenditure on real GDP is lost through importation.



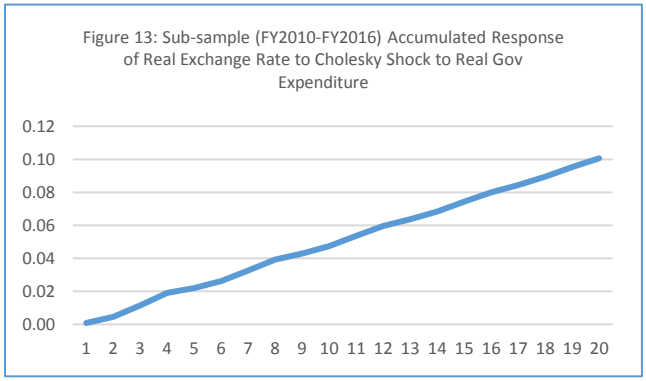


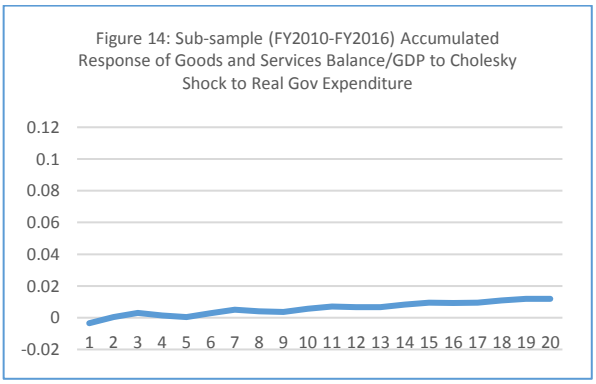
4.2.b. The second sub-sample VECM (FY2010Q1—FY2016Q3): While still considered a modest spending multiplier, why is it relatively larger than that estimated from the first sub-sample?

This sub-period was characterized by a slowdown in growth (3.3%, annually on average), and a deteriorating fiscal stance; as both the budget deficit and debt were on an upward trend. At the same time, monetary policy seems to have been accommodative; with a declining impulse response function to a fiscal expansion (Figure 12).



Additionally, this sub-period (FY2010—FY2016) witnessed nominal depreciation, in tandem with the economic downturn. Egypt's openness to trade and to capital flows also deteriorated during this period. As shown in figure 13 below, the real exchange rate actually depreciated in response to a positive fiscal shock, and figure 14 shows that the goods and services balance was rather neutral (negligible change) in response to a shock to government expenditure. Thus, the leakages (or dilution of the impact) of the spending multiplier through importation were contained during the period (FY2010—FY2016).





5. Conclusion

Egypt's spending multiplier has been low: The long-run cumulative multiplier was estimated to be 0.02 during an economic boom, and 0.35 during an economic downturn.

This research finds that Egypt's low spending multiplier can be attributed to a number of factors:

- The impact of government spending on real GDP in Egypt is sensitive to the state of the business cycle. This is consistent with the literature: The multiplier is relatively larger during an economic downturn as the economy is operating below potential.
- Monetary policy in Egypt has generally been non-accommodative to the direction of fiscal policy (working in an opposite direction to that of fiscal policy).
- Egypt's exchange rate experienced a substantive real appreciation throughout the period under study, which in turn undermined the positive effect of government spending on real output. That is, through worsening the goods and services balance (i.e., leakages in the form of importation).

- The high central government domestic debt to GDP ratio (which averaged 80% of GDP during the period under study) has also contributed to higher risk premia and loss of credibility, which rendered fiscal policy less effective.

Annex 1: Data Issues

- The empirical analysis starts in FY2005-Q1 because there are no quarterly data for government expenditure prior to this date. Also, the data end in FY2016-Q3 because as of mid-December 2016, fiscal data for the last quarter of FY2016 has not yet been published.
- Quarterly nominal government expenditure is obtained from the Ministry of Finance, Financial Monthly, Various Issues. It is deflated using the government consumption deflator from the National Accounts, published by the Ministry of Planning, Monitoring and Administrative Reform.
- Quarterly real GDP is obtained from the Ministry of Planning, Monitoring and Administrative Reform.
- Treasury bill rates are obtained from the "Time Series" section of the Central Bank of Egypt's website.
- The nominal exchange rate is the official EGP/US$, obtained from "Time Series" section of the Central Bank of Egypt's website.
- Goods and services balance are obtained from the "Time Series" section of the Central Bank of Egypt's website, and divided by the quarterly nominal GDP series obtained from the Ministry of Planning, Monitoring and Administrative Reform.
- Most studies use the "current account balance" instead of the "goods and services balance". However, we chose to use the latter for the Egyptian case because of the very large portion of private transfers in Egypt's current account. The goods and services balance thus better captures the state of domestic economic activity, while the private transfers usually reflect developments abroad.

Annex 2: Johansen Cointegration Test

Sample (adjusted): 2005Q3 2016Q3
Included observations: 45 after adjustments
Trend assumption: Linear deterministic trend
Series: L_RGDP L_R_GEXP L_TBILL L_REXRATE GNS_Y
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.822837	121.5055	69.81889	0.0000
At most 1	0.357202	43.62473	47.85613	0.1181
At most 2	0.212848	23.73815	29.79707	0.2117
At most 3	0.150387	12.96812	15.49471	0.1160
At most 4 *	0.117685	5.634258	3.841466	0.0176

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.822837	77.88072	33.87687	0.0000
At most 1	0.357202	19.88658	27.58434	0.3491
At most 2	0.212848	10.77004	21.13162	0.6702
At most 3	0.150387	7.333860	14.26460	0.4504
At most 4 *	0.117685	5.634258	3.841466	0.0176

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

L_RGDP	L_R_GEXP	L_TBILL	L_REXRATE	GNS_Y
18.17983	-5.268220	2.204444	6.764983	4.382637
-13.71729	-3.654133	-2.959224	-0.970120	-77.02402
-2.084614	-1.621056	-6.041676	-6.221185	38.23551
-9.606189	-2.411384	-4.173344	-8.865312	-25.04894
27.80374	1.289454	-1.497514	18.01615	-37.82455

Unrestricted Adjustment Coefficients (alpha):

D(L_RGDP)	-0.024077	0.008612	0.000481	-0.004790	-0.001927
D(L_R_GEXP)	0.132175	0.075551	0.058173	0.006246	-0.056650
D(L_TBILL)	-0.045351	-0.012331	0.023497	0.025629	0.004465

D(L_REXRATE)	0.006200	-0.004200	-0.006508	0.003825	-0.004484
D(GNS_Y)	-0.003795	0.005946	-0.003160	0.001042	0.003494

1 Cointegrating Equation(s): Log likelihood 399.0044

Normalized cointegrating coefficients (standard error in parentheses)

L_RGDP	L_R_GEXP	L_TBILL	L_REXRATE	GNS_Y
1.000000	-0.289784	0.121258	0.372115	0.241071
	(0.02957)	(0.03305)	(0.04122)	(0.40204)

Adjustment coefficients (standard error in parentheses)

D(L_RGDP)	-0.437722
	(0.06710)
D(L_R_GEXP)	2.402919
	(0.74123)
D(L_TBILL)	-0.824468
	(0.26377)
D(L_REXRATE)	0.112718
	(0.06756)
D(GNS_Y)	-0.068994
	(0.04755)

Annex 3: Vector Error Correction Model (VECM)

First: Model selection and lag structure

The VECM was estimated three times over different samples/sub-samples. All VECM estimations used one lag. The choice was based on the lowest Schwarz Criterion.

		1lag	2lags	3lags
Full Sample (FY2005Q1:FY2016Q3)	Akaike information criterion	-15.9558	-16.8744	-17.7747
	Schwarz criterion	-14.3498	-14.2386	-14.0885
Sub-Sample (FY2005Q1:FY2009Q4)	Akaike information criterion	-17.9063	NA	NA
	Schwarz criterion	-15.9277	NA	NA
Sub-Sample (FY2010Q1:FY2016Q3)	Akaike information criterion	-18.30958	-19.16903	NA
	Schwarz criterion	-16.38982	-16.04942	NA

Note: NA means "Not available", due to the insufficient number of observations that did not allow us to test for a larger number of lags.

Second: VECM Estimation Results (Full Sample)

Sample (adjusted): 2005Q3 2016Q3
Included observations: 45 after adjustments
Standard errors in ( ) & t-statistics in [ ]

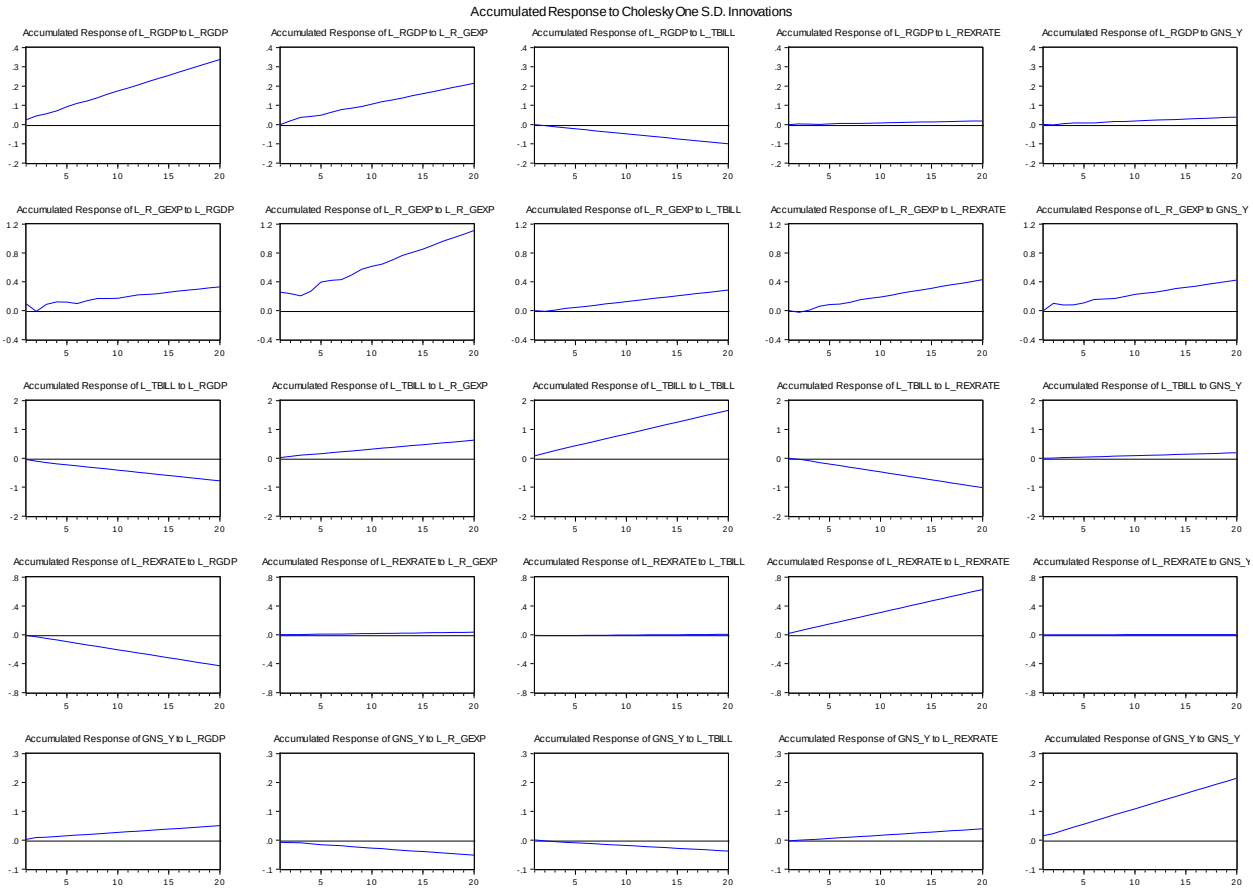
Cointegrating Eq:	CointEq1
L_R_GEXP(-1)	1.000000
L_RGDP(-1)	-3.450849 (0.53133) [-6.49473]
L_TBILL(-1)	-0.418442 (0.11435) [-3.65931]
L_REXRATE(-1)	-1.284112 (0.31258) [-4.10806]
GNS_Y(-1)	-0.831901 (1.32711) [-0.62685]
C	19.15007

Error Correction:	D(L_R_GEXP)	D(L_RGDP)	D(L_TBILL)	D(L_REXRATE)	D(GNS_Y)
CointEq1	-0.696327 (0.21480) [-3.24181]	0.126845 (0.01944) [6.52356]	0.238917 (0.07644) [3.12566]	-0.032664 (0.01958) [-1.66835]	0.019993 (0.01378) [1.45107]
D(L_R_GEXP(-1))	-0.168467	-0.049002	-0.120418	0.015597	-0.006914

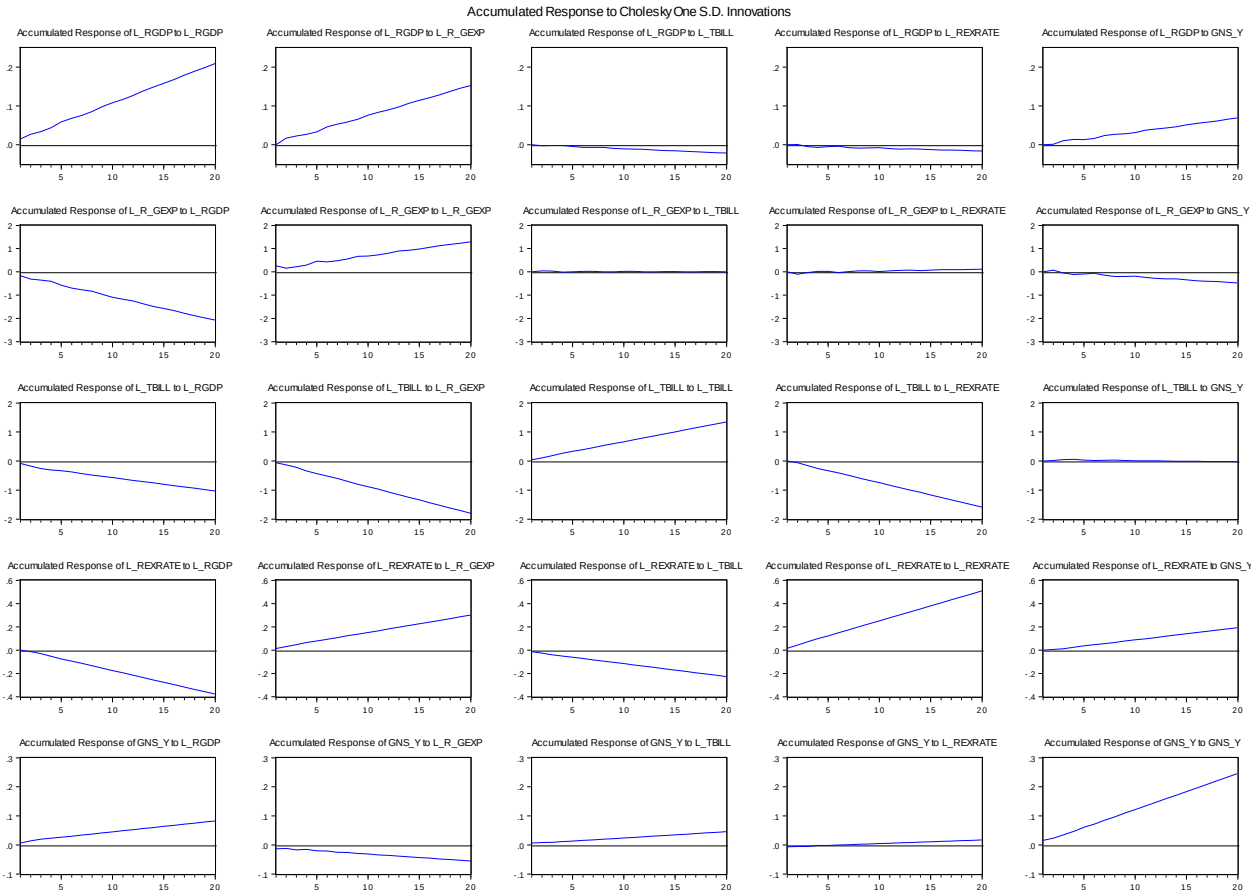
	(0.18028)	(0.01632)	(0.06415)	(0.01643)	(0.01156)
	[-0.93449]	[-3.00268]	[-1.87702]	[0.94916]	[-0.59792]
D(L_RGDP(-1))	-8.418344	-0.075373	-0.921044	-0.107106	0.208590
	(1.31079)	(0.11866)	(0.46646)	(0.11948)	(0.08408)
	[-6.42234]	[-0.63521]	[-1.97455]	[-0.89645]	[2.48079]
D(L_TBILL(-1))	-0.496723	0.001333	0.086820	0.074850	-0.020969
	(0.40866)	(0.03699)	(0.14542)	(0.03725)	(0.02621)
	[-1.21550]	[0.03602]	[0.59701]	[2.00946]	[-0.79991]
D(L_REXRATE(-1))	-1.220470	0.275912	-1.110280	0.387302	0.166304
	(1.60797)	(0.14556)	(0.57221)	(0.14657)	(0.10314)
	[-0.75901]	[1.89554]	[-1.94033]	[2.64252]	[1.61233]
D(GNS_Y(-1))	6.018340	-0.002556	0.728210	0.013929	-0.514043
	(2.14282)	(0.19398)	(0.76254)	(0.19532)	(0.13745)
	[2.80860]	[-0.01318]	[0.95497]	[0.07131]	[-3.73975]
C	0.100340	0.016219	-0.003961	-0.010067	-0.001874
	(0.05217)	(0.00472)	(0.01857)	(0.00476)	(0.00335)
	[1.92326]	[3.43419]	[-0.21336]	[-2.11686]	[-0.55988]
R-squared	0.767711	0.673661	0.321600	0.278978	0.456383
Adj. R-squared	0.731034	0.622134	0.214484	0.165133	0.370549
Sum sq. resids	2.842634	0.023294	0.359981	0.023617	0.011697
S.E. equation	0.273507	0.024759	0.097330	0.024930	0.017544
F-statistic	20.93154	13.07388	3.002359	2.450496	5.317036
Log likelihood	-1.708779	106.3878	44.78604	106.0778	121.8878
Akaike AIC	0.387057	-4.417236	-1.679380	-4.403456	-5.106126
Schwarz SC	0.668093	-4.136200	-1.398343	-4.122419	-4.825090
Mean dependent	0.017373	0.009388	0.003304	-0.018117	-0.001611
S.D. dependent	0.527375	0.040277	0.109817	0.027284	0.022114

Determinant resid covariance (dof adj.)	3.19E-14
Determinant resid covariance	1.37E-14
Log likelihood	399.0044
Akaike information criterion	-15.95575
Schwarz criterion	-14.34983

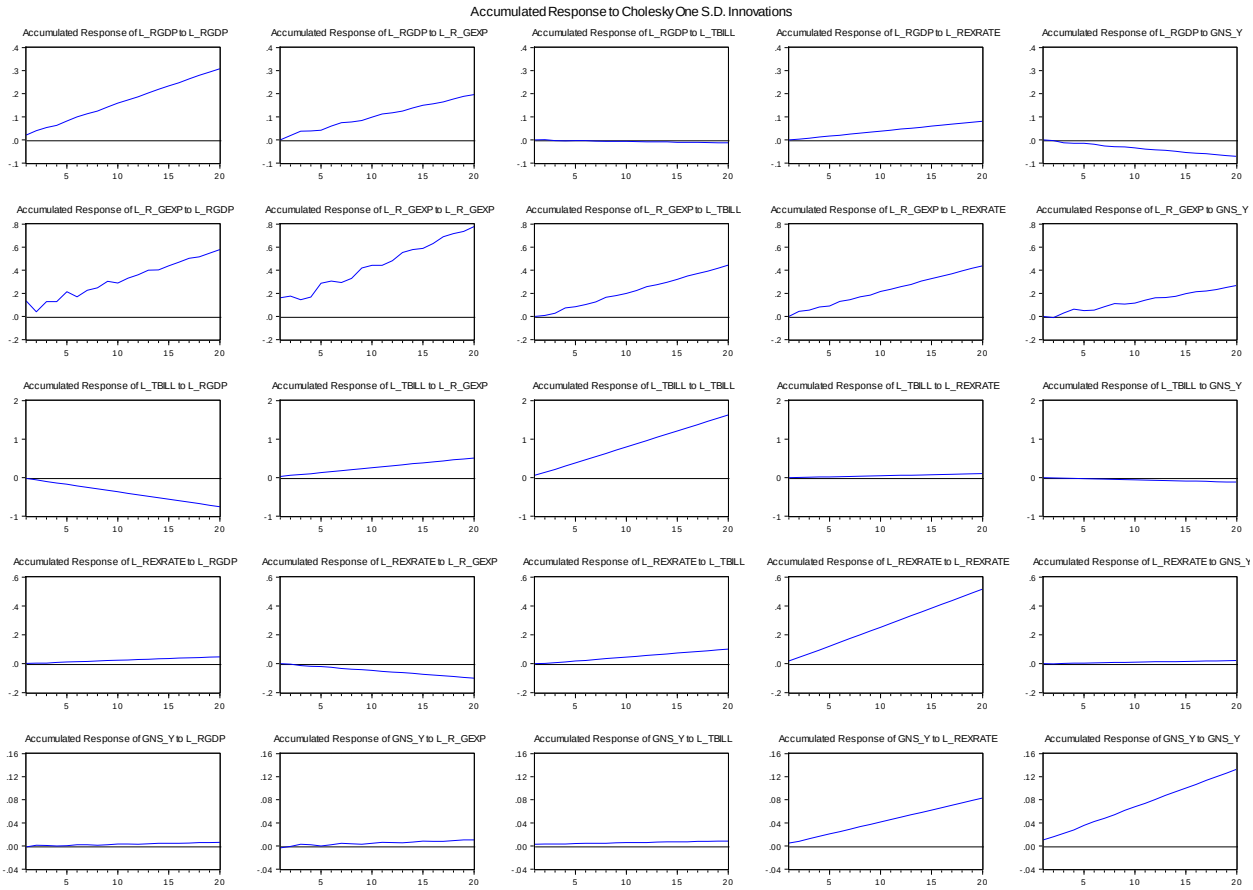
Annex 4: Accumulated Impulse Responses Generated from VECM for Full Sample (FY2005Q1-FY2016Q3)



Annex 5: Accumulated Impulse Responses Generated from VECM for First Sub-Sample (FY2005Q1-FY2009Q4)



Annex 6: Accumulated Impulse Responses Generated from VECM for Second Sub-Sample (FY2010Q1-FY2016Q3)



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