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Interaction between Fiscal Policy and Economic Fluctuation: A Case Study for Jordan

Huthaifa Alqaralleh[1]*, Ahmad Al-Saraireh[2], Hassan Alamro[1]

[1]Department of Economics, Mutah University, Al-Karak, Jordan, [2]Department of Banking and Finance, Mutah University, Al-Karak, Jordan. *Email: huthaifa89@mutah.edu.jo

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ABSTRACT

The present research aimed to examine the interaction between fiscal policy tools and economic fluctuations in Jordan. This investigation is done by assessing both Government Expense and Tax Revenue over a quarterly sample period from 1980 till Q1 2017. The Band-Pass filter is adapted to define the fluctuation variables and hence to distinguish between the phases of the economic cycle. Moreover, Econometric tools such as Johansen's cointegration test, the vector error correction model and Impulse Response Functions are utilized. All determinant variables are found to be cointegrated and influence GDP growth and hence economic fluctuations. Results of this paper provide evidence that the fiscal policy rule seems to operate with various coefficients depending on the phase of the cycle.

Keywords: Fiscal Policy, Band-pass Filter, Cointegration, Jordan
JEL Classifications: E3, E62

1. INTRODUCTION

The fiscal response to the last financial crisis sparked a debate over the stabilizing role of fiscal policy. More broadly, evidence suggests that the government spending has stimulated engines of economic activity (see, among others, Ravenna and Walsh, 2006; Arestis and Sawyer, 2008). Theoretically, the equilibrium models indicate that a shock to fiscal policy affect the economic growth to the extent that it affects the technology or inputs. Consequently, governments tend to ease their spending and tax rates during the depression time by repaying during the expansion period (see, for example, Talvi and Vegh, 2005). The later often helps to predict crowding out of private investment or consumption in response to the expansionary fiscal policy.

This debate is of central importance for both policy-makers and for the researcher alike since it provides insight into the underlying structure of modern developed economies. More precisely, an improvement in macroeconomic policy coincided with the progressive adoption of sounder fiscal rules, in which, it facilitates the stabilizing role of fiscal policies and ensure debt sustainability in the long run, avoiding expenditure increases, tax hikes, and allowing the full functioning of the automatic stabilisers (see, among others, Daude et al., 2011; Klemm, 2014; Vegh and Vuletin, 2014).

There is a large volume of published studies describing the role of such fiscal policy on the economic growth. One study by Havi and Enu (2014) highlights the importance of fiscal policy on the Ghanaian economy through the Ordinary Least Squares (OLS) estimation. Similarly, Arezki and Ismail (2013) found that fiscal variables are significant policy variables that positively affect real GDP growth rate in Nigeria. These findings are congruous with the study of Adefeso and Mobolaji (2010) on the relative effectiveness of fiscal policy on economic growth in Nigeria based on annual data from 1970 to 2007.

Ali et al. (2008) found a positive and significant effect of the fiscal policy on economic growth in South Asian countries. Jawaid et al. (2011) supported this finding in Pakistan by using the Error Correction Mechanism (ECM). Jawaid et al. (2011) also concluded that this significant and positive relationship holds in the long-run as well as the short-run. The finding of Ali et al. (2008) is further admitted in a developed context, that is the U.S.A, by Senbet (2011) who employed the VAR approach and found a significant positive impact of such policy on economic growth.

However, previous studies on the relation between the fiscal policy and economic growth are controversial. In this vein, a few studies emphasized a weak nexus for fiscal policy shocks on economic growth. An example of such literature is the study by Mutuku and Koech (2014), in which, the vector autoregressive model (VAR) is adopted over the period 1997–2010. The authors highlighted that this weak nexus is attributed to weak structural, institutional and regulatory framework. Similarly, Kamaan (2014) found that fiscal policy does not have an impact on economic growth. The results are corroborated by Montiel et al. (2014) and Lashkary and Kashani (2011).

All the studies reviewed so far, however, suffer from the fact that it does not attempt to differentiate between a bad and good time of economic. Put differently; these studies would have been more interesting if it had included the analysis of the economic state (boom and bust) into account.

The purpose of the current study is to look in detail at the fiscal policy instruments used by Jordanian governments. We argue that expansionary fiscal policy increases are the preferred vehicle for policymakers to boost the economic growth because they typically have a straightforward and immediate impact on the economy. In this paper, we, first, define the good and bad time in the economic cycle by applying a Band-Pass filter proposed by Christiano and Fitzgerald (2003). Second, we analyze the fiscal policy stance and their impact over the quarterly period Q1:1980 - Q3:2017. This study has identified provide evidence that the fiscal policy rule seems to operate with various coefficients depending on the phase of the cycle.

The paper is organized as follows. In the next section, the theoretical and empirical framework behind our model is presented. Section 3 discusses the data and methodology employed. Section 4 contains empirical results and interpretations. Finally, section 5 concludes the paper.

2. EMPIRICAL METHODOLOGY

In the following subsections, we give a brief overview of the practical methodology. The intention here is to shed light at the adopted techniques to measure the economic fluctuations and then how such volatility interacts and respond to the shock in fiscal policy.

2.1. Band-pass Filter

Much of the current literature on defining economic statues pays particular attention around the theme of isolating the cyclical pattern of the considering series (see for details Alqaralleh, 2017; 2018). Generally speaking, researcher aimed at selection of the frequency domain explanation of the time series. However, no one filter considered as the best solution across the board and the time series properties of the variables are the best criteria and guidelines for the selection of such a filter.

The band-pass filter of Christiano and Fitzgerald (2003) is designed to work in real time applications with a larger class of time series than other filters. Such filter helps in defining an asymmetric fluctuation in the time series. Since it has a steep frequency response function at the boundaries of the filter. It can be calculated as the difference between the filtered data and the ideally filtered ones. That is

$$\min\left(\omega_j-\omega_j^{\text{ideal}}\right)^2=\int_{-(2\Delta t)^{-1}}^{(2\Delta t)^{-1}}\left(H(\omega)-H^{\text{ideal}}(\omega)\right)^2\left(U^{\text{exact}}(\omega)\right)^2.d\omega \quad (1)$$

For a known spectral density series $U^{exact}(\omega)$. The parameters ω_j and ω_j^{ideal} are the cut-off cycle length in the quarter. Cycles longer than ω_j^{ideal} and shorter than ω_j are preserved in the cyclical.

2.2. Cointegration and Error Correction Mechanism

To address the long-run economic fluctuations dynamics and causality directions between economic growth and considered variables, the cointegration techniques are employed. This analysis provides a framework for estimation, inference, and interpretation when variables are not covariance stationery. According to Sims (1980), if the variables are cointegrated as such, $X_t,Y_t\sim I(1)$; there exists an error correction form of the model namely the Vector Error Correction Model, (hereafter ECM). All the terms in this EC term control are stationary (Hamilton, 1994; Watson, 1994). The equation for the VECM modified VAR

$$\Delta Y_t=\gamma_y\mu_{t-1}+\sum_{p=1}^{n}\alpha_p\Delta Y_{t-p}+\varepsilon_t \quad (2)$$

The Y_t representing the vectors of the variables, Δ represents the first difference, the μ_{t-1} being the error correction term, which captures the speed of adjustment towards the long-run values and ε_t is the error term.

Understanding to what extent the considered variables act towards the fluctuations of the GDP can be investigated through the impulse response function (IRF). This tool helps not only to highlight the degree of importance the variables encompassed to the volatility but also providing an indication of the dynamic of the shocks throughout the model.

3. DATA AND DESCRIPTIVE STATISTICS

To assess whether and how fiscal policy interacts with the economic growth in Jordanian economy, we use three variables: Government expense (GE), tax revenue (TR) and the real gross domestic product (RGDP). As was pointed out in the introduction to this paper, we also adopt The Band-Pass filter of Christiano and Fitzgerald (2003) to define the fluctuation variables and hence to distinguish between the phases of the economic cycle. The data covers the period from the first quarter of 1980 to the third quarter of 2017 (151 observations). Moreover, all observations are in real terms. Additionally, the time-series are seasonally adjusted to overcome any seasonality that may affect the analysis.

The primary stage of the cointegration analysis in this study is to determine the differencing order for the time-series to achieve stationarity by applying the unit root test. The augmented Dickey-Fuller (Dickey and Fuller; 1979, 1981) test is used to the variables, in their natural logarithm form. As shown in Table 1, the null hypothesis of the presence of a unit root is strongly rejected at 5% for the data on the first difference, $\Delta y_t = y_t - y_{t-1}$ that is, therefore, it can be said that the data is *I* (1). Moreover, the standard deviation value indicate that the observations show considerable variability over time. Also, the null hypothesis of normality is rejected, since the value of Jarque-Bera is significant at the 5% level.

The fluctuations in the Jordanian economy can be seen over the considered period. As shown in Figure 1, the Jordanian economy experiences a long phase of a boom due to the exchange rate crises in 1989. Whereas, the economic correction measures help the economy to the recovery period.

4. EMPIRICAL RESULTS

4.1. Cointegration

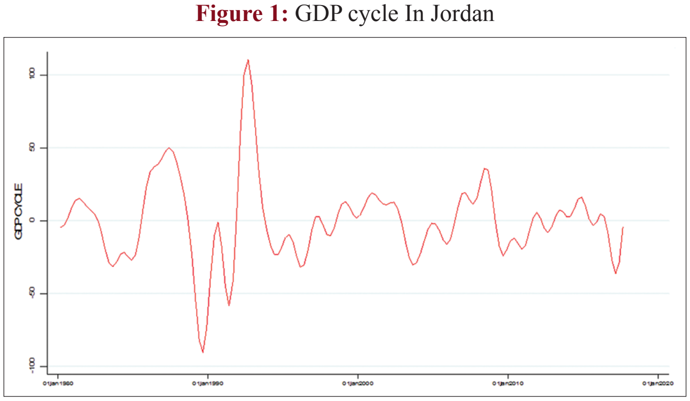
A few techniques have been developed to test for a cointegration relationship within a time series. One of the most widely used methods is Johansen maximum likelihood methodology (Johansen, 1988). The Johansen cointegration test can test the viability of a time series containing multiple cointegrating vectors, in which a vector autoregression is estimated in the first difference including the lagged variables in the specified period (Bilgili, 1998).

Table 1: Descriptive statistics

STAT	GE	TR	Cycle
Mean	5.972	5.954	6.702
Maximum	7.745	7.674	7.928
Minimum	3.745	3.325	5.178
Standard deviation	0.945	1.052	0.860
Skewness	−0.300	−0.301	−0.290
Kurtosis	2.332	2.177	1.687
Jarque-Bera	[0.061]	[0.027]	[0.001]
ADF	[0.000]	[0.000]	[0.017]

JB: Jarque-Bera normality test. ADF: Augmented Dickey-Fuller test. The 1% and 5% critical values for ADF are: -3.464 and−2.881 respectively

Figure 1: GDP cycle In Jordan



Following the seminal work in the field, the Johansen cointegration test was applied to identify a cointegrating relationship between the considered variables namely, GDP cycle, government expense (GE), tax revenue (TR), in their natural logarithm form.

Panel A and Panel B of Table 2 present the results of the trace test and the Maximal Eigenvalue test, respectively. As highlighted in the table, the null hypothesis of no cointegration embodied by r = 0 has been rejected at 5% level. Therefore, there may exist at least one stationary relationship between the variables tested. The mere presence of a cointegration relationship indicated that our tests are executed based on the VECM.

4.2. Vector Error Correction Estimates

The first step in modelling the VECM is the selection of the lag length for the variables in the model to check model adequacy. In Panel A of Table 3 both AIC, SC indicate that the smallest values arise in second-period lags for our variables. Therefore, we use the second lag of changes for the considered variables as instruments, which is a good indication as taking a too short lag may not be effective in capturing the dynamic behaviour of the variables.

After selecting the number of lags for the VECM, we can conjure to determine the existence of a relationship without the classification of the variables' respective relationship with GDP fluctuations. Results, as shown in Panel B of Table 3, are deemed to follow previous literature with the values and signs proving to be obedient to our theory.

We find a relationship between all variables concerning economic fluctuations respectively. Decoding the table, the cointegration between all variables are significant at the 5% level. Moreover, signs of the speed of adjustment coefficients support the theoretically assumed ones, which implies rapid adjustment toward equilibrium. This confirms the expectation that there is convergence to the long-run equilibrium relationship. In detail, the error in the government expense (GE) and tax revenue (TR) is corrected at or after 8% and 19% respectively. In simple terms, in the instance of these variables being too high, there is a rapid fall back toward the equilibrium in the economic cycle.

4.3. Impulse Response Function

To further understanding the volatile properties of the variables and computing the evolutions of possible shocks the IMF test is applied. This help to see how the economic cycle responds to the changes in values in the system.

Figure 2 depicts the outcome of a one standard deviation shock to each of the indicators of fiscal policy and the economic fluctuations response, in which the blue line is the pattern itself, and the red lines are a form of precaution with a 2-standard error deviation around the mean. Interestingly, graphs show that the economic growth reaction to a change in any or all variables is not instantaneous but appears roughly after two periods, this is interesting because it means that the GDP need time to adjust to any shock in the variables.

Starting with the Tax Revenue (TR), it is clear that a one standard deviation shock would result in a gradual increase over ten periods

Table 2: Trace test and the maximal eigenvalue test for cointegration

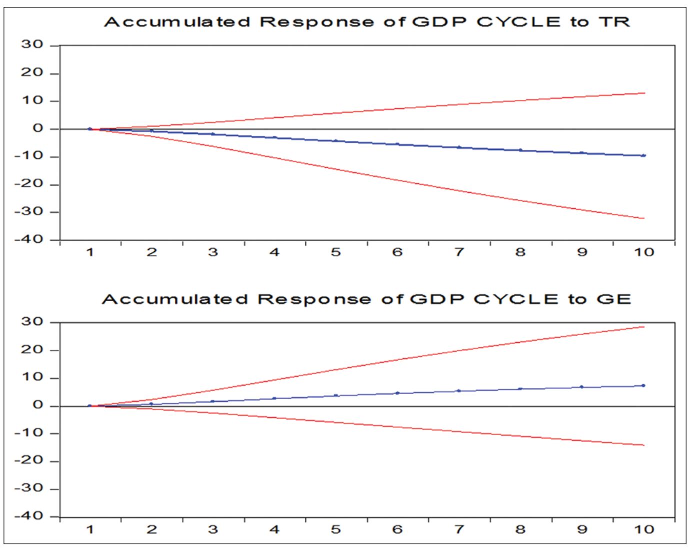
Null hypothesis	Alternative hypothesis	Statistic	95% critical value
Panel A: Trace test			
r=0	r=1	39.93*	35.19
r≤1	r=2	15.68	20.26
r≤2	r=3	9.17	09.17
Panel B: Maximal eigen value			
r=0	r=1	24.25*	22.30
r≤1	r=2	8.83	15.89
r≤2	r=3	6.85	9.16

*Significant at 5% level

Table 3: Error correction results

Error correction	D (GDP CYCLE)	D (GE)	D (TR)
Coint Eq1	−0.104	−0.081	−0.198
S. E.	(0.043)	(0.028)	(0.102)
T-stat	−2.419	−2.892	−1.941

Figure 2: Impulse response function



indicating that fluctuations in the economy would affect response with a small positive change to an increasing Tax Revenue. Although this may seem odd, it is widespread that the increase in Tax Revenue is an indication of a bad economic status of the country. Nevertheless, this does not necessarily require the decrease of tax revenue in the short term.

Regarding the Government Expense (GE), results admits our expectations, as we found that GDP seems to have a delayed response to the Government Expense being affected negatively over the 10-quarter period in a very smooth downwards slope.

5. CONCLUSION

This study aims to investigate the role of Jordan's fiscal policy in combating the economic fluctuations. To assess economic growth movements in Jordan, a Band-Pass filter of Christiano and Fitzgerald is used. Moreover, Government Expense and Tax Revenue are incorporated into a functional model. To avoid errors due to the presence of a unit root augmented Dickey-Fuller test is employed. Furthermore, a dissection of the variability of economic growth is applied in percentage terms of contribution and an automated response functioned is activated, simulating shocks to the variables at hand for further understanding. Results of this paper provide evidence that the fiscal policy rule seems to operate with various coefficients depending on the phase of the cycle.

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