Estimating Aggregate Demand in Egypt

Emara, Noha and Mordos, Elise and Tyagi, Sonika

2015

Estimating Aggregate Demand in Egypt

Noha Emara, Ph.D. [1]
Assistant Professor
Economics Department
Rutgers University

Elise Mordos
Barnard College

Sonika Tyagi
Barnard College

Abstract

This econometric study seeks to determine the most important factors of aggregate demand in Egypt so as to provide insight into how this developing nation can grow economically in the coming years. The Ordinary Least Squares estimation method was used in order to estimate nominal GDP for the time period 1975 to 2009. Based on the results the real interest rate, the inflation rate, the growth rate of government expenditure, and the growth rate of the money supply are the most statistically and economically significant factors of the growth rate of nominal GDP for the coming year. A one percent change in the growth rate of the previous year government expenditure is predicted to cause the growth rate of the current year nominal GDP to increase by 54%. The role of government expenditures on public sector wage expansion is discussed in this study as to shed light on this factor's significant influence on income inequality post-1975 in Egypt, which will continue to impact nominal GDP and social conditions for the developing nation in the coming years.

[1] Address: 313 North Fifth street, Camden, NJ, 08102
Website: http://economics.camden.rutgers.edu/emara.html, Email: noha.emara@rutgers.edu
Phone: (c) (201) 920 4510, (o) (856) 225-6096

I. Introduction

Over the past twenty years, the most heavily populated Arab nation has emerged as a developing nation experiencing economic growth. Aggregate demand is a leading macroeconomic indicator of economic growth and has continued to grow at a constant rate since the economic reforms took place in the 1990s with the exception of the last two years due to the global economic crisis. Additionally, aggregate demand is one vital indicator of economic development, which is linked to economic growth but not equated to it. Therefore, the objective of this paper is to estimate Egypt's aggregate demand, numerically represented using the nominal gross domestic product (GDP). In order to accomplish this, seven independent economic variables are utilized to explain the economic fluctuations of aggregate demand for the time period 1975 to 2009. Therefore, the econometric estimation includes data of economic variables prior to the economic reforms and under the political regimes of former Egyptian Presidents, Anwar Sadat and Hosni Mubarak. Furthermore, the impact of these independent variables on the dependent variable (nominal GDP) will be analyzed to understand Egypt's development over the sampled time period.

Kollintza and Fiorito (1994) investigated the stylized facts of business cycles in G7 countries. Based on their results, they concluded that price inflation is the leading countercyclical component of total output for all 7 countries in their investigation. Additionally, employment was found to be procyclical, lagging and significantly less variable than aggregate output.

Agénor, McDermott, and Prasad (2000) examined macroeconomic fluctuations in developing countries. They found that output fluctuations for developing countries are highly correlated with business cycles in advanced countries with little lag time between the transmissions of the output fluctuations from advanced countries to developing countries.

Additionally, their results suggested that government expenditure plays a countercyclical role in the domestic business cycles for developing nations. Furthermore, there is a strongly negative correlation between the velocity of broad money (M2) and industrial output for 11 of the 12 middle-income countries in their sample. On the other hand, money measured using several monetary aggregates and total output are positively correlated, but their relationship is not nearly as strong for developing nations compared to industrial nations.

El-Sakka and Ghali (2005) aimed to determine the most important sources of inflation in Egypt in a multivariate co-integration analysis. Their results suggest that inflation measured using the consumer price index is highly dependent on money supply. Additionally, interest rates are indirectly responsible for inflation with the net effect of high interest rates causing an upward shift in prices. Real GDP was found to have a significantly negative impact on inflation.

Kandil researched the effect of government spending on macroeconomic variables (2009) for advanced and developing nations. He found that the government multiplier is much larger for developing nations compared to advanced nations due to the limited crowding-out effect of government expenditure on investment demand.

Massoud (2010) investigated the impact of the recent global economic slowdown on Egypt by estimating the impact of foreign direct investment (FDI) inflows on the Egyptian economy by using FDI as a source of long-term economic growth. The results suggest a negative relationship between imports and economic growth. The inflation rate was found to have a weakly negative correlation with economic growth. Additionally, contrary to theory, government intervention was found to have a positive impact on economic growth.

Based on previous research and various macroeconomic theories, the growth rate of the previous year government expenditure should have a statistically significant and very large positive effect on the growth rate of the current period nominal GDP given the dependence of the Egyptian economy on the government spending. Additionally, the growth rate of the previous year real GDP is, also, expected to have a significant and large positive effect on the growth rate of the current year nominal GDP. Given that the Egyptian government runs a budget deficit partially by increasing the money supply, the growth rate of money supply, the inflation rate and the real interest should have significant effects on the growth rate of nominal GDP in the coming year. The lagged unemployment rate is, also expected to have a significant, negative effect on the growth rate of the current year nominal GDP. Similarly, the lagged population growth rate is expected to have negative but not large effect on the growth rate of the current year nominal GDP.

This macroeconomic analysis consists of the following sections: section II describes the data, section III discusses the results of the estimation, section IV discusses the results in terms of Egypt's economic development, section V presents the conclusions based on the results, section VI lists the references and section VII includes the appendix.

II. Data

All of the data collected for this paper are from the World Bank Database. Since developing countries, like Egypt, do not have a sufficient amount of quarterly or monthly data readily available, the sampled time period for this econometric analysis is made up of annual data from 1975 to 2009.

The independent variables that are used to estimate the aggregate demand were selected using several macroeconomic models. The first one is the Mundell-Fleming Model. This model theorizes that the demand side of the economy (a.k.a. aggregate demand) is highly dependent on the government expenditure, money supply, and real interest rate. Therefore, total government expenditure in constant 2000 United States dollar, the real interest rate as a percentage using the GDP deflator to adjust for inflation, and the real money supply as defined by the broad definition of money (M2) were selected as independent variables of aggregate demand in this analysis. The second macroeconomic model used is the Phillip's Curve, which illustrates the relationship between inflation rate and unemployment rate in the short run that cause shifts in the AD-AS Model. Therefore, the annual average inflation rate using consumer prices as the measurement of inflation and the average annual unemployment rate as a percentage of the total labor force were both collected and are used as independent variables in this study. The third model used to determine the selection of independent variables is the Solow Growth Model. This neoclassical long run growth model suggests that the steady state level of GDP per capita is lower for countries with high population growth rates. Therefore, the population growth rate was selected. The last variable selected is real GDP in constant 2000 U.S. dollar, which is a numerical representation of aggregate supply, and was selected using the AD-AS Model from which the dependent variable, nominal GDP, stems from. The empirical model equation to estimate aggregate demand is:

$$\Delta\log(\mathrm{NGDP}_t) = \beta_1 + \beta_2\Delta\log(\mathrm{RGDP}_{t-1}) + \beta_3\Delta\log(\mathrm{G}_{t-1}) + \beta_4\Delta \mathrm{r}_{t-1} + \beta_5\Delta \mathrm{U}_{t-1} + \beta_6\Delta\log(\mathrm{MS}_{t-1}) + \beta_7\Delta\,\mathrm{inf}_{t-1} + \Delta\beta_8\mathrm{Pop}_{t-1}$$

where log(NGDP) = growth rate of nominal GDP

log(RGDP) = growth rate of real GDP

log(G) = growth rate of real government expenditure

r = real interest rate

U = unemployment rate

log(MS) = growth rate of real money supply

inf = inflation rate

Pop = population growth rate

t-1 = previous year value

Since the number of observations for each economic indicator is not the same, the sample size used to estimate the growth rate of nominal GDP for a given year changes. The unemployment rate was unreported for the time periods 1975 to 1979 and 1985 to 1988 and in 2009. Additionally, the inflation rate was not reported in 1975, and the real money supply was not reported in 2009. As a result the sample size changes by 10 observations when the unemployment rate is added to the regression. Additionally, the nominal money supply was only available for the given time period in current Egyptian Pounds. Therefore, it was converted to USD using the official exchange rate and then divided by the average annual inflation rate to make the variable the real money supply in USD.

III. Results

The results of eight regressions are displayed in Table 1 and were used to estimate the growth rate of nominal GDP using the previous year values of each explanatory variable. All the independent variables were lagged by one year because more of these variables were found to be statistically significant. This suggests that the growth of nominal GDP is better estimated using previous year growth rates of the leading macroeconomic indicators.

Furthermore, the explanatory variables with the exception of the real interest rate (Figure 1) contained stochastic trends, or unit roots, in their original form. In Figures 1 to 7, the stochastic trend of each variable is clearly visible. In order to determine whether or not the variable contained a unit root, the Phillips-Perron unit root test was done for each variable and repeated with each lagged value until no unit root was found to be present (Table 2). All variables except the population grow rate were estimated to be stationary (Figures 8-12) after the first difference was taken for nonstationary variables. The population growth rate contained a unit root until its third difference was taken (Figure 13). The stationary values of each variable were used to estimate the aggregate demand in this analysis. Additionally, the first difference was taken for the dependent variable in order to determine the change in the annual growth rate of nominal GDP for each given year between the years 1976 and 2009 (Figures 14-15).

Regression Results

Although the coefficient on the lagged growth rate of real GDP is statistically insignificant, its expected positive magnitude is very large in the first regression (Table 1 Column 1, STATA Output 1). Also, the adjusted R^2 is negative. Therefore, the result of this regression indicated that this single independent variable explains none of the variation in the growth rate of the nominal GDP in the coming year. Additionally, the root means squared error (root MSE) is relatively high when compared to the intercept. Therefore, there is still a significant amount of variation in the growth rate of nominal GDP.

In the second regression (Table 1 Column 2, STATA Output 2), the explanatory variables, the lagged growth rate of real GDP and the lagged growth rate of government expenditure, and the constant term are all statistically insignificant. The root MSE error is still relatively high as well, and the adjusted R^2 remains negative. Furthermore, the joint significance of the two regressors is statistically insignificant at the 10% significance level. Therefore, the growth rates of these independent variables in the previous year do not explain a significant amount of the variation in the growth rate of the current period nominal GDP. Despite the insignificance of both coefficients, the magnitudes of the explanatory variables are relatively large, and their signs are as expected based on previous studies and macroeconomic theory.

The third regression with the addition of the real interest rate yielded similar results (Table 1 Column 3, STATA Output 3). None of the coefficients were statistically significant, the adjusted R^2 is still negative, the root MSE increases slightly, and the joint significance of the explanatory variables remains statistically insignificant at the 10% significance level. All the signs on the independent variables' coefficients are as expected, and the magnitudes of the lagged growth rates of real GDP and of government expenditure remain relatively large.

In the fourth regression (Table 1 Column 4, STATA Output 4), the lagged growth rate of government expenditure, lagged real interest rate, and lagged unemployment rate are statistically significant. Furthermore, the joint significance of all four regressors is statistically significant at the 10% significance level. Additionally, the adjusted R^2 increases significantly to 30.26%, and the root MSE decreases from 10.5% to 8.01%. Both of these changes in the measurements of fit indicate that the combination of these four explanatory variables in the previous year explain slightly less than a third of the variation in the growth rate of the current period nominal GDP. Additionally, the coefficients on the lagged growth rates of real GDP and government expenditure and the lagged real interest rate more than doubled in absolute value.

In the fifth regression (Table 1 Column 5, STATA Output 5), the lagged real interest rate remains statistically significant, while the other two variables become statistically insignificant. Furthermore, the adjusted R^2 decreases, the Root MSE increases, and the joint significance all five variables is less than the joint significance of all the variables in regression 4.

In the sixth regression (Table 1 Column 6, STATA Output 6), the lagged real interest rate remains statistically significant while the constant, the lagged growth rate of the money supply, the lagged growth rate of government expenditure, the lagged unemployment rate, and the newly added variable, the lagged inflation rate, become statistically significant. Also, the constant increases by more than triple its value in regressions 5 from 3.8% to 10.9% and the coefficient of the lagged growth rate of money supply increases substantially from 1.9% to 19%. The substantial changes in the coefficients suggest that the fifth regression may have an omitted variable, causing omitted variable bias. Moreover, there is an increase in adjusted R^2 increases by around 50%, and the root MSE slightly decreases as well. In addition, all the explanatory variables are jointly significant at all conventional significance levels. On the other hand, an unexpected negative sign appears on the coefficient of the lagged growth rate of real GDP, which also substantially decreases in magnitude, and on the coefficient of the lagged inflation rate. The unexpected positive coefficient may be due to imperfect multicollinearity because the inflation rate and the growth rate of the money supply are highly correlated (Table 4).

All the explanatory variables remain significant expect the lagged unemployment rate in regression 7 (Table 1 Column 7, STATA Output 7). The magnitude of the lagged growth rate of real GDP decreases slightly and remains negative. The effect of the lagged inflation rate on the dependent variable, also, remains positive. Although statistically insignificant, the lagged population growth rate has a very large impact on the growth rate of nominal GDP in the coming year. Also, the adjusted R^2 decreases by around 3%, and the root MSE increases by around 0.3%. Furthermore the joint significance of all seven independent variables in the seventh regression is statistically significant at the 5% significance level, while the joint significance of the six variables in regression 6 is significant at the 1% significance level. Therefore, the decrease in the joint significance of all explanatory variables coupled with the changes in the measurements of fit suggests that the lagged population growth rate may not be a significant indicator of the growth rate of nominal GDP in the coming year. Furthermore, the joint significance of the lagged growth rate of real GDP, the lagged unemployment rate and the lagged population growth rate is significant at the 10% significance level, but the joint significance of the lagged growth rate of real GDP and the lagged population growth was highly insignificant (Table 3). This suggests that the only significant coefficient in the joint significance test on the three individually insignificant variables is the lagged unemployment rate. Therefore, the lagged population growth rate and the lagged growth rate of real GDP should be further explored in order to determine their true significance on the dependent variable.

In regression 8 (Table 1 Column 8, STATA Output 8), the lagged population growth rate and the lagged growth rate of real GDP were removed from the regression because they were jointly insignificant with an F-statistic of only 0.07. Since the constant and the five remaining explanatory variables are all significant in this regression due to a decrease in the estimated standard errors, the seventh regression may contain at least one biased and inconsistent estimator of the growth rate of nominal GDP in the coming year. Furthermore, the adjusted R^2 is highest and the root MSE is lowest in this regression compared to the seven other regressions. Also, the joint significance of all the explanatory variables is greater with the elimination of the lagged population growth rate and the lagged growth rate of real GDP. Therefore, this furthers the suspicion that at least one of these eliminated variables is a biased and inconsistent estimator. This role of these two explanatory variables in terms of their relationship with the growth rate of nominal GDP in the coming year should be further examined to better understand their statistical insignificance and the unexpected sign on the lagged growth rate of real GDP.

Threats to Validly of Estimation Results

A very likely threat to the internal validity in this model is the presence of imperfect multicollinearity as already mentioned above. The correlation between the lagged growth rate of money supply and the lagged inflation rate is -0.9003 (Table 4). Therefore, the significant increase in the magnitude of the lagged growth rate of the money supply in regression 6 when inflation is added to the regression may be due to this. Additionally, the unexpected positive sign on the lagged inflation rate may be due to imperfect multicollinearity as well. Also, the adjusted R^2 increases by over 13% when the lagged inflation rate is added to the regression thus suggesting that this substantial increase may be partially due to an increase in the error term due to imperfect multicollinearity. Furthermore, the limited number of observations may be causing this issue to be augmented even further. The study done by El-Sakka and Ghali further suggests that imperfect multicollinearity may very well be an issue in the model causing the effect of inflation to be partially estimated in the growth rate of the money supply or vice versa. If this issue is in fact true, the estimated standard errors of the coefficients and the root MSE are overestimated causing the t-statistics of all the coefficients and the adjusted R^2 to be over estimated as well. Therefore, the results of this study are not reliable and should be further examined.

Another reason that the results are not as expected may be due to misspecifications errors. First, there may be more than one important variable missing from the regression causing omitted variable bias. This error is very likely because the adjusted R^2 is low with over half of the variation in the annual growth rate of nominal GDP in the coming year unexplained. One possible omitted variable may be net exports because the dependent variable for any given year within the sampled time period may be highly dependent on the growth rate of the previous year's net exports. If this missing variable is correlated with one of the regressors like the lagged growth rate of real GDP, there is a correlation between the estimated error term and the included explanatory variable leading to a biased estimation and incorrect standard errors.

Also, the functional form of the independent variables may be incorrect causing some variables to be insignificant when they actually are. Another possible misspecification error is an error in at least one of the explanatory variables selected for this study. In other words, at least one of the variables may be not be an imprecise measurement of the theories being measured in this study. If this is present in the results, then the incorrect variable is correlated with the estimated error term. For instance, the growth rate of real government expenditure may be more properly measured using the growth rate of real government expenditure as a percentage of real GDP. Therefore, the growth rate of real government expenditure may be correlated with the error term causing it to be statistically insignificant in some of the regressions. In this case, the solution would be to use Two Stage Least Squares (TSLS) rather than OLS to estimate the growth rate of the current year nominal GDP using variables from the previous year.

Another likely explanation is simultaneous causality within the model. This relationship causes the error term to be correlated with the explanatory variables. Therefore, the explanatory variables are biased and inconsistent estimators, so the variables may actually be statistically significant even though the regression results indicate otherwise. This relationship likely exists between the lagged inflation rate and the current year growth rate of nominal GDP because, as economic theory and previous research has found, the growth rate of nominal GDP is a function of inflation. Therefore, this may be an additional reason that the inflation rate has an unexpected positive effect on the dependent variable. The solution to this problem is to use TSLS by replacing the problematic variables with instruments thereby breaking the link between the error term and explanatory variables.

To summarize the findings, the real interest rate and inflation rate have statistically significant effects on the growth rate of nominal GDP in the coming year. The growth rate of the previous year government expenditure continuously appears to have a large and sometimes significant effect on the growth rate of the current year nominal GDP. The growth rate of money supply in the previous year has a statistically significant effect on the growth rate of the current year nominal GDP, but the high correlation between this explanatory variable and the inflation rate put each variable's statistical significance and, therefore, effect on the dependent variable at question. The unemployment rate continuously has a negative and sometimes statistically significant effect on the growth rate of nominal GDP in the coming year of around -3.5%. Finally, the growth rate of real GDP and the population growth rate do not appear to have a significantly impact on the growth rate of nominal GDP in the coming year.

In conclusion, given that the adjusted R^2 remains low with the highest percentage being 44.14% in the eighth regression, the OLS is likely the incorrect econometric model to estimate the aggregate demand of Egypt and or at least one highly significant variable is missing from the regression. However, based on previous literature and economic theory, the variables selected in this study should yield significantly better results, which leads to the conclusion that the wrong estimation method was used in this study. Two possible alternative methods are Two Stage Least Squares and Structural Vector Autoregressive. These methods applied to the same data used in this study should be further explored to determine the accuracy of the results expressed in this paper.

IV. Discussion

One of the primary focuses of this study was to understand the role that Egypt's aggregate demand plays in the country's development story. Aggregate demand is a vital indicator of economic development, which is linked to economic growth but not equated to it. Although this study requires further exploration of Egypt's aggregate demand function, improved methodology of analysis, and inclusion of variables relevant to the open door policy Egypt pursued in 1975 such as exchange rates and imports and export accounts, its initial findings offer a glimpse into the income inequality and related economic development issues that the country is currently burdened with. As of 2007, Egypt possessed a Gini coefficient of around 32.1, down from 34.4 in 2001 (CIA World Fact Book, 2011). A Gini coefficient of closer to 100 percentage points indicates perfect inequality, while a coefficient closer to 0 percentage points indicates perfect equality. However, even more telling are poverty indicators for Egypt. For example, as of 2009, about 44.4% of Egyptians continued to live on less than USD$2 a day, and inequality has been increasing (World Bank Country Data Profile, 2011).

It seems that between 1959 and 1965, Egypt pursued modern-sector enlargement growth typology, in which the investment in the modern sector resulted in the rise of a middle class and wage increases for both the modern and agricultural sectors. Amin (1994) showed that industrial output grew at a rate of 8.5% annually and employment in industry grew by 6.5% compared with 3.3% for agriculture. Furthermore, the share of manufacturing output in GDP increased from 17% in 1959 to 23% in 1965. Official statistics show a jump in the share of wages in agricultural and industrial income (25% to 33% and 27% to 32%, respectively) and in real agricultural and industrial wages (36% and 15%, respectively) between 1960 and 1966 (Amin 1994). However, beginning in the mid-1970s, the starting point for our data, significant shifts occurred in the sector-investment dynamics of Egypt, leading to skewed income inequality.

This initial study found the growth rate of government expenditures to be one of the statistically significant factors of aggregate demand for determining the growth rate of nominal GDP for the coming year. The question of where these government expenditures are employed is to be explored further, but previous studies do shed some light into their role in Egypt's income inequality picture. Moustafa (2005) found that Egyptian economic growth from 1980-2004 is manifested in the rise of the services sectors share in total civilian employment, reaching half of civilian employment in 1991 up from 1/3rd of total civilian employment in 1980. By 2004, the service sector employed 60% of total civilian labor force, while the agriculture sector's share decreased to 28% of total civilian employment (Moustafa 2005). It is notable that several studies have pointed to the expansion of public sector wages and compensation driven by government pledges as the most significant area to which the recent growth rates of government expenditures can be attributed (World Bank Report No. 24234-EGT, 2002). At the same time that the largest bulk of consumption expenditure feeding the service sector was provided primarily by the upper income strata, the manufacturing sector in Egypt shrunk dramatically and led to domestic market disruptions (Moustafa 2005). The author notes that the share of the shrinking manufacturing sector in both total employment and wages dropped significantly, feeding into an income distribution that is polarizing the upper class from the middle and lower income classes, as most non-executive jobs in the manufacturing sector are held by members of the latter two classes. Richards et al., 1990 points out that the income share of the top 10% increased from 32.1% in 1975 to about 37.2% in 1982 (Moustafa 2005). The richest fifth of the Egyptian population spend nearly half of total consumption expenditure (World Bank Report No. 24234-EGT, 2002). Higher income groups seem to have relatively higher income elasticity of demand for services and lower income elasticity of demand for manufactures, while the opposite is generally true for middle and lower income groups. Thus, worsening income distribution led to a decline in the demand for manufactured goods in Egypt, which in turn reinforced the low incomes of the poorer classes, who cannot contribute to nominal GDP at an optimal level, and the high unemployment rate, which has hovered around 9.4% in the past two years (CIA World Fact Book, 2011). This study showed that the unemployment rate continuously has a negative and sometimes statistically significant effect on the growth rate of nominal GDP in the coming year of around -3.5%. Thus, the unemployment rate will continue to be an important factor in determining the nominal GDP, workforce stability, and economic growth prospects of Egypt in the coming years. The benefits that the government expenditures have had for the upper class in Egypt point to the relevant notion that changes in income inequality depend on which group does the growing. During this government spending, it is clear that the poorer classes in Egypt have not prospered.

Simultaneously, with the structural changes and expansion of the public sector that were established as Hosni Mubarak was appointed Vice President of Egypt in 1975, the open door economic policy was established in order to allow market forces to play a role in Egypt's economy. This initial study indicates that the real interest rate, the inflation rate, the growth rate of government expenditure, and the growth rate of the money supply are the most statistically and economically significant factors of the growth rate of nominal GDP for the coming year. Vacek et al., (2008) notes that after the open door policy establishment, the budget deficit increased to more than 20% and was financed mainly by growth in the money supply and borrowing. Due to this increase in the money supply, inflationary pressures worsened and prices rose (Vacek et al., 2008). In order to combat inflation, the Egyptian government increased expenditures on subsidies. Subsidies also compose a significant part of Egypt's government expenditures and are secondary to expenditures on public sector wages (CIA World Fact Book, 2011). Harik (1992) points out that while government expenditures on food subsidies and social programs in Egypt in 1988 did help in elevating the poor, maladministration and wasteful distribution systems caused the same subsidies and programs to benefit the non-poor more than the truly poor citizens. The Egyptian government under Mubarak's regime increasingly used the money supply to finance the budget deficit. Pressures to print money have resulted in more inflation and a higher deficit, which has turned into a vicious cycle between the deficit, money supply, and inflation (El-Sakka et al., 2005).This cycle, in combination with imported inflation from global food price increases, have worsened pressures experienced by the Egyptian poor classes who have faced difficulty in meeting basic needs.

Although much of the income inequality that persists in Egypt today was established from government expenditures going toward public sector wage expansion in 1980-1990, rapid decentralization and privatization in the 1990s are linked to further increases in the income inequality gap (Belev 2001). During the selling-off of state-owned assets and businesses, only a few elite were able to acquire participation and investment in the sales. Thus, Egypt's economic opportunity base was not opened up to all or even most socioeconomic levels. Privatized assets are concentrated in the hands of the highest income strata (Belev 2001), adding more evidence to the fact that many developing and low-developed nations have found that privatization raises many complex issues, among them being increasing income inequality gaps.

V. Conclusion

Thus, in conclusion, despite improvements in methodology and further expansion of variables, which should include exchange rates and import and export factors, that are needed for this study, this initial study does align with the notion that the real interest rate, the inflation rate, the growth rate of Egyptian government expenditure, and the growth rate of the money supply will be some of the most key factors in determining the growth rate of nominal GDP for the coming year, as well as the country's future prosperity. Future studies can also evaluate the income inequality between genders in Egypt, as El-Laithy (2003) noted that female-headed households constitute on average 16% to 22% of total Egyptian households in Egypt. This future study may shed more light on the demographics of the income distribution of Egypt and the economic conditions of women in the country, as women are a vital source for growth and economic, environmental, and social prosperity for all developing nations. Furthermore, Harik (1992) calls into question the stability, quality, fairness, and governance roles of the Egyptian political system, which remain issues to this day and will have profound impacts on Egypt's economic development and income equality issues in the coming years. Future studies can evaluate governance indicators such as corruption and quality of administration for Egypt pre and post-1975, so as to offer more insight into the role of Mubarak's influence and regime on inequality of several kinds in the country.

VI. References

Agenor, Pierre-Richard, McDermott, C. John, and Prasad, Eswar. Macroeconomic Fluctuations in developing Countries: Some Stylized Facts. Working Paper of the International Monetary Fund 1999. http://www.imf.org/external/pubs/ft/wp/1999/wp9935.pdf

Amin, G., Evolution and Shifts in Egypt's Economic Policies: In Search of a Pattern in Developmentalism and Beyond. Cairo, Egypt: American University in Cairo Press, 1994. Cited within http://www.peri.umass.edu/fileadmin/pdf/UM-NS_Workshop/Moustafa_Egypt.pdf

Belev, Boyan., Privatization in Egypt and Tunisia: Liberal Outcomes and/or Liberal Policies?, Mediterranean Politics, 6: 2, 68-103, (2001). http://pdfserve.informaworld.com/397251_731223281_921020254.pdf

CIA World Fact Book – Egypt's Economy., Retrieved April 17, 2011 from https://www.cia.gov/library/publications/the-world-factbook/geos/eg.html

Emara, Noha. ECON X3029 Development Economics: Lecture, Lecture Notes. Barnard College, Spring 2011.

Emara, Noha. ECON X3018 Econometrics: Lecture, Lecture Notes. Barnard College, Spring 2011.

El-Laithy, H., The gender dimension of poverty in Egypt. Working Paper No.0127, Economic Research Forum, Cairo, Egypt. (2003). www.erf.org.eg/CMS/getFile.php?id=95

El-Sakka, M.I.T., and Ghali, Khalifa H. The Sources of Inflation in Egypt: A Multivariate Cointegration Analysis. Review of Middle East Economics and Finance, 2005; Vol. 3, No. 3, pp. 257-269. http://www.bepress.com/cgi/viewcontent.cgi?article=1046&context=rmeef

Fiorito, Riccardo, and Kollintzas, Tryphon. Stylized facts of business cycles in the G7 from a real business cycles perspective. European Economic Review, 1994; Vol. 38, No. 2, pp. 235–269. http://www.sciencedirect.com/science?_ob=MImg&_imagekey=B6V64-45F63FK-BH-1&_cdi=5804&_user=18704&_pii=0014292194900574&_origin=gateway&_coverDate=02%2F28%2F1994&_sk=999619997&view=c&wchp=dGLzVzb-zSkWA&md5=deef39d8ec92595a892be0d34b9526e3&ie=/sdarticle.pdf

Harik, I., Subsidization policies in Egypt: Neither economic growth nor distribution. International Journal of Middle Eastern Studies 24(3), 481-499., (1992). http://www.jstor.org/stable/164626

Kandil, Magda. Public Spending and the Macroeconomy: Evidence from Developing and Developed Countries. *Journal of Business and Economics*, 2009; Vol. 8, No. 2, pp. 133-158. http://www.ijbe.org/table%20of%20content/pdf/vol8-2/vol8-2-03.pdf

Moustafa, Ahmed., Does Income Inequality Effect the Composition of Growth? The Case of Egypt., Political Economy Research Institute, University of Massachusetts., (2005). http://www.peri.umass.edu/fileadmin/pdf/UM-NS_Workshop/Moustafa_Egypt.pdf

Massoud, Nada. Impact of a Crisis-Induced FDI Drop on Growth in Egypt. The Egyptian Cabinet, 2010. http://www.idsc.gov.eg/Upload/Documents/197/EN/Impact%20of%20Crisis-induced%20FDI%20Drop%20on%20Growth%20in%20Egypt.pdf

Vacek, Lindsay and Parker, Elliott., Egyptian Money Supply. Department of Economics, University of Nevada., (2008). http://www.business.unr.edu/faculty/parker/econ463/Vacek3.pdf

World Bank Country Data Profile., Retrieved April 17, 2011 from http://data.worldbank.org/data-catalog

World Bank and The Ministry of Planning in Egypt., Arab Republic of Egypt Poverty Reduction in Egypt Diagnosis and Strategy 24234-EGT, World Bank and the Ministry of Planning in Egypt., (2002). http://www.wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2002/08/23/000094946_02080904030162/Rendered/PDF/multi0page.pdf

VII. Appendix

Table 1: OLS Regression Results

Dependent Variable: Log Nominal GDP

Regression	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.057 (0.038)	0.043 (0.046)	0.048 (0.053)	0.035 (0.04)	0.038 (0.0411)	0.11* (0.053)	0.111* (0.054)	0.098*** (0.018)
Log RGDP	0.419 (0.547)	0.544 (0.564)	0.509 (0.625)	1.164 (0.683)	1.172 (0.678)	-0.218 (1.022)	-0.197 (1.052)	
Log G		0.27 (0.335)	0.335 (0.345)	0.716* (0.346)	0.671 (0.422)	0.51* (0.259)	0.51* (0.258)	0.535** (0.231)
r			-0.002 (0.004)	-0.007** (0.002)	-0.007** (0.003)	-0.009*** (0.003)	-0.009** (0.004)	-0.009*** (0.003)
U				-0.039* (0.019)	-0.036 (0.023)	-0.034* (0.016)	-0.033 (0.019)	-0.033* (0.018)
Log MS					0.019 (0.052)	0.19* (0.09)	0.189* (0.092)	0.182** (0.066)
inf						0.019** (0.007)	0.018** (0.008)	0.018*** (0.005)
Pop							-0.204 (0.768)	
Root MSE	0.09846	0.098	0.10005	0.0801	0.08193	0.07381	0.07605	0.07168
R^2	0.013	0.0365	0.0469	0.4294	0.4361	0.5693	0.5713	0.5683
Adj. R^2	-0.0186	-0.0277	-0.0517	0.3026	0.2703	0.4078	0.3712	0.4414
F-statistic	0.59	0.62	0.54	2.62	2.40	4.79	4.06	5.61
P-value of F-statistic	0.4496	0.547	0.6568	0.0695	0.0809	0.0056	0.0109	0.0031
n	33	33	33	23	23	23	23	23

Notes: *, **, and *** represent statistical significant at the 10%, 5% and 1% significance levels respectively. The numbers in the parentheses are the estimated heteroskedastic-robust standard errors.

Table 2: Phillips-Perron Unit Root Test

Variable	t-statistics	5% critical value
Log NGDP	-9.605	18.584
Log RGDP	-9.533	-18.584
Log G	-11.630	-18.584
r	-22.524	-18.508
U	-6.301	-17.900
Log MS	-10.884	-18.508
inf	-13.425	-18.584
Pop	-4.394	-18.584
Δ(Log NGDP)	-24.931	-18.508
Δ(Log RGDP)	-19.450	-18.508
Δ(Log G)	-37.797	-18.508
Δ(U)	-18.183	-17.900
Δ(Log MS)	-39.55	-18.432
Δ(inf)	-49.761	-18.508
Δ(Pop)	-4.677	-18.508
Δ(Δ(Pop))	-12.114	-18.432
Δ(Δ(Δ(Pop)))	-29.880	-18.356

Table 3: F-Test on Coefficients in Seventh Regression

Test	F-statistic	P-value of F-statistic
$E(\beta_{\log(RGDP)}) = 0$ $E(\beta_U) = 0$ $E(\beta_{Pop}) = 0$	2.55	0.0945
$E(\beta_{\log(RGDP)}) = 0$ $E(\beta_{Pop}) = 0$	0.07	0.9349

Table 4: Correlation Matrix

	Log RGDP	Log G	r	U	Log MS	Inf	Pop
Log RGDP	1.00						
Log G	-0.1939	1.00					
r	0.0463	0.3679	1.00				
U	-0.3100	-0.1719	0.0028	1.00			
Log MS	-0.0026	0.2392	-0.1834	-0.1094	1.00		
inf	0.2440	-0.3434	-0.3796	0.1162	-0.9003	1.00	
Pop	-0.1422	-0.1269	-0.3155	0.2219	-0.2621	-0.3082	1.00

Figure 1: Real Interest Rate

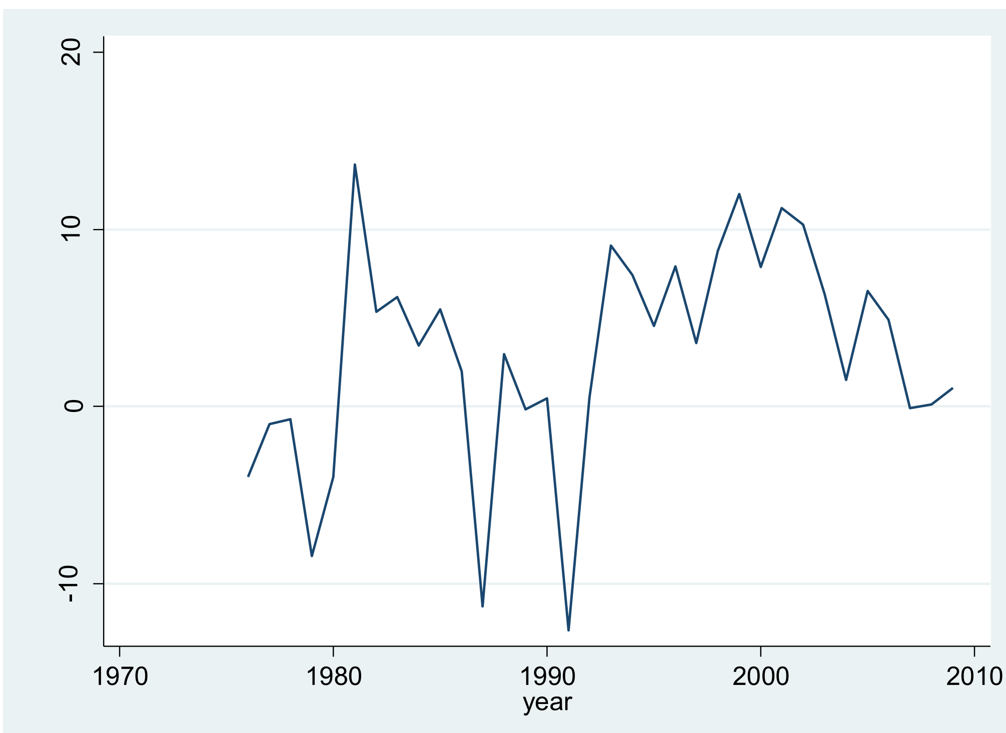


Figure 2: Growth Rate of Real GDP

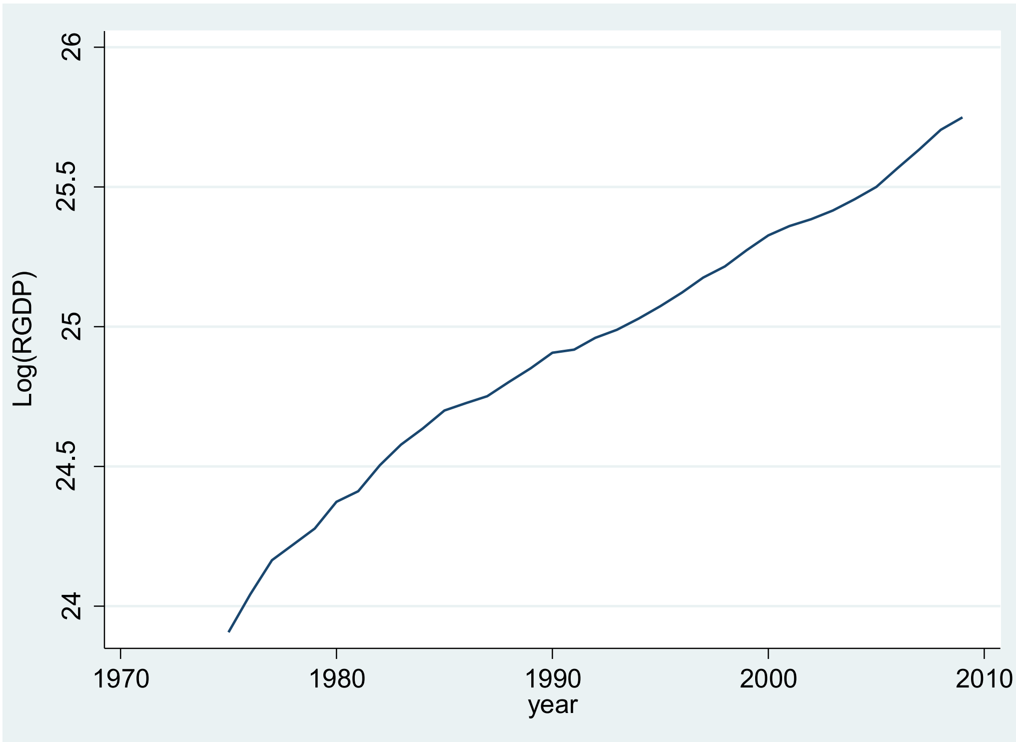


Figure 3: Growth Rate of Real Government Expenditure

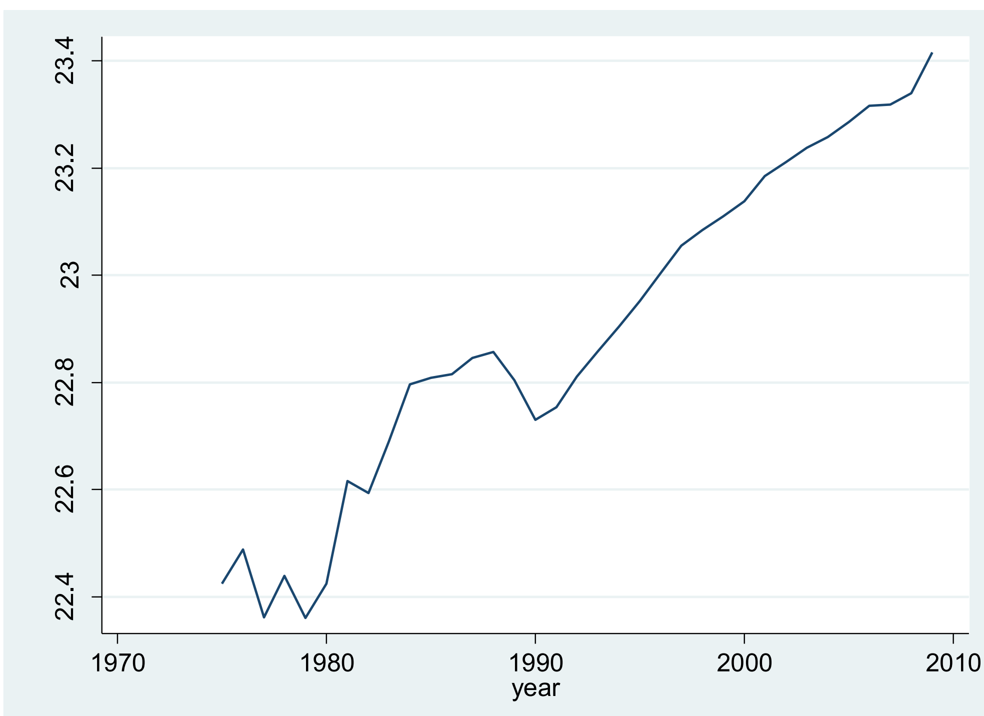


Figure 4: Unemployment Rate

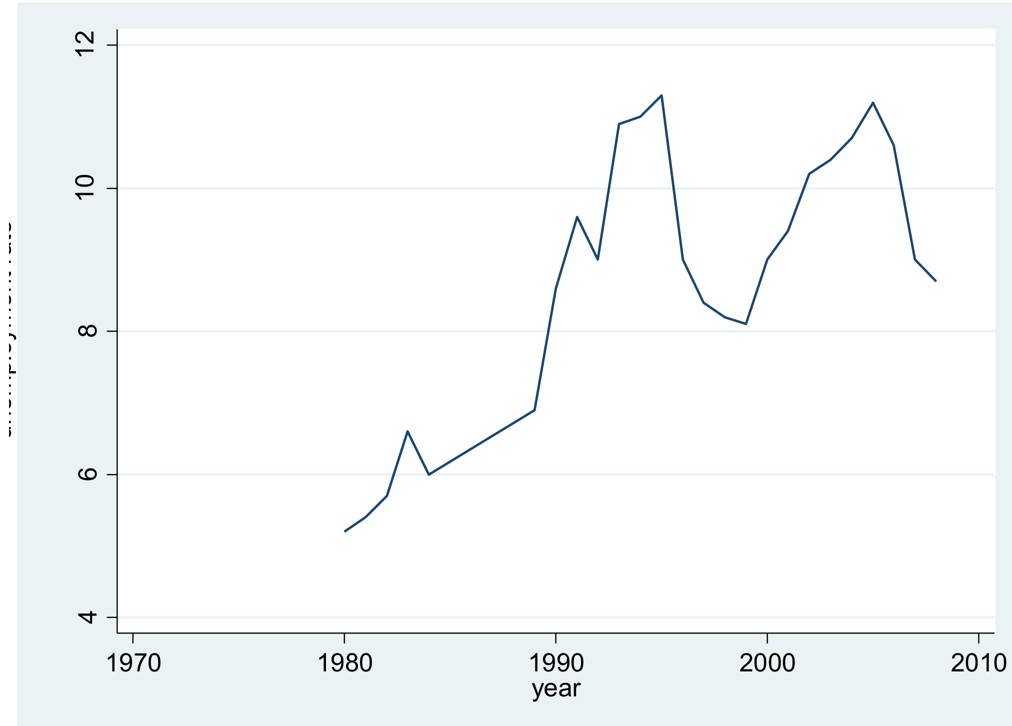


Figure 5: Inflation Rate

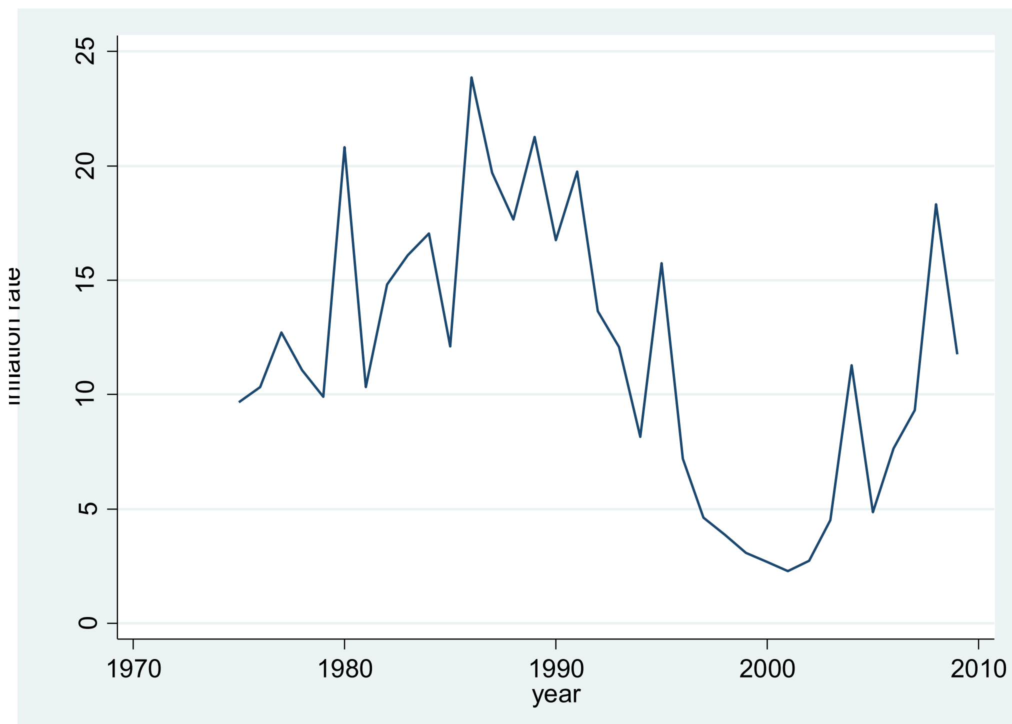


Figure 6: Growth Rate of Real Money Supply

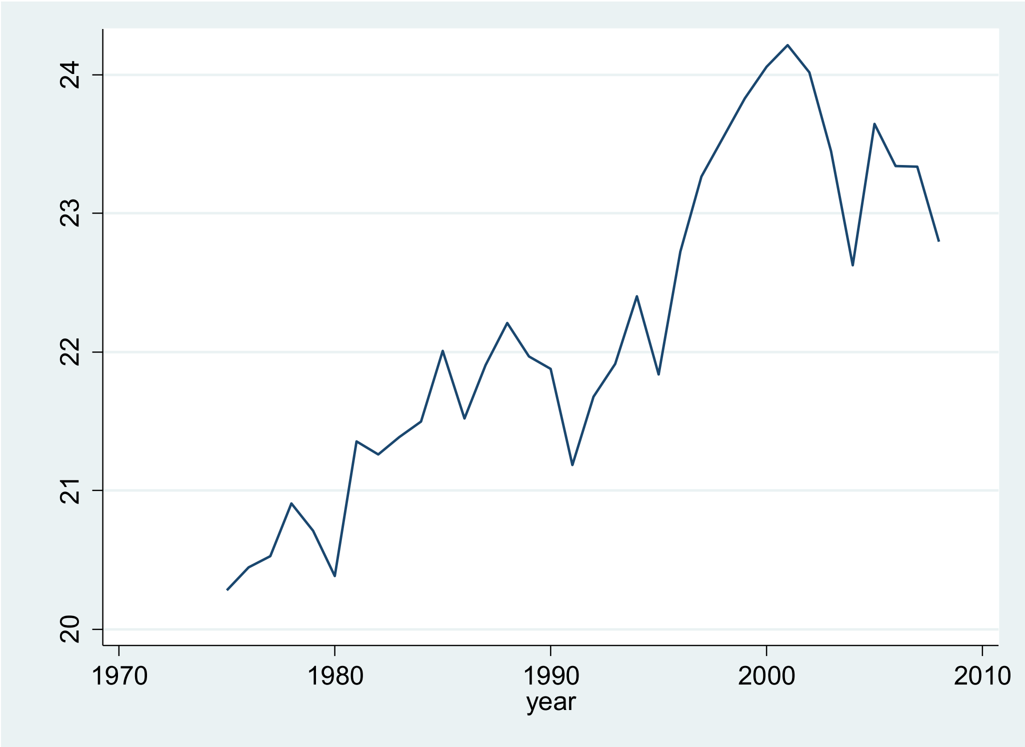


Figure 7: Population Growth Rate

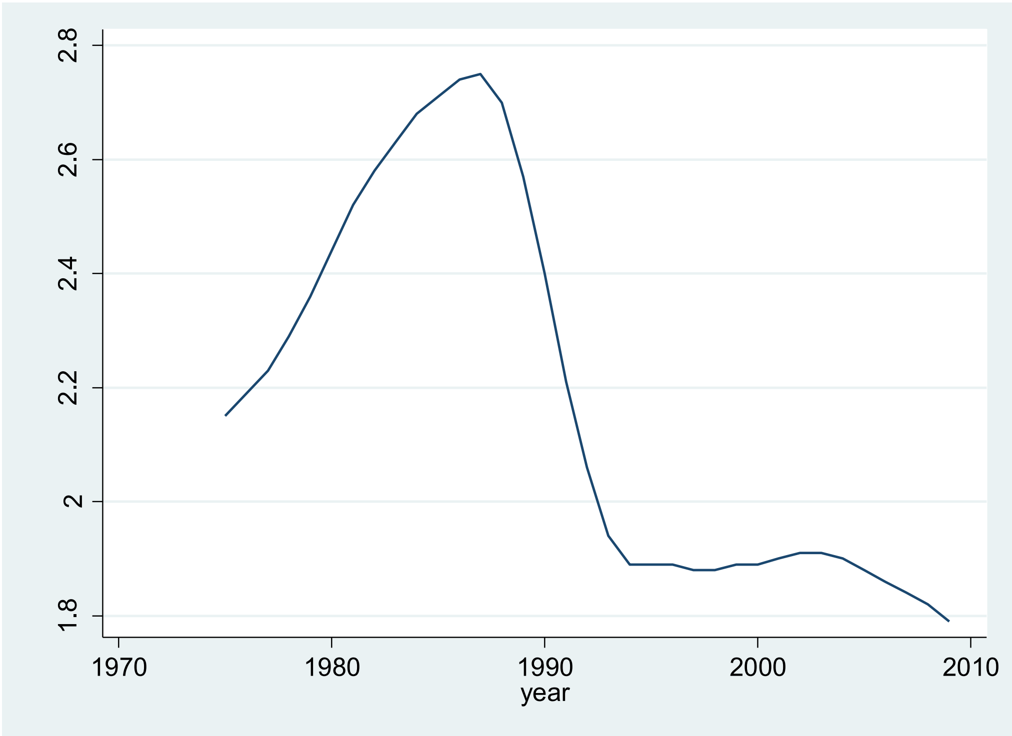


Figure 8: First Lagged Value of the Growth Rate of Real GDP

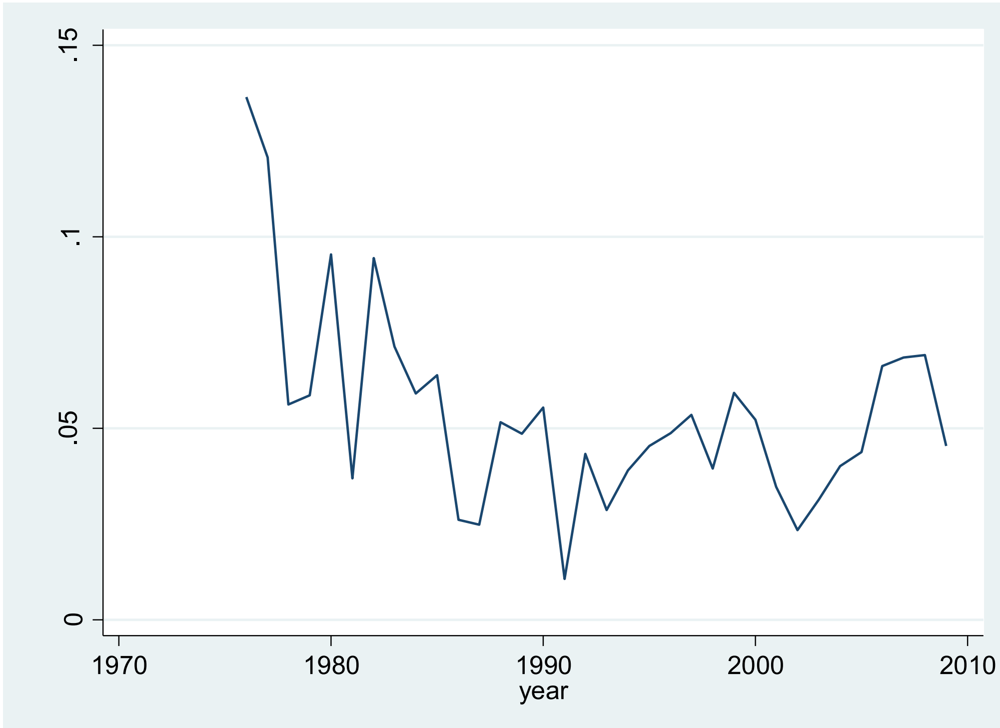


Figure 9: First Lagged Value of the Growth Rate of Government Expenditure

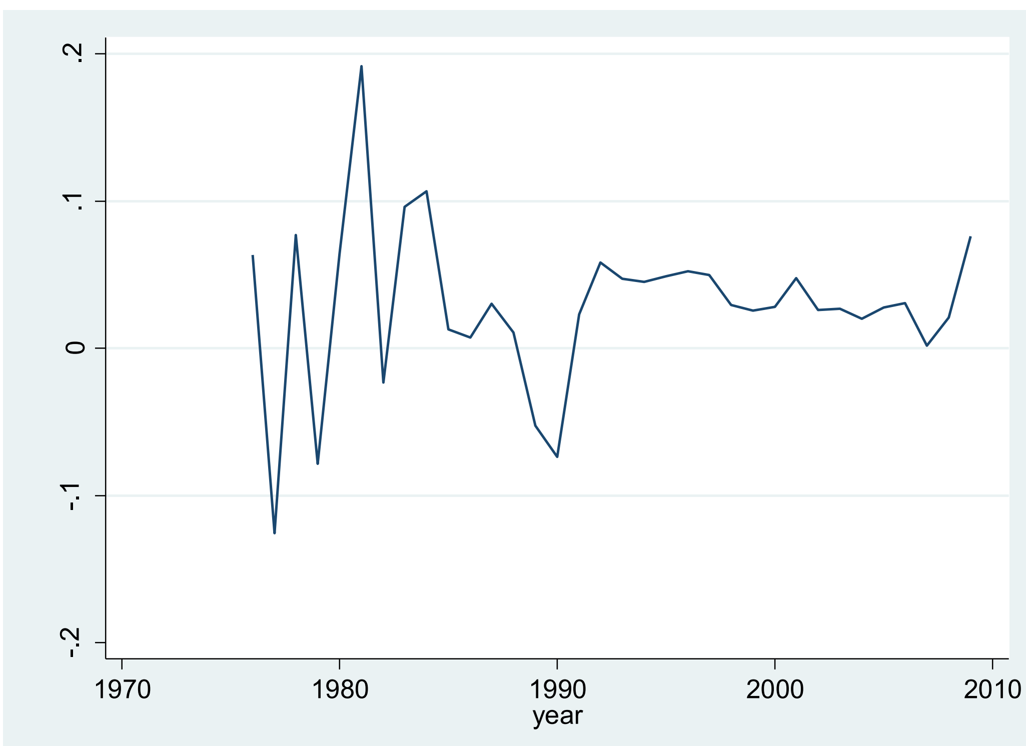


Figure 10: First Lagged Value of the Unemployment Rate

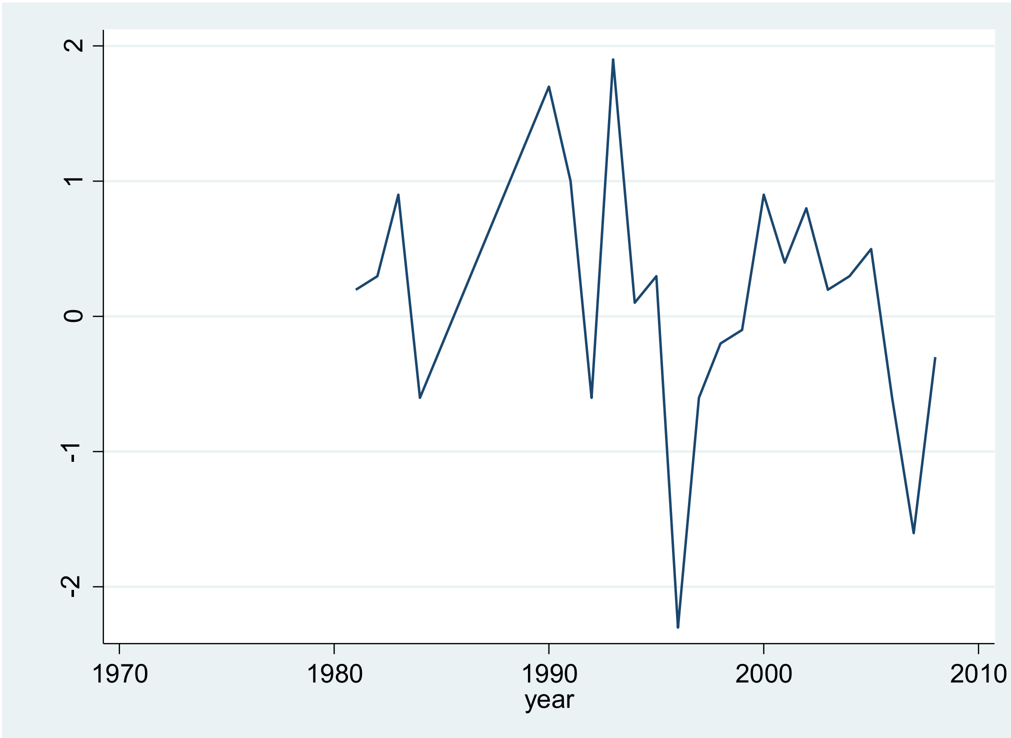


Figure 11: First Lagged Value of the Inflation Rate

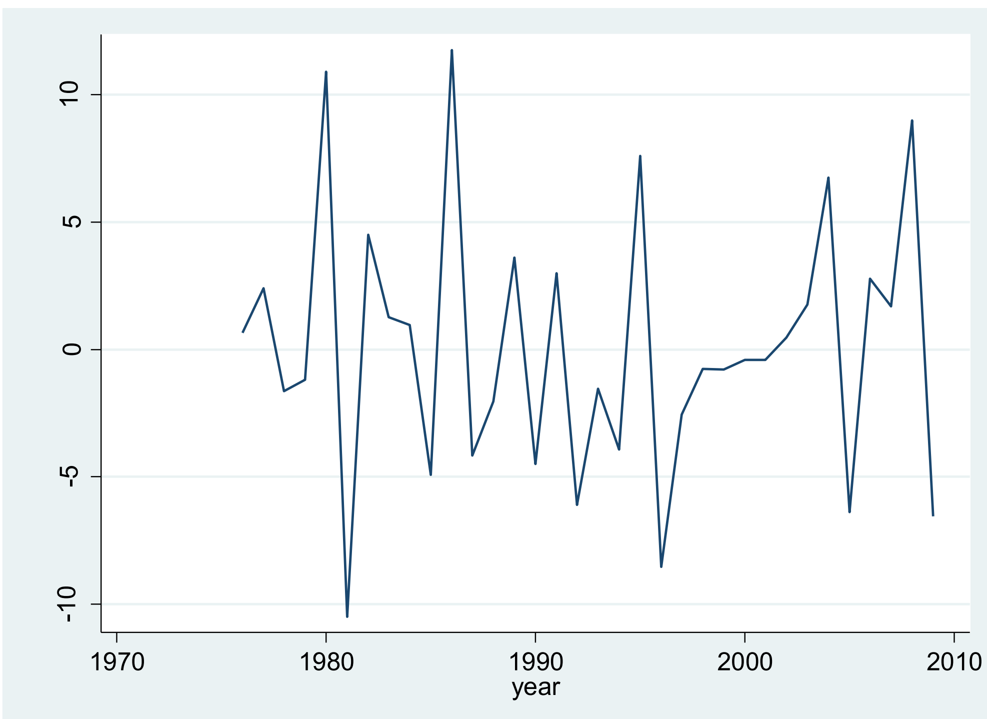


Figure 12: First Lagged Value of the Growth Rate of the Money Supply

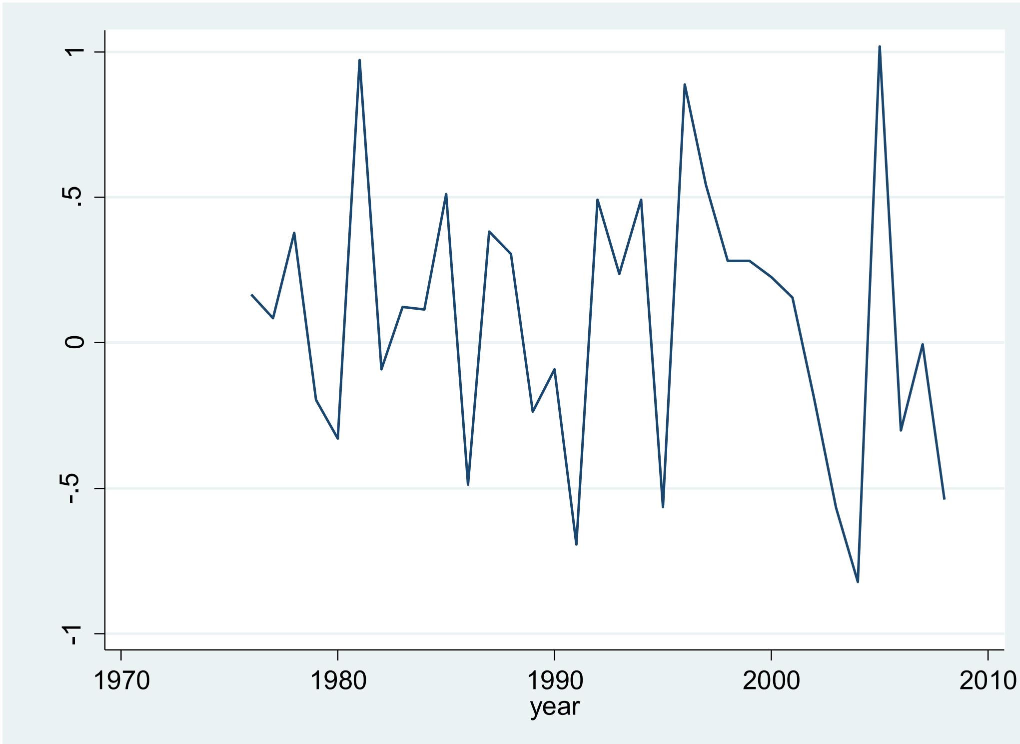


Figure 13: Third Lagged Value of the Population Growth Rate

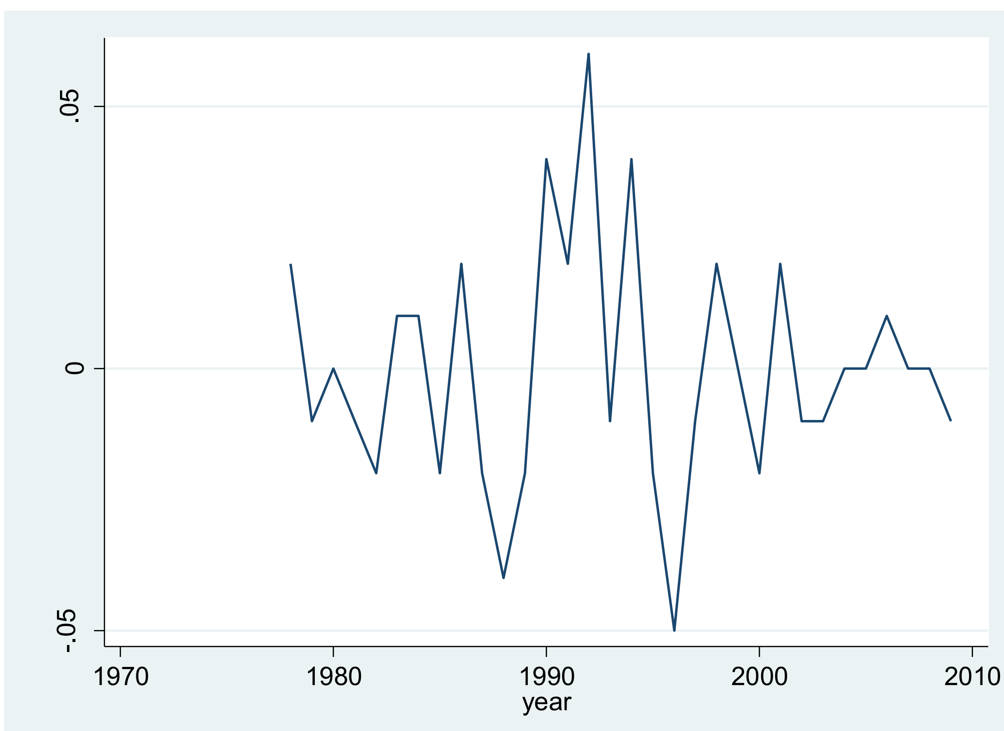


Figure 14: Growth Rate of Nominal GDP

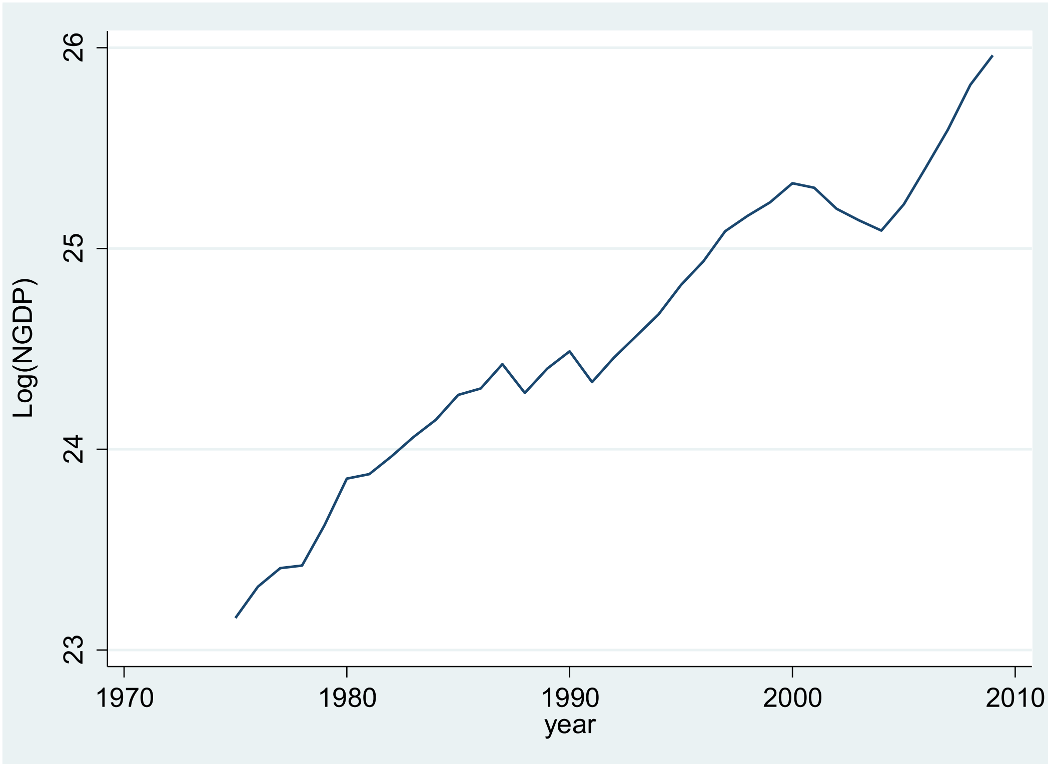
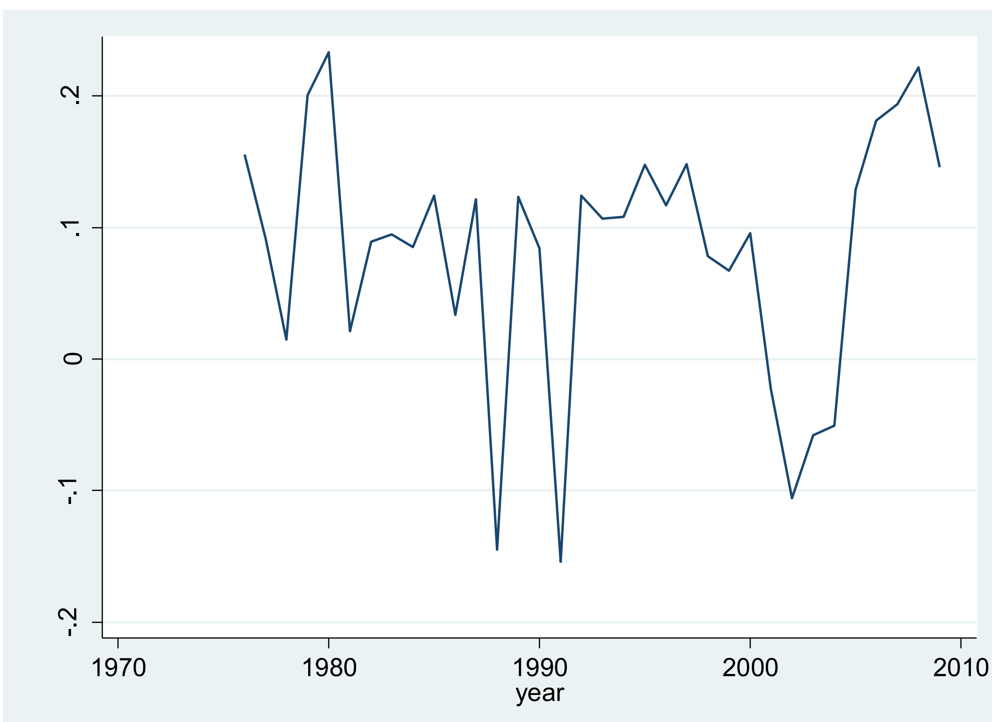


Figure 15: First Lagged Value of the Growth Rate of Nominal GDP



STATA Output 1

```
. reg clngdp lclrgdp, r

Linear regression                                      Number of obs =      33
                                                       F(  1,    31) =    0.59
                                                       Prob > F      =  0.4496
                                                       R-squared     =  0.0132
                                                       Root MSE      =  .09846
```

clngdp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lclrgdp	.4188984	.5469788	0.77	0.450	-.6966723	1.534469
_cons	.0573745	.0383538	1.50	0.145	-.0208486	.1355976

STATA Output 2

```
. reg clngdp lclrgdp lclg, r

Linear regression                                      Number of obs =      33
                                                       F(  2,    30) =    0.62
                                                       Prob > F      =  0.5470
                                                       R-squared     =  0.0365
                                                       Root MSE      =   .0989
```

clngdp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lclrgdp	.5443344	.5642574	0.96	0.342	-.6080328	1.696702
lclg	.2701062	.3354925	0.81	0.427	-.4150608	.9552732
_cons	.0430483	.0457808	0.94	0.355	-.0504487	.1365452

STATA Output 3

```
. reg clngdp lclrgdp lclg li, r

Linear regression                                      Number of obs =      33
                                                       F(  3,    29) =    0.54
                                                       Prob > F      =  0.6568
                                                       R-squared     =  0.0469
                                                       Root MSE      =  .10005
```

clngdp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lclrgdp	.508936	.6246589	0.81	0.422	-.7686348	1.786507
lclg	.3348036	.3451087	0.97	0.340	-.371023	1.04063
li	-.0017084	.0042252	-0.40	0.689	-.0103499	.0069331
_cons	.048346	.0527227	0.92	0.367	-.059484	.156176

STATA Output 4

```
. reg clngdp lclrgdp lclg li ldu, r

Linear regression                                      Number of obs =      23
                                                       F(  4,    18) =    2.62
                                                       Prob > F      =  0.0695
                                                       R-squared     =  0.4294
                                                       Root MSE      =   .0801
```

clngdp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lclrgdp	1.163922	.6829509	1.70	0.106	-.270905	2.598748
lclg	.7160133	.3459352	2.07	0.053	-.0107696	1.442796
li	-.0065485	.0024196	-2.71	0.014	-.0116319	-.0014651
ldu	-.0386166	.0187524	-2.06	0.054	-.0780139	.0007807
_cons	.0347875	.0396126	0.88	0.391	-.0484356	.1180105

STATA Output 5

```
. reg clngdp lclrgdp lclg li ldu ldlogrm2, r

Linear regression                                      Number of obs =      23
                                                       F(  5,    17) =    2.40
                                                       Prob > F      =  0.0809
                                                       R-squared     =  0.4361
                                                       Root MSE      =  .08193
```

clngdp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lclrgdp	1.172244	.6776095	1.73	0.102	-.2573872	2.601875
lclg	.6710354	.4222759	1.59	0.130	-.219889	1.56196
li	-.0073432	.0031703	-2.32	0.033	-.0140319	-.0006545
ldu	-.0363521	.0229345	-1.59	0.131	-.0847397	.0120354
ldlogrm2	.0191947	.0518509	0.37	0.716	-.0902012	.1285906
_cons	.0383894	.0411151	0.93	0.364	-.0483558	.1251346

STATA Output 6

```
. reg clngdp lclrgdp lclg li ldu ldlogrm2 ldinf, r

Linear regression                                      Number of obs =      23
                                                       F(  6,    16) =    4.79
                                                       Prob > F      =  0.0056
                                                       R-squared     =  0.5693
                                                       Root MSE      =  .07381
```

clngdp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lclrgdp	-.2180987	1.022062	-0.21	0.834	-2.384774	1.948577
lclg	.5097982	.2586677	1.97	0.066	-.0385528	1.058149
li	-.0086425	.0029111	-2.97	0.009	-.0148137	-.0024713
ldu	-.0342627	.0162386	-2.11	0.051	-.0686869	.0001615
ldlogrm2	.1904794	.0898368	2.12	0.050	.0000338	.380925
ldinf	.0186362	.0074627	2.50	0.024	.002816	.0344565
_cons	.1095918	.0530398	2.07	0.055	-.0028474	.2220311

STATA Output 7

```
. reg clngdp lclrgdp lclg li ldu ldlogrm2 ldinf ldddpop, r
```

Linear regression

Number of obs =	23
F(7, 15) =	4.06
Prob > F =	0.0109
R-squared =	0.5713
Root MSE =	.07605

clngdp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lclrgdp	-.196719	1.05238	-0.19	0.854	-2.439813	2.046375
lclg	.5095551	.2578987	1.98	0.067	-.040143	1.059253
li	-.0089909	.0038261	-2.35	0.033	-.0171461	-.0008357
ldu	-.0329689	.0191709	-1.72	0.106	-.0738306	.0078928
ldlogrm2	.1885082	.0916519	2.06	0.058	-.0068432	.3838595
ldinf	.0181506	.0076583	2.37	0.032	.0018274	.0344739
ldddpop	-.2043565	.7679745	-0.27	0.794	-1.841255	1.432542
_cons	.1108674	.0535412	2.07	0.056	-.0032529	.2249878

STATA Output 8

```
. reg  clngdp  lclg li ldu ldlogrm2 ldinf, r
```

Linear regression

Number of obs =	23
F(5, 17) =	5.61
Prob > F =	0.0031
R-squared =	0.5683
Root MSE =	.07168

clngdp	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lclg	.5354587	.2308025	2.32	0.033	.0485079	1.022409
li	-.0086681	.0027662	-3.13	0.006	-.0145043	-.0028318
ldu	-.0332716	.0178354	-1.87	0.079	-.070901	.0043577
ldlogrm2	.1824119	.0664365	2.75	0.014	.0422431	.3225808
ldinf	.0177467	.0046315	3.83	0.001	.0079752	.0275182
_cons	.0984502	.0175163	5.62	0.000	.0614941	.1354063