

International Research Journal of Finance and Economics

ISSN 1450-2887 Issue 40 (2010)

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<http://www.eurojournals.com/finance.htm>

Macroeconomic Factors that Affected Business Cycles before the 50s, after the 80s and during the Intermediate Period: Empirical Findings on the US Economy

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Abstract

The aim of this paper is twofold. On the one hand, it is investigated which is the effect of macroeconomic factors in income growth, as defined by IS-LM, and on the other hand it is examined which is the relation between these factors and economic cycles. The aim of this paper goes further and examines whether the magnitude of the effect of these factors to GDP growth remains intact over time. The examination periods includes the years 1930-1949, 1950-1979 and 1980-2008. According to the results of the analysis, the government consumption expenditure growth is the most important factor that affects positively GDP growth. A change by 10% of Government consumption leads to 1.65% GDP growth. It is also examined which is the effect of Personal consumption expenditures to gross domestic product growth by breaking down personal consumption components, namely consumption for Durable goods, consumption for Nondurable goods and consumption for Services. A change in demand for Nondurable goods is found to be the major factor that affects GDP growth. This study also shows that the duration of crises is adversely affected by lowering interest rates while being equally affected by government consumption and private investments even after adjusting for different time periods. However, the effect of these factors is somewhat smaller after 1950, maybe due to increasing globalisation. The findings are interesting for policy makers. The empirical findings of this study indicate that the role of private investments for GDP growth may be over-rated among policy makers, given the low contribution of this factor to GDP growth. On the contrary, policies that aim in increasing role of the state may lead to higher GDP growth and smaller economic crises. In line with other studies it is also found that interest rate policy affects the duration of economic cycles. However it is found that there is no effect on long-term growth.

Keywords: IS-LM, Business cycles, GDP, government expenditure, consumption.

1. Introduction

The paper investigates how macroeconomic factors can be used to affect positively GDP growth. More specifically, it is investigated which is the effect of demand and supply factors in income growth, and the relation between these factors and economic cycles. In terms of aggregate demand factors it is investigated which is the effect of Personal consumption expenditures, Government consumption expenditures and gross investment, Gross private domestic investment to GDP growth. To examine the effect of Personal consumption expenditures to gross domestic product growth, consumption is been braked down in consumption for Durable goods, consumption for Nondurable goods and consumption for Services. This breakdown was considered important since the three types of consumption have different characteristics and their growth is influenced in turn by different factors. A change in demand for Nondurable goods is found to be the major factor that affects GDP growth. Finally to investigate the relation between macro factors and economic cycles, the business cycles from 1928 to 2008 are examined. Thirteen economic cycles are identified and examined and then are regressed to examine the change of demand vs the length of crisis.

2. The IS-LM Model

It can be argued that the IS-LM model as developed by Hicks (1937) became a standard macroeconomic tool in explaining short-term economic fluctuations in macroeconomic textbooks and has continued to be a subject for economic education and research¹. Hsing (2007) examined and compared IS-LM with the competing IS-MP model developed by Taylor (2001a) and Romer (2000, 2006). He finds that IS-LM model has a higher predictive power and yields a smaller forecast error than the IS-MP model. Mountfold and Uhlig (2005) examined US data from late 1950s till 2000 and found that the best fiscal policy to stimulate the economy is a deficit-financed tax cut and that the long term costs of fiscal expansion through government spending are probably greater than the short term gains.

In this study, the part of IS-LM model is explained by ignoring the foreign sector. Therefore, total planned expenditures - i.e. "aggregate demand" becomes: $Y_d = C + I + G$

Where C is planned consumption, I is planned investment and G is planned government spending. If there is goods-market equilibrium, then aggregate demand must equal aggregate supply: $Y_d = Y$

Where Y is income (or output or aggregate supply), also being decomposed into: $Y = C + S + T$

Where S is savings, T is taxes. At equilibrium $C + I + G = C + S + T$ or, the equilibrium condition $Y_d = Y$ can be written equivalently as $I = S$ therefore planned investment equals planned savings. The equilibrium level of output is potentially any level up to the full employment level, and depends upon aggregate demand, very different from the neoclassical macro model which argued that interest rates determine the level of production. The computation of the equilibrium output level is result of the Kahn "multiplier" that, by assuming $Y = Y_d$, it implies that the equilibrium output is $Y^* = [C_0 + I_0 + G_0] / (1-c)$

Therefore, output is multiple of the autonomous terms $(C_0 + I_0 + G_0)$, where the term $1 / (1-c)$ is the Kahn (1931) "multiplier" that defines Keynes theory. The dynamic of the multiplier argues that output responds to excess demand for goods, so excess demand for goods leads to output increases ($Y_d > Y$ or $I > S$) and output decreases if there is excess supply of goods .

¹ See Gali, 1992; Revier, 2000; Weerapana, 2003

3. Methodology

3.1. Data

The data used for the empirical analysis are annual US data for the period 1928-2008. They are official data as released in the US bureau of economic analysis, while for crisis data the data provided by the National Bureau of Economic Research, Graduate Centre of the City University of New York. The examined Business Cycles, using the methodology developed by the National Bureau of Economic Research, Graduate Centre of the City University of New York.

3.2. Hypothesis Testing and Regression Analysis

Regression analysis is used to examine the association between GDP growth and the investigated macroeconomic factors.

In particular, a regressions analysis is used in order to define the coefficients of the following equations

$$DGDP = \alpha + \beta_2 * DG + \gamma_1 * D_{(1930-1949)} + \epsilon \quad (1)$$

$$DGDP = \alpha + \beta_2 * DG + \gamma_2 * D_{(1950-1979)} + \epsilon \quad (2)$$

$$DGDP = \alpha + \beta_2 * DG + \gamma_3 * D_{(1980-2008)} + \epsilon \quad (3)$$

$$DGDP = \alpha + \beta_2 * DG - 0.004 * D_{(1950-1979)} + \gamma_3 * D_{(1980-2008)} + \epsilon \quad (4)$$

$$DGDP = \alpha + \beta_1 * DC + \beta_2 * DG + \beta_3 * DI + \gamma_1 * D_{(1930-1949)} + \epsilon \quad (5)$$

$$DGDP = \alpha + \beta_1 * DC + \beta_2 * DG + \beta_3 * DI + \gamma_2 * D_{(1950-1979)} + \epsilon \quad (6)$$

$$DGDP = \alpha + \beta_1 * DC + \beta_2 * DG + \beta_3 * DI + \gamma_3 * D_{(1980-2008)} + \epsilon \quad (7)$$

$$DGDP = \alpha + \beta_4 * DDUR_G + \beta_5 * DNONDUR_G + \beta_6 * DSERVICES + \gamma_1 * D_{(1930-1949)} + \epsilon \quad (8)$$

$$DGDP = \alpha + \beta_4 * DDUR_G + \beta_5 * DNONDUR_G + \beta_6 * DSERVICES + \gamma_2 * D_{(1950-1979)} + \epsilon \quad (9)$$

$$DGDP = \alpha + \beta_4 * DDUR_G + \beta_5 * DNONDUR_G + \beta_6 * DSERVICES + \gamma_3 * D_{(1980-2008)} + \epsilon \quad (10)$$

$$CRISISY = \alpha + \beta_7 * D_IR + \beta_1 * DC + \gamma_1 * D_{(1930-1949)} + \gamma_3 * D_{(1980-2008)} + \epsilon \quad (11)$$

$$CRISISY = \alpha + \beta_7 * D_IR + \beta_2 * DG + \beta_3 * DI + \gamma_1 * D_{(1930-1949)} + \gamma_3 * D_{(1980-2008)} + \epsilon \quad (12)$$

Given that

DGDP: is the percentage change of GDP during year x,

CRISISY: is the duration (in number of years) of economic crisis from the year x forward, otherwise zero

DC: is the percentage change of Personal consumption expenditures during year x-1

DG: is the percentage change of Government consumption expenditures and gross investment during year x-1

DI: is the percentage change of Gross private domestic investment during year x-1

DDUR_G: is the percentage change of Durable goods consumption during year x-1

DNONDUR_G: is the percentage change of Non Durable goods consumption during year x-1

DSERVICES: is the percentage change of Services consumption during year x-1

D_IR: is the average percentage change of prime lending Interest rates during year x-1

D₍₁₉₃₀₋₁₉₄₉₎: is dummy variable during period 1930-1949, having value 1 during that period, zero otherwise

D₍₁₉₅₀₋₁₉₇₉₎: is dummy variable during period 1950-1979, having value 1 during that period, zero otherwise

D₍₁₉₈₀₋₂₀₀₈₎: is dummy variable during period 1980-2008, having value 1 during that period, zero otherwise

and

ε: is the error term.

4. Results

In this model, estimations take place for annual values and then regressions analysis of (1) over (12) runs in order to investigate the association of different factors to US GDP Growth and US length of economic crisis.

4.1. Consumption, Private Investment and Government Expenditures

Table 1 describes regressions that use the change of Consumption, Private Investment and Government Expenditures as well as dummy variables for different time periods (1930-1949, 1950-1979 and 1980-2008) during year x-1 to explain GDP growth during year x. t() is a regression coefficient (or, for the market slope b, the coefficient minus 1.0) divided by its standard error. The regression R-square adjusted and residual standard errors s (e) are adjusted for degrees of freedom. F-statistic is also reported.

Table 1 indicates that the growth Government consumption is the most important factor among the examined macro factors to fuel GDP growth. In particular an increase by 10% of Government consumption leads to 1.1% GDP growth, even when dummy variables are used for different time periods. This finding questions policies that aim in the curtailing of government expenditure. It was found also that while the magnitude of the effect of Government consumption growth to GDP growth is relatively stable, the administration of US Government during the 1980-2008 period lead to lower annual GDP growth by 1.5% per annum, as indicated by the coefficient of $D_{(1980-2008)}$ factor.

For private investments, it is found that the fit of regression increases from 12.6% to 27%-28%. Also, it is found that a 10% increase in Private **Investment leads to 0.55% increase in GDP, whilst a 10% increase in Government Expenditures leads to 1.43% increase in GDP**. This indicates that the role of private investment for GDP growth may be over-rated among policy makers. GDP growth enhancing policy should rather focus on Government spending

Table 1: GDP Growth and Consumption, Private Investment and Government Expenditures during different time periods

Predictor:	Intercept	DC	DG	DI	$D_{(1930-1949)}$	$D_{(1950-1979)}$	$D_{(1980-2008)}$	Regression Fit	
Panel A.DGDP= 0.062+0.109*DG+0.011*D₍₁₉₃₀₋₁₉₄₉₎+ε									
Coefficients	0,062***		0,109***		0,011			R-sq-adj	12,59%
t Stat	7,899		3,309		0,679			F	6,33
Panel B.DGDP= 0.062+0.113*DG+0.006*D₍₁₉₅₀₋₁₉₇₉₎+ε									
Coefficients	0,062***		0,113***			0,006		R-sq-adj	12,31%
t Stat	6,815		3,503			0,479		F	6,19
Panel C.DGDP= 0.070+0.108*DG-0.015*D₍₁₉₈₀₋₂₀₀₈₎+ε									
Coefficients	0,070***		0,108***				-0,015	R-sq-adj	13,48%
t Stat	7,871		3,349				-1,096	F	6,76
Panel D.DGDP= 0.073+0.107*DG-0.004*D₍₁₉₅₀₋₁₉₇₉₎-0.018*D₍₁₉₈₀₋₂₀₀₈₎+ε									
Coefficients	0,073***		0,107***			-0,004	-0,018	R-sq-adj	12,34%
t Stat	5,083		3,255			-0,254	-1,011	F	4,47
Panel E.DGDP= 0.036+0.244*DC+0.154*DG+0.065*DI-0.007*D₍₁₉₃₀₋₁₉₄₉₎+ε									
Coefficients	0,036**	0,244	0,154***	0,065*	-0,007			R-sq-adj	27,27%
t Stat	2,635	1,222	3,892	2,071	-0,435			F	7,93
Panel F.DGDP= 0.031+0.250*DC+0.150*DG+0.062*DI-0.009*D₍₁₉₅₀₋₁₉₇₉₎+ε									
Coefficients	0,031**	0,250	0,150***	0,062**		0,009		R-sq-adj	27,58%
t Stat	2,390	1,322	4,243	2,286		0,704		F	8,05
								Sample	75
Panel G.DGDP= 0.036+0.284*DC+0.143*DG+0.055*DI-0.018*D₍₁₉₈₀₋₂₀₀₈₎+ε									
Coefficients	0,036**	0,284	0,143***	0,055*			-0,005	R-sq-adj	27,23%
t Stat	2,629	1,520	3,960	2,007			-0,393	F	7,92

An asterisk, two asterisks and three asterisks indicate 10%, 5% and 1% statistical significance, respectively

Policy Implications

Given the contribution of the examined factors to GDP, some inferences can be made about the cost and the benefit of policies that aim to GDP growth through. It can be investigated, whether the state should pursue a policy that favours the funding of personal consumption (e.g. through tax credits), either the funding of private investment (e.g. by lowering enterprise tax) or the funding of government consumption. Table 2 shows the contribution of these factors to GDP.

Table 2: Consumption, Private Investment and Government Expenditures as a percentage of GDP Growth

	1929-1949	1950-1979	1980-2008
Personal consumption expenditures/GDP	69,0%	62,3%	66,9%
Gross private domestic investment/GDP	9,7%	16,0%	16,2%
Government consumption expenditures and gross investment/GDP	20,6%	21,5%	19,4%

The conjunction of **Table 1** and **Table 2** indicates that the contribution of private investments to next year GDP growth is very small. Given that Private Investments are approximately 16% of GDP, the cost of 10% increase in private investments ($10\% \times 16\% = 1.60\%$) is smaller than the benefit for GDP increase for the following year (0.58%). Therefore, it could be argued that even if a tax reduction policy leads to a proportional increase of private investments, the benefit of this policy is smaller than the cost in the examined period.

The Change in Private Consumption (denoted as DC in Tables) leads to an important increase in GDP. In particular an increase in Private Consumption by 1% in year x-1 is followed by 0.56% increase in GDP during the following year x. The fit of the regression is high (R square adjusted is 12.69%). The significance of the coefficient of the Change in Private Consumption is high (Statistical significance at 5%).

Even when combined with private investment and government expenditure it remains a statistical significant factor, though the coefficient decreases. The findings indicate that given that Private Consumption are approximately 67% of GDP, the cost of 1% increase in private investments ($1\% \times 67\% = 0.67\%$) is yet smaller than the benefit for GDP increase for the following year (approximately 0.28%). Therefore, it again could be argued that a tax incentive policy that leads to a proportional increase of private Consumption is not as effective as it is generally believed. As in the case of private investment, the cost of this policy is higher than the benefit in the examined period.

On the contrary, the results provide an indication that a shift in Government Expenditures is followed by an important and statistical significant shift in GDP. The coefficient decreases from 0.165 in Panel B to 0.146 in Panel G, but significance remains high at 1% level. In particular an increase in Government Expenditures by 10% in year x-1 is followed by 1.46% increase in GDP during the following year x. The fit of the regression is particularly high when Government Expenditure Growth is the only factor that explains GDP shifts (R square adjusted is 26.85%) and increases incrementally with the addition of the other two variables. It could be argued that the cost of 10% increase in private investments ($10\% \times 20\% = 2\%$) is smaller than the benefit for GDP increase for the following year (approximately 1.45%), but the ratio of cost over benefit is better (70%, compared to approximately 40% in the other cases)

4.2. Consumption for Durable Goods, Non Durable Goods and Services

At this stage, it is investigated whether Consumption in Durables, Non Durables and Services affect GDP growth in the long-run. For that scope, it is investigated which is the effect of change of Consumption for Durable Goods, Non Durable Goods and Services during year x-1 over GDP growth during year x. For the scope of investigating the change of coefficients during other periods, dummy variables are induced for different time periods (1930-1949, 1950-1979 and 1980-2008).

The following table (**Table 3**) illustrates the findings.

Table 3: GDP Growth and Consumption in Durable Goods, Non Durable Goods and Services during different time periods

Predictor:	Intercept	DDUR G	DNONDUR G	DSERVICES	D ₍₁₉₃₀₋₁₉₄₉₎	D ₍₁₉₅₀₋₁₉₇₉₎	D ₍₁₉₈₀₋₂₀₀₈₎	Regression Fit	
DGDP= 0.051+0.041*DDUR G+0.641*DNONDUR G-0.264*DSERVICES-0.002*D₍₁₉₃₀₋₁₉₄₉₎+ε									
Coefficients	0,051	0,041	0,641***	-0,264	-0,002			R-sq-adj	16,23%
t Stat	2,788	0,804	3,402	-0,978	-0,105			F	4,58
DGDP= 0.048+0.044*DDUR G+0.659*DNONDUR G-0.322*DSERVICES+0.012*D₍₁₉₅₀₋₁₉₇₉₎+ε									
Coefficients	0,048	0,044	0,659***	-0,322		0,012		R-sq-adj	17,07%
t Stat	3,171	0,903	3,849	-1,368		0,851		F	4,81
DGDP= 0.053+0.036*DDUR G+0.610*DNONDUR G-0.226*DSERVICES-0.010*D₍₁₉₈₀₋₂₀₀₈₎+ε									
Coefficients	0,053	0,036	0,610***	-0,226			-0,010	R-sq-adj	16,88%
t Stat	3,337	0,737	3,567	-1,025			-0,748	F	4,76

An asterisk, two asterisks and three asterisks indicate 10%, 5% and 1% statistical significance, respectively

According to the results, 10% growth in Non Durable Goods leads to 6.4% next year GDP Growth. In the examined regressions, the significance of this factor is found high (1% level), even after accounting for dummy variables for different time periods. Both growth in Service Consumption and growth in Durables Consumption have statistically insignificant coefficients. These findings are interesting. If consumption in Durables does not lead to GDP Growth in the long-run, then the tax policy that favors Durables consumption for the boosting of the national economy may be a questionable practice that needs some justification. On the contrary, policies that aim in keeping the consumption of non-durables may be more effective.

4.3. Crises and Factors

Table 4 describes regressions that use the change of Consumption, Private Investment and Government Expenditures as well as change in prime lending rate and dummy variables for different time periods (1930-1949, 1950-1979 and 1980-2008) during year x-1 to explain the Duration of Crisis during year x and forward.

Table 4: Crisis Duration and Changes in Interest Rates, Consumption, Private Investment and Government Expenditures during different time periods

Predictor:	Intercept	D IR	DC	DG	DI	D ₍₁₉₃₀₋₁₉₄₉₎	D ₍₁₉₈₀₋₂₀₀₈₎	Regression Fit	
CRISISY= 0.596+15,577*D IR-3.457*DC+ε									
Coefficients	0,596***	15,577**	-3,457*					R-sq-adj	11,15%
t Stat	4,513	2,969	-2,137					F	5,64
CRISISY= 0.581+15,862*D IR-3.552*DC+0,222*D₍₁₉₃₀₋₁₉₄₉₎-0.089*D₍₁₉₈₀₋₂₀₀₈₎+ε									
Coefficients	0,581***	15,862**	-3,552*			0,222	-0,089	R-sq-adj	13,04%
t Stat	3,728	3,003	-2,215			1,347	-0,600	F	3,77
CRISISY= 0.438+15,464*D IR-0,690*DG-0,686*DI+0,425*D₍₁₉₃₀₋₁₉₄₉₎-0.101*D₍₁₉₈₀₋₂₀₀₈₎+ε									
Coefficients	0,438***	15,464**		-0,690*	-0,686**	0,425*	-0,101	R-sq-adj	15,31%
t Stat	3,973	2,998		-1,888	-2,762	2,391	-0,693	F	3,68

An asterisk, two asterisks and three asterisks indicate 10%, 5% and 1% statistical significance, respectively

Table 4, indicates that both private investment and government expenditure can be effective together with interest rate policy. A decrease of interest rates by 100 bps leads to a decrease of duration of crisis by 0.155 years. A 100% increase in government expenditure can lead to the decrease of duration of crisis by 0.690 years. Similarly, a 100% increase in private investment can lead to the decrease of duration of crisis by 0.686 years. The positive and statistically significant coefficient for the period 1930-1949, denoted by the variable **D₍₁₉₃₀₋₁₉₄₉₎**, may indicates that the exercise of fiscal policy had been more effective in the period 1930-1949 than during the 1950-2008 period, probably due to more intense interaction of US economy with other economies in recent times. Increasing globalisation may be the reason for this development.

Policy Implications

What is obvious is, therefore, that whilst decreasing interest rates are the easiest and the first step towards resolving of crisis, the increase of government expenditure is the next policy that leads to a shortened crisis. Given the magnitude of the effect of the increase of Government consumption expenditures on GDP, this paper provides an indication that the increase in government consumption is a single most effective move in fuelling GDP whilst shortening the duration of crisis.

These findings may add a further insight into the possible mix of policy that could be followed by regulatory authorities and governments for both the boost of economy and the resolution of crises. Shifts of interest rates are found to be an effective tool for the shortening of the duration of crisis, when combined with increase of consumption but they have no contribution for GDP growth.

On the other side, an increase of consumption and the increase of private investment contribute to GDP growth, but in terms of efficiency, the increase in Government Expenditures is the factor that contributes the most to GDP growth. In particular, the contribution of Government expenditures investments in GDP growth is more than double than that of private investments.

5. Conclusion

In terms of aggregate demand factors it is investigated which are the effect of Personal consumption expenditures, Government consumption expenditures, Gross private domestic investment and Interest rates to both GDP growth and the duration of crises. The results indicate that demand-side variables as implied in IS-LM model, are the main explanation of US GDP, being generally in line with Fates and Milo (2001), Blanchard and Parotid (2002), Hosing (2007), Mona celli and Parotid (2007) and Vergos, Christopoulos and Mylonakis (2009).

In particular, it was found that the change in government consumption expenditures is by the far the most important factor that affects positively GDP growth, whilst a mix of interest rate decrease and increase in personal consumption expenditures may be an effective tool to shorten the duration of crises. It is also found that the effect of fiscal policy is smaller after 1950, maybe due to increasing globalisation. Finally, findings show that policies that favor consumption of durables may not have a long-run effect of GDP growth, while (tax or other) policies that maintain or enhance the consumption of non-durables may be more meaningful.

Findings are interesting for policy makers and may add a further insight into the possible mix of policy that could be followed by regulatory authorities and governments for both the boost of economy and the resolution of crises. Overall, the empirical findings of this study indicate that the role of private investments for GDP growth may be over-rated among policy makers, given the low contribution of this factor to GDP growth, *even after adjusting for different time periods*. This implies that Keynesian practices may be more effective than initially thought. On the contrary, policies aiming at increasing the role of the state may lead to higher GDP growth and shorter economic crises. In line with other studies, it was found that interest rate policy affects the duration of economic cycles, hence without effect on long-term growth.

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