

Business Cycles in Pakistan

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Abstract

Gross domestic product, like any other time series, may be considered a combination of four processes, viz. long-run trend, business cycles, seasonal variations and short-run shocks. The series of GDP can be decomposed in to these components by using some statistical method. Such a decomposition of annual real GDP of Pakistan reveals that the Pakistan's economy has completed three business cycles and is currently under a recessionary phase of fourth business cycle. The current recessionary phase is expected to bottom out in 2012 after which a recovery would start. It is also expected that overall real GDP growth would remain around three percent during the next five years.

Keywords: Cycles, Decompositions, Time series trends

JEL classification: C22, E27, E32, N1

1. Introduction

The path of economic growth for any country depends on a number of factors including structural changes in the economy, rate of capital formation, natural calamities, political instabilities, global economic trends, self-feeding business cycles, etc. and the combined effect of all these factors is most commonly represented in the country's gross domestic product (GDP). While the growth in real GDP is a commonly used yardstick to measure the pace of economic activities, it is often desirable for macroeconomic policy purposes to assess whether it is just transient, permanent or some reflection of business cycle. The overall real GDP growth, in fact, coalesces in itself four streams of economic motions: seasonal variations in economic activities, a long-run trend, business cycles, and short-run shocks to the economy. These motions can be separated from each other by applying some statistical techniques on the series of overall real GDP growth.

The objective of this paper is to decompose the growth series of real GDP of Pakistan into its above-mentioned components, and also to project them for determining future path of the real GDP. Moreover, an attempt has also been made to relate the trend and cyclical movements in real output with those of money growth and inflation. Such type of dialysis gives more insights to understand the changing pattern of economic growth and its association with key macroeconomic variables, and thus help policy makers in addressing the shocks appropriately. In the literature, a number of methods have been proposed for separating the trend from the cyclical component of an economic time series. The most popular of these is the Hodrick-Prescott (1997), while others include Rotemberg (1999), Baxter-King filter (1995), etc. This study has used the Hodrick-Prescott filter. See Pedregal and Young (2000), Pederson (1998) and Reeves *et al.* (2000) for some useful comments on HP filter.

A brief summary of the methodology used is provided in the following section. Results are presented and explained in section 3, while the last section concludes the paper.

2. Methodology

The methodology consists of two steps; first to dissect the real GDP growth to get its components, and second to project the components into future.

Note. An earlier version of this paper was released as State Bank of Pakistan Working Paper No. 01 in September 2001. Views expressed in this paper are the authors' personal views and do not necessarily reflect those of the institutions to which the authors are affiliated.

Given that high frequency (*i.e.* monthly or quarterly) data of GDP is not available in Pakistan, we have used annual series of real GDP obtained from Handbook of Statistics on Pakistan Economy 2005 published by the State Bank of Pakistan for data from 1949-50 to 2002-03 and Pakistan Economic Survey 2009-10 published by the Ministry of Finance for years onward.

A similar exercise is done with broad money (M2) growth and inflation (measured by consumer price index) in order to explore the dynamics of relationships among key macroeconomic variables. As in annual series of data, seasonal motions are unidentifiable, we assume that the series of real GDP growth, M2 and inflation are aggregations of three components, *viz.* trend, cyclical movements, and irregular movements. This assumption is similar to that adopted by US Bureau of Census in its seasonal adjustment program (the latest version of which is X-12-ARIMA). In symbolic form:

$$Y_t = T_t + C_t + I_t \tag{1}$$

where Y_t is the original time series, T_t is its Long-run trend, C_t is cyclical movements, and I_t is irregular movements (shocks).

The HP filter is used in two stages to separate these components; first to extract the long-run trend (T_t) from the original series and then to filter out cycles (C_t) from the rest. The HP filter proceeds as follows:

$$X_t = S_t + D_t \tag{2}$$

It assumes that a series (say X_t) has two components; a smooth one (S_t) and deviations (D_t) from S_t , *i.e.* such that over a long period of time the sum of deviations (D_t) is near zero.

In order to filter out S_t from X_t , it minimizes the following:

$$\text{Min: } \Sigma D_t^2 + \lambda \Sigma (\Delta^2 S_t)^2 \tag{3}$$

The parameter λ is a positive number, which penalizes variability in the smooth component (S_t). Δ is the difference operator, power of which shows the order of differentiation. The higher the value of λ , the smoother is the solution series. Hodrick and Prescott suggested $\lambda = 100$ for annual data.

We have applied the HP filter on the original series of real GDP growth, M2 growth and inflation to extract their trend (T_t) components. By subtracting the trend from the original series (Y_t), we get a new series (Z_t) that contains cyclical and irregular components.

$$Z_t = Y_t - T_t = C_t + I_t \tag{4}$$

We again apply the HP filter on Z_t . In this second stage the HP filter wheedles out oscillations around the smooth component that is nothing but Cycles C_t . The difference between Z_t and C_t represents shocks or Irregular component (I_t).

The next step is to project trend and cycles in real GDP growth into future over a five-year period. For this purpose, autoregression moving average models have been used. The procedure includes establishing order of integration by unit root test (results are available with authors); identification and selection of model with the help of autocorrelation, partial autocorrelation functions and some information criterion; and diagnostics etc. (see Appendix). Following the usual procedure of selecting a time series model, we have identified the following models for components:

For trend component (T_t):

$$(1 - \alpha_1 L - \alpha_2 L^2 - \alpha_3 L^4 - \alpha_3 L^5) T_t = \alpha_0 + (1 + \beta_1 L + \beta_2 L^2 + \beta_2 L^3) \varepsilon \tag{5}$$

L is lag operator and ε is error term, normally distributed around constant mean.

For cyclical component (C_t)

$$(1 - \phi_1 L - \phi_2 L^2) C_t = \phi_0 + (1 + \pi_1 L + \pi_2 L^2 + \pi_3 L^7 + \pi_3 L^9) \varepsilon \tag{6}$$

3. Results

The three components of Pakistan's real GDP growth have been shown in Figure 1. It seems that excessively high altitude of business cycles in Pakistan has induced changes in the long-run trend growth rates. It is evident that real GDP growth in Pakistan has completed at least three business cycles since 1950s and is now passing through the fourth cycle. The first cycle ended with a peak in 1964-65, the second ended in 1984-85 and the third ended with a peak in 2004-05. Since 2005-06, the economy is in recessionary phase of a fourth business cycle. A complete time frame of phases of business cycles in Pakistan has been given in Table 1.

It is estimated that this phase of recession would continue till 2011-12 and then a recovery process may initiate. Table 1 reveals the following features of business cycles in Pakistan:

1. Pakistan's economy went into recession soon after the independence. The whole decade of 1950s witnessed economic sluggishness that may be attributed to communal upsets, lack of infrastructure, weak (or virtually absent) industrial base, lack of private sector confidence on the infant economy, etc.
2. The economy started recovering by late 1950s. Interestingly, the recovery period is shorter than the recession. It may be postulated that appropriate economic planning and its effective implementation helped the economy recover quickly.
3. The periods of late 1960s and early 1970s are characterized with recession; the economy fell into recession almost as quickly as it had recovered during the last decade. The war of 1965, separation of East Pakistan and the nationalization of industrial, financial and other institutions could have adversely affected the business confidence during this period.
4. It took 10 years for the economy to recover from second recession compared with a 7-year recovery period in the first cycle. Particularly, the economy slowed down in mid 1980s, and did not achieve even the peak level of last cycle that it fell into next recession.
5. Third recession started after mid 1980s and it was the longest period of recession that lasted until 1997. It followed a sharp but a short period of economic revival that was primarily supported by foreign capital inflows.
6. However, after the peak of 2005, the economy fell down with the same speed as that with which it recovered during the first half of the decade.
7. According to our projection, the economy would continue to remain in recession till 2012; then a recovery process may start (Figure 2).

The long-run trend in real GDP growth, on the other hand continued to be at a rising path till mid of 1960s; then it remained at a steady state with some downward and upward dents induced by the business cycles. This pattern of growth has some bearings on structural developments in early 60s including the green revolution, the industrial revolution, the development of financial institutions, etc., and the impact of 1965 war on the later half of the 1960s.

Another very intriguing result is a higher trend growth rate during 1970s – a poorly rated decade by economists compared with all the later periods. There may be many explanations to it; one is the role of public fixed investment. Public fixed investment was 12.4 percent of GDP during 1973-74 to 1983-84 compared with 9.7 percent and 9.4 percent during the two adjacent periods as argued by Arby (2001). It suggests that some positive structural changes occurred during this period. However, as mentioned above, the 1970s also witnessed a recession of second business cycle, which may have some fainting effects on the overall economic performance. Figure 2 also shows the projection of long-run trend that are made on the basis of the model given in equation (5). It is estimated that the trend growth will start rising from year 2014. By combining the projections of trend growth and cyclical component, it is estimated that the real GDP would be growing with an annual rate of around 3 percent in coming five years as given in Table 2. The projection is based on the assumption that the economy will not suffer from positive or negative shocks during that period.

Relationship with M2 Growth and Inflation

Figure 3 gives a pictorial view of trend growth rate of real GDP along with M2 growth and inflation trends. While movements in opposite directions by inflation and real GDP growth trend are evident, no clear association can be established between M2 growth and real output growth in the long-run. Thus a long-run neutrality of money could be ascertained in case of Pakistan.

The pattern of cyclical movements in real GDP growth in relation with inflation and M2 growth is almost the same as their respective long-run trends. However, the nature of relationship between M2 growth and inflation witnessed a structural change in early 1990s: Before 1990s, the cycles of M2 growth had been following cycles in inflation, *i.e.* inflation preceded M2 growth, while after 1990 the M2 growth cycle preceded inflation cycle. Although establishing some casual relationship between M2 growth and inflation is not within the scope of this paper, this evidence does suggest that monetary policy had been passive before the era of financial reforms started in 1990 and it has been proactive since then.

4. Conclusion

The paper has decomposed, statistically, the real GDP of Pakistan into three components, viz. long-run trend, business cycles and short-run shocks and explored the relationship of growth trend and business cycle with the similar components of M2 growth and inflation. It also projected overall real GDP growth for next five years (2011-2015) on the basis of projected trend and business cycle. It is found that the Pakistan’s economy, after passing through three complete phases of business cycles, is now facing a recession of the fourth business cycle. It is projected that the current recession will continue until 2012 and then a recovery would take place.

The results of this study also provide some interesting insights into the relationships among key macroeconomic variables including:

- (a) The money growth has been neutral in the long run in terms of its impact on real output.
- (b) The monetary policy has been passive prior to era of financial liberalization of 1990s and then it become pro-active.
- (c) Inflation and real output have been showing cyclical movements in opposite directions. Although nothing can be deduced in terms causality from this result, it can still be argued that high inflation is associated with lower GDP growth implying inflation has costs to the economy.

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Table 1. Time Frame of Business Cycles in Pakistan

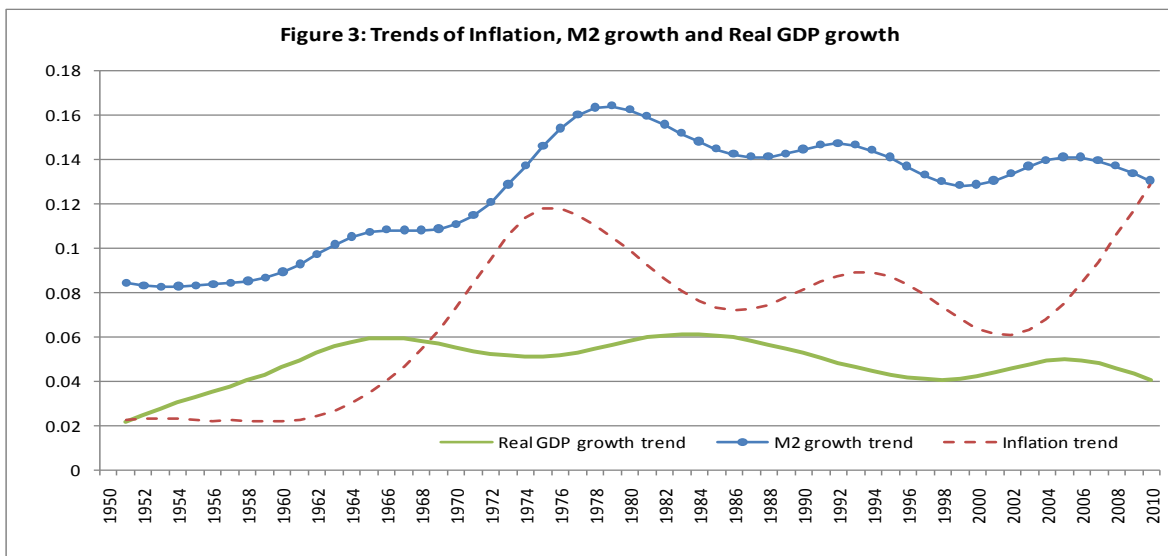
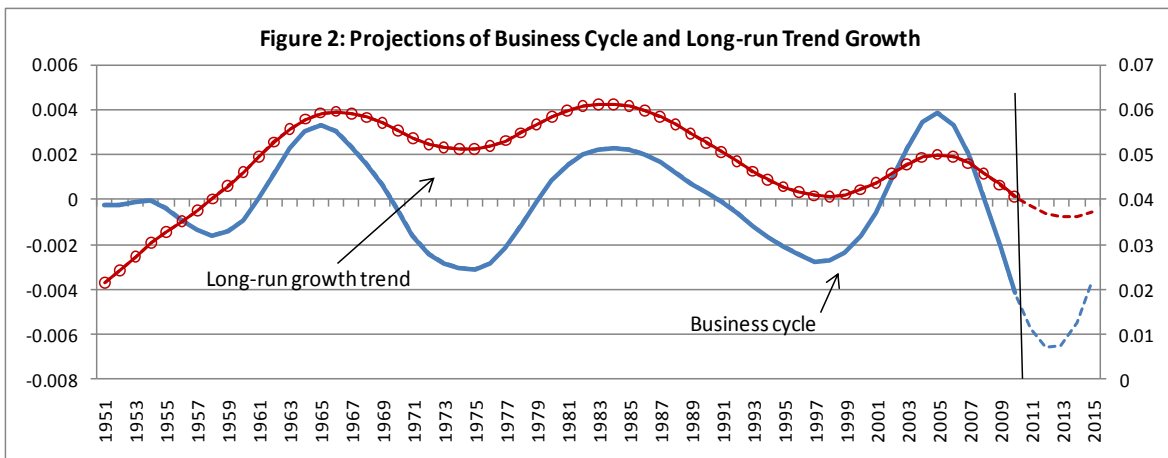
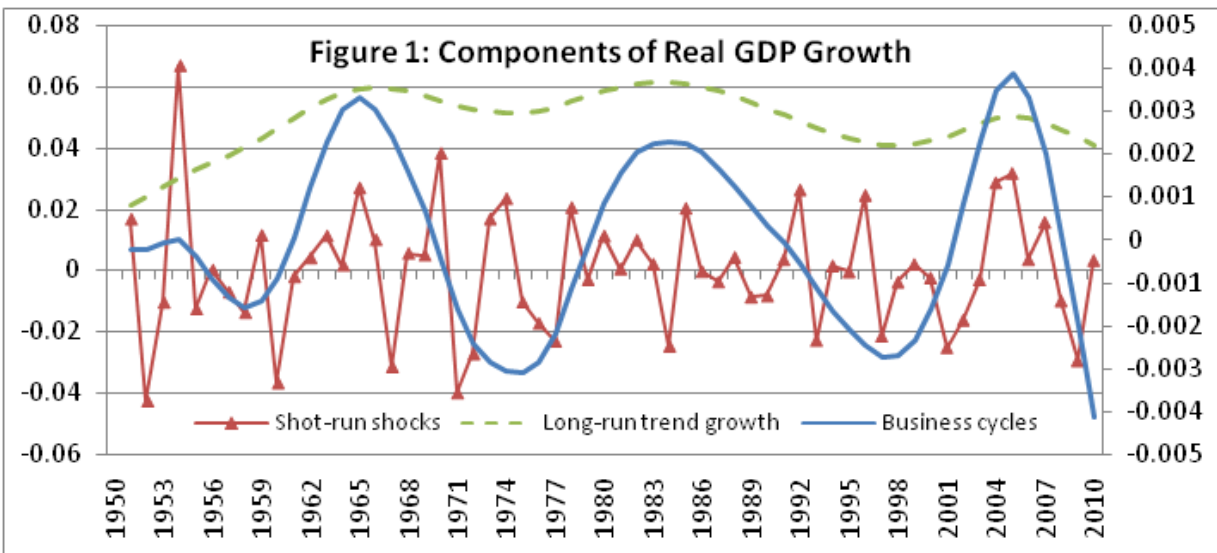
Business Cycle	Recession	Trough	Recovery	Peak
First cycle: 1949-1965 (16 years)	1949-58 (9 years)	1958	1959-65 (7 years)	1965
Second cycle: 1966-1985 (20 years)	1966-75 (10 years)	1975	1976-85 (10 years)	1985
Third cycle: 1986-2005 (20 years)	1986-97 (12 years)	1997	1998-2005 (8 years)	2005
Fourth cycle: 2006-	2006-12*	2012*		

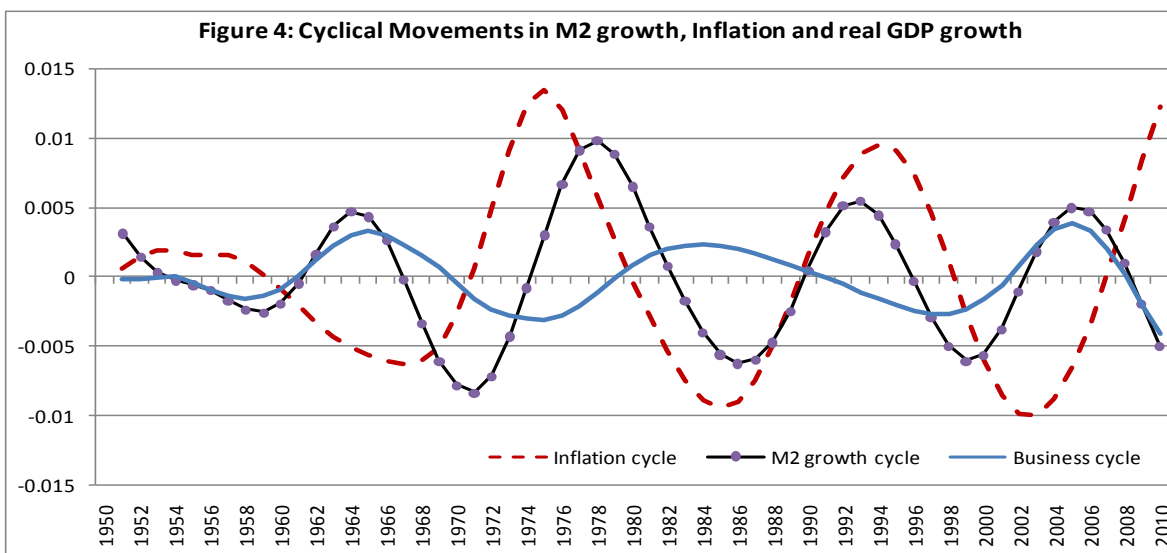
*Projected on the basis of models given in equation (6); see Appendix for results.

NOTE: Figures in parentheses show duration of the cycle and its phases.

Table 2. Projected real GDP Growth

Year	% Growth
2010-11	3.3
2011-12	3.0
2012-13	3.0
2013-14	3.1
2014-15	3.4





Appendix

Projection of Business Cycle and Long-run Trend of Real GDP Growth

Both the series of business cycle and trend of real GDP growth were found integrated of order zero through Augmented Dickey Fuller test. We selected two models as given in equations (5) and (6) in the text among a number of identifications of univariable time series model for the two series on the basis of minimum Akaike information criterion. The estimated parameters are the following.

Equation 5: for Long-run trend
 Dependent variable: Trend of real GDP growth
 Sample (adjusted): 1956 2010

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.0510	0.0024	21.3	0.00
AR(1)	1.7462	0.1290	13.5	0.00
AR(2)	-0.5184	0.2168	-2.4	0.02
AR(4)	-0.7344	0.1881	-3.9	0.00
AR(5)	0.4720	0.1025	4.6	0.00
MA(1)	1.6574	0.1770	9.4	0.00
MA(2)	1.5472	0.2341	6.6	0.00
MA(3)	0.4602	0.1626	2.8	0.01
Adjusted R-squared	0.9997			
Jarque-Bera test statistic for normality				0.557 (p 0.75)

Equation 6: for Business Cycle
 Dependent variable: Business Cycle
 Sample (adjusted): 1953 2010

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.0002	0.0002	-0.7	0.47
AR(1)	1.8895	0.0304	62.1	0.00
AR(2)	-1.0313	0.0382	-27.0	0.00
MA(1)	1.2407	0.0966	12.8	0.00
MA(2)	0.7850	0.0557	14.1	0.00
MA(7)	-0.1624	0.0648	-2.5	0.02
MA(9)	-0.2642	0.0258	-10.2	0.00
Adjusted R-squared	0.9977			
Jarque-Bera test statistic for normality				2.3 (p 0.44)

These models were then used to project long-run trend and business cycles for period from 2011 to 2015. The projected series are depicted in the following diagrams.

