Production and Unemployment Cycles in the Caribbean: The Case of Barbados and Trinidad and Tobago

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Abstract:
This paper investigates some of the topics related to the discerning of trends and cycles in production and unemployment data of the Caribbean economies of Barbados and Trinidad & Tobago. Using the Hodrick-Prescott and Baxter-King filters, this study proposes a chronology and a description of some of the cyclical properties of these series. Next, it examines the causality relationships that combine these variables. Empirical evidence from the cross-correlation coefficients indicates that the unemployment rate leads the cycle in both countries.

1. Introduction

Business cycles, which can be succinctly defined as recurrent fluctuations in aggregate economic activity, have occupied the interest of macro economists due to their important policy implications. For instance, because economic disequilibria can either be temporary or permanent, the ability of the policy analyst to accurately pinpoint an economy's position in its business cycle is a definite advantage when developing strategies to correct these imbalances, during the design of stabilization and adjustment programmes (see Agénor and Montiel, 1996).

Researchers have developed a wide range of econometric and statistical techniques aimed at documenting the empirical regularities of business cycles. From the existing literature, different theories have emerged that, for the most part, explain a business cycle as a natural outcome of an economic system. Modern real business cycle (RBC) theory defends the idea that cycles arise as an equilibrium outcome of the activities of rational

economic agents, are characterised by the strong focus on technology shocks as the driving forces of fluctuations in economic activity, and are dominated by propagation mechanisms utilised to spread the effects of these shocks overtime (see Lucas, 1976; Kydland and Prescott, 1982; Long and Plosser, 1983). In essence, modern RBC theorists test competing postulates about the sources and propagation mechanisms of the cyclical fluctuations by comparing how different models mimic important aspects of the cyclical behaviour of actual economies through time. Unfortunately, as noted by Agénor, McDermott and Prasad (2000), most of the research in this area has been limited to developed countries. This is because in developing countries, there are constraints on the quality and frequency of economic data, and these countries are more susceptible to sudden crises and marked changes in macroeconomic variables, thus obscuring any type of cycle or economic regularity.

In light of the above, empirical studies for developing economies are a welcomed contribution to the debate of how best to explain fluctuations in macroeconomic variables such as production and employment. Although some work has been done on Latin America, Africa and Asia (see Agénor, McDermott and Prasad, 2000; Belaisch and Soto, 1998; Kydland and Zarazaga, 1997; Rodriguez-Mata, 1997) no studies have been undertaken for Caribbean territories. Therefore, this article attempts to fill this lacuna by focusing on two small, open, but diverse economies: Barbados (a tourism-oriented economy) and Trinidad and Tobago (an oil-dependent economy). These countries were also chosen because of their relative economic stability and the availability of quarterly output data.

More specifically, this paper seeks answers to these questions: What sequencing technique should be employed to identify major cyclical movements in the real Gross Domestic Product (GDP) of these countries of Trinidad and Tobago and Barbados? What are the cyclical properties of the Barbados and Trinidad and Tobago GDPs? With respect to the labour market, is it possible to identify and describe the cyclical factors affecting the level of unemployment? How can structural and cyclical unemployment be characterised for Barbados and Trinidad and Tobago? What is the relationship between the cycles of unemployment and output in these two countries?

2. A Brief Overview of Concepts and Methodological Principles

Macroeconomists have differing opinions on how to interpret the evolution of a variable in terms of its long-term path (growth) and its short-term dynamics (fluctuations). As Abraham-Fois (1991) points out, the definitions proposed for the different phases of the business cycle have continued to evolve throughout the twentieth century. In the early years, the cycle was represented as a succession of phases in the following order: crisis, depression, recovery, and so on. Then, during the 1920s, the concept of "recession" became more popular than that of "crisis". In the 1930s, the Nine-Point Cycle method was developed to give a definitive picture of the various phases of cycles. Between the 1940s and 1980s, the various methodologies suggested for the observation of cycles, relied heavily on Burns and Mitchell (1946) description of business cycle fluctuations, characterised as durations of expansion and contraction and the timing of turning points. Since the end of the 1980s, however, the need to compare and contrast RBC models with the stylised facts, made the calibration of cycles common practice. Following Lucas (1977), RBC theorists started to think of the business cycle as the deviations of aggregate real output from its long-term trend, and business cycle regularities as the dynamic co-

movements of the cyclical components of key economic variables. From this basis, the variances, auto-correlations and dynamic cross-correlations of the cyclical components of real output and other economic variables were calculated in order to quantify the qualitative characteristics of the cycle. These statistics are, respectively, the phenomena of relative variability, persistence and covariance (Hairault, 2000). This way of measuring business cycles is standard in the empirical literature on historical cycle fluctuations and is discussed in more detail below.

2.1 Measuring the Business Cycle

The path observed for the initial series (x_t) is assumed to be the result of a combination of different unknown contributing factors, whose movements may be simulated by the following additive model:

$$x_t = T_t + C_t + \varepsilon_t \qquad (1)$$

with T_t, C_t and ε_t representing the trend, the cyclical component and the irregular component, respectively. An important question emerges: How can the trend and the cyclical components each be identified and separated? In fact, depending on the mathematical hypotheses used to define the spectral characteristics of the trend and the cycle, a number of different approaches could be taken to decompose the cycle in Equation (1). One such approach could be the filtering out of all the components, distinguishing between those associated with low frequencies (in order to determine the trend) and those related to high frequencies (isolating the cyclical component). For instance, in the case of quarterly variables, long-term movements in the trend may be more than 32 quarters in duration, while short-term movements may be between 6 and 32

quarters in length for the cycle and less than 6 quarters for the irregular component (see Burns and Mitchell, 1946).

Another less demanding approach, and the one used in this paper, is to isolate the trend term (T_t) and then consider C_t as an estimate of the business cycle component. This procedure conforms to the above-mentioned Lucas' (1977) definition of the business cycle as "movements about a trend in Gross National Product".

Several methods are available to separate the cyclical movement, but the one often chosen is that of Hodrick and Prescott (1980), which involves the minimisation of a weighted sum of two terms. The first term corresponds to the variation in the cyclical component, represented by the difference between the raw series and the trend, and the second term, the variation of the growth rate from the trend. In formal terms, the programme to be solved is:

$$Min\{Var(x_t - T_t) + \lambda Var(\Delta T_t - \Delta T_{t-1})\} \tag{2}$$

which is equivalent to:

$$Min\left\{\sum_{t=1}^{n}(x_t - T_t)^2 + \lambda\sum_{t=3}^{n}\left[(T_t - T_{t-1}) - (T_{t-1} - T_{t-2})\right]^2\right\} \tag{3}$$

The parameter λ weights the importance of the second term relative to the first, and can be interpreted as the opportunity cost of introducing fluctuations in the trend. If $\lambda = 0$, then the solution of Equation (3) is $T_t = x_t$, and the trend coincides with the raw series. Conversely, if λ tends to infinity, the minimum is obtained for $\Delta T_t = T_t - T_{t-1} =$ constant (the trend is linear). For $\lambda \in [0, +\infty]$, this "filter" has a modulating effect on the cyclical

component if σ_1 and σ_2 are denoted as the standard errors of T_t and (x_t-T_t), respectively, and Equation (3) may then be re-written as:

$$\text{Min}\left\{\sigma_1^{-2}\sum_{t=1}^{n}(x_t-T_t)^2+\sigma_2^{-2}\sum_{t=3}^{n}\left[\Delta^2 T_t\right]^2\right\}$$

where $\lambda=\sigma_2^2/\sigma_1^2$ and $\Delta^2 T_t=(T_t-T_{t-1})-(T_{t-1}-T_{t-2})$. Here λ is clearly shown as dividing the total fluctuations into long-term and short-term fluctuations, with its value determined by the observed fluctuations. Hodrick and Prescott (HP) established a value of $\lambda=1600$ for the USA.

From a purely practical point of view, the solution of Equation (3) is obtained from the first-order condition by differentiating with respect to T_t. With the introduction of the lag operator L, this solution leads to an analytical expression for the cyclical component $C_t=x_t-T_t$ (see Pedersen, 1999):

$$C_t=\left[\frac{\lambda(1-L)^2.(1-L^{-1})^2}{\lambda(1-L)^2.(1-L^{-1})^2+1}\right]x_t \qquad (4)$$

One interesting property of this HP filter, revealed by this equation, is that, it eliminates the non-stationary components of x_t ,whose order of integration is less than or equal to four.

On the other hand, more recent studies have alluded to deficiencies in the HP filter, notably those of Harvey and Jaeger (1993) and Cogley and Nason (1995). The main limitations cited were: (i) the arbitrary choice of the parameter λ gives equal weighting to a cyclical variation of 5% and a 1/8% change in the growth rate; (ii) when estimating the trend, the HP filter does not distinguish between short-term fluctuations, which may

be interpreted in terms of the economy (the cycle) and those that cannot be explained (errors in measurement) and; (iii) the tendency of this process to deform the dynamic properties of the data by introducing spurious cycles.

Given these deficiencies, other authors have proposed alternative filters that they claim better identify the stylised facts of the cycle. For example, Baxter and King (1995) – hereafter BK – suggested, a band-pass filter of finite order K, which is a moving-average approximation of an ideal band-pass filter. With trend-reducing properties and symmetric weights, this specification ensures that there is no phase shift in the filter output. A major advantage of this filter is its ability to extract from the data those fluctuations that are within a certain range of frequencies and, in particular, those that characterise the cycle, which are 6 to 32 quarters in duration. This method can be developed formally as follows: let x_t and y_t be, respectively, the original and filtered series related by

$$y_t = \sum_{i=-K}^{K} a_i L^i x_t \tag{5}$$

The weights a_i, where $i= 1, 2, \ldots, K$, are determined by applying a Fourier transform $\alpha(\omega)$ to Equation (3). Their values are determined through solving the following programme:

$$\underset{a_i}{\text{Min}}\, Q = \int_{-\pi}^{\pi} \left|\beta(\omega) - \alpha(\omega)\right|^2 d\omega \tag{6}$$

$\beta(\omega)$ denotes the ideal filter gain with cut-off frequencies ω_1 and ω_2, so $\beta(\omega)-\alpha(\omega)$ is the discrepancy arising from the approximation at frequency ω. The solution is given by:

$a_i = b_i + \theta$, where $i = 0, \pm 1, \pm 2, \ldots, \pm K$, and

$$b_i = \begin{cases} \dfrac{\omega_2 - \omega_1}{\pi} & \text{if } i = 0 \\ \dfrac{1}{\pi_i}(\sin \omega_2 i - \sin \omega_1 i) & \text{if } i = 0, \pm 1, \pm 2, \ldots, \pm K \end{cases} \tag{7}$$

$$\theta = \frac{-\sum_{-K}^{K} b_i}{2K+1}$$

2.2 *Identification of Cycles*

Once the C_t series has been obtained, the next step is the identification of the cycles, which can be of two types: major cycles and minor cycles. With respect to major cycles (periods of fluctuation from trough to trough) the traditional procedure consists of an iterative process whereby: (i) the minimum point for the entire period is identified; (ii) this point is bounded by the nearest and highest peaks; (iii) the trough that is deepest and closest to the peak recently identified in (ii) ..... and; (iv) the procedure is repeated. To determine the minor cycles the same method is followed for a sub-period bounded by two major troughs. To avoid overlapping, the principle is established that a cycle ends in a trough and begins immediately after the trough of the previous cycle.

The ability of this procedure to provide good results depends on the correct identification of the turning points in the cycle, that is, its peaks and troughs. Any error in identifying these, which may be due to significant irregularities (captured by the residual component) or from a phase shift (artificial time-lag), leads to an erroneous calibration of the cycle. Therefore, the various statistical and econometric techniques utilised to describe,

decompose and predict the movement of economic variables may give different results. This is what Fayolle (1996) was referring to when he wrote that "not only the mean of the cycle, but the second-order statistical moments (variance and temporal auto-covariance) of the trend and cyclical components, as well as their function in response to an exogenous factor, depend heavily on the method used". One must, therefore, display great dexterity when using these techniques.

3. Data and Stylised Facts

The raw data of the quarterly time series used in the empirical investigations below spans three decades 1970s, 1980s and 1990s, and were compiled from heterogeneous sources. For Trinidad and Tobago, the data were available over the sample period of 1971Q1 to 1998Q4. The real GDP series is computed from annual data published by the Central Statistical Office (see Watson, 1997) and the unemployment rate data was procured from various issues of the Annual Labour Force Report. In the case of Barbados, the data covers the period 1975Q1 to 2000Q4. Real GDP is an updated version of Lewis (1997) while the unemployment rate was sourced from the Continuous Household Labour Force Survey undertaken by the Barbados Statistical Service.

3.1 The Real GDP Series

As revealed in Chart 1, real output of the Trinidad and Tobago economy grew rapidly over the period 1971-1982. In 1982, this upward growth trend reversed, with real GDP declining from TT$5,964 million in 1982Q4 to TT$5,311million by 1984Q4. This break in the growth trend in real GDP can be mainly explained by the fall in oil prices in 1983. Since that time, Trinidad and Tobago's real GDP contracted each year up to 1989. In

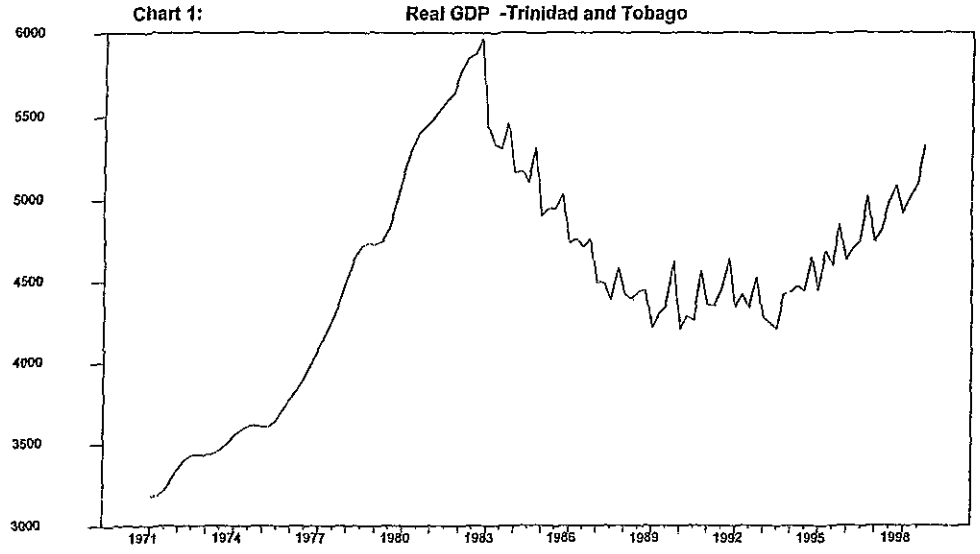
fact, between 1980 and 1990, real GDP decreased by an average of 4.7% per annum, in contrast to an average increase of 5.9% between 1970 and 1980.

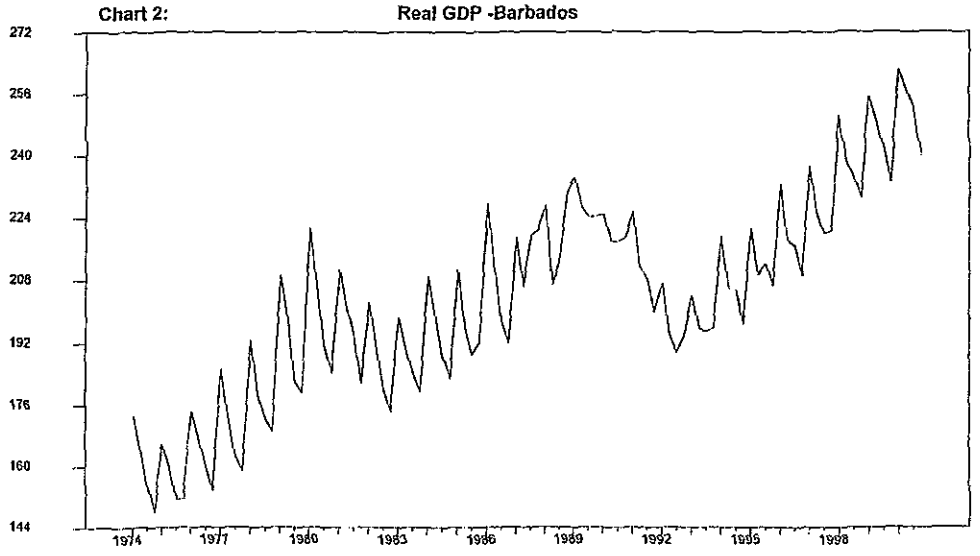
Real GDP recovered in 1990, growing by 1.7% that year and 3.1% in the next. These figures are partly explained by the hike in oil prices associated with the Persian Gulf War. However, in 1992, with the conflict over, oil production declined once again, resulting in negative growth rates up to 1993. From 1994 onwards, Trinidad and Tobago's real GDP has generally followed an upward trend.

With respect to Barbados, real GDP grew during the first quarter of every year over the period 1974 to 2000 (see Chart 2). This indicates that economic activity, primarily due to the lucrative winter tourist season and sugar production, reaches its peak during Q1 of each year. A more detailed analysis of the trend in Barbadian GDP identifies three distinct sub-periods. The first, which extends from 1974 to 1986, reveals that for almost all of the years (eleven of thirteen), production contracted in Q2, Q3 and Q4, the decline was less pronounced between Q2 and Q3, and in Q4, real GDP tended to decrease on average, to approximately 10% of its Q1 level.

During the second sub-period, from 1987 to 1991, real GDP showed less year-to-year fluctuation than in the first sub-period. In fact, in 1987 and 1988 expansions were registered between Q2 and Q3 and between Q3 and Q4. In 1989 and 1990, increases were recorded for the first three quarters of each year. The year 1991 had a similar profile to the preceding period.

The third sub-period, which covers the years between 1992 and 2000, exhibits some similarity between the quarterly trends of the first sub-period. There was a systematic decrease in real GDP in the second quarter of each year, except in 1995. Furthermore, output declined in Q3 and Q4 of each year, except in 1992, 1993 and 1997.





3.2 The Unemployment series

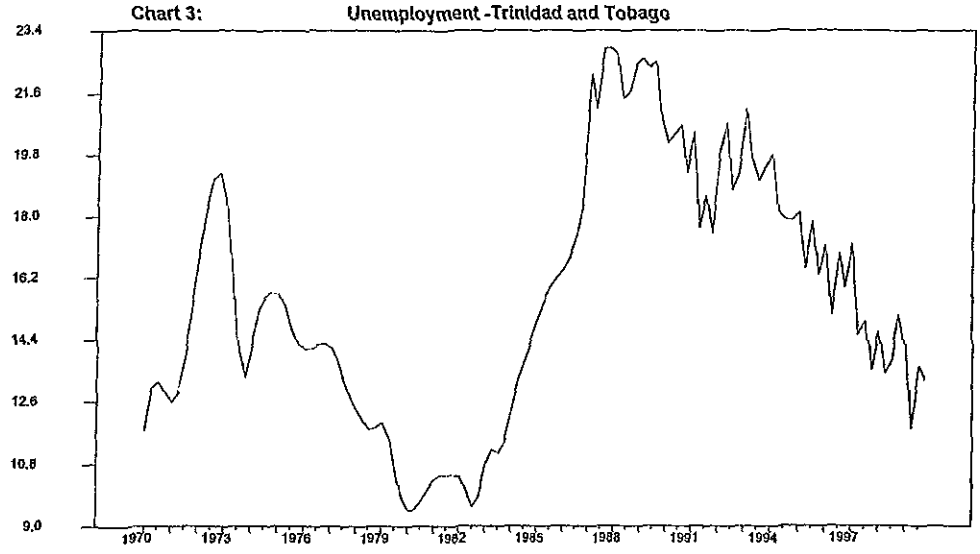
Chart 3 shows that in the case of Trinidad and Tobago the trend in unemployment is characterised by significant fluctuations, particularly after 1989. Between 1970 and 1972, unemployment increased by 43.5%, but later declined in 1973 and 1975 from 69.8 million in Q1 of 1973 to 51.6 million in Q4 of that year, and from 60.8 million in Q1 of 1975 to 57.6 million in Q4. Conversely, 1974 and 1976 represented periods of recovery due to the revenue effects of rising oil prices.

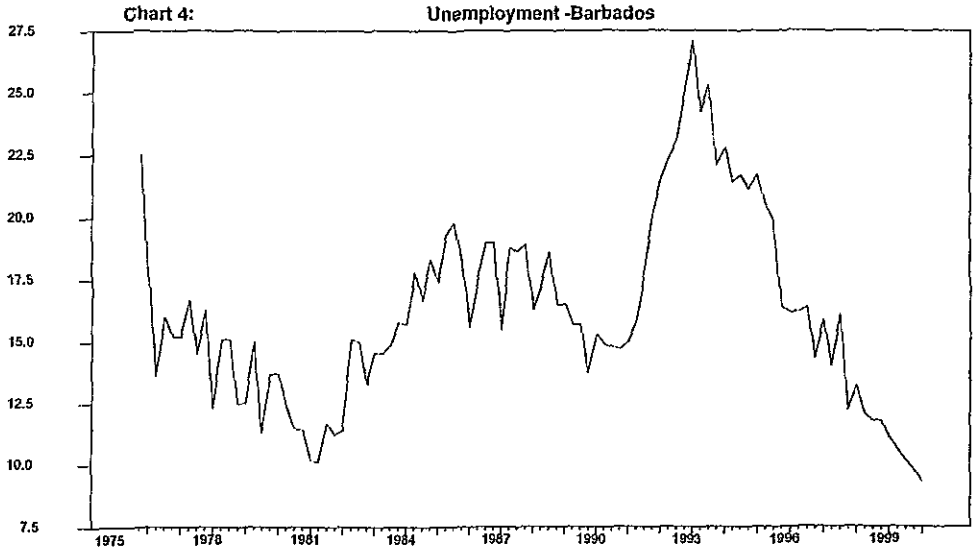
During the period from 1977 to 1983, unemployment followed a general downward trend despite rebounding slightly from time to time. From 1983 to 1989, the reverse was true, as unemployment recorded extremely high growth rates. For example, in 1984, 1985 and 1987 the growth rates were 27.6%, 16.3% and 31.5%, respectively. These large increases continued into 1988, when unemployment reached approximately 100 million. In 1990-91 employment rebounded somewhat, but this improvement was short-lived, as unemployment began to rise once again in 1991-92 when the world economy slipped further into recession.

With respect to Barbados, a first glance at Chart 4 reveals that the unemployment rate appears to be a relatively unstable variable, whose path seems to be a combination of three curves. The first curve spans the period 1975-1981. In 1975, Barbados' unemployment rate reached an alarming 22.5%. It then declined gradually, following a linear trend, until 1981, when it registered its third-lowest level for the period.

The second curve refers to the years 1982 to 1991, during which unemployment experienced significant changes, first increasing from 11.4% in 1982Q1 to 19.8% in

1985Q3, then fluctuating around a relatively high figure of over 15% until 1989Q3, after which it contracted marginally until 1990Q4.





The third curve, which relates to the period 1991-2000, is parabolic in form. The upward-sloping portion of this parabola represents the years 1991-93, a recessionary

period for the Barbadian economy. This period was characterised by an eight-percentage salary cut for public workers, massive lay-offs and a rate of unemployment that steadily increased from 17.3% in 1990 to 23% in 1992, then to 25.1% in 1992Q4 and 27.1% in 1993Q1. The downward-sloping portion shows a spectacular decline in the unemployment rate from nearly 30% in 1993 to 9.3% by 2000Q1. This drop was due mainly to the effects of prudent policy actions, a reduction in the labour force, resulting from emigration and adjustments made after the census found that prior population estimates were too low.

4. Econometric results

In order to capture the cyclical component of the time series described above, two filters - HP and BK – were applied directly to the raw data without any adjustment to eliminate potential seasonal variations and without pre-testing for unit roots. This was done for two reasons. Firstly, when the time series are seasonal and unadjusted, they seasonal component is taking into account by the filters. Indeed, with the HP filter, the seasonal movements are encapsulated in the irregular component while their are eliminated by the BK filter. Secondly, the two filters possess the remarkable property of rendering stationary any integrated process of up to the fourth order.

4.1 A Chronology of the GDP series

The cyclical components obtained from applying the HP and BK filters to the Trinidad and Tobago and Barbados data are presented in Charts 5 and 6. The major conclusion derived from a detailed visual inspection of these charts is that the two methods give very similar results.

Chart 5 : The Cyclical component of Real GDP for Trinidad and Tobago: A Comparison of the Methods

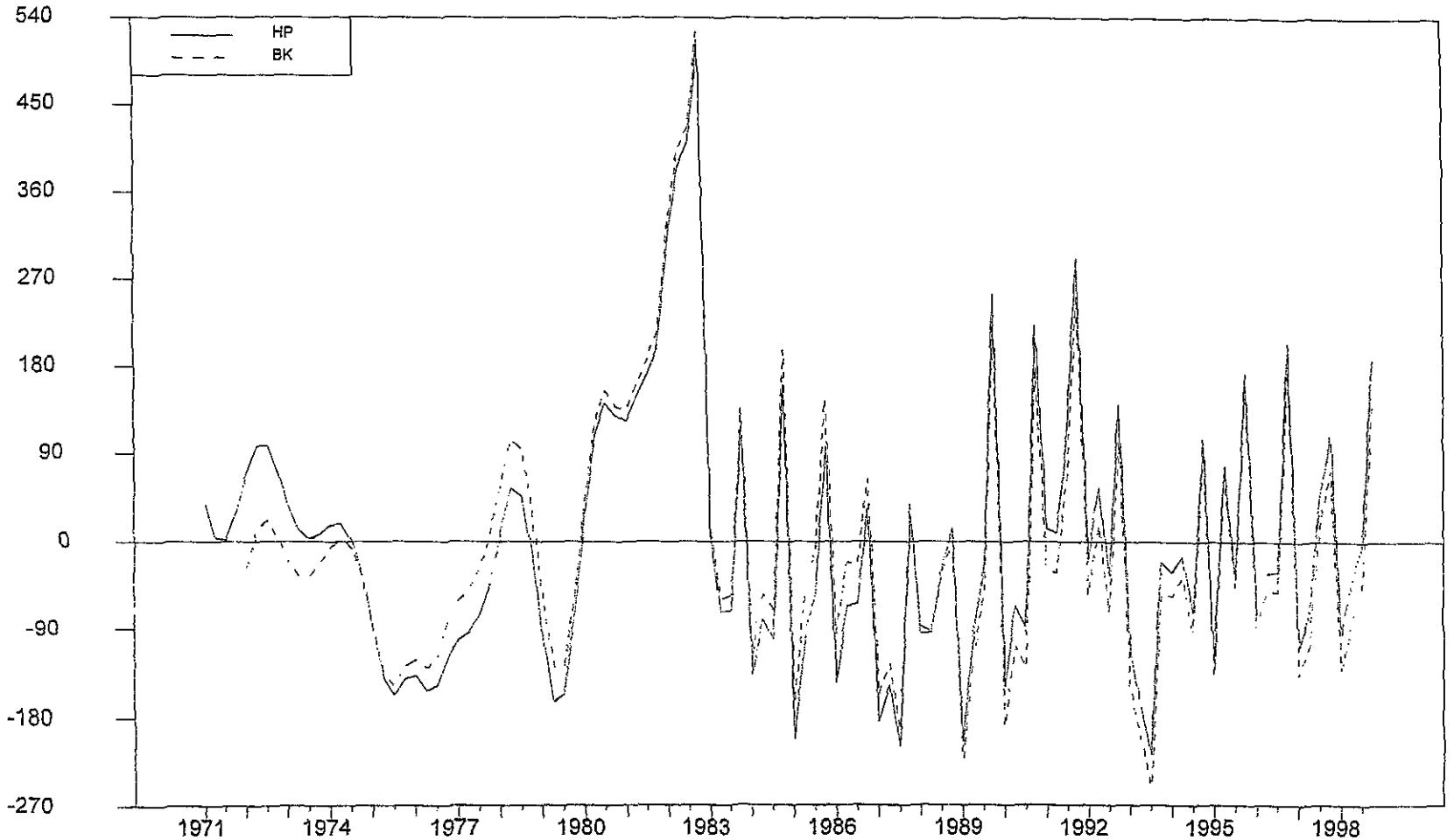
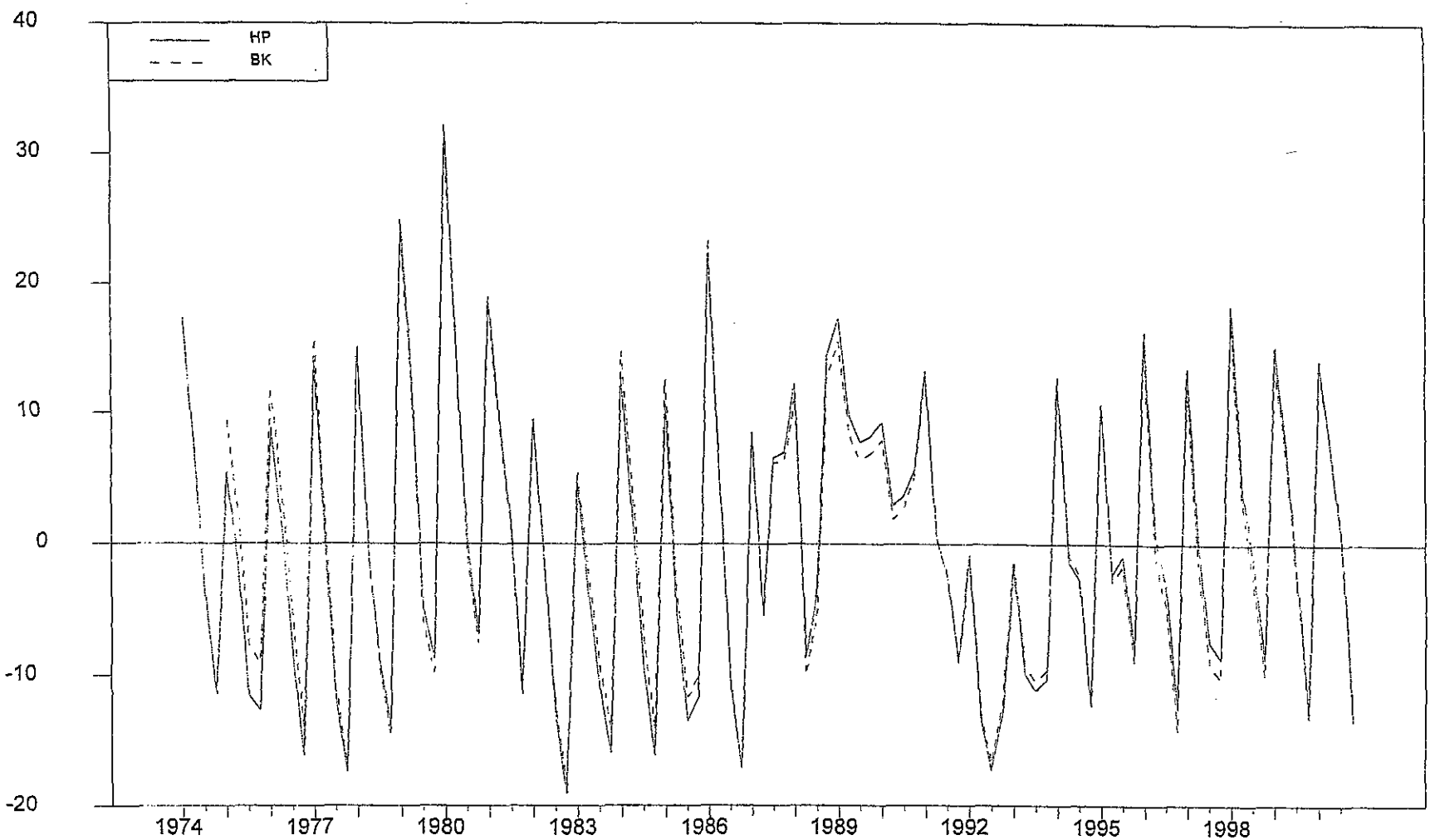


Chart 6: The Cyclical Component of GDP for Barbados: A Comparison of the Methods



Measuring the cycles proved to be quite challenging for both countries, especially for the period after 1982:4, because of their short durations and small amplitudes. Therefore, the variations about the trend during the period 1983:2-1990:4 were not incorporated into the cycles. In fact, over these 7 years, the cyclical component followed a more erratic path than in the other periods, with a large number of turning points.

Nevertheless, in undertaking the analysis (working under the constraint of using only cycles of between 6 and 32 quarters in duration in accordance with the common definition of the business cycle) the observations (Table 1) appear to conform to the stylised facts previously summarised in this text. For instance, ...

Given the established chronology, two methods may be used to measure the duration of successive cycles: from trough to trough or from peak to peak. For Trinidad and Tobago, the former case reveals that the cycles are between 14 and 23 quarters in length and in the latter, they are between 8 and 24 quarters (Table 1). With respect to Barbados' GDP, it is quite difficult to identify the trend given the high level of fluctuations in the curves in Chart 6. Nevertheless, cycles between 8 and 24 quarters were derived and it was found that between 1976 and 1994 the cycles were much longer, lasting between 15 to 24 quarters. After 1994, the cycles were 9 quarters in length (Table 2). The existence of these cycles of between 8 and 24 quarters indicates that both the Barbados and the Trinidad and Tobago GDPs record regular phases of acceleration and deceleration, characteristic of their main areas of economic activity – tourism services and petroleum products, respectively

Table 1: Peaks and troughs of Trinidad GDP cycle between 1972 and 1998 (% Change in GDP)

	Troughs			Peaks		
Date	Amplitude		Time elapsed since last trough (in quarters)	Amplitude		Time elapsed since last peak (in quarters)
	HP	BK		HP	BK	
1972:3				2.97	0.64	
1975:3	-4.15	-3.93				
1978:2				1,18	2.30	23
1979:2	-3.35	-2.66	15	.		
1982:4				9.41	9.67	18
1983:2	-1.35	-1.11	14			
1984:4				3.14	3.87	8
1989:1	-4.62	-5.01	23			
1989:4				5.88	5.06	20
1993:3	-4.93	-5.61	18			
1995:4				3.75	3.45	24
1997:1	-2.23	-2.82	14			
1998:4				3.72	2.88	12

Table 2: Peaks and troughs of Barbados GDP cycle between 1974 and 2000 (% Change in GDP)

	Troughs			Peaks		
Date	Amplitude		Time elapsed since last trough (in quarters)	Amplitude		Time elapsed since last peak (in quarters)
	HP	BK		HP	BK	
1974:1						
1977:4	-9.85	-9.57				
1980:1				17.06	16.43	24
1982:4	-9.83	-9.41	20			
1986:1				10.96	11.58	24
1986:4	-8.16	-8.10	16 .			
1989:1				8.02	7.10	12
1992:3	-8.34	-8.09	23			
1994:1				5.96	6.27	20
1994:4	-5.86	-5.77	9			
1996:1				7.58	6.95	8
1996:4	-5.63	-6.33	8			
1998:1				8.00	7.29	8

In order to compare the amplitudes of the regularities in the business cycles of different countries, the standard deviations of their respective cyclical components, obtained from the logarithm of the GDP series, is normally examined. Indeed, these standard deviations are expressed in the same unit since they are ratios of the cycle and the trend. On the

other hand, when the series are in levels, each standard deviation is not comparable because ..... From Table 3 the values computed show that the business cycle is more pronounced in Barbados than in Trinidad and Tobago. However, comparing Barbados and Trinidad and Tobago volatilities to developing and industrial countries reveal that there are in line with the ones for the developing countries (compare, for example, Agénor, McDermott and Prasad, 2000) but much higher than the level typically recorded in industrial countries (compare, for example, with Fournier, 1999).

Table 3. **Summary statistics for the cyclical components of GDP**

	Standard deviation		Autocorrelations					
	Level	Logarithm	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6
Barbados								
HP	11.11	5.6	0.09	-0.25	-0.05	0.75	-0.05	-0.31
BK	10.78	5.4	0.04	-0.32	-0.11	0.76	-0.07	-0.34
Trinidad and Tobago								
BH	135.32	2.7	0.45	0.38	0.18	0.48	0.06	0.07
BK	136.31	2.8	0.45	0.37	0.17	0.48	0.06	0.07

4.2 A Chronology of the Unemployment Series

As with the real GDP series, the BK and HP filters on the unemployment data matches almost exactly (see Charts 7 and 8). For Trinidad and Tobago (Table 4), the sample obtained shows 5 major cycles over the 1971Q1 to 1997Q4 period. The cycles' lengths vary from 6 to 36 quarters. In fact, the periods 1972Q4 to 1975Q4 and 1987Q3 to 1991Q3 correspond to cycles with 14 and 18 quarters respectively and the periods 1974Q4 to 1976Q4 and 1984Q4 to 1986Q4 relate to 9-quarter cycles and shorter cycles,

Chart 7: **The Cyclical Component of Unemployment for Trinidad and Tobago: A Comparison of the Methods**

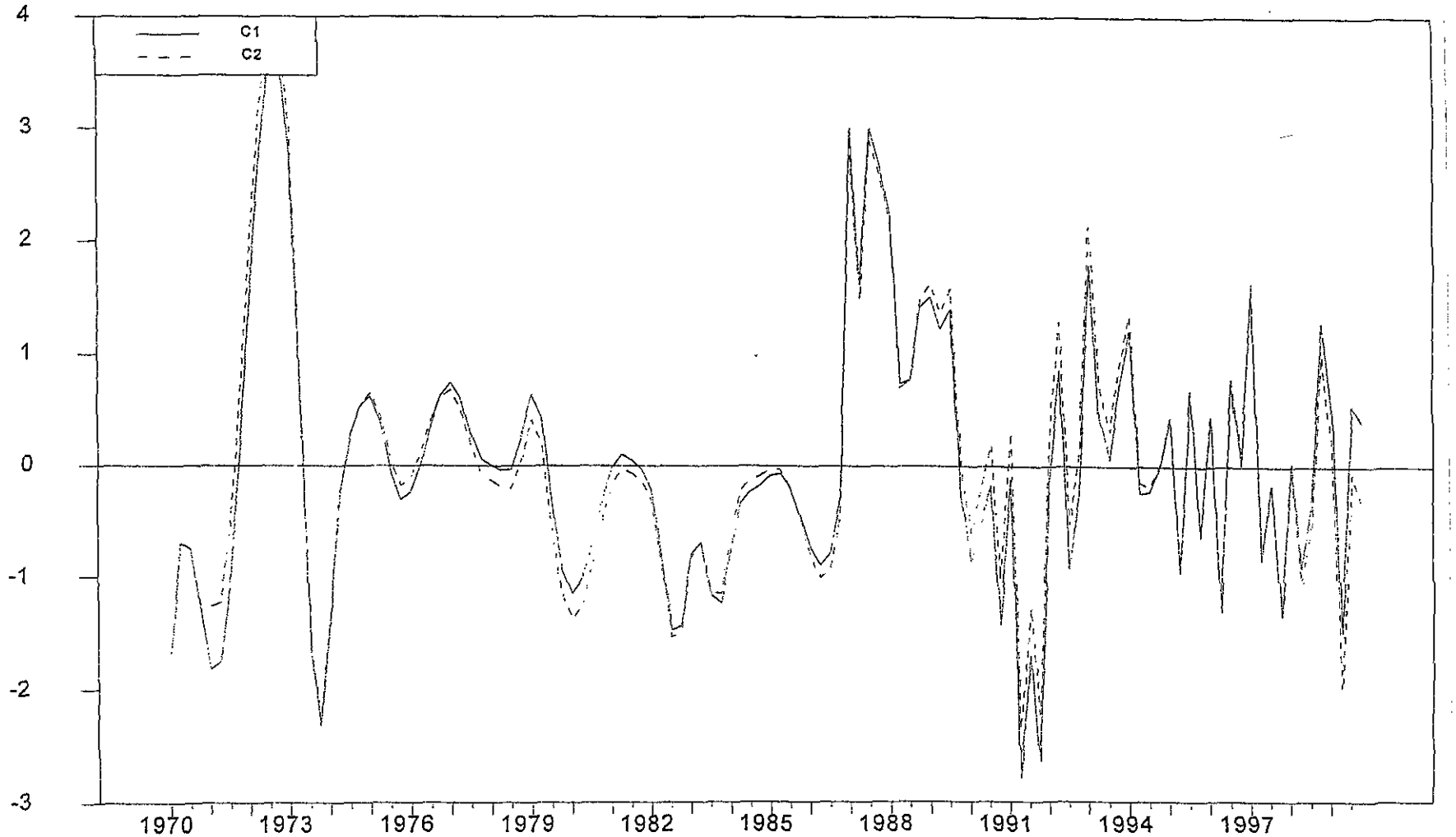
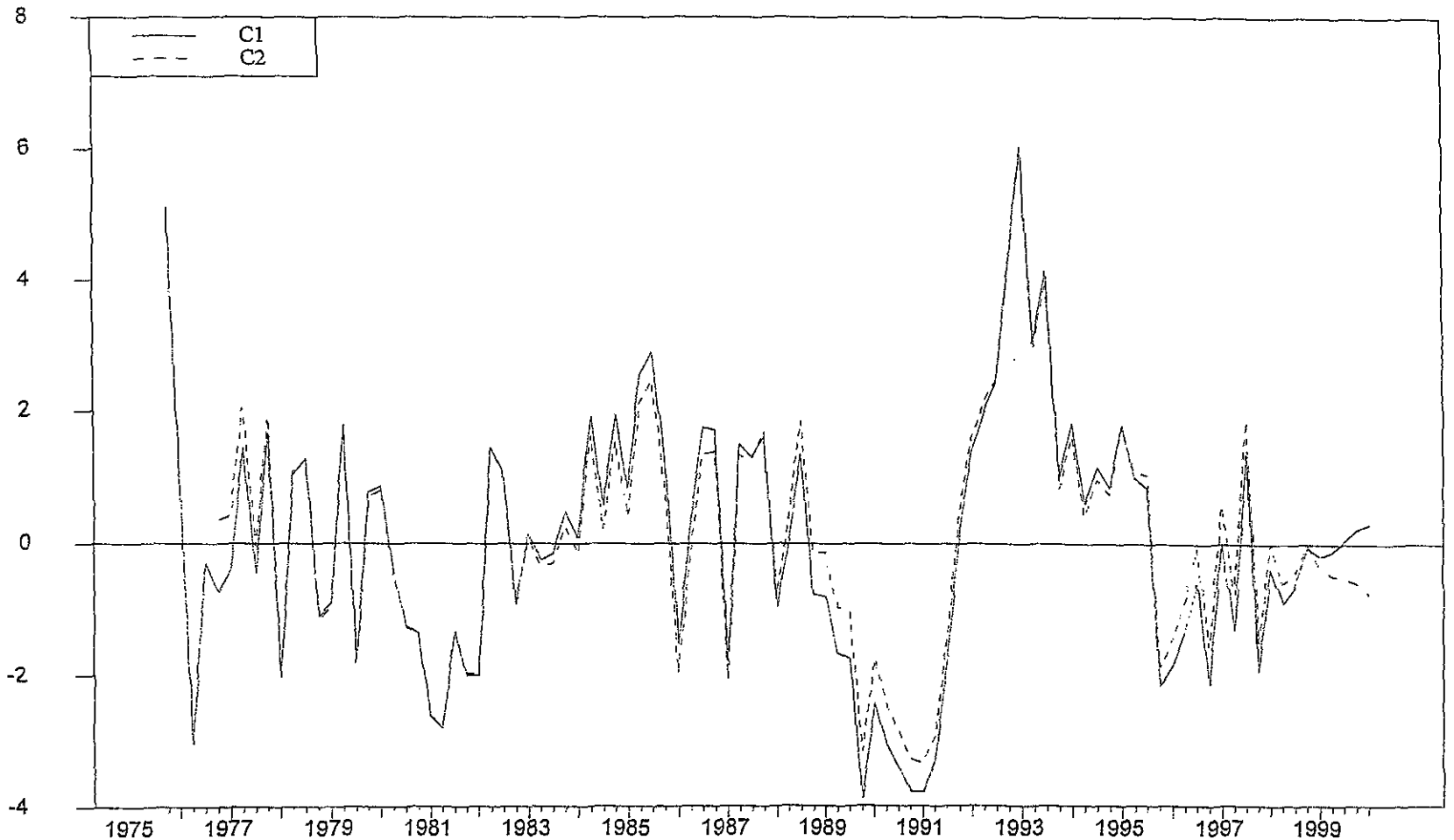


Chart 8: The Cyclical Component of Unemployment for Barbados: A Comparison of the Methods



while shorter cycles are identified for the periods 1991Q3 to 1992Q2, 1992Q2 to 1993Q1, 1993Q1 to 1994Q3 and 1994Q1 to 1995Q1.

In the case of Barbados (Table 5), from 1995Q2 (when the cyclical component first reaches 0), one can identify a single unemployment cycle for the period 1995Q1 to 1996Q3, which is 7 quarters in length. One cannot identify any minor cycles in this case.

Table 4: Peaks and troughs of Trinidad unemployment rate cycle between 1972 and 1998 (% Change in GDP)

	Troughs			Peaks		
Date	Amplitude		Time elapsed since last trough (in quarters)	Amplitude		Time elapsed since last peak (in quarters)
	HP	BK		HP	BK	
1972 :4				21.13	23.65	
1973 :4	-13.77	-13.16				
1977 :1				8.94	7.97	17
1982 :4	-14.47	-14.41	36			
1987 :3				18.76	18.00	42
1991 :2	-13.19	-13.35	26			
1993 :1				9.79	11.40	22
1996 :2	-8.58	-8.52	20			
1997 :1				9.34	8.23	16
1997 :4	-10.85	-13.97	6			

Table 5: Peaks and troughs of Barbados unemployment rate cycle between 1974 and 2000 (% Change in GDP)

	Troughs			Peaks		
Date	Amplitude		Time elapsed since last trough (in quarters)	Amplitude		Time elapsed since last peak (in quarters)
	HP	BK		HP	BK	
1977:2				9.46	13.99	
1978:1	-14.25	-13.53				
1979:2				16.61	13.01	8
1981:2	-21.76	-21.76	13			
1985:3				17.16	14.22	25
1987:1	-10.39	-11.79	23			
1988:3				7.78	11.09	12
1989:4	-22.11	-18.81	11			
1993:1				28.85	28.52	18
1995:4	-11.73	-10.38	24			
1997:3				9.19	13.22	18
1997:4	-13.88	-11.01	8			

5. Causality between the Cycles of Production and Unemployment Series

Having identified and described the production and unemployment cycles in the preceding sections, their causal relationship can now be examined. From a public-policy perspective, understanding this causal relationship is vital, no matter a country's level of development, because one of the central tenets of any government is to foster an enabling environment that promotes economic growth and employment generation. Therefore, public policy must be informed, wherever possible, by the benefits of realising a country's productive potential as the ultimate medium and long-term goal of ensuring the well being of its citizenry. In this regard, it becomes necessary to measure the gap or "shortfall" between actual production (real GDP), and potential output - that is, the level of output that an economy can potentially sustain by optimal use of its capital and labour resources without exerting undue pressures in the goods and labour markets.

Since the beginning of the 1960s, economists have grappled with the problem of how best to determine an economy's productive potential. Several techniques have been proposed, some of which have been adopted by the Organisation of European Cooperation and Development (OECD), the IMF and the European Commission. For instance, the European Commission has been using the cyclical component derived from the HP filter as an estimator of productive potential, whilst the IMF and the OECD favour a structural econometric approach that employs a production function with substitutable factors, usually a Cobb-Douglas-type function.

Following the European Commission, the movement in the cyclical component of GDP is compared with that of unemployment to see those periods that converge and diverge. Instead of undertaking a visual inspection, the correlation between these cyclical

components are calculated with different time lags, that is, $\Delta(j), j \in 0,\pm1,\pm2,...\pm6$. From Table 6, it is observed that most of the correlation coefficients are negative with absolute values less than 0.45 (see table 6). The negative value of $\Delta(0)$, obtained with the HP filter, seems to indicate that the unemployment rate is counter-cyclical. From these cross-correlation coefficients, the unemployment rate leads the cycle by 3 periods for Barbados and 4 periods for Trinidad and Tobago (the j that maximise $|\Delta(j)|$).

Table 6 : Correlations between the cyclical components of GDP and unemployment rate, lagged from –6 to 6 quarters

Lag	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
Barbados													
HP	0.15	0.03	-0.02	0.04	-0.12	-0.30	-0.36	-0.26	-0.29	-0.41	-0.37	-0.20	-0.18
BK													
Trinidad & Tobago													
HP	-0.04	-0.02	-0.11	-0.02	-0.21	-0.19	-0.32	-0.16	-0.31	-0.19	-0.35	-0.08	-0.30
BK													

6. On Okun Law

After showing that the correlation between the two cyclical components exists but is not very pronounced, an attempt was made to formalize and quantify it. For many years, Okun's Law has been the main theoretical point of departure for analysing the relationship between economic activity and unemployment. A simplified version of Okun's Law can be expressed functionally in terms of output (y), potential output (y*), the unemployment rate (u), and the structural rate of unemployment (u*) as follows:

$$\frac{(y-y^*)}{y^*} \times 100 = -_{\alpha} \times (u-u^*) \qquad (8)$$

This simple model is estimated using a two-step procedure for both Barbados and Trinidad & Tobago. First, the cyclical components of GDP and unemployment rate are

checked for stationarity using the Dickey-Fuller tests and Phillips-Perron tests. These tests confirm that the two series are stationary in both countries. Second, equation (8) is estimated by OLS. The results gives a poor R^2. This implies that Okun's law may not be very relevant in these two economies. This law is based on the hypothesis that the labor force which is not utilized represent a correct measure of the unoccupied ressources. So, both in Barbados and Trinidad & Tobago, the labor force may not be a correct measure of the unoccupied ressources.

7. Conclusion

This paper has presented some preliminary results of an examination of the business cycles of Barbados and Trinidad and Tobago within the RBC framework. The discussion has been guided by two main objectives. The first, which is essentially statistical and descriptive in nature, focused on establishing a chronology of the cyclical movements in the Barbadian and Trinidadian production and unemployment cycles, while highlighting and comparing their characteristics. The second is more analytical in nature and deals with the important conclusions to be drawn from the comparison of the cyclical components of these cycles.

The empirical results are interesting from various perspectives:

- The application of the Hodrick-Prescott and Baxter-King filters to the quarterly GDP and unemployment data revealed that both the Barbadian and the Trinidadian economies have experienced relatively moderate fluctuations during the course of the last three decades. The average amplitude of these fluctuations appears to be much

greater than for many developed countries, which supports the hypothesis that small, open economies suffer the effects of economic shocks more intensely.

- The application of both of these filters to the data series may lead to divergent results. Nevertheless, they have the advantage of being able to provide estimates of the "output gap", thus shedding some light on the actual position of an economy within its structural fluctuations.
- The comparison of the cycles for the two variables for each country leads to the conclusion that the unemployment rate leads the cycle in both countries.

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