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Robust Estimates of Okun's Coefficient for South Africa

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Accelerated and Shared Growth in South Africa: Determinants, Constraints and Opportunities

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Robust Estimates of Okun's Coefficient for South Africa

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Unemployment in South Africa is exceptionally high, irrespective of the definition used to measure the size of the labour force as well as the number of unemployed (26.7% and 38.8%, according to the strict and expanded definitions of unemployment, respectively (Statistics South Africa, 2005:ii)). Furthermore, unemployment has increased substantially since the 1970s (Terreblanche, 2002:31; UNDP, 2003). Therefore, the deep concern of policymakers in South Africa about high and increasing unemployment is justified (The Presidency, 2006:2), due to the associations that exist between unemployment and poverty; human capital erosion; social exclusion; crime; and social instability (Kingdon and Knight, 2004:391, 2005:2; UNDP, 2003:144; Terreblanche, 2002:31, 42, 383, 390, 401).

Combating unemployment is one of the corner stones upon which the government's Accelerated and Shared Growth Initiative – South Africa (ASGISA) is built. The ASGISA objectives are to halve poverty and unemployment (rates) by 2014 (The Presidency, 2006:2). To achieve these objectives, government posits that the average annual GDP growth rate between 2004 and 2014 should be 5% (4.5% for the period 2005 to 2009; 6% for the period 2010 to 2014). However, the United Association of South Africa (UASA) (2006:30) estimates that average annual GDP growth rates of 6.5% to 7% and 9.3% to 10% are required to halve the strict and expanded unemployment rates respectively. Given the importance attached to sustained, increased economic growth in addressing unemployment in policy circles, this paper estimates the relationship between economic activity (specifically cyclical GDP) and changes in the unemployment rate (specifically cyclical unemployment).

Furthermore, economic growth is only one determinant of the change in the unemployment rate. Changes in the unemployment rate can be decomposed as follows (Dickson and Thompson, 2000:3):

$$\Delta UR_t = \%\Delta LF_t - \%\Delta \mathrm{E_t} \qquad (1)$$

where *UR* denotes the unemployment rate, *LF* denotes the labour force and *E* denotes employment (note that % indicates percentage change). Equation (1) can then be further decomposed as (Dickson and Thompson, 2000:7):

$$\Delta UR_t = [\%\Delta LFPR_t + \%\Delta POP_t] - [\%\Delta \mathrm{Y_t} - \%\Delta \mathrm{APL_t}] \qquad (2)$$

where *LFPR* denotes the labour force participation rate, *POP* denotes the working age (15-65 years) population, *Y* denotes real GDP and *APL* denotes the average product of labour (defined as *Y/E*). The unemployment rate would increase if labour supply growth (% *LF*) exceeds labour demand growth (% *E*); Several authors confirm that this has been the case in South Africa (Terreblanche, 2002:31, 374; UNDP, 2003; Bhorat, 2004:946-7; Casale *et al*, 2004:989; Kingdon and Knight, 2005:4).

From equation (2) above, the unemployment rate would only remain constant if real GDP growth were equal to the sum of the growth rates of labour force participation, the economically active population and the average product of labour. Figure 1 below shows the relationship between changes in the unemployment rate, (actual) real GDP growth and "required" GDP growth (which is defined as the sum of labour force growth and growth in the average product of labour (Blanchard, 2006:186)).

As illustrated by Figure 1, the South African unemployment rate increased in each successive year for the period 1983-2003 (from 9.46% to 30.14% (Quantec, 2006)). The most rapid increases occurred in the mid- and late 1990s, due to large deviations between the actual and required real GDP growth rates. Actual average annual real GDP growth was equal to 2.38% and 1.89% for the periods 1970-2005 and 1983-2003, respectively, whilst average annual "required" real GDP growth equalled 2.98% and 3.14% for the periods 1970-2005 and 1983-2003, respectively (SARB, 2006; Quantec, 2006; authors' own calculations). One explanation for the large deviations between actual and "required" growth is the rapid growth of the labour force since the 1970s, and especially the rapid growth of the African population during this period (Terreblanche, 2002:31, 374; Kingdon and Knight, 2005:5-6). Furthermore, the average productivity of labour also increased markedly over this period, largely due to increases in the capital-labour ratio (Terreblanche, 2002:374-382; UNDP, 2003:151, 183-185; Bhorat, 2004:944-5; Kingdon and Knight, 2005:13). On the other hand, real GDP growth was sluggish over this period, due to the two successive oil crises of the 1970s, and the intensification of the liberation struggle during the 1970s and 1980s (Terreblanche, 2002: 375).

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Figure 1: Changes in unemployment, actual and "required" real GDP growth, 1971-2005

Sources: SARB, 2006; Quantec, 2006; authors' own calculations.

In addition to sluggish economic growth, structural shifts in output have led to structural shifts in the demand for certain categories of labour[2]. These structural shifts, together with the increasing capital intensity of production, have led to a decrease (over time) in the elasticity of employment with respect to output (Terreblanche, 2002:432; UNDP, 2003:151; Bhorat, 2004:949). Table 1 below indicates the "cumulative" elasticities between employment growth and economic growth; changes in the unemployment rate and employment growth; as well as changes in unemployment and economic growth for five year periods from 1971-2005. The elasticities in Table 1 were calculated as follows: the cumulative percentage change in employment over a specific five year period was divided by the cumulative change in the real GDP over the same five year period to obtain the elasticity of employment with respect to economic growth (the employment coefficient (Barker, 1999:82)). The cumulative change in the unemployment rate was divided by the cumulative change in employment over a specific five-year period to obtain the elasticity of unemployment with respect to employment growth. Finally, the elasticity of unemployment with respect to economic growth was calculated as the cumulative change in the unemployment rate divided by the cumulative change in real GDP over a specific five-year period.

Table 1: "Cumulative" elasticities between employment, unemployment and economic growth, 1971-2005

Period	"Cumulative" elasticities		
	Employment-growth	**Unemployment-employment**	**Unemployment-growth**
1971-75	1.05	-0.23	-0.24
1976-80	0.54	0.29	0.16
1981-85	3.33	0.75	2.51
1986-90	0.82	0.32	0.27
1991-95	0.71	1.40	0.99
1996-00	0.06	9.02	0.56
2001-05	0.45	-0.25	-0.11

Sources: SARB, 2006; Quantec, 2006; authors' own calculations.

As indicated in Table 1, employment growth has become less responsive to economic growth since the mid-1980s (due to structural shifts in production and employment, identified above). For the period 2001-05, a one percent increase in real GDP was associated with a 0.45% increase in employment (which represents a substantial

[2] Structural shifts refer to the decreasing contribution of the primary sector to GDP accompanied by the increasing contribution of the tertiary sector to GDP. This has led to the demand for skilled workers increasing relative to the demand for unskilled workers (Terreblanche, 2002:374; Bhorat, 2004:944-5).

improvement over the previous period). The employment coefficients calculated in Table 1 further indicate that during only one of the five year periods considered (1996-2000) was there any notion of "jobless growth" (the reader is also referred to Bhorat (2004:946) for a further exposition).

The elasticities of unemployment with respect to employment growth and GDP growth were negative (as one would expect) for only two of the seven five-year periods, namely the first (1971-75) and the last (2001-05). In all the other five-year periods, increased economic activity and employment were associated with increased unemployment. Although disconcerting, the aforementioned observation is by no means surprising, especially in the light of equations (1) and (2), as well as Figure 1, above: the unemployment rate will only decrease if employment growth exceeds labour force growth and if actual GDP growth exceeds "required" GDP growth. The type of shock(s) affecting the economy further complicates the relationship between the unemployment rate and economic growth, as pointed out by Weber (1995:435). The expected negative relationship between unemployment and growth will only hold if the economy is affected by demand shocks; in the presence of supply shocks (stagflation) this expected negative relationship breaks down. Therefore, it is quite probable that the South African economy could have been affected by successive supply shocks during the period 1976-2000 (cf. Terreblanche, 2002:375-376).

In addition, Table 1 indicates that even though the relationship between GDP growth and the unemployment rate became negative during 2001-2005, changes in unemployment were relatively unresponsive to changes in the real GDP (a 1% increase in real GDP was associated with a 0.11 percentage point decrease in the unemployment rate). This observation could have serious policy implications. ASGISA's objective is to halve unemployment by 2014 (i.e. to reduce the strict /official unemployment rate by about 14 percentage points) (The Presidency, 2006:2). To achieve this objective, real GDP will have to increase by 5% per annum for the period 2005-2014, which implies that real GDP will have to increase by 63% during 2005-2014. The implicit assumption made here is that the elasticity of unemployment with respect to economic growth (as defined above) will equal -0.22 (which is more than double the elasticity obtained for the period 2001-2005). On the other hand, UASA (2006:30) estimates that real GDP growth of between 6.5-7% p.a. will be required to halve the strict /official unemployment rate. Therefore, their estimates imply that real GDP will have to increase by between 88% and 97% to reduce the unemployment rate by 14 percentage points. This, in turn, implies that the elasticity of unemployment with respect to growth (as defined above) lies between -0.16 and -0.14, which is more or less in line with the actual elasticity that prevailed in 2001-2005. Assuming (rather restrictively) that the elasticity of unemployment with respect to the real GDP remains -0.11 over 2005-2014, the South African economy will need a cumulative real GDP increase of roughly 127% (more or less equal to the total increase in the real GDP over the last 30 years (SARB, 2006; authors' calculations)). This, in turn, implies that real GDP will have to increase by 8.55% p.a. (compared to 5% p.a. as per ASGISA).

In light of the preceding discussion, it becomes imperative to establish to what extent economic growth influences the unemployment rate in South Africa. Observed unemployment can be decomposed into structural and cyclical unemployment and economic growth is more likely to affect the latter. Okun's (1962) law posits an inverse relationship between (cyclical) unemployment and (cyclical) output[3]. Therefore, this paper sets out to investigate the link between cyclical unemployment and cyclical output by applying Okun's law to South Africa. More specifically, it sets out to obtain robust estimates of Okun's coefficient by employing different detrending methods.

RESEARCH METHOD

According to Grant (2002:97-8) and Attfield and Silverstone (1998:625), the relationship between unemployment and output as posited by Okun (1962) is a gap equation. Thus, the first method used to estimate the Okun's law is based on the notion of the gap between observed and potential output as well as the gap between observed and potential (natural) unemployment – hence, the "gap" model (Lee, 2000:334)[4]. The "gap" model takes the following bivariate specification:

$$y_t^c = y_t - y_t^p \qquad (3)$$

$$u_t^c = u_t - u_t^p \qquad (4)$$

[3] The authors also considered using cointegration analysis to estimate the long run relationship between real GDP and unemployment in South Africa. Unfortunately, the two series were not cointegrated for the period under consideration (1970-2005).

[4] Annual data for the period 1970 to 2005 will be used for estimation purposes. Data on real GDP was obtained from the SARB (2006). The unemployment series was obtained from Quantec (2006) and is constructed by taking the difference between the total labour force and total number of employed persons (the latter includes both formal and informal sector employees).

$$u_t^c = \gamma y_t^c + \varepsilon_t \qquad (5)$$

where y^c denotes the logarithm of cyclical output (i.e. the output gap); y denotes the logarithm of observed output; y^p denotes the logarithm of potential output; u^c denotes the cyclical unemployment rate; u denotes the observed unemployment rate; u^p denotes the potential unemployment rate; γ denotes Okun's coefficient (γ < 0); and ε is a stochastic error term (Weber, 1995:438; Moosa, 1997:337; 1999:296). Several authors also employ the gap specification to estimate Okun's coefficient (cf. Lee, 2000:334; Harris and Silverstone, 2001:2). However, these authors specify the Okun's law equation the other way around with the output gap as the dependent variable. Nonetheless, conclusions reached from this specification are qualitatively the same as those of the specification in equation (5) (Lee, 2000:333, footnote 2). Following Moosa (1997:337, 1999:296) and Weber (1995:438), some dynamics are added to equation (5) since equation (5) assumes a contemporaneous relationship which may not be theoretically plausible. This yields equation (6):

$$u_t^c = \alpha + \sum_{i=1}^{m} \beta_i u_{t-i}^c + \sum_{i=0}^{m} \gamma_i y_{t-i}^c + \varepsilon_t \qquad (6)$$

where γ_0 denotes the contemporaneous effect of output on unemployment. Equation (6) specification also can be used to calculate the long run effect of cyclical output on cyclical unemployment (Moosa, 1997:337; 1999:296). This long run effect is measured by calculating a function of the coefficients obtained from equation (6), i.e. ω:

$$\omega = \frac{\sum_{i=0}^{m} \gamma_i}{1 - \sum_{i=1}^{m} \beta_i} \qquad (7)$$

Given that empirical results for equation (6) might be sensitive to the choice of detrending technique (Grant, 2002:98; Moosa, 1997:336; 1999:293-4), this paper will use eight methods to obtain estimates of potential output (i.e. y^p) and five methods will be used to obtain the estimates for potential unemployment (i.e. u^p). This will result in the estimation of eight versions of equation (6) summarised in Table 1 below.

Table 2: Variations of equation 6

Equation	u^p	y^p
(6.1)	First difference method	First difference method
(6.2)	Linear trend representation	Linear trend representation
(6.3)	Hodrick-Prescott (HP) Filter	Hodrick-Prescott (HP) Filter
(6.4)	Band-Pass (BP) Filter	Band-Pass (BP) Filter
(6.5)	Beveridge-Nelson (BN) decomposition	Beveridge-Nelson (BN) decomposition
(6.6)	Hodrick-Prescott (HP) Filter	Production Function Approach with HP
(6.7)	Band-Pass (BP) Filter	Production Function Approach with BP
(6.8)	Beveridge-Nelson (BN) decomposition	Production Function Approach with BN

The first difference method does not involve an estimation of the permanent components of the unemployment and output series. Instead, the cyclical components in equation 6 (i.e. u^c and y^c) are merely taken to be the first differences of the y and u series (cf. Lee, 2000:333). Attfield and Silverstone (1997:228) note that if the output and unemployment series are individually I(1), and the two gaps are cointegrated, then the relationship between the two gaps (i.e. equation (6)) is misspecified if they are obtained using the first difference method. The linear trend representation, on the other hand, assumes that an economic series contains a deterministic trend that grows at a constant rate. This is one of the major drawbacks of this approach as there is an increased interest in the stochastic nature of the long run trends in economic time series (Grant, 2002:99). Given a time series x_t and a linear trend variable t, the detrended (cycle) series (e_t) can be obtained by estimating the following regression (cf. Grant, 2002:98):

$$x_t = a_0 + a_1 t + e_t \qquad (8)$$

The Hodrick-Prescott (HP) Filter, Band-Pass (BP) Filter and the Beveridge-Nelson (BN) decomposition[5] are other statistical techniques used to distinguish between permanent and transitory changes in the output and

[5] See Hodrick and Prescott (1997), Baxter and King (1995) and Beveridge and Nelson (1981), respectively.

unemployment time series. The Hodrick-Prescott (HP) filter is a generalisation of a linear trend method that allows the slope of the trend to change gradually over time (Hodrick and Prescott, 1997). Suppose that the observed series is denoted by x_t which can be decomposed into a trend (μ_t) and a stationary component ($x_t - \mu_t$). The HP filter minimizes the sum of the squared deviations between the trend and the actual series, with a penalty for the curvature that keeps the trend smooth (λ). Thus, the HP function is given by:

$$\textit{Minimise:}\ 1/T\sum_{t=1}^{T}(x_t - \mu_t)^2 + \lambda/T\sum_{t=2}^{T}[(\mu_{t+1} - \mu_t) - (\mu_t - \mu_{t-1})]^2 \qquad (9)$$

where T denotes the number of observations. According to convention, λ takes on a value of 100 for annual data, 1600 for quarterly data and 44000 for monthly data. If $\lambda = 0$, the HP filter would yield the original series and if $\lambda \to \infty$, the HP filter would result in a linear time trend (Enders, 2004:224). Given the use of annual data in this study, λ is set to 100. One of the criticisms of the HP Filter is that it can generate cycles that do not exist in the original series. The paper therefore also employs a frequency filter proposed by Baxter and King (1995). This filter is used to isolate the cyclical component of a time series by specifying a range for its duration. Roughly speaking, the band-pass filter is a linear filter that takes a two-sided weighted moving average of the data where cycles in a "band" (given by a specified lower and upper bound) are "passed" through, or extracted, and the remaining cycles are "filtered" out. When applied to annual data, the band-pass filter proposed by Baxter and King (1995) takes the form of a 3-year moving average:

$$x_t^f = \sum_{h=-1}^{h=1} a_h x_{t-h} = a(L)x_t \qquad (10)$$

where L is the lag operator. The weights a_h can be derived from the inverse Fourier transformation of the frequency response function. Baxter and King (1995) adjust the band-pass (BP) filter with a constraint that the gain is zero on the zero frequency. This constraint implies that the sum of the moving average coefficients must be zero. When using the BP filter, 1 year is sacrificed at the beginning and the end of the time series.

Beveridge and Nelson (1981) propose a different method of extracting a cycle form a series. A time series x_t can be represented as the k-period ahead forecast of output at time t by adding all forecastable future changes to the current observation (Grant 2002:100-2), i.e.:

$$E_t(x_{t+k}) = x_t + E_t\left(\sum_{i=1}^{k}\Delta x_{t+i}\right) \qquad (11)$$

If x_t series is I(1), Δx_t is I(0) and hence has an estimable moving average representation through Wold decomposition:

$$\Delta x_t = \mu + \varepsilon_t + \lambda_1\varepsilon_{t-1} + \lambda_2\varepsilon_{t-2} + \ldots + \lambda_i\varepsilon_{t-i} \qquad (12)$$

where μ is the mean forecastable change in x_t and $\varepsilon_t \sim NIID(0, \sigma^2)$. Combining (10) and (11) and extending the forecast function over a long period of time, the expected value of x (k periods into the future) is given by:

$$E_t(x_{t+k}) = x_t + k\mu + \sum_{i=1}^{\infty}\lambda_i\varepsilon_t + \sum_{i=2}^{\infty}\lambda_i\varepsilon_{t-1} + \ldots \qquad (13)$$

The expected innovations (i.e. the ε series) are obtained by fitting an ARIMA model to the first difference of the x_t series and using the estimated parameters to forecast future changes in the x_t series over a very long horizon. Assuming that future expected innovations have a mean of zero, equation (12) can be written as:

$$E_t(x_{t+k}) = x_t^p + k\mu \qquad (14)$$

Thus, by rearranging equation (13) the current permanent component can be obtained as a long run forecast from equation (12):

$$x_t^p = E_t(x_{t+k}) - k\grave{\imath} \quad (15)$$

The cyclical component of x_t is then obtained as follows:

$$x_t^c = x_t - x_t^p \quad (16)$$

The production function method entails the estimation of a production function to obtain the y^p series, hence a more economic approach (c.f. Smit and Burrows, 2002; Arora and Bhundia, 2003). Following Arora and Bhundia (2003:5-6), the study uses a constant returns-to-scale Cobb-Douglas production function:

$$Y = AL^aK^{1-a} \quad (17)$$

where the weights of labour and capital (i.e. *a* and *1-a*) are taken to be the average shares of labour and capital in national income for the period under consideration. Next, the total factor productivity is calculated as follows (Smit and Burrows, 2002:5; Arora and Bhundia, 2003:6):

$$A = Y / L^aK^{1-a} \quad (18)$$

The Hodrick-Prescott (HP), Beveridge-Nelson (BN) and Band-pass (BP) filters are then applied to both labour and total factor productivity (it is assumed that capital is always utilised at full capacity) (Burger and Marinkov, 2006:180). The smoothed values of labour and total factor productivity are then substituted into equation (18) to calculate the potential output:

$$Y_{HP}^p = A_{HP}L_{HP}^aK^{1-a} \quad (19)$$

$$Y_{BP}^p = A_{BP}L_{BP}^aK^{1-a} \quad (20)$$

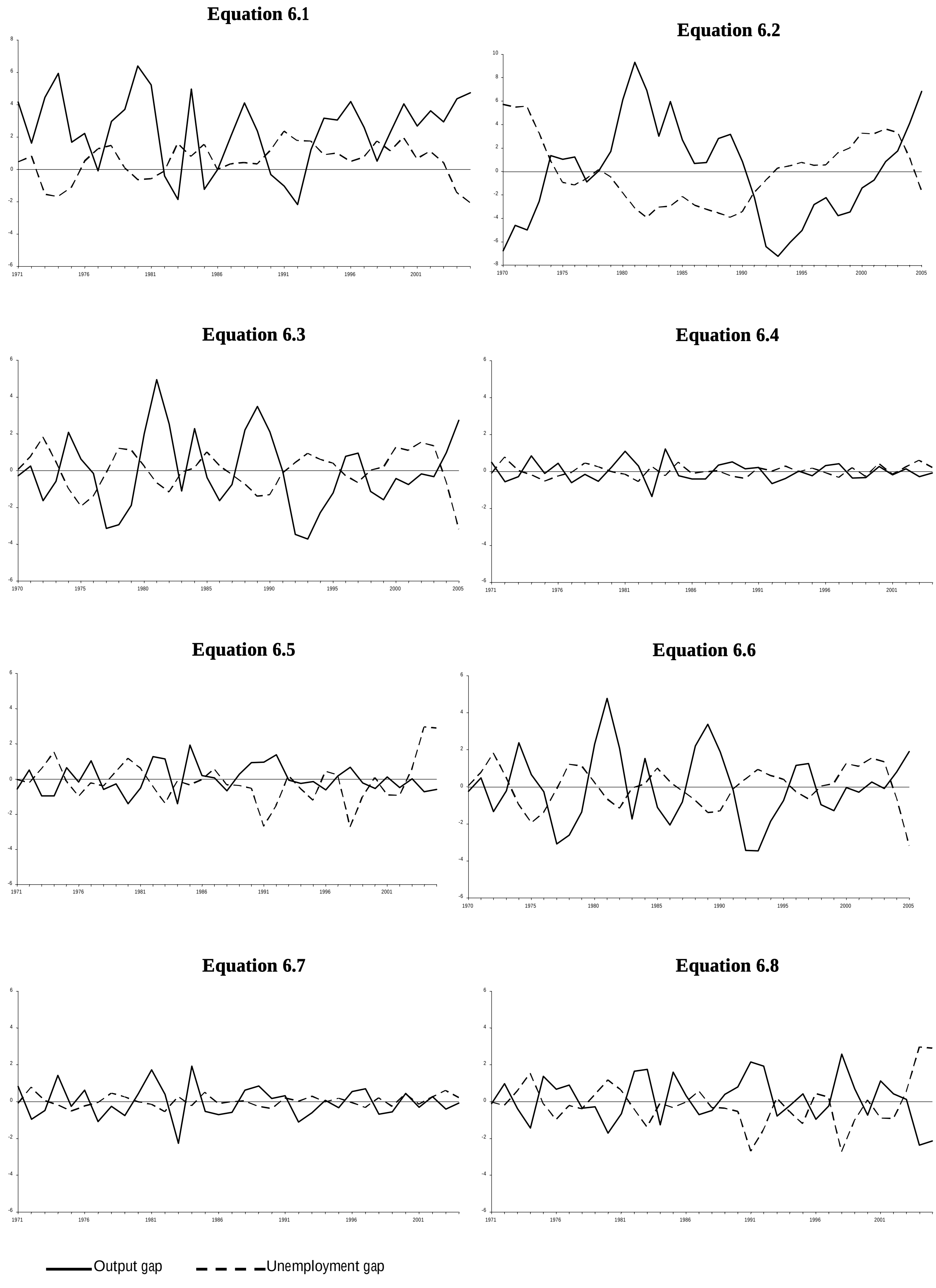
$$Y_{BN}^p = A_{BN}L_{BN}^aK^{1-a} \quad (21)$$

The output gaps are then calculated as the difference between the natural logs of actual and potential outputs as calculated by the HP, BN and BP methods (Burger and Marinkov, 2006:180).

RESULTS

Figure 2 contains the estimates of the unemployment and output gaps obtained by using the methods listed in Table 2. A negative relationship between the unemployment gap and the output gap is apparent from all the figures. It is also interesting to note the chronology as well as the amplitude of the different estimates of the gaps. The Band-Pass Filter and the Beveridge-Nelson gaps have a much lower amplitude and a higher frequency when compared to the other gaps. Furthermore, at the end of the sample, cyclical output exceeds cyclical unemployment for the BP and the BN estimations (other estimations indicate the opposite). Grant (2002:104) has similar findings where different methods of detrending yield gaps (cycles) that differ both qualitatively and quantitatively. Specifically, he finds wide disparities between the Hodrick-Prescott estimate of the output gap (cycle duration of about 4-6 years), linear trend measure of the output gap (long cycles with a high degree of variability) and the Beveridge-Nelson estimate of the output gap (cycles of high frequency and low amplitude) (Grant, 2002:104).

Figure 2: Cyclical GDP and cyclical unemployment



Next, the results from the estimation of equation (6) using the different measures of the gaps are summarised in Table 3 below. The estimates of the contemporaneous Okun's coefficient ($_{0}$) are all statistically significant at the

5% significance level. Furthermore, they are all negative; though there are large differences in the magnitudes of these coefficients (this can be attributed to the different techniques used to estimate the gaps (cf. Lee, 2000:341)). The lags of the output gaps are only significant in equations (6.4) and (6.7). The estimates of the long run Okun's coefficient ( ) are on average double the contemporaneous Okun's law coefficient ($_0$), indicating that the Okun's relationship for South Africa is stronger in the long run. It also seems that cyclical unemployment has some inertia effects as indicated by the $_1$ and $_2$ coefficients in equations (6.1), (6.2), (6.3), (6.5) and (6.6). For equations (6.2), (6.3) and (6.6) the $_1$ coefficient is positive, statistically significant and larger than one. This indicates that the one period lag of cyclical unemployment is associated with an increase in the contemporaneous cyclical unemployment rate of more than one percentage point (which is greater than expected, *a priori*). However, this effect is offset in the next period by the $_2$ coefficient, which is negative and statistically significant in all three these cases (i.e. equations (6.2), (6.3) and (6.6)), implying that the sum of the coefficients on lagged cyclical unemployment is positive, and less than one (as would be expected *a priori*). Diagnostic tests indicate possible serial correlation for equation (6.4) and possible misspecification for equations (6.3) and (6.6).

Table 3: Estimation Results

Equation	(6.1)	(6.2)	(6.3)	(6.4)	(6.5)	(6.6)	(6.7)	(6.8)
$_1$	0.767**	1.312**	1.060**	-0.215	0.444**	1.095**	-0.189	0.199
	(4.084)	(7.706)	(5.828)	(-1.334)	(2.278)	(5.978)	(-1.187)	(0.961)
$_2$	0.063	-0.456**	-0.693**	0.052	-0.221	-0.729**	0.083	0.076
	(0.289)	(-2.866)	(-3.619)	(0.314)	(-1.108)	(-3.804)	(0.500)	(0.401)
$_0$	-0.173**	-0.224**	-0.177**	-0.338**	-0.679**	-0.168**	-0.202**	-0.780**
	(-2.459)	(-3.562)	(-2.379)	(-3.635)	(-3.230)	(-2.118)	(-3.557)	(-8.071)
$_1$	0.060	0.162	0.103	-0.276**	-0.246	0.106	-0.167**	-0.074
	(0.760)	(1.649)	(1.193)	(-2.668)	(-1.003)	(1.204)	(-2.681)	(-0.429)
$_2$	0.064	-0.029	-0.075	-0.203*	0.080	-0.086	-0.125**	0.070
	(0.947)	(-0.397)	(-0.975)	(-1.993)	(0.330)	(-1.090)	(-2.064)	(0.424)
	-0.288	-0.632	-0.236	-0.702	-1.088	-0.234	-0.447	-1.080
Adj. R^2	0.418	0.920	0.706	0.283	0.426	0.696	0.280	0.769
Serial correlation	2.208	2.332	4.326	0.826	6.968	4.451	1.273	3.853
LM test	(0.332)	(0.312)	(0.364)	(0.662)	(0.138)	(0.348)	(0.529)	(0.426)
Heteroscedasticity	11.473	9.659	8.061	6.662	10.183	9.054	6.082	10.413
test (White)	(0.322)	(0.471)	(0.623)	(0.757)	(0.425)	(0.527)	(0.808)	(0.405)
Normality test	2.104	0.161	0.159	0.859	0.448	0.154	0.831	1.177
(JB)	(0.349)	(0.923)	(0.923)	(0.651)	(0.799)	(0.926)	(0.660)	(0.555)
Ramsey's RESET	1.312	0.967	2.095	2.528	1.340	2.090	3.105	0.919
test	(0.519)	(0.617)	(0.112)	(0.283)	(0.512)	(0.112)	(0.212)	(0.346)

Note: 1. For the estimated coefficients t-statistics are included in parentheses (** and * denote significance at 5 and 10% levels, respectively).
2. For serial correlation, heteroscedasticity test, normality as well as the Ramsey's RESET tests p-values are included in parentheses.

Figure 3 contains the recursive coefficient estimates of the $_0$ coefficient estimated in equations (6.1) through to (6.8). All of the plots (except perhaps equations (6.5) and (6.8)) indicate stability, with the estimated coefficients ranging between -0.17 and -0.78.

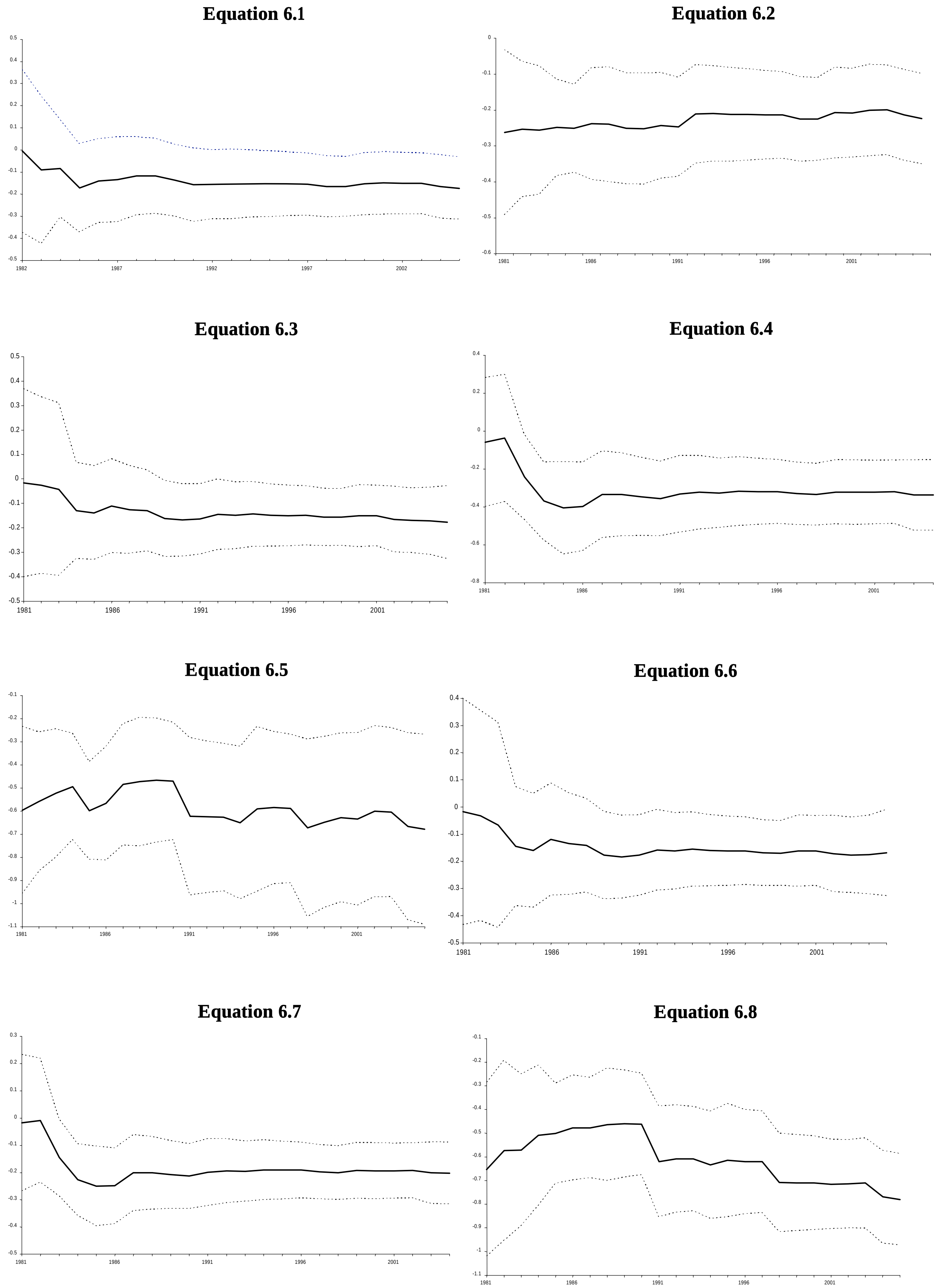
CONCLUSION

This paper estimated the relationship between cyclical unemployment and cyclical output by using a variety of detrending methods to decompose output and unemployment series into their trend and cyclical components. The detrending methods used yielded unemployment and output cycles that differed substantially in terms of the chronology of the phases of the cycles as well as the amplitudes and frequencies of the cycles. However, irrespective of the detrending method used to estimate the dynamic relationship between cyclical output and cyclical unemployment, the contemporaneous relationship between these two variables was always found to be statistically significant. Estimates of the "short run" (contemporaneous) Okun's coefficient ranged between -0.17 and -0.78, while estimates of the "long-run" Okun's coefficient ranged between -0.24 and -1.09. In all estimations, the long run coefficient was found to be larger (often substantially) than the short run coefficient. These results seemingly indicate the presence of an Okun's law relationship in South Africa over the period 1970-2005. Recursive estimates of the contemporaneous Okun coefficient further revealed that this relationship remained relatively stable over the sample period.

Although the presence of an Okun's law relationship in South Africa is encouraging, specifically with regard to the growth and unemployment targets set out by the government in its ASGISA strategy, it should be noted that unemployment and output can be decomposed into cyclical AND structural components. Changes in cyclical

GDP will only affect cyclical unemployment. Policymakers should take care not to confuse changes in cyclical GDP and cyclical unemployment with changes in the trend (“structural”) components of GDP and unemployment.

Figure 3: Recursive coefficient estimates of $_{0}$ *in equation 6*



Higher economic growth might not necessarily lead to a reduction in the unemployment rate (as illustrated in Table 1 and Figure 1) (cf. Terreblanche, 2002:432; Bhorat, 2004:951; UNDP, 2003:152). Moreover, cyclical unemployment was found to represent only a small fraction of total unemployment, irrespective of the detrending method[6]. A comprehensive unemployment strategy for South Africa should take the abovementioned findings into consideration and should recognise the difference between changes in cyclical output and cyclical unemployment on the one hand (and, therefore, factors leading to changes in the cyclical variables) and changes in structural (trend) output and structural unemployment on the other (and, therefore, factors leading to changes in the structural variables).

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