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An investigation into the determinants of the South African unemployment rate, 1970-2002

From 1970 to 1977 unemployment in South Africa oscillated around a near-constant mean. Since 1983 unemployment has shown a definite upward trend defying the existence of a long-run natural rate. South African unemployment data exhibits signs of hysteresis, suggesting that long-run unemployment is endogenously determined. Empirical results confirm that the total fixed capital stock, interest rate and degree of unionisation of the labour force are important factors in explaining the unemployment rate in South Africa. This implies that long-run equilibrium unemployment in South Africa is endogenously determined by economic as well as institutional factors.

'n Ondersoek na faktore wat die Suid-Afrikaanse werkloosheidskoers bepaal, 1970-2002

Die Suid-Afrikaanse werkloosheidskoers het van 1970 tot 1977 rondom 'n byna-konstante gemiddelde beweeg. Sedert 1983 is daar 'n duidelike opwaartse neiging wat die bestaan van 'n langtermyn natuurlike werkloosheidskoers weerspreek. Histerese blyk teenwoordig te wees in Suid-Afrikaanse werkloosheidsyfers wat dui op die endogene aard van langtermyn werkloosheid. Empiriese ontleding bevestig dat totale vaste kapitaalvoorraad, rentekoerse en die invloed van vakbondbedrywighede in die arbeidsmag belangrike bydraers tot Suid-Afrikaanse werkloosheid is. Die langtermyn ewewigsvlak van werkloosheid word endogeen bepaal deur ekonomiese sowel as institusionele faktore.

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A distinctive feature of the South African economy is the high level of unemployment, the tempo at which the unemployment rate has increased over the last three decades and the seemingly inherent inability of natural economic forces to bring about the necessary adjustments to reverse the situation.[1] Various studies confirm the existence of hysteresis in the data-generating process of unemployment in South Africa (Schoeman 2003, Koller 2004).

The unprecedented high levels and persistence of unemployment in Europe have led to numerous studies on the economics of unemployment.[2] These studies attempted to explain not only the relatively high levels of unemployment, but also its persistence or remanence. These studies form the basis of this study. The aim of this article is to identify some of the factors that help to explain the level of unemployment in South Africa.

1. The behaviour of unemployment in South Africa[3]

Figure 1 illustrates the unemployment rate in South Africa from 1970 to 2002.[4]

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1   A previous version of this paper was presented at the Scottish Economic Society Annual Conference, Ramada Jarvis Hotel, Perth, 29-31 March 2005. The valuable comments of various anonymous referees are greatly appreciated. The usual disclaimer applies.

2   Cf Blanchard & Summers 1986, Layard *et al* 1991, Cross *et al* 1997, Cross *et al* 1998, Blanchard & Wolfers 1999, Ball & Mankiw 2002.

3   For a detailed discussion of each of the three categories cf Schoeman (2003) or Schoeman *et al* (2004).

4   The actual unemployment time series data used in the analysis was obtained from Quantec. The data used is formal unemployment data on an annual basis of the sample period 1970-2002. The data for formal-sector employment is based on the Surveys of Employment and Earnings plus adjustments for underrepresentation in service industries. For this purpose the standardised employment series of the Development Bank of Southern Africa was utilised as the basis.
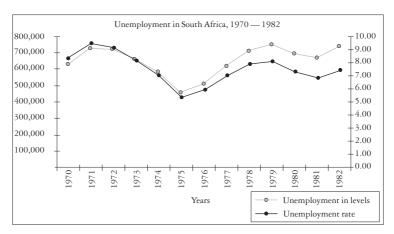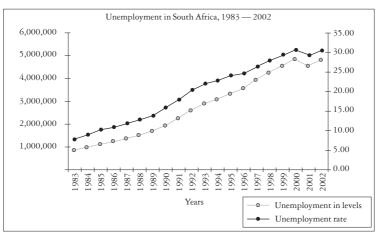
Figure 1: Unemployment rate in South Africa 1970-2002

Source: Quantec

Unemployment ranged from 6 to 10% between 1970 and 1983. From 1970 to 1977, unemployment oscillated around a near-constant mean. Actual unemployment appears to have had no influence on mean unemployment during this period. The period 1977 to the end

of 1983 is characterised by unemployment moving to a higher and changing mean level. An adverse shock in 1977 not only put actual unemployment on a higher level, but also appears to have started to influence mean unemployment at this time.[5] The relationship between inflation and unemployment that existed until the late 1960s clearly broke down, with stimulatory policies not able to reduce higher rates of unemployment (Hodge 2002: 420).

The behaviour of unemployment after 1984 changed dramatically compared to the period 1970 to the end of 1983. In the period after the negative shock in 1983, unemployment became totally dependent on its past values. Unemployment has increased sharply since 1984, up from about 7.5% in 1984 to just over 30% in 2002. Unemployment, it seems, developed a life of its own and did not deviate in any way from the path it followed. There were no indications in the data-generating process after 1984 that unemployment would revert to the average unemployment level of the 1970s.

A possible explanation for the behaviour of unemployment since 1984 is the presence of hysteresis. Hysteresis describes any system in which the equilibrium position depends on the history of the system (Blanchard 2000: 438-9, Cross 1993). The implication is that the system's current behaviour will depend on past shocks or selective past shocks.

Schoeman *et al* (2004: 9) found that the South African unemployment time series was univariate in nature and difference stationary of integrated order 1. The generating process of the series can best be described as an AR(1) — ARMA with ARCH effects in the residuals at a 2-% level of significance. The ARCH effects in the residuals of linear models are an indicator of non-linearity in the conditional mean of the underlying regression model. According to Krasnosel'skii & Pokrovskii (1989), hysteresis will be exhibited by any system containing a non-linear relationship. Schoeman *et al* (2004: 9) conclude that the behaviour of unemployment in South Africa did point to the presence of the strong form of hysteresis or the remnant influence

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5   A shock is defined as an unexpected temporal change (perturbation) in non-economic and economic factors which changes actual unemployment.

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of all sorts of extreme shocks. An increase in actual unemployment leads to an increase in long-term equilibrium unemployment.

Working with a different base, Koller (2005: 11-2) did a similar study using the Hodrick-Prescott (HP) filter and various unit root tests to examine the hysteresis effect in South African unemployment. Her findings also provide evidence in support of the hysteresis hypothesis in relation to South African unemployment data. According to Koller (2005: 12), the unit root properties of the cyclical fluctuations of unemployment have persistent effects on the level of unemployment. These findings imply path dependence or endogenousness in the South African unemployment data-generating process (Koller 2005: 18).

The presence of hysteresis in the South African unemployment data implies that our unemployment is not mean reverting and that we do not observe the presence of a so-called natural rate of unemployment. Unemployment is thus endogenously determined within the economy and not exogenously as some natural rate around which the observed rate will fluctuate. The next section tries to identify some of these factors that help to explain the level of unemployment in South Africa. The presence of hysteresis justifies the modelling of the South African unemployment rate — something that would not have been plausible had hysteresis been absent.

2. Factors underlying unemployment in South Africa

2.1 Incorporating the institutional structure of the South African labour market

As stated, Figure 1 clearly indicates the change in behaviour of South African unemployment after 1983. These changes coincide with a period in the early 1980s when fundamental reform took place in the institutional structure of the South African labour market (Hofmeyr 1994: 13). A very important point in this process was the implementation of the accepted recommendations of the Wiehahn Commission's report on industrial relations in South Africa (Hofmeyr 1993: 266). However, the Wiehahn Commission began more than a decade earlier.

In 1977 two landmark commissions were formed: the Wiehahn Commission to investigate all aspects of labour relations and the Riekert Commission to investigate all other aspects of labour utilisation. The Wiehahn Commission's report recommended that Africans be given full trade union rights and that existing African unions be recognised and fully incorporated into the official industrial relations machinery (Hofmeyr 1994: 27). These recommendations were accepted and implemented in stages by the South African government.

As a result of this process there has been a large increase in the number of unions and unionised workers in South Africa since 1979 (Van Heerden & Van Tonder 1987: 34). Significant increases in wage levels in these industries, which otherwise would have experienced wage decreases, were experienced at the same time (Hofmeyr 1993: 278). In the pre-Wiehahn era only 55 000 to 70 000 workers were believed to belong to 27 unregistered black trade unions out of a total black workforce of 7 million at the end of 1977. This was barely 1% of the black workforce compared with a union membership of about 23% among the 3 million economically active whites, coloureds and Asian workers (Jowell 1979). By 1984 there were some 35 unions with over 400 000 members. Although this only accounted for some 10% of the labour force, the proportion was much higher in certain sectors (Hofmeyr 1994: 27).

In 2005 there were about 3 million trade union members in South Africa. This comprises just fewer than 40% of those in formal employment, excluding the agricultural sector, domestic worker and self-employed persons. This represents an annual increase of nearly 6% (Barker 2007: 92-3). In 1997 the International Labour Organisation described this as the largest increase among the 92 countries that it surveyed in its annual study of the world's labour markets (Barker 2007: 93).

The theoretical possibility of a negative employment effect of trade unions is well known in the literature and some international empirical studies support this view (Ehrenberg & Smith 2006: 473). In South Africa, there is evidence that unions caused a higher wage differential in South Africa than in other countries. Studies by Hofmeyr (1993 & 1998), Moll (1993) and Fallon & Lucas (1998) provide

evidence to this effect. Another unique characteristic of the South African union movement is its dual role in history.

The role of trade unions in South African society became increasingly political in nature. Trade unions were seen as a vehicle for liberation from oppression. Unions like the National Union of Mineworkers (NUM) grew rapidly and became steadily more militant, culminating in a three-week strike in 1987. The union was torn between political and economic objectives (Jones & Inggs 1994: 9). Organised business was not ready for "militant" black trade unions. The new industrial relations system did not contribute much to the establishment of sound collective relationships at the time. Instead, it was seen as a frame of reference for conflict handling, whereby employers tried to restrict conflict and the government resorted to the tactic of "buying time" (Slabbert 1999: 2).

In this climate of considerable uncertainty, business had no option but to react. Economic reality was a powerful weapon in the hands of business. After 1978 rising labour costs encouraged the replacement of labour by capital (Jones 1990: 53). The mining houses forced the NUM to consider the question of low productivity and the resultant need to reduce the labour force. In the five years after 1987, no fewer than 200 000 jobs were shed in the mining sector alone (Jones & Inggs 1994: 9).

This increasingly political nature of trade unions came to the fore at a time when the South African economy, following the 1976 Soweto uprising, was a net exporter of capital. Overseas pressure mounted. European and American codes of conduct were drawn up for international firms operating in South Africa in the face of mounting pressure to withdraw investment altogether (Hofmeyr 1994: 26). At the very moment when the South African economy needed foreign investment to meet the burgeoning demands of a modern infrastructure, the international sanctions campaign not only cut off the supply, but also forced the country to become a net exporter of capital (Jones 1990: 42). Mounting political pressure on the one hand and the growing labour cost and low productivity due to unions' growing politicisation on the other go a long way to explain the outflow of capital from South Africa during this period.

The unique role of trade unions in the South African labour market, the existing theoretical negative employment effects of unions, the fast growth of unions from 1980 to 2002 and the correlation between this growth and rising unemployment provide the theoretical foundation that this institutional factor might have played an important part in the hysteresis evident in South African unemployment since 1980. Various measures of union power were also included in the work done by Darby & Wren-Lewis (1993) for Britain. The following variable was constructed for a preliminary analysis: UNOFEM representing unionisation as a percentage of formal employment.[6]

Figure 2 illustrates the correlation between unemployment and the degree of unionisation in South Africa.
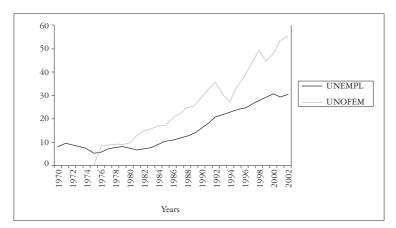
Figure 2: Unemployment and unionisation in South Africa, 1970-2002

Source: Quantec, Department of Labour, International Labour Organisation

6   The Department of Labour only collected data on the number of unionised workers as a percentage of paid employees available up to 1984. As a result the time series of unionisation as a percentage of formal employment was constructed and used.

Unionisation will be included in the analysis as a factor unique to the South African situation. The other variables in our model are analogous to those of Cross *et al* (1998).

2.2 Empirical results of Darby & Wren-Lewis (1993) and Cross *et al* (1998)

Darby & Wren-Lewis (1993), Cross *et al* (1997) and Cross *et al* (1998) did similar work on unemployment in Britain from 1959 to 1996. Using Johansen's procedure to determine long-run equilibrium unemployment, Darby & Wren-Lewis (1993) were unable to identify a single cointegrating vector underlying long-run equilibrium unemployment in the UK.

After transforming the data to take into consideration only the extremities of "unnatural and natural" shocks, creating hysteresis indices, Cross *et al* (1998: 1) found:

> Both natural and unnatural variables enter a cointegrating vector for UK unemployment 1959-1996. The natural variable is the replacement ratio. The 'unnatural' variables are the hysteresis index of the exchange rate and the hysteresis indices for the real oil price and the real exchange rate.

This supported the existence of a single valid Error Correction Model (ECM) of transformed data of the United Kingdom unemployment rate (Cross *et al* 1998: 13). Their findings suggest:

> … that perturbations and not necessarily sustained shifts in such real variables change the equilibrium rate of unemployment in the United Kingdom (Cross *et al* 1998: 14).

It follows from their study that long-term unemployment in the UK was caused by more than merely economic variables. In fact, all sorts of extreme shocks played a role in this process. The above result had two interesting implications:

> The first is that they cast doubt on whether the monetary neutrality axiom, imposed by the natural rate hypothesis, applies to the equilibrium rate of unemployment. The second is that they suggest that the equilibrium rate of unemployment may display remanence in that when real shocks disappear, their effects on equilibrium unemployment do not. It will be interesting to see if these results also apply to other countries and different time periods (Cross *et al* 1998: 15).

3. Empirical results for South Africa: 1980-2002

We attempt to estimate a cointegrating vector, modelling the long-run equilibrium relationship between South African unemployment and identified explanatory variables. The data is annual from 1980 to 2002. The estimation period is limited because data for the degree of unionisation is available only from 1979. The data was obtained from International Financial Statistics, the Department of Labour, the International Labour Organisation and the South African Reserve Bank. As stated earlier, the data for unemployment was obtained from Quantec.

Any employment estimates in South Africa are fraught with difficulties and should be used with care. This is even more so at the regional level, and stems largely from the historical lack of consistent and comprehensive surveys based on both the enterprise and household populations (Kingdon & Knight 2003).

Quantec Research has constructed an employment database with sectoral and provincial employment time series data using the following sources:

> Labour Force Surveys (LFS): Stats SA; October Household Survey/General Household Survey (OHS/GHS): Stats SA; Population Censuses, 1970-2001: Stats SA; Industry Censuses (various): Stats SA; EasyData Standardised Provincial Demographic Database: Quantec Research; Survey of Employment and Earnings (SEE): Stats SA; Development Bank of Southern Africa (DBSA) Standardised Employment Series: DBSA (discontinued during the late 1990s); Manpower Survey: Stats SA and the Department of Labour (discontinued in 1996); SA Labour Statistics: Stats SA (last published in 1996), and the EasyData Standardised Industry Database: Quantec Research (Quantec 2007: 1).

Regarding the discontinuities in the SEE, Quantec linked the new and old SEE (before the service industries were comprehensively covered) by phasing in the new SEE from 1985 onwards. Previously, the DBSA Standardised Employment Series was used as the basis to give estimates of the service industries (Quantec 2007: 2).

Darby & Wren-Lewis (1993) and Cross *et al* (1998) identified important economic factors underlying unemployment in Britain. All the explanatory variables identified by them are present in our

empirical analysis, together with the UNOFEM variable, identified in the above discussion. These are summarised in Table 1.

Table 1: Variables used in the South African analysis

TFCS	Total fixed capital stock
BA	Bankers' acceptance rate
UNEMPL	Unemployment rate
UNOFEM	Unionisation as % of formal employment
CRUDE	Crude oil price (average for year)
REER	Real effective exchange rate (1995 = 100)

The proposed unemployment function is specified as follows:

$$\text{UNEMPL} = f \, (\text{TFCS, UNOFEM, REER, CRUDE, BA})$$

3.1 Empirical results

The empirical analysis continues with an investigation of the univariate properties of each time series. The results are reported in Table 2.

Table 2: Augmented Dickey-Fuller test statistics (variables in levels)

Variable	I(0)	I(1)	I(2)
TFCS	-1.1988	-2.6072	-3.5878*
BA	-4.6825*		
UNEMPL	0.13655	-2.7012	-3.9021*
UNOFEM	-0.45097	-4.0403*	
CRUDE	-2.2041	-3.7899*	
REER	-1.5743	-3.8755*	

* The null hypothesis of a unit root can be rejected at a 5% level of significance.

As was expected, the interest rate variable (BA) is I(0) while UNEMPL and TFCS, unexpectedly, turned out to be I(2). Although in economic terms we do not expect unemployment to be forever increasing and reaching levels of 100%, the I(2) outcome of the unit root tests is not surprising if one looks at the graph (Figure 1) for the period. The Philips-Perron test confirms the I(2) nature. One way

of handling the I(2) outcome could be to override the test statistic on economic grounds. The problem with this is that the Johansen procedure specifically states that all data should be entered in I(1) format. If I(0) or I(2) data is mixed with I(1) data it leads to incorrect statistical estimates. For this reason we stated that unemployment is I(2) and included the differenced I(1) format in the estimation. The rest of the variables are all I(1). The Johansen technique requires that all variables included in the Vector Error Correction Model (VECM) should be I(1). Therefore the first differences of UNEMPL and TFCS will be included,[7] while BA features only in the error correction equation, helping to explain some of the short-run dynamics.

Authors have warned against the use of the Johansen technique with a limited number of observations (cf Hakkio & Rush 1991) as this can lead to rejection of co-integration because of the low power of the test. However, the same authors admit that the appropriate time length may vary from case to case and that shorter sample periods may be acceptable in a multivariate setup (Hakkio & Rush 1991: 579). Recent studies on transition economies deal with the same lack of data as we are experiencing — cf for example Erjavec (2003) on the Croatian experience. Komárek & Melecký (2001: 22) suggested that under conditions of low quality of data and a small sample of observations, as experienced in transition economies, the application of several methods is seen to be important. They then proceed to confirm their Johansen results with results of other models. We follow the same approach.

The Johansen maximal statistic confirms the presence of one cointegrating vector at a 5% level of significance. The estimated cointegrating vector, with the respective t-statistics in brackets, is as follows:

$$DUNEMPL = -2.3138 - 0.00004\,DTFCS + 0.02770\,UNOFEM + 0.04495\,REER$$
$$(1.60) \quad (-2.59) \qquad (1.99) \qquad\qquad (3.08)$$
$$- 0.08230\,CRUDE$$
$$(-2.78)$$

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7   These were indicated by inserting a D in front of each variable in the model.

At -0.759 the error-correction term of the error-correction model displays the expected negative coefficient and is statistically significant with a 0.2% probability of making a mistake in rejecting the null hypothesis that the estimated coefficient is zero. In the same error correction model the interest rate variable (BA) displays a positive coefficient which is statistically significant at a 5% level.

Following the example of Cross *et al* (1998) the same equation was estimated using the Engle & Granger approach. All the estimated coefficients exhibit the same signs and roughly the same magnitudes as the Johansen estimates. However, only the coefficients of DTFCS and BA prove to be statistically significant. The residuals of this regression are stationary, which confirms the presence of co-integration.

Both the Johansen and Engle & Granger results confirm the presence of co-integration, indicate a negative relationship between unemployment and fixed capital stock, and indicate a positive relationship between unemployment and interest rates. Diagnostic tests for both models confirm the absence of serial correlation and heteroskedasticity; both F-statistics confirm that the regressions are statistically meaningful in explaining variations in unemployment; and the Ramsay RESET test does not indicate any specification error in either of the two models.

The results have several important implications. Key endogenous variables play a significant role in explaining the actual unemployment level in South Africa. This implies that long-run equilibrium unemployment in South Africa is endogenously determined by economic as well as institutional factors. The empirical study was done over a relatively short time period. Further research covering a longer period can perhaps provide more conclusive evidence.

Total fixed capital stock is one of the variables identified that explain unemployment in South Africa. This corresponds with the theory that increased investment creates jobs. The significance of the interest rate variable (BA) comes as no surprise and is echoed in the long-reigning critique against the strict monetary policy on the part of the labour unions in the country.

Furthermore, the Johansen results indicate that a higher level of unionisation, as well as a stronger rand, leads to higher unemployment. Because of the relatively short time period and the fact that these two explanatory variables did not render statistically significant coefficients in the Engle & Granger estimation, these results should be treated with caution.

4. Conclusion

From 1970 to 1977 unemployment in South Africa oscillated about or reverted to a near-constant mean. Data on unemployment has shown a definite upward trend in the level of unemployment since 1983 with very little semblance of a return to a long-run natural rate of unemployment. This article is an initial investigation into the dynamics behind this self-evolving nature of unemployment in South Africa since the early 1980s.

This study was able to estimate, with cointegration methodology and short-run dynamic data, a cointegrating vector that underlies long-run unemployment in South Africa. This implies that long-run equilibrium unemployment in South Africa is endogenously determined by economic as well as institutional factors. Our empirical results confirm that the following variables are important in explaining the unemployment rate in South Africa: the total fixed capital stock, the interest rate and, to a lesser degree, the unionisation of the labour force. There are concerns about the statistical significance of the unionisation variable, as not all models used rendered this variable statistically significant. Unionisation as such may not be significant but rather the unions' behaviour or their relationship with firms in the economy. Further research on this aspect is needed.

After careful consideration these results are not surprising. During the period under consideration, the South African economy experienced a number of shocks and underwent several important structural changes. The 1980s were characterised by sanctions and disinvestment. This was followed by the impact of political and economic uncertainty in the early 1990s, followed by social, political and economic changes, both locally and internationally during the

last part of the previous millennium. The advent of globalisation and its effect comes to mind as a pertinent example in this regard.

The period under consideration is therefore one of significant instability and structural changes that resulted in high unemployment levels that may remain for years to come. A matter for further research, to make any meaningful policy recommendations to decrease unemployment, is to determine why these shocks continue to have a lasting effect on unemployment after economic reality has changed for the better.

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