

# THE EVOLUTION OF BUSINESS CYCLES SINCE 1960

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## 1. INTRODUCTION

A popular view in recent years is that the nature of world business cycles has changed over time due to globalization, which is associated with developing trade links and more integrated financial markets. A very large element of globalization is the surge in cross-border capital flows over the last two decades. Since the early 1980s, capital flows has been raised from less than 5% to approximately 20% of GDP in advanced economies<sup>1</sup>. The question to be answered, though, is whether world business cycles really have changed over time in response to stronger global linkages.

International trade linkages generate both demand and supply spillovers across countries. Through these types of spillovers, stronger international trade linkages can result in more highly correlated business cycles<sup>2</sup>. Some empirical studies have found that growing global linkages have a positive impact on the synchronization of business cycles in advanced countries. It

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<sup>1</sup> KOSE, MA, OTROK, C & WHITEMAN, CH 2003. Understanding the evolution of world business cycles. Work in progress: Iowa Economic Research Institute.

<sup>2</sup> KOSE, MA, OTROK, C & WHITEMAN, CH 2003. Understanding the evolution of world business cycles. Work in progress: Iowa Economic Research Institute.

was found that the extent of financial linkages, sectoral similarity and the volume of intra-industry trade all have a positive impact on business cycle correlations. International trade is the most important transmission channel of business cycles<sup>3</sup>. There is a significant common component in driving business cycles in developed and developing countries<sup>4</sup>.

This paper examines the nature of business cycles with specific reference to South Africa. The evolution of the South African business cycle will be examined in different periods in comparison to other countries. The world factor's impact on the business cycle will be investigated and the question to be answered is: has the global factor become more important in explaining business cycles?

The evolution of the cycle will then be explained by dividing the time period (1960-2003) into three distinct sub-periods: 1960-1972 (quarter 1) (Bretton Woods fixed exchange rate regime); 1973-86 (quarter 2) (common shocks associated with sharp fluctuations in the price of oil and contractionary monetary policy in industrialized countries) and 1986 (quarter 3)-2003 (quarter 3) (globalization period).

This division of the time period is important for differentiating the impact of common shocks from that of globalization on the degree of co-movement of business cycles. Principle component analysis will be used to track the

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<sup>3</sup> IMBS, J 2002: Trade, finance, specialization synchronization. Working paper: London Business school.

<sup>4</sup> KOSE, MA, OTROK, C & WHITEMAN, CH 2003. Understanding the evolution of world business cycles. Work in progress: Iowa Economic Research Institute.

changes in business cycles since 1960. Thereafter variance decomposition will be done to establish the variation explained by the world, the country or the specific variable. After this, the types of shocks explaining the changes in the nature of business cycles will be looked at.

## **2. THE HISTORY OF THE SOUTH AFRICAN BUSINESS CYCLE**

After the Second World War, South Africa enjoyed an unprecedented rapid rate of economic growth. Between 1946 and 1971 national income increased year after year. Recessions took the form not of declines in national income, but merely decelerations in its growth rate, growth recessions<sup>5</sup>. South Africa's transformation into an industrialized society had occurred earlier, in the period 1930-60, when the contribution of manufacturing to GDP had doubled to more than 20 percent. After the 1960s, manufacturing continued to be the leading sector as it expanded faster than the overall economy. It not only contributed to GDP but was also a provider of employment. In the mid-1970s both the economy and industrial production slowed down. GDP dropped, the population expanded and unemployment increased.

South Africa experienced a financial revolution between 1961 and 1990. Traditional functions of clearing banks changed, and the Reserve Bank exercised a very considerable influence over the economy. The Governor played a major role in converting the government to a belief in the virtues of free enterprise and a more market-related economy. The causes of this financial revolution were:

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<sup>5</sup> JONES, S & MULLER, A 1992: The South African Economy, 1910-90. Macmillan: London.

- Sustained economic growth
- Industrial expansion
- Rising per capita incomes
- Technological progress
- Pressure to reduce costs
- Example of other countries

Sustained economic growth created new financial opportunities, which required radical responses on the part of the established institutions. In real terms, the growth of the GDP has been decelerating since the 1960s, when the economy grew at an annual average rate of 8.8 percent a year for nine years. This halved in the succeeding decade and fell further to 3% in 1979-1988. The decade of the gold and oil price rise therefore seems to have marked the transition from rapid to only moderate growth. After the decline in growth in 1994, similar to the lowest turning point in the 80s, a recovery was on the cards – particularly in the wake of the country's first democratic election. Since then growth averaged at 2.8% till the Asian crisis in 1998, where after the recovery was slow with an average of 2.7% till 2003. However, on a quarter to quarter basis, economic activity picked up further in the second quarter of 2004, with real gross domestic product expanding for the 23<sup>rd</sup> quarter, the longest expansion since the availability of data since 1960, this is shown in figure 2 <sup>6</sup> .

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<sup>6</sup> SOUTH AFRICA. South African Reserve Bank Quarterly Bulletin (September 2004). South African Reserve Bank: Pretoria.

Figure 1 Downswings in the South African business cycle

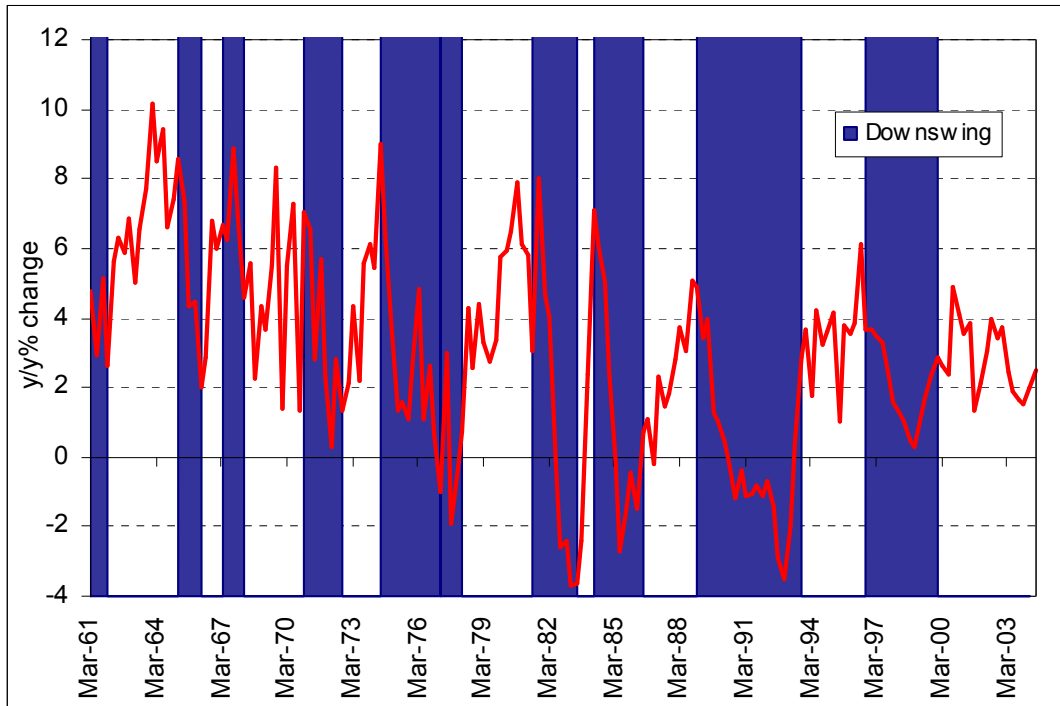
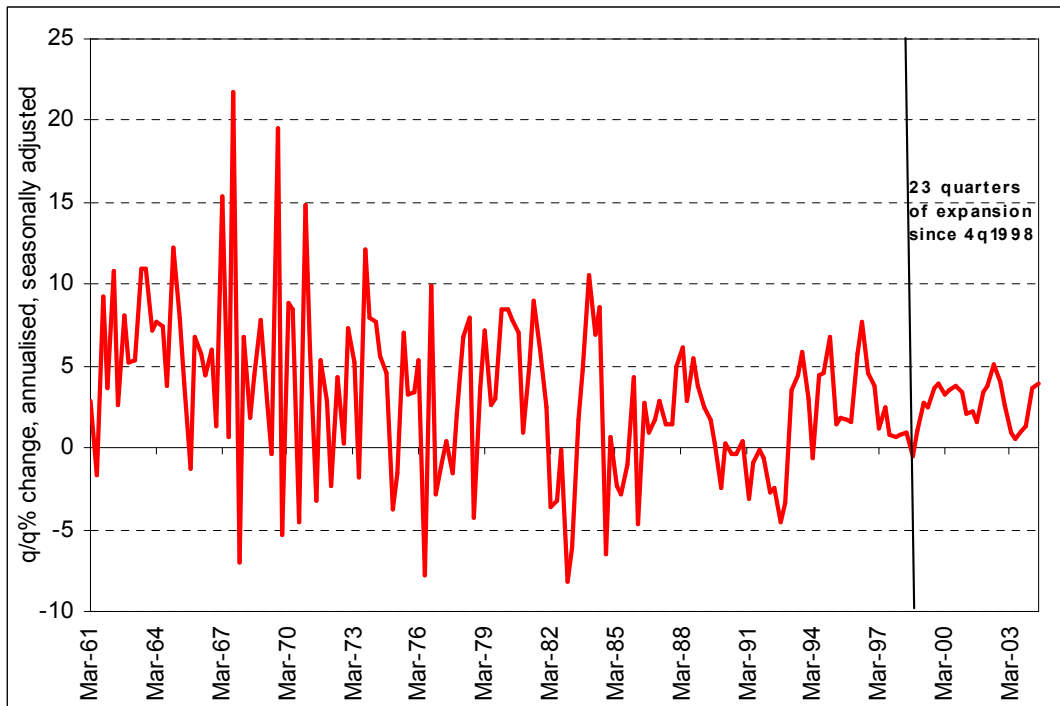


Figure 2 Quarter on quarter real GDP growth rate



Source: South African Reserve Bank, Quarterly Bulletin (September 2004)

### 3. PRINCIPLE COMPONENT ANALYSIS

A static factor model provides a description of the variance-covariance matrix of a set of random variables; the method of principle components is one implementation of this idea. A dynamic factor model provides a description of the spectral density matrix of a set of time series, and thus the factors describe contemporaneous and temporal co-variation among the variables<sup>7</sup>.

In this implementation, there are K dynamic, unobserved factors thought to characterize the temporal co-movements in the cross-country panel of economic time series. Let N denote the number of countries, M the number of time series per country, and T the length of the time series. Observable variables are denoted  $Y_{it}$  for  $i = 1 \dots M \times N$ ,  $t = 1 \dots T$ . There are two types of factors: N country-specific factors and the single common factor.

The macro time series data is from the I-net Bridge database and the McGregor BFA databank. Quarterly output, consumption and investment data of the countries for the period 1961(quarter 1) to 2003 (quarter 3) (except for Korea, where it is from 1971 (quarter 1) were used. M=3 per country for N=6 countries, with T=171 time series observations for each were used. In the procedure growth rates were used, which means the size of the country has no direct impact on the results. The econometric procedure that extracts common components does not for example distinguish between a 2% growth rate in the US and a 2% growth rate in SA.

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<sup>7</sup> ALEXANDER, C 2001: Market models – A guide to financial data analysis. Wiley: England.

The principle component method employed here is a standard method for extracting the most important uncorrelated sources of variation in a multivariate system<sup>8</sup>. One of the objectives of principle component analysis is to reduce the dimensions so that only the most important sources of information are used.

### 3.1 **The advantages of principle component analysis**

- Computational efficiency that results from the lack of correlation between the principle components and the dimension reduction from taking just a few of them.
- It provides a tractable and intuitive framework that will often aid understanding of the dynamics of market behaviour.

The principle component methods' objective is to reduce dimensionality by taking only the  $m$  principle component. This is useful in highly correlated systems because there will only be a few independent sources of variation and most of these can be explained by just a few principle components.

In this paper the changes in the business cycle during the period 1961-2003 will be studied. The principle component method was employed to estimate common components in main macroeconomic variables (output, consumption and investment). South Africa will be compared to the US, G7, Japan, UK and Korea. Using the model, common and country-specific factors will be estimated. These factors are used to quantify the relative importance of the

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<sup>8</sup> ALEXANDER, C 2001: Market models – A guide to financial data analysis. Wiley: England.

common and country components in explaining co-movement in each observable aggregate over three distinct periods: Bretton Woods (1960-1972 (quarter 2), period of common shocks (1972 (quarter 3)-1986 (quarter 2) and the globalization period (1986 (quarter 3)-2003 (quarter 3))<sup>9</sup>. This study uses two types of factors: namely, country-specific and then the benchmark – the G7 factor (the G7 countries include US, UK, Japan, France, Germany, Italy and Canada).

#### **4. RESULTS OF THE PRINCIPLE COMPONENT ANALYSIS FOR THE FULL SAMPLE**

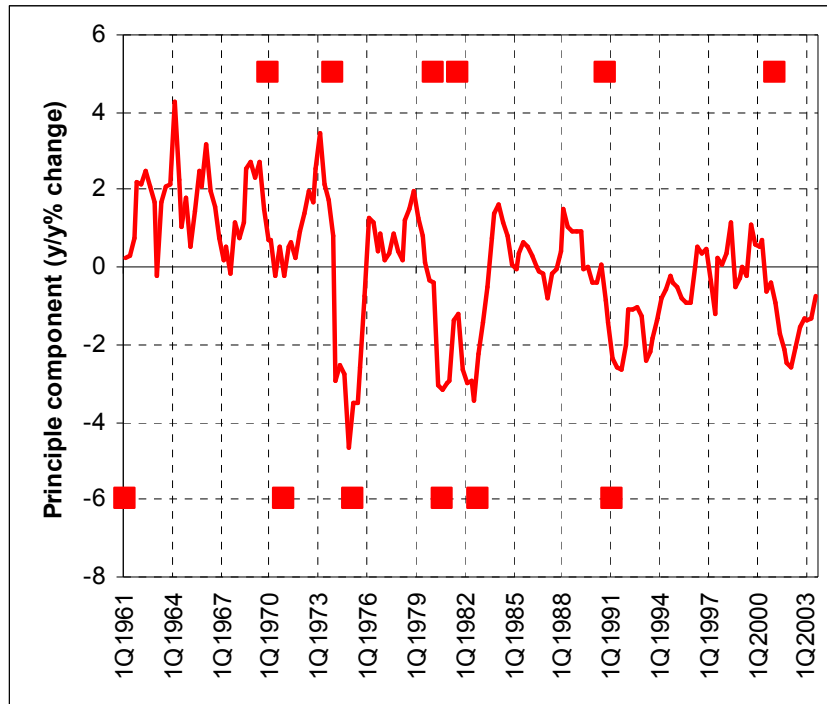
##### **4.1 The world cycle**

The G7 factor is the proxy for the world cycle. The G7 factor captures most of the major economic events. The G7 factor is consistent with the steady expansionary period of the 1960s, the boom in the early 70s, the recession in the mid-70s (first oil price shock), the recession in the early 80s (tight monetary policies of industrialized nations), the expansionary period of the late 80s, the recession of the early 90s, and the highly synchronized downturn of early 2000. The recovery in 2003 is also evident in this factor. This factor coincides with the NBER reference cycle (indicated by the red blocks).

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<sup>9</sup> KOSE, MA, OTROK, C & WHITEMAN, CH 2003. Understanding the evolution of world business cycles. Work in progress: Iowa Economic Research Institute.

Figure 3 G7 business cycle and the NBER reference dates



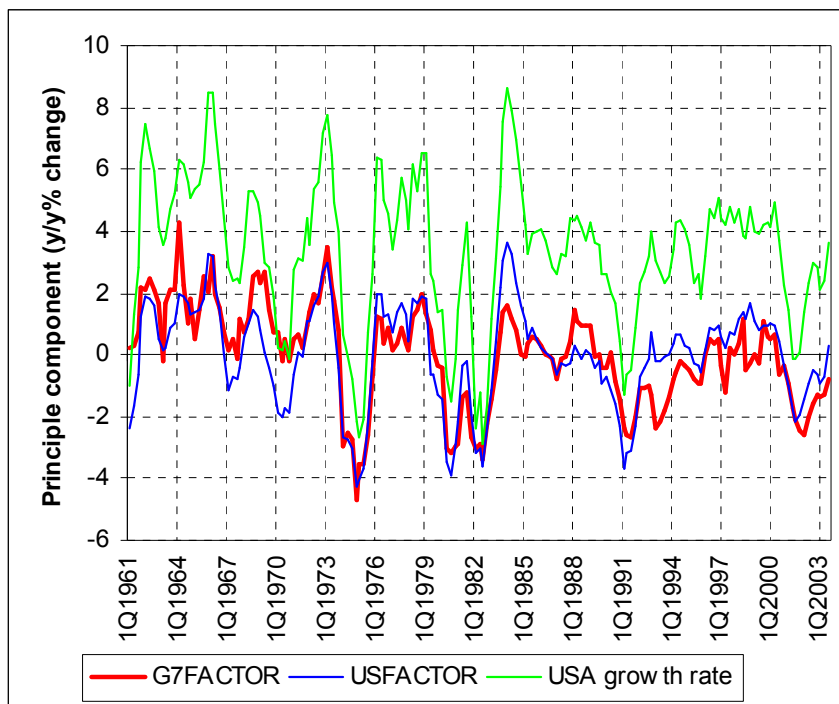
To see the interaction of country-specific factors with the world cycle, the figures that will follow present the G7 factor along with the country-specific factors and the growth rates of output. In each figure the blue line represents the country-specific factor and the green line the growth rate of output for each country.

#### 4.2 United States

Figure 4 indicates that several of the peaks and troughs of the US country factor coincide with the NBER reference cycle dates (NBER reference cycle dates: Troughs: Feb 1961, November 1970, March 1975, July 1980, November 1982, March 1991. Peaks: April 1960, December 1969, November 1973, January 1980, July 1981, July 1990, March 2001.

The G7 factor and the US country factor exhibit some common movements. However, there are some differences between the two factors. In the late 60s the US was contracting and the G7 was booming back to back. In the early 1970s the G7 was expansionary and the US contracting. In the mid-90s the US experienced an expansionary phase, while the G7 factor was contracting. Towards the end of the 90s the G7 factor was at a downturn, while the US was booming. The correlation between these factors is 81%, suggesting that the US represents an important source of G7 economic fluctuations.

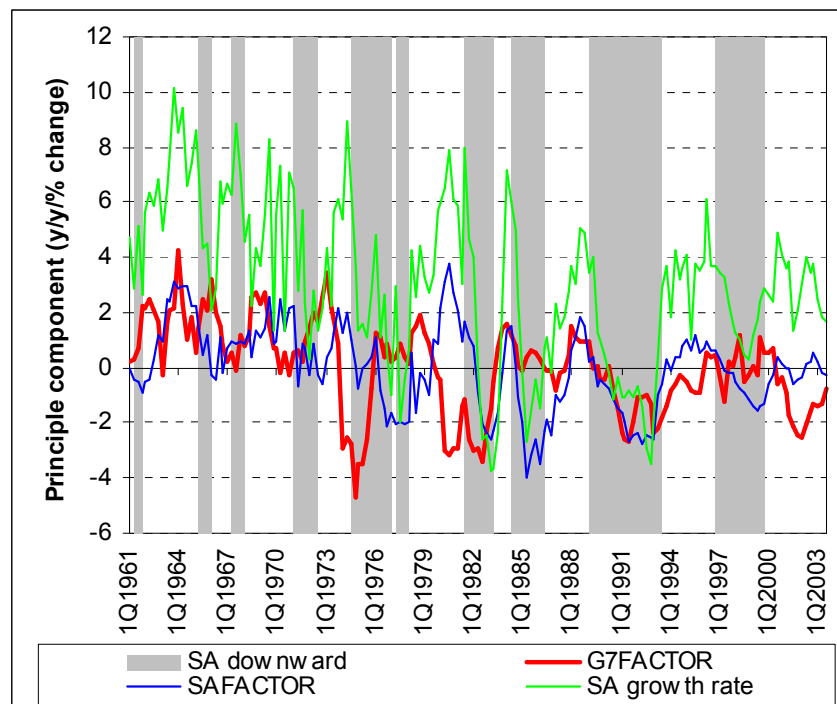
Figure 4 World factor and the US country factor



### 4.3 South Africa

The South African factor coincides with some of the downward phases of the G7 factor. There was a downward phase in 1982 and 1985 in South Africa but an expansion in the G7. This indicates that the downturn in the South African business cycle was country-specific. During the downward phase in 1991 the G7 factor and the South African factor coincided, but the G7 factor expanded towards the end of the phase. The same goes for the downward phase in 1997, where the G7 recovered more quickly than South Africa. The correlation between the world factor and SA is 18% for the full sample, meaning that most of the changes in the business cycle in South Africa are country-specific.

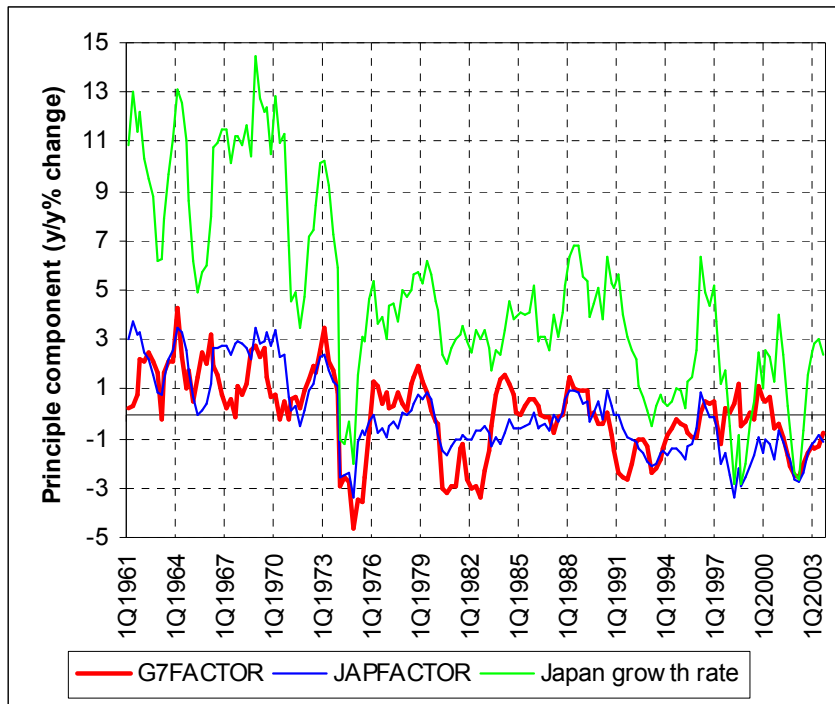
Figure 5 World factor and the SA country factor



### 4.4 Japan

There are some periods of co-movement between the world and Japan. The major difference between them is the boom in the late 60s in Japan, when the G7 factor was contracting; in the early 80s the situation was similar. The correlation between the two is 67%, suggesting that the G7 is an important source of fluctuations in Japan, although fluctuations in Japan have an important component not related to the world.

Figure 6 World factor and the Japan country factor

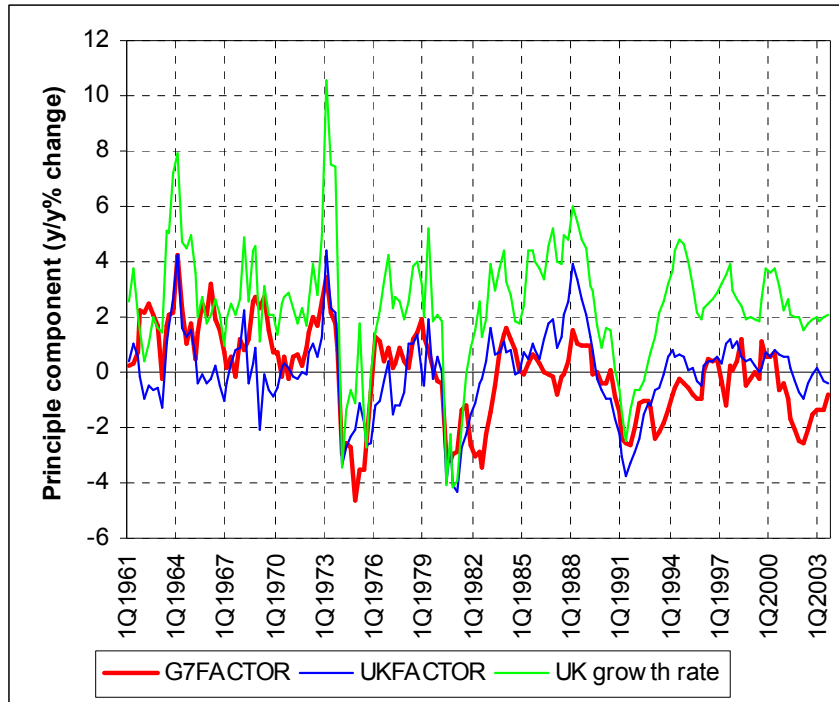


#### 4.5 United Kingdom

There is some co-movement between the UK and the world cycle. However, there are periods where changes are country-specific, such as in the late 60s, 80s and 90s. The correlation is 59%, meaning that fluctuations in the UK

business cycle can follow the world, but that there are definitely country-specific factors influencing the cycle.

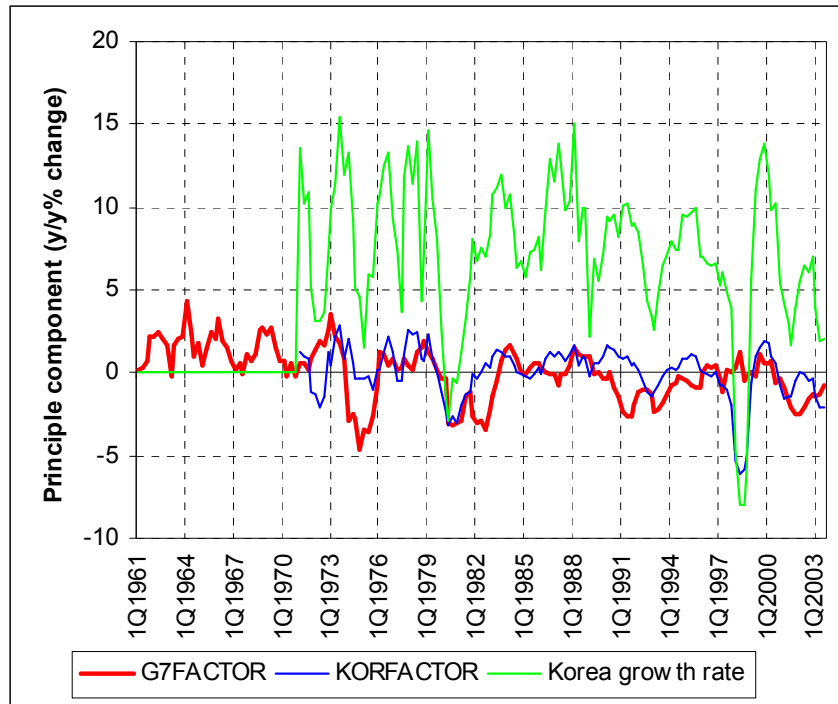
Figure 7 World factor and the UK country factor



#### 4.6 Korea

Korea, which is also an emerging market, has a correlation of 24% with the world factor, over the whole sample period. This suggests, as with South Africa, that fluctuations are more country-specific.

Figure 8 World factor and the Korea country factor



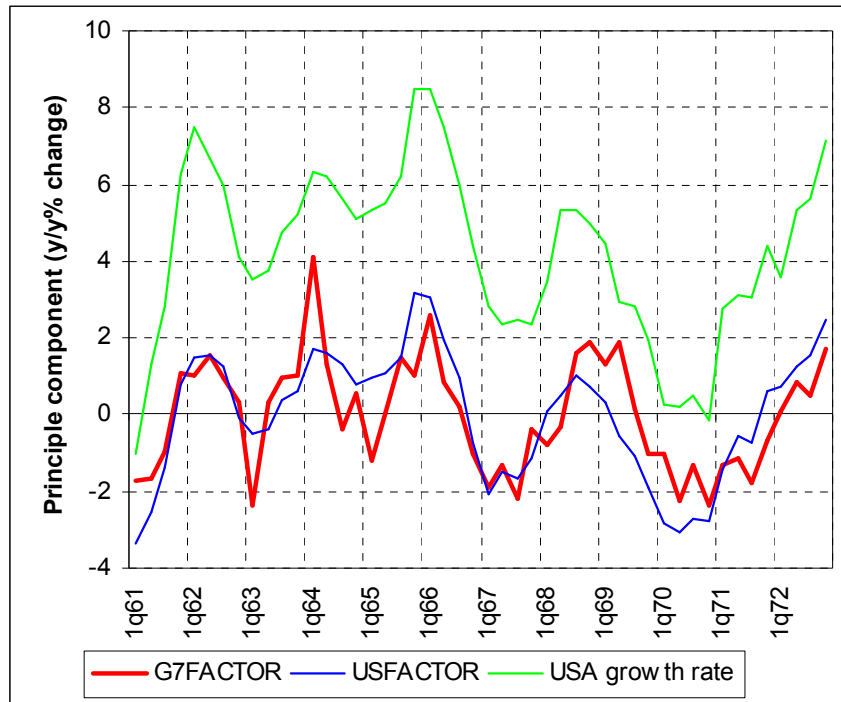
The results reported in this section suggest that to an extent that there are country-specific and worldwide sources of economic shocks, and that these play different roles at different points in time and around the globe. In some episodes, the country factor is more strongly reflective of domestic economic activity, while in others the domestic growth reflects the common worldwide pattern embodied in the G7 factor. It is important, however, to divide the full sample into sub-samples to take all the different financial systems, exchange rate regimes and globalization into account, in order to establish the changes in business cycles over time.

## 5. PRINCIPLE COMPONENT ANALYSIS FOR THE SUB PERIODS

First period: Bretton Woods period (first quarter 1961 – fourth quarter 1972)

### 5.1 United States

Figure 9 World factor and the US country factor: Bretton Woods period



The correlation between the world factor and the US factor (94%) is still high.

The graph clearly shows that the US growth rate is following the G7 factor.

### 5.2 South Africa

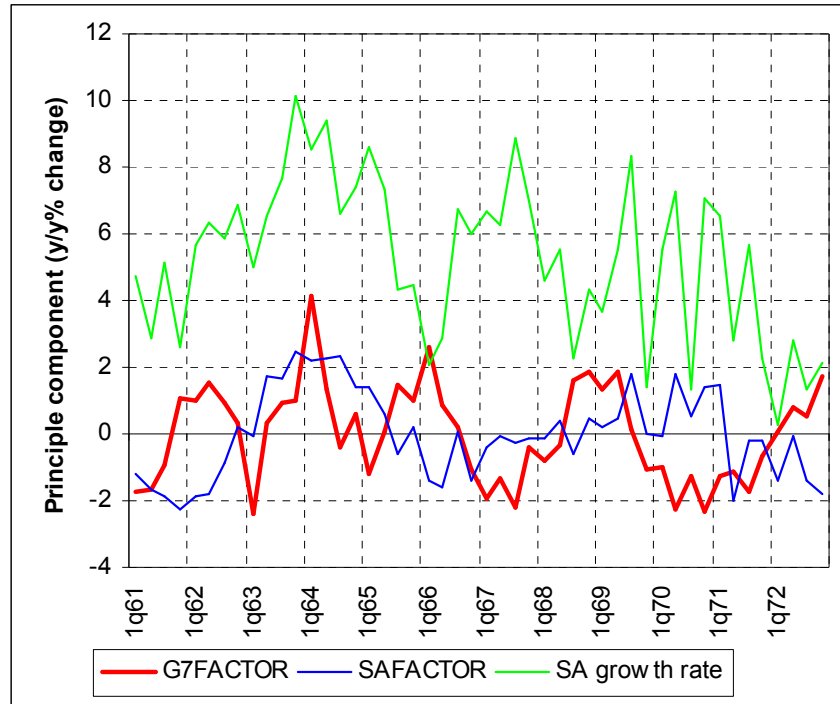
The correlation between the world factor and the South African factor is -45%.

This implies a negative weak relationship and this can be seen in Figure 10, where the world experiences a boom there is a recession in South Africa.

This might imply a lead-lag relationship between the world factor and the SA factor, but in some periods there is no such relationship. Therefore it can be

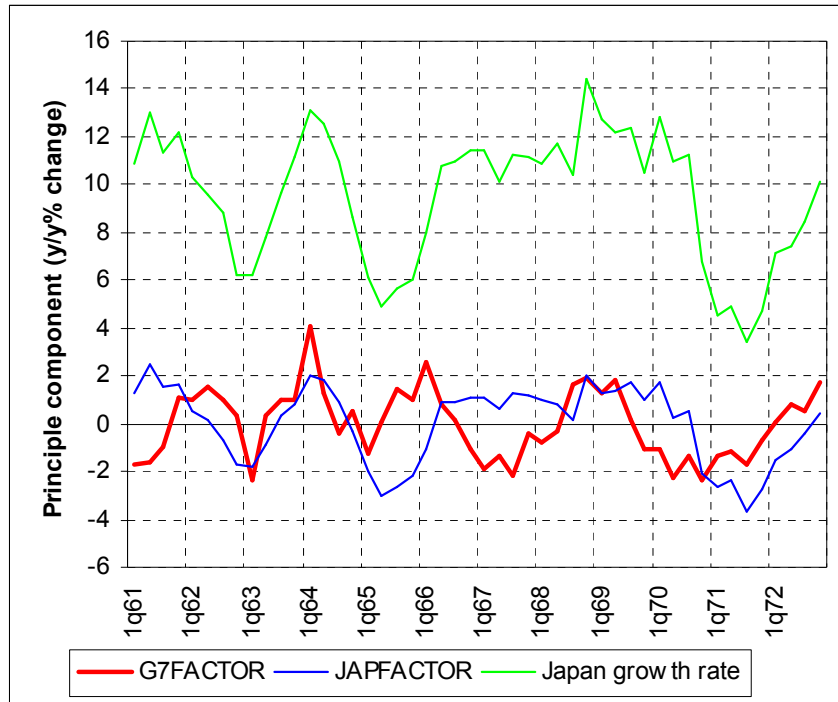
said that fluctuations in the South African business cycle during this period are due to country-specific shocks.

Figure 10 World factor and the SA country factor: Bretton Woods period



### 5.3 Japan

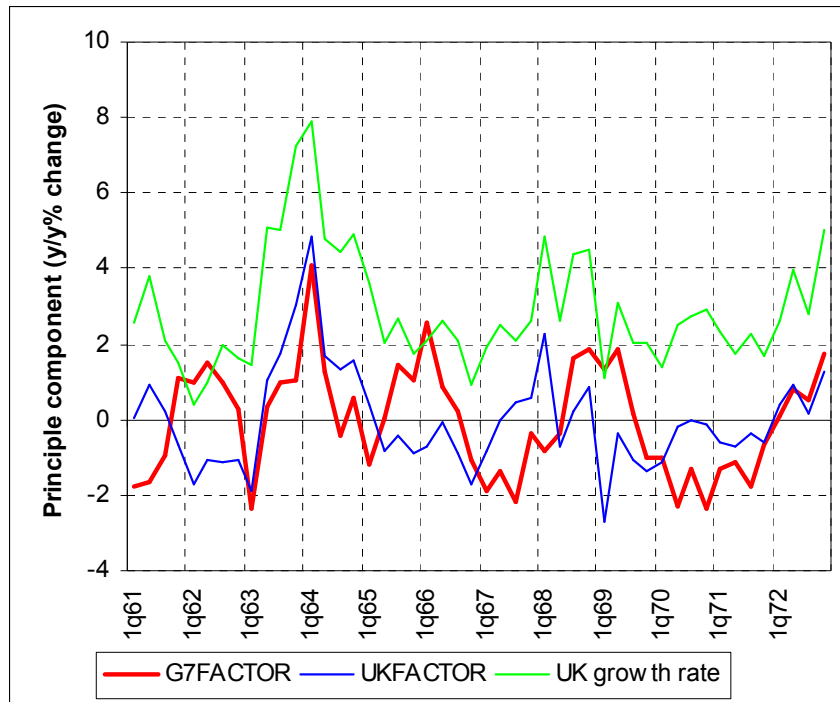
Figure 11 World factor and the Japan country factor: Bretton Woods period



The correlation between the Japanese factor and the world factor is 96%. The growth rate is thus following the G7 factor and this implies that the world has an influence on the Japanese cycle.

## 5.4 United Kingdom

Figure 12 World factor and the UK country factor: Bretton Woods period



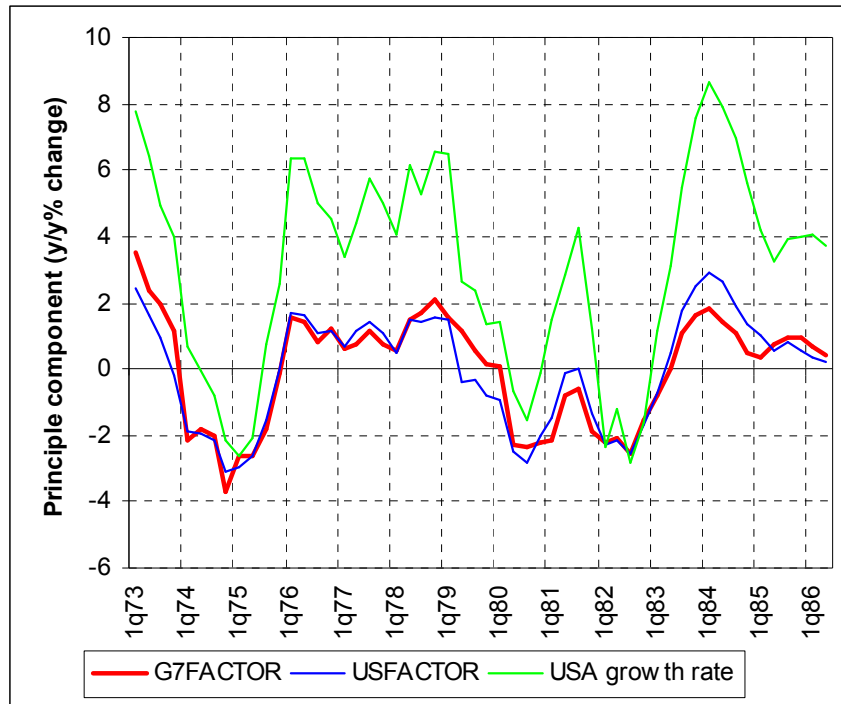
The correlation between the UK factor and the world is 92%. This implies a high co-movement between the UK factor and the world factor. The UK growth rate is therefore following the world cycle closely. Deviations of the UK factor from the world factor are probably due to consumption or investment.

## 6. SECOND PERIOD: COMMON SHOCK PERIOD (FIRST QUARTER 1973 – SECOND QUARTER 1986)

### 6.1 United States

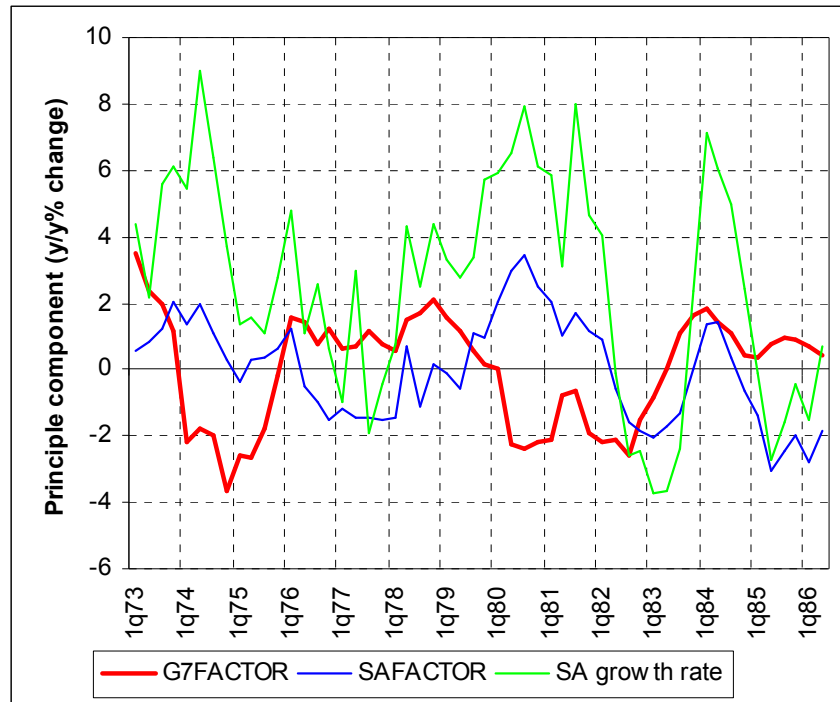
The correlation between the world factor and the US factor is 93% and from the graph it is clear that there is co-movement. There is no difference between the Bretton Woods period and the shock period. The US is following the world cycle.

Figure 13 World factor and the US country factor: Common shock period



## 6.2 South Africa

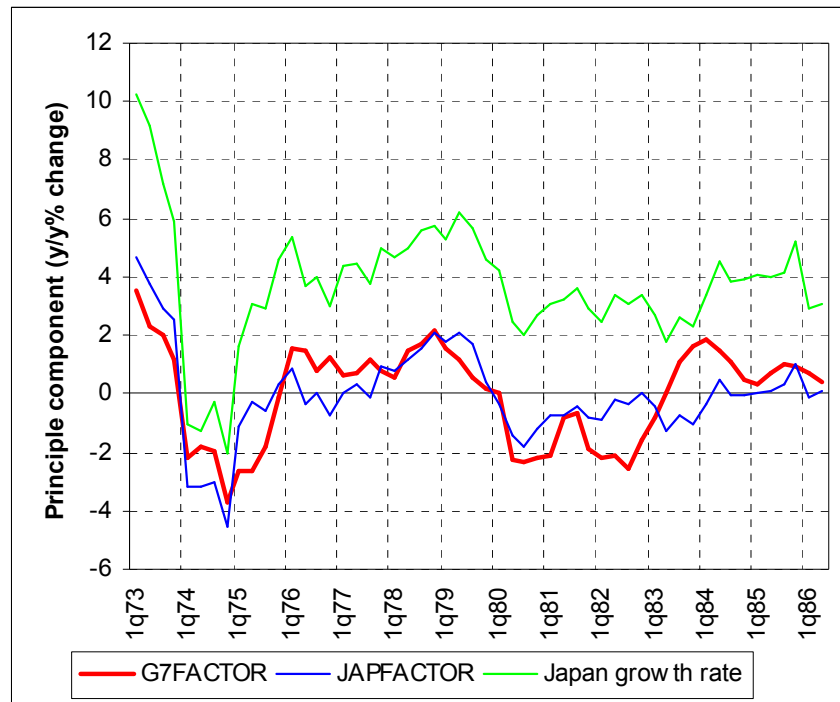
Figure 14 World factor and the SA country factor: Common shock period



The correlation between the SA factor and the world factor is still negative at 27%, implying that when the world is in recession SA is in a boom (the world factor is leading the SA factor with one period). The negative correlation is a result of the closed economy during this period in South Africa, specifically the political sanctions during the 1980s.

### 6.3 Japan

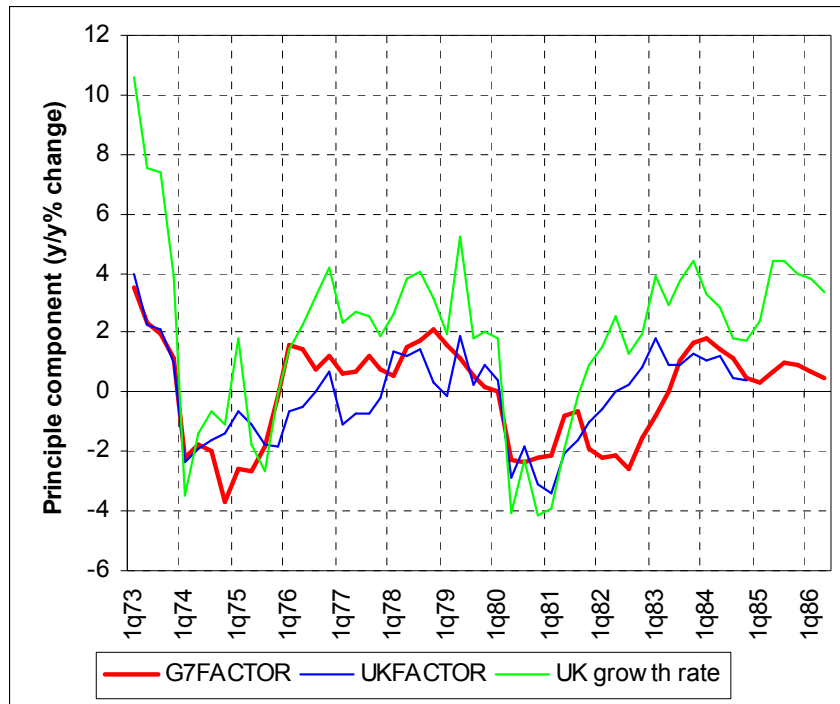
Figure 15 World factor and the Japan country factor: Common shock period



During this period the relationship between the world and Japan's factor is weaker than in the previous period (74%), implying that country-specific factors played a role during this period. The change in the correlation may be because the OPEC recession hit harder and faster in Japan than in the rest of the world, reflecting Japan's strong dependence on imported oil.

## 6.4 United Kingdom

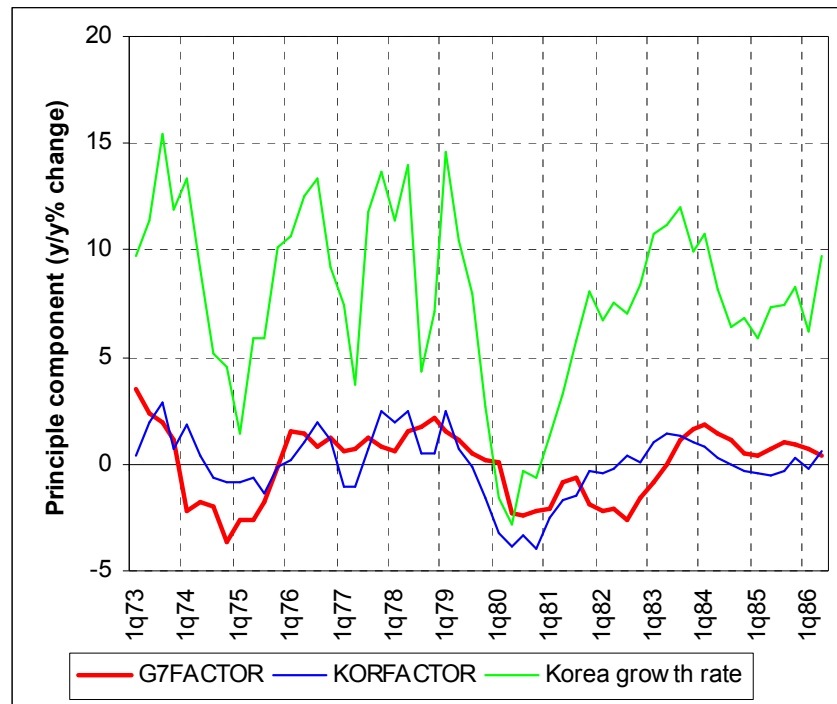
Figure 16 World factor and the UK country factor: Common shock period



The correlation during this period dropped to 70%, indicating that some of the fluctuations in the cycle were country-specific.

## 6.5 Korea

Figure 17 World factor and the Korea country factor: Common shock period



There is co-movement between the Korean factor and the world factor at 53%. This emerging market moves more closely with the world than South Africa. The reason for this is that Korea liberalized its economy earlier than South Africa did.

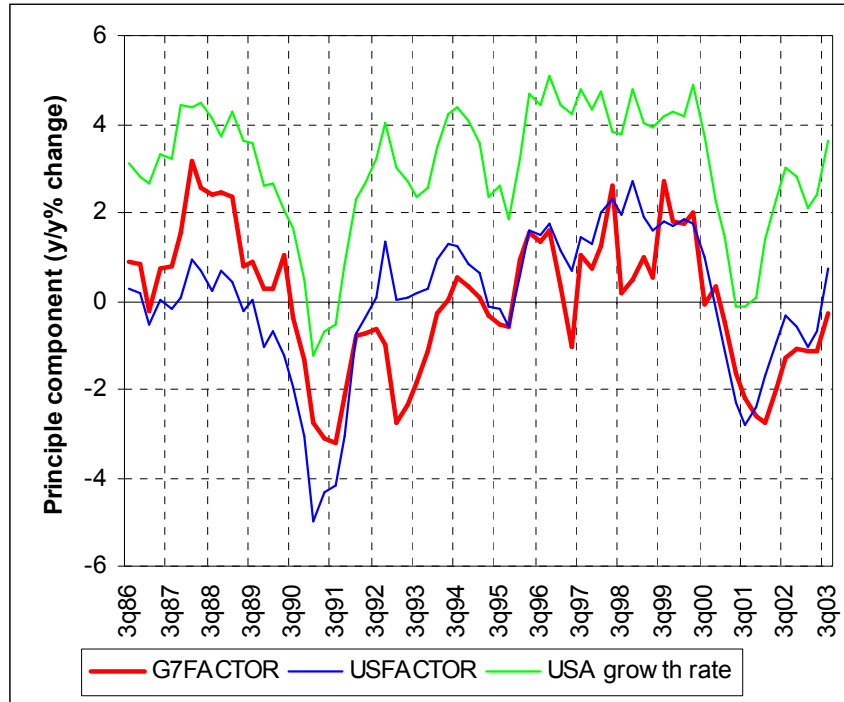
## 7. THIRD PERIOD: GLOBALIZATION PERIOD (THIRD QUARTER 1986 – THIRD QUARTER 2003)

### 7.1 United States

The correlation is 71% between the world factor and the US factor in this period. This is lower than in the common shock period, meaning that in this globalization period some of the fluctuations in the US business cycle were

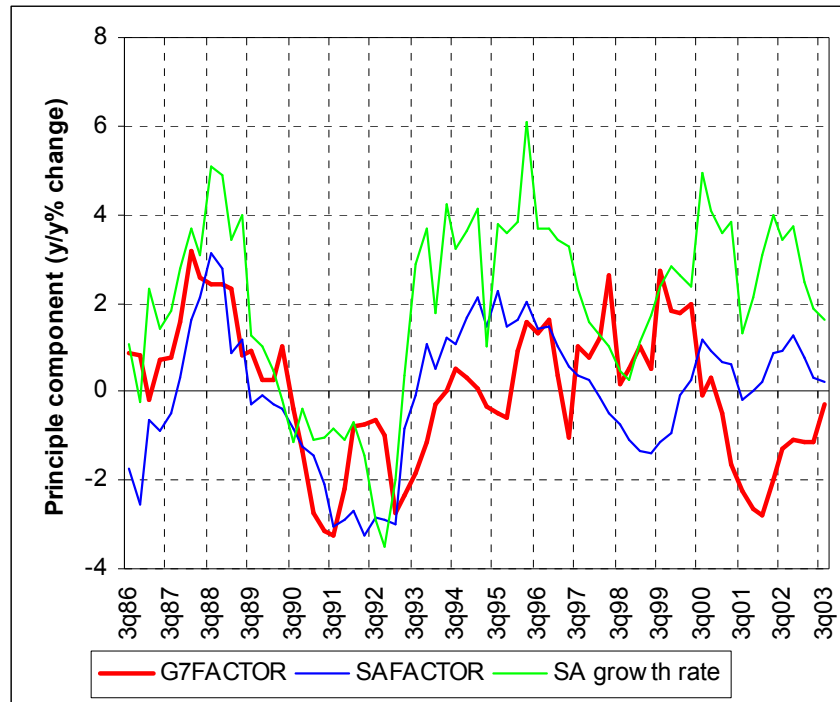
country-specific. These country-specific fluctuations can be seen in the third quarter of 1993 and between the third quarter 1998 and the third quarter 1999.

Figure 18 World factor and the US country factor: Globalization period



## 7.2 South Africa

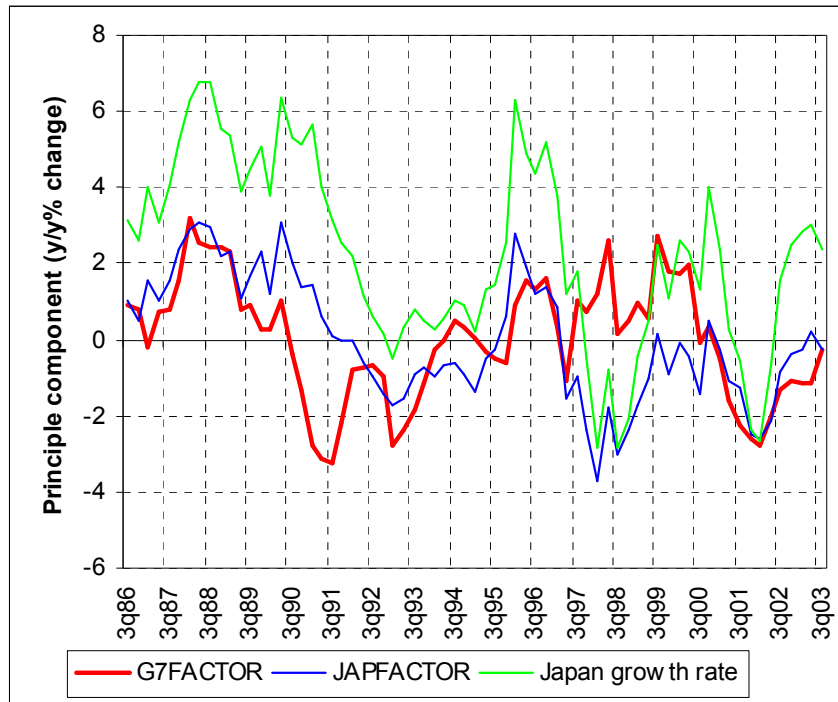
Figure 19 World factor and the SA country factor: Globalization period



The correlation between the world factor and the South African factor is positive in this period at 38%. This implies some co-movement between South Africa and the world cycle, with some fluctuations due to country-specific fluctuations. From 1986 to 1997 there was co-movement in the sense that the SA factor was booming when the world economy was booming. From the end of 1997 this changed again to a negative relationship which can be attributed to the Asian crisis and the crisis in Argentina in 2001, which spilled over to emerging markets.

### 7.3 Japan

Figure 20 World factor and the Japan country factor: Globalization period

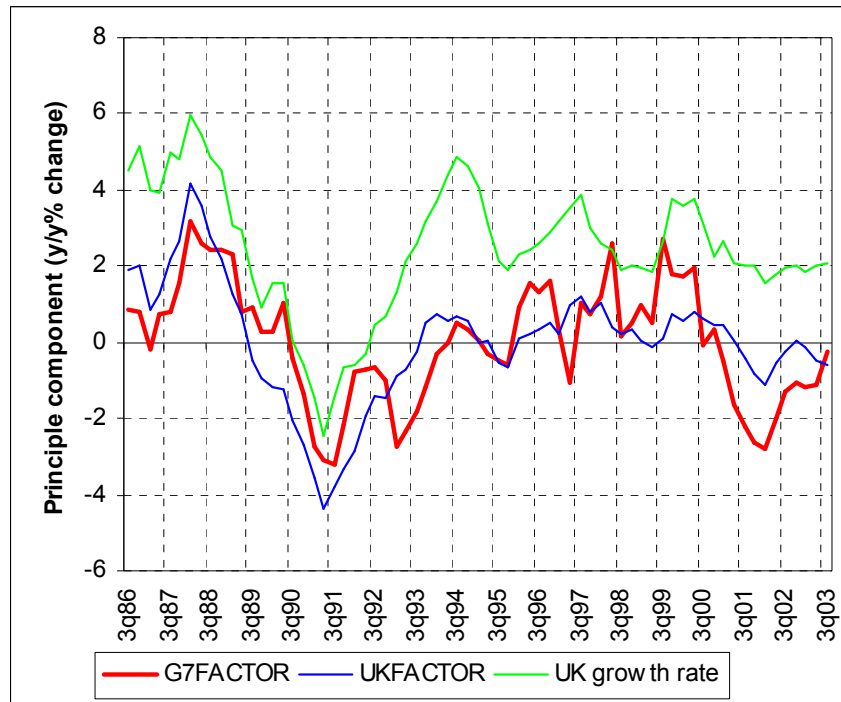


The correlation between Japan and the world dropped to 40%. During this period most of the variations in the Japanese factor were country-specific. This makes economic sense as the Japanese economy was in recession for most of the late 90s, when the world was booming. The recovery was slower than that of the world after the global downturn in 1998.

## 7.4 United Kingdom

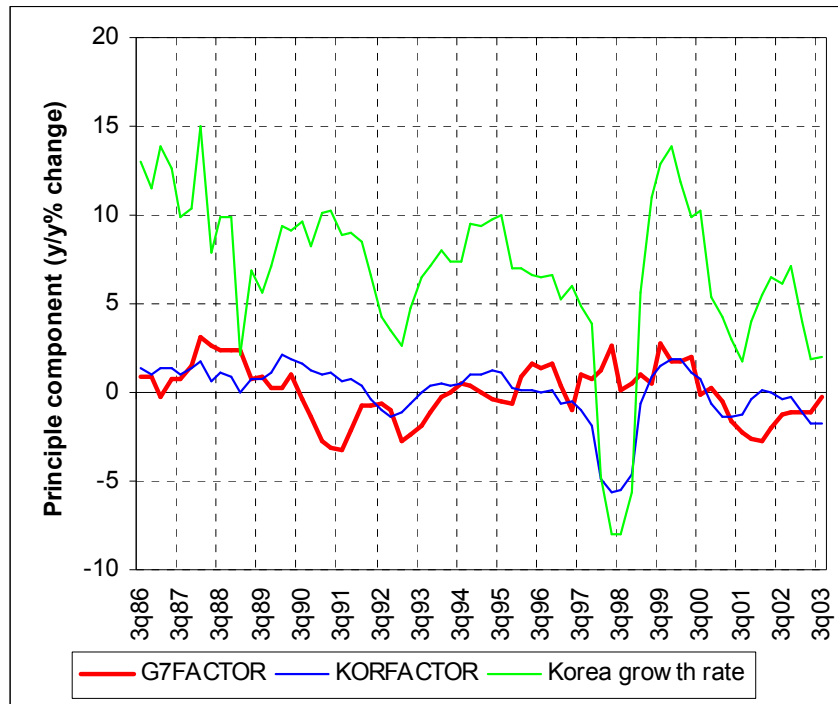
The correlation between the world factor and the UK factor is 72%. There is no difference from the shock period. This still implies that most of the movement in the UK factor is due to fluctuations in the world factor.

Figure 21 World factor and the UK country factor: Globalization period



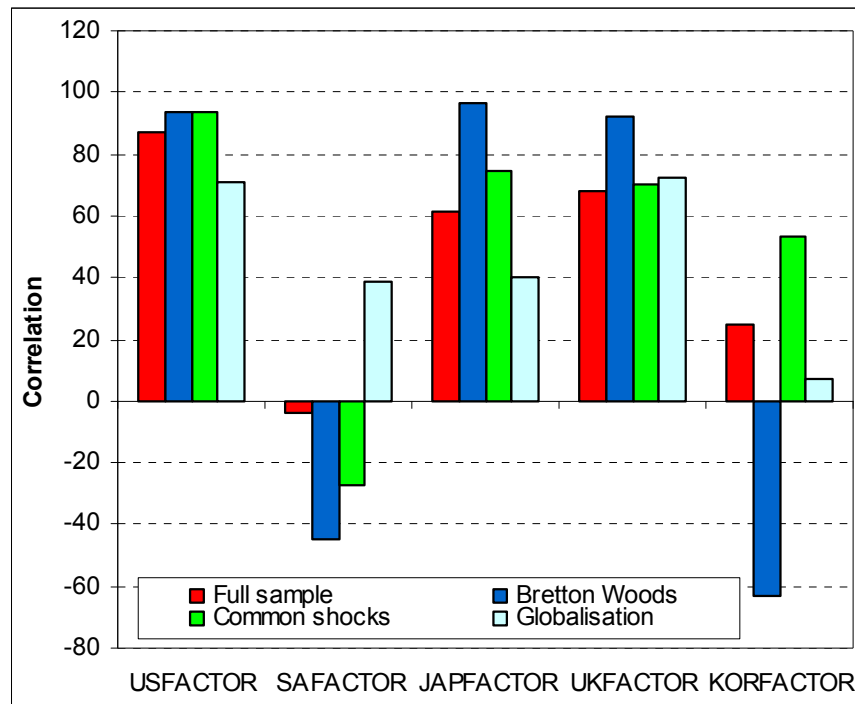
## 7.5 Korea

Figure 22 World factor and the Korea country factor: Globalization period



The correlation is 6%. Most of the fluctuations during this period were country-specific. This lower co-movement is due to the Asian crisis in 1997/98. This reiterates that, as with South Africa, Korea is an emerging market, and is seen as a risk, and is still paying the price of liberalizing later than other countries.

Figure 23 Correlations of country factors with the world factor



From the correlations it is evident that the correlations between the world and the country factors changed over time. The changes are not that marked in the more advanced economies (US, UK, Japan), but in the emerging markets there was a lot of change. This may be a result of greater financial liberalization leading to higher correlations between business cycles<sup>10</sup>.

From the previous section it is clear that there are periods of co-movement between the countries and the world. Increased integration could also affect the dynamics of co-movement by changing the nature and frequency of the shocks<sup>11</sup>. The following should be noted:

<sup>10</sup> IMBS, J 2002: Trade, finance, specialization synchronization. Working paper: London Business school.

<sup>11</sup> KOSE, MA, OTROK, C & WHITEMAN, CH 2003. Understanding the evolution of world business cycles. Work in progress: Iowa Economic Research Institute.

- As trade and financial linkages get stronger, the need for a higher degree of policy coordination might increase, which in turn raises the correlations between shocks associated with nation-specific fiscal and/or monetary policies. This has a positive impact on business cycle synchronization.
- Shocks pertaining to changes in productivity could become more correlated, if increased trade and financial integration leads to an acceleration in knowledge and productivity spillovers across countries.
- Increased financial integration and developments in communication technologies lead to faster dissemination of new shocks through financial markets.

## **8. REASONS FOR CO-MOVEMENT**

The interactions of profits, investment, credit and the financial markets are enduring features of market economies which play a central role in business cycles. The increasing global integration of capital, goods and financial markets is widely believed to have led to more interdependencies between national business cycles (Bordo and Helbling: 2003).

Institutional changes such as free capital mobility, floating exchange rates, and the increase in international arbitrage and speculative activities have increased interdependence among the major capitalist nations, which is likely to lead to more synchronization of cycles<sup>12</sup>.

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<sup>12</sup> BORDO, MD & HELBLING, T 2003: Have national business cycles become more synchronized? National Bureau Of Economic Research, Working paper 10130.

The correlation between business cycle synchronization and integration is not necessarily positive. Stronger trade integration may lead to greater regional specialization, which can lead to less output synchronization, with industry-specific shocks<sup>13</sup>. Increased financial integration might be an endogenous reaction to the regionalization of real sector linkages, as the latter allows for gains from global asset diversification. Less correlated shocks (real regionalization) and endogenous financial development are needed to account for the changes in the international business cycle, because of globalization there is less international co-movement<sup>14</sup>.

There are conflicting results regarding the linkages between the business cycles of industrialized countries<sup>15</sup>. The case against synchronization was

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<sup>13</sup> BORDO, MD & HELBLING, T 2003: Have national business cycles become more synchronized? National Bureau Of Economic Research, Working paper 10130.

<sup>14</sup> HEATHCOTE, J & PERRI, F 2002: Financial globalization and real regionalization. National Bureau of Economic Research: Working Paper 9292.

<sup>15</sup> HELBLING, T & BAYOUMI, T 2003: Are they all in the same boat? The 2000-2001 growth slowdown and the G7 and business cycle linkages. Manuscript: International Monetary Fund.

posited by Doyle and Faust in 2002<sup>16</sup>. However, studies using dynamic factor models found increased linkages<sup>17</sup>.

The notion of business cycles becoming more synchronized across countries captures the observation that the timing and magnitudes of major changes in economic activity appear increasingly similar<sup>18</sup>. Harding and Pagan<sup>19</sup> proposed a definition of cross-country synchronization, which is an offspring of the traditional concepts developed by the NBER in the 1920. They argue that if cycles are synchronized their turning points will occur more or less at the same time. They derived the statistical measure-concordance correlation, which determines if national cycles are significantly synchronized. This approach boils down to national business cycles being in the same phase at about the same time. Some researchers think the NBER approach is too atheoretical. To test synchronization they instead use standard correlations and factor-based measures. The real GDP as a measure of the business

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<sup>16</sup> DOYLE, B & FAUST, J 2002: An investigation of co-movement among the growth rates of the G-7 countries. Federal Reserve bulletin, October: Federal Reserve Board.

<sup>17</sup> KOSE, MA, OTROK, C & WHITEMAN, CH 2003. Understanding the evolution of world business cycles. Work in progress: Iowa Economic Research Institute.

<sup>18</sup> BORDO, MD & HELBLING, T 2003: Have national business cycles become more synchronized? National Bureau Of Economic Research, Working paper 10130.

<sup>19</sup> HARDING, D & PAGAN, AR 2002: Dissecting the cycle: A methodological investigation. Journal of monetary economics, 49(2), March 2002: 363-381.

cycle are used rather than the synthetic reference cycle series used by the NBER<sup>20</sup> & <sup>21</sup>.

## 9. VARIANCE DECOMPOSITION FOR THE FULL SAMPLE

To measure the relative contributions of the world, country and particular factors to variations in aggregate variables in each country the share of the variance of each macroeconomic aggregate due to each factor will be estimated. For each sub-period the variance decompositions that decompose the fraction of variance of each macroeconomic aggregate that is attributable to the G-7 factor, the country factor or the idiosyncratic component is calculated.

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<sup>20</sup> HARDING, D & PAGAN, AR 2003: A comparison of the business cycle dating methods. Journal of economic dynamics and control, 27(9) July 2003: 1681-1690.

<sup>21</sup> STOCK, JH & WATSON, MW 2003. Understanding changes in international business cycle dynamics. National Bureau of Economic Research: Working paper 9859.

**Table 1 Variance decomposition: Full sample: first quarter 1961-  
third quarter 2003**

<b>COUNTRY</b>	<b>VARIABLE</b>	<b>WORLD</b>	<b>COUNTRY</b>	<b>IDIOSYNCRATIC</b>
<b><i>US</i></b>	Output	46	44	9
	HH*	35	39	26
	INV**	36	50	14
<b><i>South Africa</i></b>	Output	10	60	30
	HH	6	65	29
	INV	2	65	34
<b><i>Japan</i></b>	Output	28	65	7
	HH	27	54	19
	INV	25	54	21
<b><i>Korea</i></b>	Output	2	87	12
	HH	0	71	29
	INV	2	66	32
<b><i>UK</i></b>	Output	34	49	17
	HH	12	57	32
	INV	15	46	39

Source: Eviews output

\*Household spending

\*\*Investment

From the full sample it can be concluded that variations in output in the US are due to country and world factors. Household spending can be equally

explained by world and country factors and 26% are explained by the idiosyncratic variable.

Fluctuations in output in South Africa are due to country-specific factors and the variable itself: this might be due to the very late financial liberalization in this country. Household spending is mostly influenced by country factors and investment is due to more country-specific components.

In Japan output can be explained by the country factor and to a lesser extent by the world. Household spending is also mainly due to the country factor but equally explained by the variable itself and the world. The same holds for investment in Japan.

The variations explained in Korea are very similar to those in South Africa. This is due to the fact that both countries are emerging markets and liberalized their financial systems later than the developed markets. In Korea most variations in output can be explained by the country factor and most of household spending and investment is explained by the country factor, with some of the variation being due to the variables themselves.

In the UK the world factor explains about 30% of the variation in output and 49% is because of the country factor. In household spending most of the variation is due to the country factor and the variable itself, with about 10% being explained by the world factor. Investment is also explained mostly by the country and the variable itself, and about 15% is due to the world factor.

The most important results from this table are that the world factor differs quite significantly across countries. The world factor plays a more important role in volatility in the business cycle in the US, UK and Japan. In SA and Korea the country-specific factor is more important in explaining variations in the

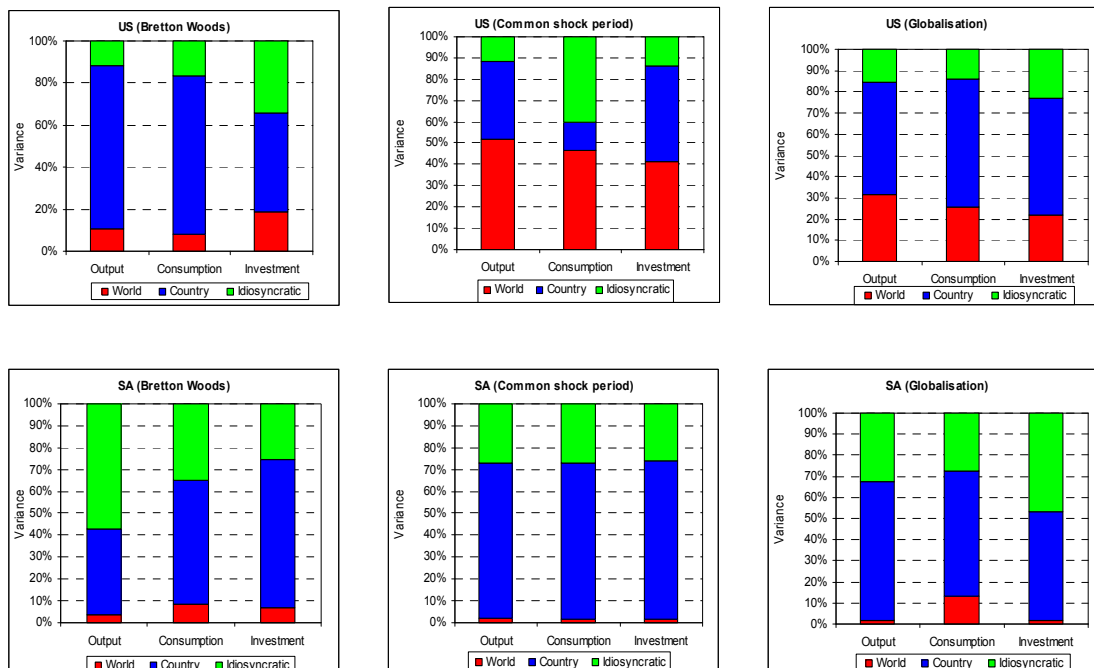
business cycle. This shows the difference between more advanced economies and emerging markets.

In the previous sections the importance of the world factor was showed to vary over time in explaining time series patterns of fluctuations in output. This section shows that the impact of the world and country factor differs across macroeconomic aggregates. The next section explains how their role in explaining the volatility of these aggregates changes over time.

## **10. THE CHANGING NATURE OF BUSINESS CYCLES**

To study the evolution of the roles played by the world (G7) and country-specific factors in driving business cycles the full sample were divided into distinct sub-samples. Factor models for each sub-period were estimated; in this section variance decompositions were calculated that decompose the fraction of variance of each macroeconomic aggregate that is attributable to the world factor, the country factor or the idiosyncratic component. To make the results more comparable the variances explained by each component are graphically presented in Figure 24.

Figure 24 Variances explained by each component



The world factor played a greater role in explaining variations in the shock period. The country-specific factor is still very prominent in explaining the business cycle in all three sub-periods. However this factor increased in the globalization period in all the countries except in South Africa, where it declined from 70% to about 60%.

**Table 2 Variance decomposition: Bretton Woods period**

<b>COUNTRY</b>	<b>VARIABLE</b>	<b>WORLD</b>	<b>COUNTRY</b>	<b>IDIOSYNCRATIC</b>
<b><i>US</i></b>	Output	11	77	12
	HH	8	75	17
	INV	19	47	34
<b><i>South Africa</i></b>	Output	3	39	57
	HH	8	57	35
	INV	7	68	25
<b><i>Japan</i></b>	Output	36	60	3
	HH	29	45	25
	INV	16	60	25
<b><i>Korea</i></b>	Output	<i>No data available</i>	<i>No data available</i>	<i>No data available</i>
	HH	<i>No data available</i>	<i>No data available</i>	<i>No data available</i>
	INV	<i>No data available</i>	<i>No data available</i>	<i>No data available</i>
<b><i>UK</i></b>	Output	9	69	21
	HH	13	28	59
	INV	8	63	28

Source: Eviews output

**Table 3 Variance decomposition: Common shock period**

<b>COUNTRY</b>	<b>VARIABLE</b>	<b>WORLD</b>	<b>COUNTRY</b>	<b>IDIOSYNCRATIC</b>
<b><i>US</i></b>	Output	52	37	12
	HH	46	14	40
	INV	41	45	14
<b><i>South Africa</i></b>	Output	2	71	27
	HH	1	72	27
	INV	1	73	26
<b><i>Japan</i></b>	Output	47	37	15
	HH	32	49	19
	INV	46	34	21
<b><i>Korea</i></b>	Output	11	75	14
	HH	7	76	17
	INV	3	54	43
<b><i>UK</i></b>	Output	58	27	15
	HH	23	60	18
	INV	7	46	47

Source: Eviews output

**Table 4 Variance decomposition: Globalization period**

<b>COUNTRY</b>	<b>VARIABLE</b>	<b>WORLD</b>	<b>COUNTRY</b>	<b>IDIOSYNCRATIC</b>
<b><i>US</i></b>	Output	31	53	15
	HH	25	61	14
	INV	22	55	23
<b><i>South Africa</i></b>	Output	2	66	32
	HH	13	60	27
	INV	1	52	47
<b><i>Japan</i></b>	Output	18	61	21
	HH	15	71	14
	INV	20	52	28
<b><i>Korea</i></b>	Output	1	87	13
	HH	0	81	19
	INV	5	66	30
<b><i>UK</i></b>	Output	8	69	23
	HH	3	70	27
	INV	17	50	33

Source: Eviews output

### **10.1 Variance of output explained for each country**

For all the countries, except SA (and Korea – for lack of data) there is a significant increase in the variance of output explained by the G7 factor in the common shock period relative to the first period. However, moving from the common shock period to the globalization period, the variance explained by the G7 factor has declined in all countries, except in South Africa where it stayed the same except for consumption which rose to 13%.

For the US the G7 factor is more important in the globalization period than in the Bretton Woods period, where in Japan and in South Africa it is less important than in the Bretton Woods period. In the UK it is more or less the same. Even though no data is available for Korea during the Bretton Woods period, the G7 factor is almost non-existent during the globalization period. A possible explanation for this might be that while the US liberalized its capital accounts in the 70s, the other countries did not remove all of the barriers on capital account transactions until the beginning of the 90s. Thus the effect of financial integration was felt early during the common shock period for the US but for the other countries the full impact of financial reforms occurred only during the globalization period.

The lower variance in the globalization period than the Bretton Woods period might be due to the financial crisis in 1997 and 2001, which hit the emerging markets the hardest: in other words, business cycles in these countries have been mostly driven by domestic forces during the period of globalization.

### **10.2 Variance of consumption explained for each country**

To evaluate the consumption explained by the G7 factor, the first and third period will be compared (to isolate the role of globalization in driving the degree of co-movement).

The following question should be answered: what is the impact of increased financial linkages on the degree of co-movement in consumption fluctuations? In the US and SA the variance of consumption due to the G-7 factor in the globalization period has risen relative to the first period. This is consistent with theory posited by Cole in 1993, where financial integration reduces the impact of wealth effects associated with a country's own productivity shocks while it increases the wealth effects of productivity shocks abroad.

These changes increase the cross-country consumption correlations. Increasing financial linkages could also increase the degree of consumption co-movement as they stimulate specialization of production through the reallocation of capital in a manner consistent with countries' comparative advantage in the production of different goods<sup>22</sup>.

### **10.3 Variance of investment explained for each country**

The G-7 factor becomes more important in explaining investment variation over time. The variance of investment captured by the G-7 factor has increased in US, Japan and the UK but not in SA.

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<sup>22</sup> KOSE, MA, OTROK, C & WHITEMAN, CH 2003. Understanding the evolution of world business cycles. Work in progress: Iowa Economic Research Institute.

The country factor becomes less important in explaining the variance of output in the US in the globalization period relative to the first period, and it is more or less the same in the UK.

In investment the country factor becomes less important in South Africa, Japan and the UK, and the US is a little higher in the globalization period relative to the first period. These results are consistent with the findings of several recent studies documenting that there has been a decrease in the degree of business cycle synchronization from the common shock period to the globalization period. For investment, the G7 factor becomes more important over time.

## **11. WHAT ARE THE SOURCES OF CHANGES IN THE BUSINESS CYCLE?**

In the previous section the changes in the degree of co-movement across countries and the importance of the world factor in each period have been documented. Increased financial and trade linkages played a role in explaining these developments.

It is important to understand how the roles of different types of shocks in explaining these developments change over time. The effect of including source variables (monetary policy, fiscal policy, terms of trade and oil prices) on the variance decompositions reported earlier will be tested. Thus  $Y_t$  does not depend only on the G7 and the country factors but also on monetary, fiscal, terms of trade and oil variables.

In the second analysis the more traditional impulse response functions often used in VAR analysis is employed. Here the response of a country factor to shocks that originate in a particular country is measured.

**11.1 Variance decompositions of different sources of changes in the business cycle**

Government spending, oil prices and terms of trade are all entered as log first differences and interest rates entered in levels.

If Table 1 and 5 are compared it is evident that the country-specific factors change almost significantly across all variables. Apparently the variables added as source variables are most useful in explaining the variation that is country-specific to many of the time series.

**Table 5 Variance decomposition of the sources of changes in the business cycle: Full sample: first quarter 1961- third quarter 2003**

VARIABLE	WORLD	COUNTRY	OIL	T OF T*	G EXP**	I RATE***	IDIO****
<b>UNITED STATES</b>							
OUTPUT	50	31	5	5	0	3	6
HH	40	18	4	9	0	5	22
INV	35	40	6	7	2	2	9
<b>SOUTH AFRICA</b>							
OUTPUT	3	51	2	4	1	11	29
HH	2	61	0	0	0	9	27
INV	1	51	1	1	4	5	38

JAPAN							
OUTPUT	30	46	1	2	1	8	12
HH	26	46	3	3	2	3	16
INV	22	37	1	5	1	11	24
KOREA							
OUTPUT	0	71	2	13	2	1	11
HH	0	56	1	12	2	0	28
INV	2	44	1	18	3	2	31
UNITED KINGDOM							
OUTPUT	37	40	5	2	2	2	11
HH	16	56	2	1	3	3	19
INV	14	36	2	2	7	0	38

Source: Eviews output

\*Terms of trade \*\*Government expenditure

\*\*\*Interest rate

\*\*\*\*Idiosyncratic component

**Table 6 Variance decomposition (including sources of changes in the business cycle): Common shock period**

VARIABLE	WORLD	COUNTRY	OIL	T OF T	G EXP	I RATE	IDIO
UNITED STATES							
OUTPUT	35	35	8	5	1	11	6
HH	41	11	6	6	7	11	18
INV	31	37	5	6	1	8	12
SOUTH AFRICA							
OUTPUT	4	57	1	2	1	10	25

HH	2	54	3	1	3	8	29
INV	3	54	3	6	1	8	25
<b>JAPAN</b>							
OUTPUT	17	24	9	11	10	13	17
HH	21	32	8	20	4	3	10
INV	8	31	11	7	6	17	20
<b>KOREA</b>							
OUTPUT	3	63	3	12	3	5	11
HH	1	51	4	13	4	10	16
INV	3	31	2	26	4	4	30
<b>UNITED KINGDOM</b>							
OUTPUT	41	19	12	8	4	4	11
HH	21	45	9	4	8	1	12
INV	10	43	3	7	0	1	35

Source: Eviews output

All the factors declined in this period compared to Table 3. This is an indication that the source variables added explain the changes in the business cycle.

**Table 7 Variance decomposition (including sources of changes in the business cycle): Globalization period**

VARIABLE	WORLD	COUNTRY	OIL	T OF T	G EXP	I RATE	IDIO
<b>UNITED STATES</b>							
OUTPUT	42	30	3	2	4	2	17

HH	43	27	10	0	2	5	13
INV	30	29	6	2	19	1	12
<b>SOUTH AFRICA</b>							
OUTPUT	2	42	1	2	2	23	29
HH	6	38	2	1	2	23	27
INV	5	25	4	2	10	16	37
<b>JAPAN</b>							
OUTPUT	21	56	4	4	2	0	14
HH	16	63	3	2	5	1	10
INV	13	55	1	7	2	1	21
<b>KOREA</b>							
OUTPUT	2	68	1	15	2	0	11
HH	1	66	0	11	4	0	18
INV	7	38	4	20	5	1	24
<b>UNITED KINGDOM</b>							
OUTPUT	16	48	2	8	2	5	19
HH	6	61	3	7	2	2	19
INV	18	44	0	3	6	4	24

Source: Eviews output

In comparing Table 7 to Table 4 it is clear that in the US the world factor increased when the sources were added. This implies the importance of the world cycle after globalization. In South Africa all the factors declined: this is an indication that the sources added to the model in fact do cause the business cycle in South Africa, especially the interest rate. The world factor does not seem to have a huge influence on SA's cycle, but it is still early days,

since SA entered the globalized world later than the other countries. In Japan all the factors were more or less the same, except for a higher world factor explaining output. In Korea the world factor rose marginally and the country factor declined. Terms of trade play an important role in explaining the business cycle. In the UK the world played a larger role in explaining the cycle and the other two factors declined. It is evident from this analysis that although source variables have been added to the model the world factor still has an impact on business cycles.

## **12. CONCLUSION**

In this paper the evolution of the business cycle since 1960 was examined. Firstly factor models for each country (US, SA, Japan, Korea, and UK) were constructed using principle component analysis with output, consumption and investment data. These factors were compared to the G7 factor – the benchmark for the world business cycle. It was found that there is some co-movement between some countries and the world factor. The results reported in this section suggest that to the extent that there are country-specific and worldwide sources of economic shocks, these play different roles at different points in time and around the globe. In some episodes, the country factor is more strongly reflective of domestic economic activity, while in others the domestic growth reflects the common worldwide pattern embodied in the G7 factor. It was important, however, to divide the full sample into sub-samples to take all the different financial systems, exchange rate regimes and globalization into account, in order to establish the changes in business cycles over time. Correlation analysis was employed to establish the changes in the

different time periods. From the correlations it was evident that the correlations between the world and the country factors changed over time. The changes are not so great between more advanced economies (US, UK, Japan), but in the emerging markets these changes were significant. This may be due to greater financial liberalization which leads to higher correlations between business cycles. After the analysis of the common trends between countries and the world the variance decompositions were calculated to determine the amount of variation in three main aggregates (output, consumption and investment) can be explained by the world factor, the country factor and the variable itself. The most important results from this were that the world factor differs quite a lot across countries. The world factor plays a more important role in volatility in the business cycle in the US, UK and Japan. In SA and Korea the country-specific factor is more important in explaining variations in the business cycle. This shows the difference between more advanced economies and emerging markets. Again the sample was divided into the three sub-periods. The world factor played a greater role in explaining variations in the shock period. The country-specific factor is still very prominent in explaining the business cycle in all three sub-periods. However, this factor increased in the globalization period in all the countries except in South Africa, where it declined from 70% to about 60%. This results were confirmed when sources of the changes in the business cycle, such as monetary policy, fiscal policy, oil shocks and terms of trade, were added to the model.