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Developing Country Business Cycles: Revisiting the Stylised Facts

Rachel Male

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Queen Mary
University of London

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Rachel Male*

Queen Mary, University of London

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Abstract

Identifying business cycle stylised facts is essential as these often form the basis for the construction and validation of theoretical business cycle models. Furthermore, understanding the cyclical patterns in economic activity, and their causes, is important to the decisions of both policymakers and market participants. Previous analyses of developing country stylised facts have tended to feature only small samples, for example the seminal paper by Agénor *et al.* (2000) considers just twelve middle-income economies. Consequently, unlike for the industrialised countries, there is not a consistent set of developing country business cycle stylised facts. Motivated by importance of these business cycle statistics, this paper makes an important contribution to the literature by extending and generalising the developing country stylised facts for a sample of thirty-two developing countries. In particular, it is found that real interest rates are, on average, weakly procyclical in developing countries, not countercyclical as previously reported; this holds only for the Latin American economies. There is evidence that money leads the cycle in numerous developing economies, and thus that monetary shocks are an important source of business cycle fluctuations. However domestic credit, which is thought to fulfil an important role in determining investment, and hence economic activity, in developing economies, is found to lag, rather than lead, the cycle, thus implying that fluctuations in output influence credit rather than credit influencing the business cycle. A final key empirical finding is that developing country business cycles are characterised by significantly persistent output fluctuations; however, the magnitude of this persistence is somewhat lower than for the developed countries. Furthermore, prices and nominal wages are found to be significantly persistent in almost all of the developing countries. This finding is particularly important, because it justifies the use of theoretical models with staggered prices and wages for the modelling of developing country business cycles.

JEL Classification: E31, E32, E52, F41, O50

Keywords: Business cycle; Developing economies; Stylised facts; Volatility; Persistence; Cross-correlations.

*Email: r.male@qmul.ac.uk

1 INTRODUCTION

In 1990, Kydland and Prescott established the first set of “stylised facts” for business cycles in the developed world, based on their research into the US business cycle. This led to a burgeoning of literature freshly interested in the statistical properties of business cycles. However, this literature predominantly concentrated on the business cycles of industrialised countries. A noticeable exception to this pattern was the seminal paper by Agénor, McDermott and Prasad in 2000 that established a set of stylised facts for the business cycles of developing countries, and it is these stylised facts that are the subject of interest in this paper.

Stylised facts, such as the ones conveyed by Kydland and Prescott (1990) and Agénor *et al.* (2000) are an important stepping-stone to the construction of a successful theoretical model, as they are often used as the empirical basis for formulating and validating theoretic models of the business cycle. Therefore, it is extremely important to ensure that the stylised facts are as accurate as possible. In the case of industrialised countries this is not a huge problem as there is a vast literature, providing substantial country coverage, and with the majority of the findings being robust between countries and authors. However, this is not the case for developing countries.

Since Agénor *et al.* (2000) there have been numerous papers looking at developing countries, such as Rand and Tarp (2002), Neumeyer and Perri (2005) and Aguar and Gopinath (2007). However the majority of these papers have remarkably small data sets, for example, Agénor *et al.* (2000) have a sample of twelve middle-income countries, Rand and Tarp (2002) have fifteen, whilst Neumeyer and Perri (2005) have only five developing countries in their sample. Noticeable exceptions to this rule are papers by Pallage and Robe (2001) and Bulir and Hamann (2001) which have 63 and 72 developing countries, respectively, in their samples. These papers, however, concentrate purely on stylised facts relating to foreign aid and consequently their datasets are not applicable in this analysis.¹ A fundamental feature that is clearly apparent from reviewing these papers is that there is not the same consistency of findings as for the industrialised countries; only some of the stylised facts reported in Agénor *et al.* (2000) are similarly reported in the subsequent literature and there is less consensus between countries, such that the results clearly depend on the countries included in the study. Motivated by this lack of consistency and the importance of business cycle stylised facts, this paper aims to generalise the business cycle statistics for a much larger sample of developing countries, and secondly to construct a more comprehensive set of stylised facts for use in subsequent theoretic modelling of developing country business cycles.

In section two, this paper briefly reviews the literature and documents the stylised facts for both industrialised and developing country business cycles. Section three details the methodology employed in order to carry out the statistical analysis required to compute such stylised facts, whilst section four outlines the data sources and the countries included in this study. Section five documents the empirical regularities found

¹ Pallage and Robe (2001) employ annual data for only two variables: GDP per capita and official development assistance. Similarly, Bulir and Hamann (2001) use annual data on aid, fiscal revenue and GDP. Neither of these datasets is sufficient to conduct a comprehensive analysis of developing country business cycles and the related stylised facts.

including persistence of output and prices, volatility and cross-correlation analysis, and compares these results to the stylised facts reported in the literature. Finally, section six concludes and provides a summary of the main stylised facts emerging from this study.

2 LITERATURE REVIEW – WHAT ARE THE STYLISED FACTS?

The stylised facts of industrialised country business cycles are well established; a vast body of literature documents a wide range of empirical regularities amongst these countries (Kydland and Prescott, 1990; Backus and Kehoe, 1992; Backus, Kehoe and Kydland, 1995; King and Watson, 1996; Basu and Taylor, 1999; Chari *et al.*, 2002). However, this is not the case for developing countries. It is therefore important when trying to determine a set of developing country stylised facts, to first understand the key features of the industrialised country business cycles. These empirical regularities will then serve as benchmarks for comparison and identification of developing country stylised facts.

The empirical regularities, or stylised facts, for the industrialised countries include:

- Persistent real output fluctuations and real exchange rate fluctuations (in recent years). Real exchange rates are also typically fairly volatile.
- Volatility of output, consumption and net exports very similar (consumption and net exports slightly less volatile than output) whilst investment is consistently 2 to 3 times more volatile and government expenditures are significantly less volatile than output (by around half).
- A remarkably stable relationship between output, consumption and inflation.
- Consumption, investment, employment, inflation and money velocity all generally procyclical.
- Increasing procyclicality of the real wage, whilst price is consistently countercyclical and inflation is generally procyclical.
- Ratio of net exports to output typically countercyclical.
- Government expenditures typically acyclical.
- International comovements in output, consumption and investment, but output correlations are generally higher than consumption correlations.
- Correlations between the real exchange rate and aggregate quantities, in particular relative consumption, are fairly small.

The stylised facts for the industrialised countries are summarised in Table 1. This table reveals that the business cycles of all the countries have fairly similar properties; investment is clearly 2 to 3 times more volatile than output, consumption and net exports; real output, consumption, investment and real wages are all procyclical, whilst net exports and government expenditures are generally countercyclical and acyclical respectively.

Table 1. Properties of Business Cycles in OECD Countries (1970:1 – 1990:2)

Country	St. Dev (%)		Ratio St. Dev to St. Dev of Y				Correlation with Y					
	y	nx	c	i	g	n	y	c	i	g	nx	n
Australia	1.5	1.2	0.7	2.8	1.3	0.3	0.6	0.4	0.7	0.2	0	0.1
Austria	1.3	1.2	1.1	2.9	0.4	1.2	0.6	0.7	0.8	-0.2	-0.5	0.6
Canada	1.5	0.8	0.9	2.8	0.8	0.9	0.8	0.8	0.5	-0.2	-0.3	0.7
France	0.9	0.8	1.0	3.0	0.7	0.6	0.8	0.6	0.8	0.3	-0.3	0.8
Germany	1.5	0.8	0.9	2.9	0.8	0.6	0.7	0.7	0.8	0.3	-0.1	0.6
Italy	1.7	1.3	0.8	2	0.4	0.4	0.9	0.8	0.9	0	-0.7	0.4
Japan	1.4	0.9	1.1	2.4	0.8	0.4	0.8	0.8	0.9	0	-0.2	0.6
Switzerland	1.9	1.3	0.7	2.3	0.5	0.7	0.9	0.8	0.8	0.3	-0.7	0.8
UK	1.6	1.2	1.2	2.3	0.7	0.7	0.6	0.7	0.6	0.1	-0.2	0.5
US	1.9	0.5	0.8	3.3	0.8	0.6	0.9	0.8	0.9	0.1	-0.4	0.9
Europe	1.0	0.5	0.8	2.1	0.5	0.9	0.8	0.8	0.9	0.1	-0.3	0.3

Source: Backus, Kehoe and Kydland (1995, p. 334; Table 11.1)

The number of empirical studies for developing countries is rather more limited, however includes works by Agénor *et al.* (2000), Rand and Tarp (2002), Neumeyer and Perri (2005) and Aguar and Gopinath (2007). In 2000, Agénor *et al.* established a set of stylised facts for the business cycles of developing countries and this has become the seminal work upon which most subsequent studies compare their findings.

Based on a sample of twelve middle-income developing countries (Korea, Malaysia, Mexico, Morocco, Nigeria, the Philippines, Tunisia, Turkey and Uruguay) for the period 1978:1 – 1995:4, Agénor *et al.* (2000) found significant differences from industrialised country business cycles. Their key findings, or stylised facts, and how these compare to the stylised facts for the industrialised countries are as follows. Firstly, output volatility varies substantially across developing countries and is on average much higher than the level typically observed in industrial countries. However, developing countries also show considerable persistence in output fluctuations as observed in the industrialized countries. Secondly, that activity in industrial countries, as measured by world output and world real interest rate, has a significantly positive influence on output in most developing countries. Thirdly, government expenditures and the fiscal impulse appear to be countercyclical whilst there is no distinct pattern in government revenue; it is acyclical in some countries in their sample and significantly countercyclical in others. Fourthly, there is evidence of procyclical real wages as in the developed countries. Fifthly, whilst prices are widely documented as being countercyclical in the industrialised countries, there appears to be no consistent relationship between either output and prices or output and inflation in developing countries. Sixthly, contemporaneous correlations between money and output are broadly positive, but not very strong, which is in contrast to the evidence for many industrial countries, and suggests that there is need to examine the key role often assigned to monetary policy in stabilization programs in developing countries. Furthermore, whilst the velocity of broad money is weakly procyclical in most industrialised countries it appears to be strongly countercyclical in this sample of developing countries. Seventhly, there is no robust relationship between the trade

balance and output. Where it is procyclical, this *“may indicate that fluctuations in industrial output are driven by export demand and that imports are not as sensitive to domestic demand fluctuations as they are in industrial countries”* (Agénor *et al.*, 2000, p.280). Furthermore, terms of trade are strongly procyclical suggesting much of the fluctuation in output in developing countries can be explained by terms of trade shocks, as has been suggested by Mendoza (1995). However, it is important to note that this is based on results for just three of the sample countries. Finally, there appears to be no systematic pattern for the correlation of nominal or real effective exchange rates and industrial output.

A subsequent paper by Rand and Tarp (2002) added to this work by examining the duration of the business cycles and the volatility of the variables in addition to the cross-correlation analysis. Based on a sample of fifteen developing countries (five in Sub-Saharan Africa, five in Latin America and five in Asia and North Africa), with a quarterly dataset for the duration analysis (1980:1 – 1999:4) and an annual dataset for the cross-correlation and volatility analysis (1970 – 1997) they report the following key results. Firstly, that developing country business cycles are significantly shorter than those of the industrialised countries; however, Male (2010) reveals this not to be the case. Secondly, that output is more volatile than in developed countries, but by no more than 15 to 20%, whilst consumption is generally more volatile than output, which is the opposite to what is found in developed countries. Thirdly, that consumption and investment are strongly procyclical, which is consistent with what is observed in the industrialised countries. However, the pattern is not so clear for prices and inflation; prices are not consistently countercyclical as for the industrialised countries and furthermore, inflation appears to have the same cyclical pattern as CPI, such that it is countercyclical for the majority of the sample, whilst in the developed countries inflation is generally procyclical. Fourthly, there is no consistent relationship between government consumption and output such that *“governments seem to have a limited stabilising role on the economy”* (Rand and Tarp, 2000, p.2084), but this is similar to the observation in industrialised countries; see Table 1. Fifthly, money aggregates are generally procyclical, as in industrialised countries. In addition, there is some indication of a positive relationship between domestic credit and output. Sixthly there is no clear pattern when it comes to the terms of trade, whereas in industrialised countries there is generally positive correlation between lagged values of terms of trade and output. Finally, aid and foreign direct investment (FDI) appear to be highly volatile and show no signs of being procyclical, which is the opposite of the findings of Pallage and Robe (2001) and Bulir and Hamann (2001).

Other recent studies by Aguar and Gopinath (2007) and Neumeyer and Perri (2005) add some interesting finding to the developing country stylised facts. Firstly, based on a sample of thirteen countries (Argentina, Brazil, Ecuador, Israel, Korea, Malaysia, Mexico, Peru, Philippines, Slovakia, South Africa, Thailand and Turkey) Aguar and Gopinath (2007) report a similar degree of output persistence but that output is twice as volatile as in the industrialised countries, whilst consumption is around 40% more volatile. Secondly, that the ratio of investment volatility to output volatility is not dissimilar from that found in the developed countries. Thirdly, that net exports are around 3 times more volatile and strongly countercyclical, as opposed to weakly countercyclical in the developed countries;

and finally, that consumption and investment strongly procyclical, as found in the developed countries.

Neumeier and Perri (2005) find the very interesting result that real interest rates in developing countries are countercyclical and lead the cycle whereas they find no such pattern with the developed countries; real interest rates are mildly procyclical. They also find the volatility of real interest rates to be on average 40% higher in the developing countries. This is based on a sample of five developing countries (Argentina, Brazil, Korea, Mexico and the Philippines) and five developed countries (Australia, Canada, Netherlands, New Zealand, and Sweden).

In summary, the key features that the literature appears to hail as the stylised facts for developing countries are:

- Business cycles are generally shorter and more volatile than those of the industrialised countries.
- Output is more volatile than in developed countries, but there is a similar degree of persistence in output fluctuations.
- Consumption is more volatile than output in developing countries, opposite of developed country case.
- Activity in developed countries, as measured by world output and world real interest rate, has a significantly positive influence on output in most developing countries.
- Prices are not consistently countercyclical, as for developed countries, and inflation is not consistently procyclical.
- Consumption, investment, real wages, money aggregates are all generally procyclical, which is consistent with the findings for developed countries. However these relationships are typically weaker in the developing country samples.
- Real interest rates are countercyclical and lead the cycle, whereas real interest rates are typically mildly procyclical in developed countries. Real interest rates are also more volatile in the developing countries.
- No clear relationships in terms of government expenditure, nominal or real effective exchange rates or terms of trade and output.

However, these facts are formed on the basis of very small samples of developing countries and even based on these small samples there appears to be less consistency between countries than for the industrialised country samples. Thus, this paper proceeds to an empirical analysis to examine whether the developing country stylised facts hold for a much larger sample of developing countries, or whether they are robust only for specific subsets of countries as chosen by these authors.

3 METHODOLOGY

3.1. Detrending

The first step is to deseasonalize the data. This is done using the Census Bureau's X-12 ARIMA seasonal adjustment program. This is important for the correct implementation of the subsequent detrending procedure. For example, the HP filter will pass all of the series variations associated with the quarterly seasonal frequencies. Given that seasonal variation should not contaminate the cycle, for seasonal series the HP filter has to be applied to seasonally adjusted series (Kaiser and Maravall, 2001).

Once deseasonalized, logarithms are taken of the data, as is common practice in the business cycle literature, and then the series are filtered to extract the stationary (cyclical) component and the non-stationary (trend) component. This is carried out because, following Lucas (1977), the business cycle component of a variable is defined as its deviation from trend. Furthermore, certain empirical characterisations of the data, including cross-correlations, are only valid if the series are stationary (Agénor *et al.*, 2000).

In choosing a detrending technique, most researchers appear to opt for either the Hodrick-Prescott (HP) filter (Hodrick and Prescott, 1997) or the band-pass (BP) filter (Baxter and King, 1999), of which the HP filter is the most common choice:

"One can say that the HP filtering of X11-SA series has become the present paradigm for business-cycle estimation in applied work" (Kaiser and Maravall, 2001, p.66)

The HP filter is a linear filter designed to optimally extract a non-stationary trend component, which changes smoothly over time, from an observed non-stationary time series. Assuming that the (deseasonalized) time series y_t can be decomposed into an additive cyclical component c_t and trend component g_t , extracting the trend component will yield a stationary cyclical component, which can be used by researchers to analyse the business cycle:

$$y_t = c_t + g_t \quad \text{for } t = 1, \dots, T$$

The trend component, g_t , is determined by minimising:

$$\sum_{t=1}^T c_t^2 + \lambda \sum_{t=2}^T [(g_t - g_{t-1}) - (g_{t-1} - g_{t-2})]^2$$

Where, the smoothing parameter λ penalizes variability in the trend. The smoothing parameter λ is chosen *a priori*

"... to isolate those cyclical fluctuations which belong to the specific band which the researcher wants to investigate" (Canova, 1998, p.485)

The HP filter has the advantage that it does not amplify high-frequency noise (unlike a standard first differencing approach). However, it does have several disadvantages which mean that the method of detrending an economic time series by means of the HP filter should be used with care. Firstly, it allows much of the high frequency noise to be

left outside the business cycle frequency band; the low-frequency BP filter has been adjusted to account for this. However, as a result it tends to underestimate the cyclical component (Rand and Tarp, 2002). Secondly, the HP filter gives imprecise estimates of the trend at the end-points of the time series. Thirdly, the HP filter cannot capture structural breaks in the data series. Fourthly, the HP filter can induce spurious cycles in the filtered series. And finally, the HP filter relies on an arbitrary choice of the smoothing parameter λ .

This final point has caused much controversy over what the optimal value of λ should be. The default choice is that of $\lambda = 1600$ for quarterly data as computed, rather arbitrarily, by Hodrick and Prescott (1997):

“Our prior view is that a 5 percent cyclical component is moderately large, as is a one-eighth of 1 percent change in the growth rate in a quarter. This led us to select $\sqrt{\lambda} = 5/(1/8) = 40$ or $\lambda = 1600$ as a value for the smoothing parameter” (p.4)

However, Kydland and Prescott (1990), amongst others, find this value to be reasonable for quarterly time series and Hodrick and Prescott (1997) find that their results are little changed if λ is changed by a factor of four to 400 or 6400. Furthermore, using the default value of $\lambda = 1600$ Canova (1998) finds that:

“The HP1600 filter produces results which are similar to those obtained with conventional band-pass filters (e.g. frequency domain masking the low frequency components of the data or standard MA filters) and concentrates the attention of the researcher on cycles with an average duration of 4–6 yr” (p.508)

Rand and Tarp (2002) find that *“the optimal value of λ is between five and 377 when quarterly data are used”* (p.2074) for their sample of 15 developing countries. However, this draws on their finding that business cycles in developing countries are much shorter than those in developed countries.² As discussed in Male (2010), there is no clear significant difference between the duration of developing and developed country business cycles. The finding of Rand and Tarp (2002) results from their comparison of developing country business cycles measured from industrial production data with the standard results for developed country cycles, which are almost certainly calculated using real GDP. Thus, since the average length of cycles in this study is approximately 5 years, with a minimum length of 2.2 years and a maximum of 13.8 years, this choice of λ appears to be consistent with this sample.

Despite all the criticisms, the HP filter remains the most commonly applied detrending technique in the business cycle literature and thus is the one applied here, with smoothing parameter $\lambda = 1600$. And, as Kaiser and Maravall (2001) note:

“...a positive feature of the generalized use of the HP filter is that it has brought homogeneity in method, so that the effect of the choice of filter has been stabilized” (p.80)

² They find the length of business cycles in their sample to be between 7.7 and 12 quarters compared with the 24 and 32 quarters reported for developed countries.

3.2. Volatility, Persistence and Correlations

After deseasonalizing and detrending the series' to obtain the cyclical components, the statistical analysis of the data can be carried out.³ It should be noted that, as is standard in the literature, in the subsequent analysis all references to the variables refer to the cyclical components. The statistical analysis concentrates on those statistical features which are commonly quoted as the stylised facts of business cycles, namely volatility, persistence and cross-correlations.

Volatility, or relative volatility, reports the magnitude of fluctuations of the variables of interest. Volatility is measured by the standard deviation of the variable whilst relative volatility is the ratio between the volatility of the variable of interest and the volatility of industrial production. A relative volatility of one implies that the variable has the same cyclical amplitude as the aggregate business cycle (as proxied by industrial production); whilst a relative volatility greater than one implies that the variable has greater cyclical amplitude than the aggregate business cycle.

The persistence of the cyclical component of a variable is measured by its autocorrelation function. The significance of the persistence is measured using the Ljung-Box portmanteau (Q) test for white noise; if the statistic has $p > 0.05$ then this is not significant and is considered to imply that there is little or no persistence in the cyclical component.

Finally, following Agénor *et al.* (2000), the degree of co-movement of the variables of interest (y_t) with industrial production (x_t) is measured by the magnitude of the correlation coefficient $\rho(j)$, $j \in \{0, \pm 1, \pm 2, \dots\}$. A series y_t is considered to be pro-cyclical if the contemporaneous coefficient $\rho(0)$ is positive, acyclical if the contemporaneous coefficient $\rho(0)$ is zero and countercyclical if the contemporaneous coefficient $\rho(0)$ is negative. Figure 1 illustrates a procyclical series (y_t) that either lags, is synchronous or leads the business cycle (x_t), whilst Figure 2 shows this for a countercyclical series.

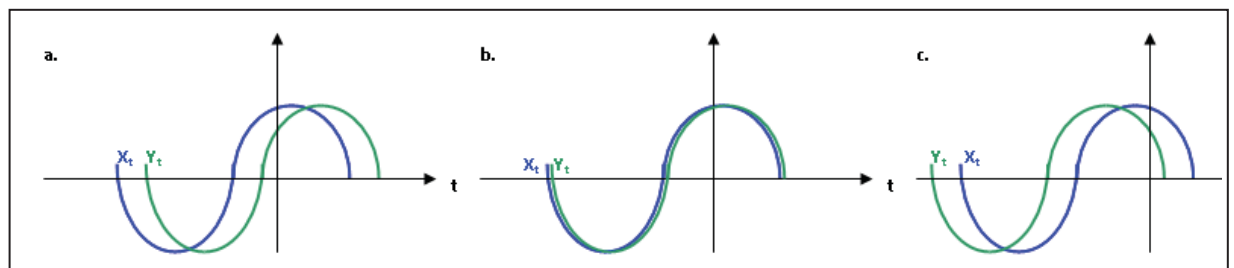


Figure 1. Series y_t is procyclical and (a) lags the cycle, (b) is synchronous with the cycle, (c) leads the cycle.

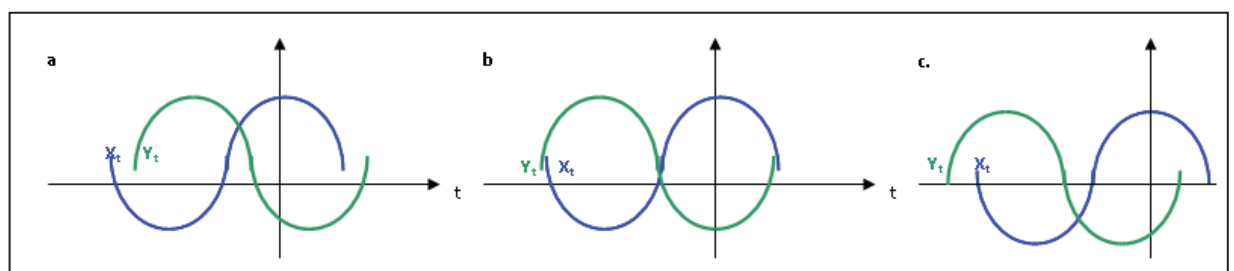


Figure 2. Series y_t is countercyclical and (a) lags the cycle, (b) is synchronous with the cycle, (c) leads the cycle.

³ PCGive was used for the purposes of deseasonalizing and detrending the data. All subsequent statistical analysis in this paper was performed using STATA.

The cross-correlation coefficients $\rho(j), j \in \{0, \pm 1, \pm 2, \dots\}$ indicate whether a series y_t leads, lags or is synchronous with the business cycle (x_t). Series y_t is considered to lead the cycle by j periods if the largest cross-correlation coefficient arises for a negative j (i.e. a lagged value of y_t), be synchronous with the cycle if the largest cross-correlation coefficient arises at $j = 0$ or lag the cycle by j periods if the maximum cross-correlation arises for a positive j . For example, let y_t be a procyclical series that leads the business cycle, as in Figure 1(c). In this case the maximum positive cross-correlation coefficient will occur for the correlation between x_t and y_{t-j} .

4 DATA

There are thirty-two developing countries included in this sample, of which there are five African countries (Côte d'Ivoire, Malawi, Nigeria, Senegal and South Africa), four North African and Middle Eastern countries (Israel, Jordan, Morocco and Tunisia), nine Latin American countries (Argentina, Barbados, Brazil, Chile, Colombia, Mexico, Peru, Trinidad and Tobago, and Uruguay), eight Asian countries (Bangladesh, Hong Kong, India, South Korea, Malaysia, Pakistan, the Philippines and Turkey) and six Central and Eastern European countries (Hungary, Lithuania, Macedonia, Romania, the Slovak Republic and Slovenia). In addition, three developed countries, the United Kingdom, the United States and Japan, are included as benchmarks upon which to compare the results for the developing countries. For a detailed discussion of the countries included, see Male (2010).

As discussed in Male (2010), reliable real GDP data, which is usually used as a measure of the aggregate business cycle, is not available for a large number of developing countries, especially where quarterly data is concerned. Thus, the suggestion of Agénor *et al.* (2000) is followed, and indexes of industrial production are used as a suitable proxy for the aggregate business cycle.

The other variables selected for analysis are also selected following Agénor *et al.* (2000). They include price variables (the consumer price index, inflation and the real wage rate); public sector variables (government expenditure, government revenue and the fiscal impulse); trade variables (imports, exports, trade balance and terms of trade); exchange rates (real and nominal effective exchange rates); money variables (broad money, private sector credit, interest rate and gross fixed capital formation); and finally, world output and world real interest rate to represent economic activity in the main industrial countries.

The primary data source is the International Monetary Fund (IMF) International Financial Statistics (IFS) database. In the few cases where data was not available through the IMF, the variables were sought through the countries' national statistics databases. The sample period varies depending on the availability of quarterly data for each country. However, there is good data coverage for the period from 1980 to 2004 across countries.⁴ Details of the data, including the corresponding IMF IFS series codes, can be found in Appendix A.

⁴ For a discussion of why this time-frame is appropriate, see Male (2010).

5 EMPIRICAL RESULTS

5.1. Persistence

A key empirical feature of the industrialised countries' business cycles is the significant persistence of output fluctuations, and the existing stylised facts for developing countries suggest that these cycles also exhibit significant output persistence. There is also evidence of significant persistence of real exchange rate fluctuations in the industrialised countries, although there have been few, if any, empirical studies on this for the developing countries. These two empirical features have drawn much theoretical consideration, and most models incorporate nominal rigidities in the form of sticky prices and sticky wages in-order to explain these features. If such models are also to be applied to developing country business cycles, it is necessary to examine whether prices and nominal wages are indeed sticky in these countries.

Thus, this section examines both the persistence of output and real exchange rate fluctuations for the developing countries, and the persistence of both the consumer price index and real wage. Table 2 reports the persistence of output and real effective exchange rates (REER), whilst Table 3 reports the persistence of the consumer price index and the nominal wage.

Examination of the autocorrelations of output reveals that for most of the developing countries there is significant output persistence. However, the magnitude of this persistence is somewhat lower than for the industrialised countries; for example, the average autocorrelation coefficient at lag one for the industrialised countries is 0.84 whilst it is just 0.59 for the developing countries, furthermore at lag four the average coefficient for the industrialised countries is 0.146, but this has dropped to zero for the developing countries. There are a few exceptions amongst the developing countries, for which output is not significantly persistence, namely Malawi, Morocco and Macedonia.

Secondly, examination of the autocorrelations of the real effective exchange rates reveals that, with the sole exception of the Slovak Republic, all the developing countries exhibit significant real exchange rate persistence. However, the magnitude of this persistence is slightly lower than that for the developed countries; the average autocorrelation coefficient at lag one for the US, UK and Japan is 0.84, whilst it is 0.701 for the developing countries.

Thirdly, for all of the countries, with the exception of Uruguay, there is significant price persistence, although again this persistence is of a lower magnitude than for the industrialised countries. The lack of price persistence observed in Uruguay is explained by the extremely high average annual rate of inflation observed over the sampling period.⁵ Finally, the persistence of the nominal wage is examined. In this case, all of the developing countries display significant nominal wage persistence (or stickiness), but as with all the other variables, this is of a significantly lower magnitude than for the industrialised countries.

The finding of significant price and wage persistence is important, because it justifies the use of theoretical models with staggered prices and wages for the modelling of developing country business cycles. However, the fact that this persistence is of a lower

⁵ The average annual inflation rate in Uruguay for the period 1980:1 – 2002:3 is 46%

magnitude must be taken into consideration, for example by implementing shorter contract durations.

Table 2. Persistence of Output and the Real Effective Exchange Rate (REER)

Region	Country	Output					REER				
		Lag 1	Lag 2	Lag 3	Lag 4	Q	Lag 1	Lag 2	Lag 3	Lag 4	Q
OECD	US	0.886	0.672	0.440	0.199	517.8**	0.883	0.639	0.503	0.349	417.4**
	UK	0.756	0.549	0.372	0.147	451.6**	0.795	0.541	0.334	0.121	409.1**
	Japan	0.891	0.671	0.388	0.091	396.6**	0.835	0.621	0.460	0.264	650.7**
Africa	Côte D'Ivoire	0.432	0.149	0.189	0.047	142.6**	0.689	0.429	0.222	0.042	161.3**
	Malawi	0.351	-0.036	-0.108	-0.029	18.8	0.435	0.265	-0.028	-0.014	44.2**
	Nigeria	0.641	0.351	0.185	0.056	325.9**	0.846	0.648	0.441	0.230	262.9**
	Senegal	0.385	0.074	0.039	-0.164	76.0**	...	...	...	...	...
	South Africa	0.814	0.641	0.442	0.206	598.0**	0.760	0.501	0.337	0.117	214.1**
North Africa	Israel	0.635	0.427	0.208	-0.032	218.3**	0.679	0.323	0.057	-0.128	142.9**
	Jordan	0.452	0.020	-0.175	-0.310	62.6*	...	...	...	...	...
	Morocco	0.041	0.188	0.207	-0.196	53.6	0.629	0.164	-0.174	-0.261	160.9**
	Tunisia	0.422	0.233	0.138	-0.104	71.3**	0.818	0.623	0.461	0.263	391.5**
Latin America	Argentina	0.808	0.584	0.329	0.070	99.6**	...	...	...	...	...
	Barbados	0.614	0.418	0.155	0.018	168.7**	...	...	...	...	...
	Brazil	0.632	0.153	-0.114	-0.267	91.9**	...	...	...	...	...
	Colombia	0.565	0.341	0.144	-0.049	133.2**	0.798	0.590	0.392	0.161	182.1**
	Chile	0.767	0.551	0.348	0.132	521.5**	0.771	0.556	0.353	0.138	538.1**
	Mexico	0.800	0.603	0.370	0.158	377.6**	0.610	0.447	0.295	0.130	377.6**
	Peru	0.817	0.556	0.312	0.142	325.2**	...	...	...	...	...
	Trinidad	0.415	0.248	0.038	-0.184	91.6**	0.814	0.620	0.474	0.325	518.1**
Uruguay	0.635	0.574	0.382	0.128	186.7**	0.747	0.442	0.236	0.011	212.6**	
Asia	Bangladesh	0.396	0.052	-0.044	-0.121	72.6**	...	...	...	...	...
	Hong Kong	0.725	0.445	0.144	-0.106	155.7**	0.801	0.539	0.257	0.013	293.0**
	India	0.652	0.530	0.348	0.224	348.0**	...	...	...	...	...
	Korea, South	0.776	0.537	0.299	0.109	371.6**	...	...	...	...	...
	Malaysia	0.798	0.549	0.283	0.033	313.3**	0.829	0.570	0.372	0.205	271.8**
	Pakistan	0.251	0.028	0.091	-0.030	44.5**	0.698	0.356	0.131	-0.058	141.1**
	Philippines	0.717	0.495	0.275	0.084	157.8**	0.733	0.388	0.095	-0.169	261.9**
	Turkey	0.621	0.411	0.219	-0.071	231.8**	...	...	...	...	...
East Europe	Hungary	0.865	0.737	0.561	0.405	384.2**	0.794	0.610	0.468	0.284	300.1**
	Lithuania	0.539	0.096	-0.071	-0.274	42.2**	...	...	...	...	...
	Macedonia	0.351	-0.036	-0.108	-0.029	18.8	0.435	0.265	-0.028	-0.014	44.2**
	Romania	0.836	0.712	0.611	0.471	678.9**	0.701	0.472	0.161	-0.124	155.7**
	Slovenia	0.591	0.288	-0.027	-0.281	103.6**	...	...	...	...	...
	Slovak Republic	0.637	0.307	0.084	-0.046	93.5**	0.442	0.050	-0.228	-0.298	39.1
Average	Developed	0.844	0.630	0.400	0.146	...	0.838	0.600	0.432	0.245	...
	Developing	0.593	0.351	0.180	0.000	...	0.701	0.443	0.215	0.043	...

Significance is denoted by * if $p < 0.05$ and ** if $p < 0.01$

Table 3. Persistence of Prices and Wages

Region	Country	CPI				Q	Nominal Wage				
		Lag 1	Lag 2	Lag 3	Lag 4		Lag 1	Lag 2	Lag 3	Lag 4	Q
OECD	US	0.940	0.826	0.672	0.480	846.7**	0.814	0.611	0.449	0.258	343.3**
	UK	0.911	0.759	0.563	0.368	707.2**	0.887	0.722	0.509	0.302	649.9**
	Japan	0.912	0.781	0.610	0.384	608.0**	0.946	0.819	0.639	0.434	623.8**
Africa	Côte D'Ivoire	0.826	0.625	0.432	0.250	488.9**	...	...	...	...	...
	Malawi	0.731	0.442	0.150	-0.067	61.9**	0.529	0.204	-0.003	-0.172	32.1*
	Nigeria	0.764	0.504	0.344	0.137	298.9**	...	...	...	...	...
	Senegal	0.843	0.655	0.465	0.267	501.2**	...	...	...	...	...
	South Africa	0.781	0.571	0.347	0.109	447.1**	...	...	...	...	...
North Africa	Israel	0.459	0.316	0.269	0.144	109.9**	...	...	...	...	...
	Jordan	0.883	0.761	0.615	0.438	562.5**	...	...	...	...	...
	Morocco	0.814	0.572	0.321	0.062	316.9**	...	...	...	...	...
	Tunisia	0.808	0.481	0.145	-0.100	125.9**	...	...	...	...	...
Latin America	Argentina	0.816	0.558	0.267	0.073	114.6**	...	...	...	...	...
	Barbados	0.902	0.756	0.592	0.405	774.5**	...	...	...	...	...
	Brazil	0.889	0.703	0.484	0.250	150.2**	...	...	...	...	...
	Colombia	0.566	0.297	0.098	-0.087	195.7**	...	...	...	...	...
	Chile	0.491	0.375	0.214	-0.075	123.8**	0.727	0.476	0.358	0.249	104.9**
	Mexico	0.829	0.671	0.521	0.384	319.4**	0.467	0.549	0.386	0.178	195.4**
	Peru	0.328	0.523	0.266	0.085	57.2**	...	...	...	...	...
	Trinidad	0.887	0.702	0.504	0.334	665.2**	...	...	...	...	...
Uruguay	0.418	-0.091	-0.096	-0.114	32.8	...	...	...	...	...
Asia	Bangladesh	0.786	0.561	0.272	0.064	143.1**	...	...	...	...	...
	Hong Kong	0.889	0.765	0.623	0.473	469.2**	0.781	0.620	0.413	0.224	76.8**
	India	0.918	0.759	0.553	0.317	980.4**	...	...	...	...	...
	Korea, South	0.913	0.762	0.583	0.377	605.9**	...	...	...	...	...
	Malaysia	0.931	0.788	0.598	0.388	952.5**	...	...	...	...	...
	Pakistan	0.906	0.757	0.593	0.417	778.4**	...	...	...	...	...
	Philippines	0.810	0.601	0.347	0.123	403.7**	...	...	...	...	...
Turkey	0.667	0.404	0.246	0.071	86.6**	...	...	...	...	...
East Europe	Hungary	0.891	0.731	0.568	0.382	358.3**	0.499	0.225	0.068	0.153	104.3**
	Lithuania	0.628	0.309	0.103	-0.054	40.7*	...	...	...	...	...
	Macedonia	0.731	0.442	0.150	-0.067	61.9**	0.529	0.204	-0.003	-0.172	32.1*
	Romania	0.814	0.571	0.406	0.181	178.6**	0.720	0.599	0.482	0.204	181.0**
	Slovenia	0.451	0.309	0.183	0.098	50.3**	0.723	0.511	0.300	0.126	89.8**
	Slovak Republic	0.780	0.552	0.293	0.088	158.6**	0.583	0.334	0.058	-0.196	44.4**
Average	Developed	0.921	0.789	0.615	0.411	...	0.883	0.717	0.533	0.331	...
	Developing	0.755	0.554	0.358	0.167	...	0.618	0.414	0.229	0.066	...

Significance is denoted by * if $p < 0.05$ and ** if $p < 0.01$

5.2. Volatility

The volatility analysis measures the magnitude of fluctuations of the variables of interest. From the previous literature, the stylised facts concerning volatility for developing country business cycles are:

- Output volatility is higher than for the developed countries.
- Consumption volatility is higher than output volatility; the opposite finding to that of the developed economies.
- Inflation volatility is similar to that of the developed countries.
- Investment volatility is two to three times higher than output volatility, which is similar to the levels observed in developed countries.
- The real interest rate is significantly more volatile than for the developed countries.
- Private credit is on average less volatile than in the developed countries.
- Net exports are around three times more volatile than output.
- Real exchange rates volatility is similar to that for the developed countries.

These findings are examined here to see whether they are consistent when the sample is expanded to include thirty-two developing countries. Tables 4(a), 4(b) and 4(c) present the results for the volatility of the variables for the individual countries, regional groups and income groups, respectively. Tables 5(a), 5(b) and 5(c) similarly present the results for relative volatility.

Firstly, output is, on average, twice as volatile in the developing countries than in the developed countries. Output is particularly volatile amongst the poorest countries; where, on average, output is 2.5 times more volatile than output in the industrialised economies. This contradicts the finding of Rand and Tarp (2002) who state that output is no more than 20% more volatile in developing countries; however, this discrepancy may result from their choice of HP-filter smoothing parameter.⁶

Loayza *et al.* (2007) similarly document that output in developing economies is significantly more volatile than that of the industrialised economies and suggest that the excessive volatility in developing economies arises from three key sources. The first of these suggestions is that developing countries are subject to greater exogenous shocks. The second is that developing economies may be subject to greater domestic shocks arising, for example, from policy mistakes. The third, and final, is that external shocks have greater effects on volatility because the developing economies do not possess either the financial markets necessary to diversify risks or the ability to perform stabilising macroeconomic policy. This final point has significant implications for the welfare of the economy. Hnatkovska and Loayza (2005) document a significant negative relationship between economic growth and output volatility, which is exacerbated by underdeveloped financial markets and institutions. Thus, under these conditions, external shocks have a greater effect on volatility and consequently lower economic growth. In particular, it is estimated in Hnatkovska and Loayza (2005) that a one-standard-deviation increase in volatility would reduce the economy's growth rate by 1.3%.

⁶ Rand and Tarp (2002) document that developing country business cycles are significantly shorter than those of the industrialised countries. Thus, they alter the HP-filter smoothing parameter accordingly. However, as revealed in Male (2010), the developing country cycles are not significantly shorter. Thus, it is not necessary to alter the smoothing parameter.

Table 4(a). Volatility (measured as percentage standard deviation)

Country	OUTPUT	CPI	CCPI	RW	BM	BMVI	RDC	GEX	GREV	FI	EXP	IMP	TB	TOT	RPC	RGFCF	RMMR	RLR	NEER	REER
US	2.9	1.3	27.6	1.1	1.6	3.4	3.1	3.2	4.5	5.8	7.2	6.1	5.7	2.7	1.5	5.2	27.3	16.5	4.9	4.5
UK	2.6	2.0	82.2	1.5	8.4	8.4	6.5	...	...	...	5.4	6.1	4.9	2.9	1.9	4.5	38.4	14.4	4.4	5.1
Japan	3.7	1.8	75.0	1.2	1.7	3.6	2.6	...	...	...	7.2	11.8	8.3	6.6	1.6	3.9	47.2	7.4	7.3	7.5
Africa																				
Côte D'Ivoire	8.0	3.6	91.6	...	8.1	9.7	5.3	...	...	...	22.6	19.5	17.5	14.9	9.9	36.4	14.5	3.9	8.0	8.0
Malawi	6.2	8.0	52.8	...	7.2	8.9	14.5	20.0	9.3	21.4	14.4	13.9	18.3	12.0	8.4	20.6	...	11.3	13.8	12.4
Nigeria	7.0	10.0	375.8	...	9.4	13.2	13.0	100.6	80.8	83.7	24.6	21.7	28.9	...	22.2	52.0	...	14.3	20.5	24.0
South Africa	3.4	1.4	33.9	...	3.3	3.5	3.8	6.4	7.4	7.8	11.9	15.7	13.9	3.8	2.4	6.0	21.9	13.4	8.4	8.0
Senegal	7.4	4.7	91.4	...	5.4	8.2	7.7	...	...	...	37.7	13.3	33.6	...	6.0	11.0	14.7	2.5	...	...
North Africa																				
Israel	4.3	26.2	56.0	...	49.9	22.4	9.2	89.4	90.7	14.1	6.5	10.6	11.1	3.9	20.2	19.9	...	37.7	19.9	7.2
Jordan	8.2	3.7	75.4	...	3.3	8.5	4.9	16.3	13.1	23.1	16.3	11.8	17.0	...	13.3	19.7	...	28.9	3.3	3.2
Morocco	2.9	1.7	77.0	...	2.5	3.3	5.2	6.8	6.3	14.3	14.7	10.5	13.1	11.1	5.3	16.3	10.4	3.4	2.5	1.9
Tunisia	3.5	0.7	25.6	...	3.0	3.5	3.5	13.8	13.0	0.4	13.9	10.3	10.4	...	2.4	9.0	6.6	3.4	3.4	...
Latin America																				
Argentina	9.6	56.6	104.7	...	42.2	7.9	19.2	8.3	9.0	6.9	12.5	22.9	25.4	4.2	6.0	14.5	...	45.2	...	...
Barbados	4.3	3.5	67.2	...	3.3	4.8	7.0	7.1	7.4	9.8	16.5	8.9	16.3	...	9.3	...	...	8.8	...	...
Brazil	3.3	59.6	63.4	...	56.8	9.9	11.2	61.1	11.9	12.3	10.4	13.1	14.3	15.9	6.4	8.4	101.8	11.8	...	...
Chile	8.3	7.1	56.7	0.9	5.8	5.6	6.1	94.1	97.0	1.3	17.2	17.3	2.0	...	7.7	23.6	22.4	14.2	6.5	2.1
Colombia	3.1	4.8	446.4	...	4.0	4.6	7.4	6.7	6.4	9.6	11.0	13.1	16.5	10.2	2.3	14.4	23.2	11.5	6.8	6.8
Mexico	3.6	37.1	39.6	10.5	11.4	14.1	15.7	14.5	11.4	9.9	11.4	16.5	14.5	...	5.9	8.1	30.8	30.7	...	...
Peru	8.5	79.1	106.1	...	42.6	7.5	9.1	34.4	12.2	14.9	13.2	19.9	23.4	...	...	12.7	...	26.7	...	...
Trinidad	5.9	2.4	49.3	...	3.9	7.6	6.0	...	...	...	18.7	17.9	20.1	13.4	19.0	36.8	...	5.3	7.0	6.9
Uruguay	5.4	47.8	41.6	...	41.3	12.2	13.1	20.3	12.7	12.3	16.2	17.5	19.6	...	13.9	19.1	35.2	26.7	14.0	9.2
Asia																				
Bangladesh	4.4	1.5	59.7	...	3.6	4.2	5.0	...	...	...	10.8	13.9	16.0	...	2.5	2.8	...	4.2	...	...
Hong Kong	3.8	1.9	54.3	1.7	2.4	3.4	3.5	9.4	9.3	21.3	7.0	7.9	3.1	2.3	2.5	7.4	49.6	11.6	3.9	4.0
India	2.6	3.9	89.2	...	5.8	6.8	4.6	8.5	8.7	1.3	7.5	11.4	10.7	9.8	4.7	...	25.7	4.4	...	...
Korea, South	5.1	3.4	50.5	...	6.9	4.9	3.0	12.2	10.0	11.5	9.4	13.7	12.8	5.3	3.7	9.7	16.5	10.9	...	...
Malaysia	6.7	2.1	60.8	...	3.2	7.2	4.5	10.1	13.2	12.7	10.4	11.6	8.3	9.7	7.6	23.2	4.4	13.8	5.2	5.2
Pakistan	4.2	3.2	49.0	...	3.6	7.5	5.5	13.2	12.5	0.7	13.5	12.2	15.2	10.4	...	11.7	19.2	...	4.3	4.3
Philippines	18.0	7.1	78.7	...	3.9	19.1	9.2	11.2	20.8	10.8	11.5	11.6	12.4	6.4	8.0	12.3	19.9	14.2	6.9	6.1
Turkey	4.0	38.8	28.2	...	9.6	7.5	13.7	33.3	33.5	77.1	12.3	14.1	16.8	7.0	4.6	9.6	26.8	...	...	...
East Europe																				
Hungary	4.7	2.6	28.3	3.1	4.5	7.7	5.8	7.9	9.8	7.6	7.1	7.3	7.6	2.8	2.6	3.2	...	12.1	4.5	3.9
Lithuania	14.5	23.3	69.8	...	10.0	13.3	12.6	7.5	8.2	5.1	10.6	11.6	6.9	...	5.7	11.3	26.2	20.6	...	...
Macedonia	6.7	15.1	372.5	2.4	13.4	19.5	11.7	...	...	...	8.4	11.2	8.7	...	...	...	...	28.4	34.2	8.9
Romania	8.3	19.1	45.4	9.3	11.6	15.5	13.5	24.7	13.4	12.3	15.0	13.9	12.3	...	6.6	8.6	...	...	...	12.5
Slovak Republic	2.7	2.1	42.4	2.9	2.5	3.3	13.9	6.3	7.2	5.6	10.8	9.7	7.2	...	2.4	10.7	15.4	14.0	4.7	3.5
Slovenia	2.4	4.1	26.7	9.9	7.6	4.6	5.0	3.6	3.8	4.8	9.9	8.9	4.7	...	1.5	4.3	19.3	26.8	...	...

Table 4(b). Summary of Volatility (by Region)

Region	OUTPUT	CPI	CCPI	RW	BM	BMVI	RDC	GEX	GREV	FI	EXP	IMP	TB	TOT	RPC	RGFCF	RMMR	RLR	NEER	REER
US,UK and Japan	3.1	1.7	61.6	1.2	3.9	5.1	4.1	3.2	4.5	5.8	6.6	8.0	6.3	4.1	1.7	4.5	37.6	12.7	5.5	5.7
Africa	6.4 [§]	5.5	129.1	...	6.7	8.7	8.9	42.4	32.5	37.6	22.2 [§]	16.8 [§]	22.4 [§]	10.2	9.8	25.2	17.0	9.1	12.7	13.1
North Africa	4.7	8.1	58.5	...	14.7	9.4	5.7	31.6	30.8	13.0	12.8	10.8	12.9 [§]	7.5	10.3	16.2 [§]	8.5 [§]	18.3	7.3	4.1
Latin America	5.8 [§]	33.1 [§]	108.3	5.7	23.5 [§]	8.2	10.5 [§]	30.8	21.0	9.6	14.1 [§]	16.3 [§]	16.9 [§]	10.9	8.8 [§]	17.2 [§]	42.7	20.1	8.6	6.3
Asia	6.1	7.7	58.8	1.7	4.9	7.6	6.1	14.0	15.4	19.3	10.3 [§]	12.0	11.9 [§]	7.3	4.8 [§]	11.0 [§]	23.2	9.8	5.1	4.9
Eastern Europe	6.6	11.0	97.5	5.5	8.3	10.6	10.4 [§]	10.0	8.5	7.1	10.3 [§]	10.4	7.9	2.8	3.8	7.6	20.3	20.3	14.5	7.2
All Developing Countries	6.0 [§]	15.2 [§]	90.9	5.1 [§]	12.2 [§]	8.7	8.5 [§]	24.0	20.0	15.3	13.6 [§]	13.5	14.3 [§]	8.4 [§]	7.3 [§]	15.3 [§]	25.2	15.9	9.3	7.3

Table 4(c). Summary of Volatility (by Income)

Income	OUTPUT	CPI	CCPI	RW	BM	BMVI	RDC	GEX	GREV	FI	EXP	IMP	TB	TOT	RPC	RGFCF	RMMR	RLR	NEER	REER
High	3.1	1.7	61.6	1.2	3.9	5.1	4.1	3.2	4.5	5.8	6.6	8.0	6.3	4.1	1.7	4.5	37.6	12.7	5.5	5.7
Upper Middle	5.4 [§]	18.1 [§]	71.8	5.5 [§]	14.7 [§]	8.4	9.2 [§]	23.5	20.1	13.4	11.8 [§]	13.3	12.3 [§]	7.1	6.8 [§]	13.3 [§]	30.3	18.5	8.1	6.3
Lower Middle	5.7	17.2	...	2.4	11.4	8.3	6.7	16.9	11.4	10.7	13.3 [§]	12.6	14.6 [§]	10.7	7.0	13.9	12.1 [§]	18.1	9.5	4.6
Low	7.6 [§]	5.5	...	...	6.2	10.0	8.5	35.1	29.9	29.3	18.4 [§]	15.1 [§]	19.6 [§]	10.8 [§]	8.8	22.5	18.7	7.8	12.3	12.6

OUTPUT – real manufacturing or industrial production, CPI – consumer price index, CCPI – inflation, RW – real wage, BM – broad money, BMVI – broad money velocity indicator, RDC – real domestic private sector credit, GEX – real government expenditure, GREV – real government revenue, FI – fiscal impulse, EXP – real exports of goods and services, IMP – real imports of goods and services, TB – trade balance, TOT – terms of trade, RPC – real private consumption, RGFCF – real gross fixed capital formation (investment), RMMR – real money market rate, RLR – real lending rate, NEER – nominal effective exchange rate, REER – real effective exchange rate.

Note that numbers in italics indicate that annual rather than quarterly data has been used for that particular result. All of the variables refer to the Hodrick-Prescott filtered cyclical component. Significant differences from the developed country benchmarks (the United States, United Kingdom and Japan) are denoted by § ($p < 0.05$) and § ($p < 0.01$).

Table 5(a). Relative Volatility

Country	CPI	CCPI	RW	BM	BMVI	RDC	GEX	GREV	FI	EXP	IMP	TB	TOT	RPC	RGFCF	RMMR	RLR	NEER	REER
US	0.5	9.4	0.4	0.6	1.1	1.1	1.1	1.5	2.0	2.4	2.1	1.9	0.9	0.5	1.8	9.3	5.6	1.7	1.5
UK	0.8	32.2	0.6	3.3	3.3	2.5	...	...	...	2.1	2.4	1.9	1.1	0.7	1.8	15.0	5.6	1.7	2.0
Japan	0.5	20.1	0.3	0.5	1.0	0.7	...	...	...	1.9	3.2	2.2	1.8	0.4	1.1	12.7	2.0	2.0	2.0
Africa																			
Côte D'Ivoire	0.5	11.4	...	1.0	1.2	0.7	...	...	...	2.8	2.4	2.2	1.9	1.2	4.5	1.8	0.5	1.0	1.0
Malawi	1.3	8.6	...	1.2	1.4	2.4	3.3	1.5	3.5	2.3	2.3	3.0	2.0	1.4	3.4	...	1.8	2.3	2.0
Nigeria	1.4	54.0	...	1.3	1.9	1.9	14.5	11.6	12.0	3.5	3.1	4.2	...	3.2	7.5	...	2.1	3.0	3.4
South Africa	0.4	10.0	...	1.0	1.0	1.1	1.9	2.2	2.3	3.5	4.6	4.1	1.1	0.7	1.8	6.5	3.9	2.5	2.4
Senegal	0.6	12.4	...	0.7	1.1	1.1	...	...	...	5.1	1.8	4.5	...	0.8	1.5	2.0	0.3	...	...
North Africa																			
Israel	6.1	12.9	...	11.5	5.2	2.1	20.7	21.0	3.3	1.5	2.4	2.6	0.9	4.7	4.6	...	8.7	4.6	1.7
Jordan	0.5	9.2	...	0.4	1.0	0.6	2.0	1.6	2.8	2.0	1.5	2.1	...	1.6	2.4	...	3.6	0.4	0.4
Morocco	0.6	26.9	...	0.9	1.2	1.8	2.4	2.2	5.0	5.1	3.7	4.6	3.9	1.8	5.7	3.7	1.2	0.9	0.7
Tunisia	0.2	7.2	...	0.9	1.0	1.0	3.9	3.7	0.1	3.9	2.9	3.0	...	0.7	2.5	1.9	1.0	1.0	...
Latin America																			
Argentina	5.9	10.9	...	4.4	0.8	2.0	0.9	0.9	0.7	1.3	2.4	2.7	0.4	0.6	1.5	...	4.7	...	...
Barbados	0.8	15.7	...	0.8	1.1	1.6	1.7	1.7	2.3	3.8	2.1	3.8	...	2.2	...	...	2.1	...	...
Brazil	18	19.1	...	17.1	3.0	3.4	18.4	3.6	3.7	3.1	4.0	4.3	4.8	1.9	2.5	30.7	3.6	...	...
Chile	0.9	6.8	0.1	0.7	0.7	0.7	11.3	11.6	0.2	2.1	2.1	0.2	...	0.9	2.8	2.7	1.7	0.8	0.3
Colombia	1.6	145.8	...	1.3	1.5	2.4	2.2	2.1	3.1	3.6	4.3	5.4	3.3	0.7	4.7	7.6	3.7	2.2	2.2
Mexico	10.3	11.0	2.9	3.2	3.9	4.4	4.0	3.2	2.8	3.2	4.6	4.0	...	1.6	2.3	8.6	8.5	...	...
Peru	9.3	12.5	...	5.0	0.9	1.1	4.0	1.4	1.7	1.6	2.3	2.8	...	...	1.5	...	3.1	...	...
Trinidad	0.4	8.4	...	0.7	1.3	1.0	...	...	...	3.2	3.0	3.4	2.3	3.2	6.3	...	0.9	1.2	1.2
Uruguay	8.8	7.7	...	7.6	2.2	2.4	3.7	2.3	2.3	3.0	3.2	3.6	...	2.6	3.5	6.5	4.9	2.6	1.7
Asia																			
Bangladesh	0.4	13.6	...	0.8	1.0	1.1	...	...	...	2.5	3.2	3.7	...	0.6	0.7	...	1.0	...	...
Hong Kong	0.5	14.5	0.5	0.6	0.9	0.9	2.5	2.5	5.7	1.9	2.1	0.8	0.6	0.7	2.0	13.2	3.1	1.0	1.1
India	1.5	34.5	...	2.2	2.6	1.8	3.3	3.4	0.5	2.9	4.4	4.1	3.8	1.8	...	9.9	1.7	...	...
Korea, South	0.7	9.9	...	1.3	1.0	0.6	2.4	2.0	2.2	1.8	2.7	2.5	1.0	0.7	1.9	3.2	2.1	...	...
Malaysia	0.3	9.0	...	0.5	1.1	0.7	1.5	2.0	1.9	1.5	1.7	1.2	1.4	1.1	3.5	0.7	2.1	0.8	0.8
Pakistan	0.8	11.7	...	0.9	1.8	1.3	3.2	3.0	0.2	3.2	2.9	3.6	2.5	...	2.8	4.6	...	1.0	1.0
Philippines	0.4	4.4	...	0.2	1.1	0.5	0.6	1.2	0.6	0.6	0.7	0.7	0.4	0.4	0.7	1.1	0.8	0.4	0.3
Turkey	9.7	7.0	...	2.4	1.9	3.4	8.3	8.4	19.2	3.1	3.5	4.2	1.7	1.1	2.4	6.7	...	...	...
East Europe																			
Hungary	0.6	6.0	0.7	1.0	1.6	1.2	1.7	2.1	1.6	1.5	1.6	1.6	0.6	0.6	0.7	...	2.6	1.0	0.8
Lithuania	1.6	4.8	...	0.7	0.9	0.9	0.5	0.6	0.4	0.7	0.8	0.5	...	0.4	0.8	1.8	1.4	...	...
Macedonia	2.2	55.4	0.4	2.0	2.9	1.7	...	...	...	1.3	1.7	1.3	...	...	...	...	4.2	5.1	1.3
Romania	2.3	5.5	1.1	1.4	1.9	1.6	3.0	1.6	1.5	1.8	1.7	1.5	...	0.8	1.0	...	...	...	1.5
Slovak Republic	0.8	15.6	1.1	0.9	1.2	5.1	2.3	2.6	2.1	4.0	3.6	2.6	...	0.9	3.9	5.6	5.1	1.7	1.3
Slovenia	1.7	11.1	4.1	3.2	1.9	2.1	1.5	1.6	2.0	4.1	3.7	2.0	...	0.6	1.8	8.0	11.1	...	...

Table 5(b). Summary of Relative Volatility (by Region)

Region	CPI	CCPI	RW	BM	BMVI	RDC	GEX	GREV	FI	EXP	IMP	TB	TOT	RPC	RGFCF	RMMR	RLR	NEER	REER
US,UK and Japan	0.6	20.6	0.4	1.5	1.8	1.4	1.1	1.5	2.0	2.1	2.6	2.0	1.3	0.5	1.6	12.3	4.4	1.8	1.8
Africa	0.8	19.3	...	1.0	1.3	1.4	6.6	5.1	5.9	3.4 ^f	2.8	3.6 ^f	1.7	1.5	3.7	3.4 ^f	1.7	2.2	2.2
North Africa	1.9	14.1	...	3.4	2.1	1.4	7.3	7.1	2.8	3.1	2.6	3.1	2.4	2.2	3.8	2.8 ^f	3.6	1.7	0.9
Latin America	6.2 ^f	26.4	1.5	4.5	1.7	2.1	5.8	3.4	2.1	2.8	3.1	3.4 ^f	2.7	1.7 ^h	3.1 ^f	11.2	3.7	1.7	1.4
Asia	1.8	13.1	0.5	1.1	1.4	1.3	3.1	3.2	4.3	2.2	2.7	2.6	1.6	0.9	2.0	5.6 ^f	1.8	0.8 ^h	0.8 ^h
Eastern Europe	1.5 ^f	16.4	1.5	1.5	1.7	2.1	1.8	1.7	1.5	2.2	2.2	1.6	0.6	0.7	1.6	5.1 ^f	4.9	2.6	1.2 ^f
All Developing Countries	2.7 ^h	18.7	1.1	2.3	1.6	1.7	4.5	3.7	3.1	2.6	2.7	2.8 ^h	1.8	1.3 ^h	2.7 ^h	7.1 ^f	3.3	1.8	1.4

Table 5(c). Summary of Relative Volatility (by Income)

Income	CPI	CCPI	RW	BM	BMVI	RDC	GEX	GREV	FI	EXP	IMP	TB	TOT	RPC	RGFCF	RMMR	RLR	NEER	REER
High	0.6	20.5	0.4	1.4	1.8	1.4	1.1	1.5	2.0	2.2	2.5	2.0	1.3	0.5	1.5	12.3	4.4	1.8	1.8
Upper Middle	3.7 ^h	17.5	1.5	3.2	1.7	2.0	4.9	4.0	3.2	2.6	2.8	2.7	1.7	1.4 ^h	2.7 ^f	7.8	4.1	1.8	1.3 ^f
Lower Middle	2.3	...	0.4	1.7	1.5	1.3	3.1	2.4	2.0	2.8	2.5	2.9	3.2	1.4	3.0	3.4 ^f	2.6	1.7	0.9 ^h
Low	0.9	...	...	1.1	1.5	1.3	5.4	4.4	4.1	2.8 ^h	2.5	3.2 ^h	2.0	1.3	3.0	3.7 ^f	1.2	1.6	1.7

For notes see Table 4(c)

Returning to Tables 4(a) and 4(b), it is evident that the African and Eastern European countries exhibit the highest average volatilities. However, the Eastern European average is skewed by the exceedingly high output volatility of 14.5% observed in Lithuania, with all the other Eastern European countries exhibiting much lower output volatility. Another country with exceedingly high output volatility is the Philippines; at 18% this is three times greater than the developing country average and six times greater than the developed country average. This high output volatility was similarly observed in the amplitude analysis in Male (2010), where it was observed that the Philippines experience, on average, a 69% increase in output during business cycle expansions and a 50% reduction in output during recessions, compared to a 6.4% rise during expansions and a 2% decline during recessions in the US.⁷ Given the previous analysis, the excessive volatility in the Philippines may go some way to explaining the country's relatively poor growth rates, in relation to the other Asian economies.⁸

Secondly, from Tables 5(a),(b) and (c), it is apparent that consumption in the developed countries (the US, the UK and Japan) is on average 50% less volatile than output, whereas in the developing countries consumption is, on average, 30% more volatile than output; however, there is much regional variation. Consumption volatility is highest in North Africa, and in particular in Israel where it is almost five times more volatile than output. Conversely, on average consumption volatility is slightly lower than output volatility in the Asian and Eastern European regions. The fact that consumption volatility is higher than output volatility in Africa, North Africa and Latin America points to a lack of consumption smoothing over the course of the business cycle in these regions. Thus, large welfare gains may be possible through reductions in consumption volatility in these regions (Loayza *et al.*, 2007).

Thirdly, government revenue and expenditure are significantly more volatile in the developing countries, than in the developed countries. On average government expenditure is four and a half times more volatile than output and government revenue is almost four times more volatile than output. This situation is worst in North Africa, where both government expenditure and revenue are more than seven times more volatile than output. The observed high volatility in these developing countries suggests that the government may actually aggravate business cycle fluctuation, rather than help to smooth them.

Fourthly, from the existing stylised facts, it is expected that investment volatility in the developing countries should be two to three times higher than output volatility and of a similar level to that in the developed countries. However, whilst the East European countries have similar investment volatilities to the US, UK and Japan, the other developing countries have significantly higher investment volatilities. In particular, Africa and North Africa where investment volatility is almost four times greater than output volatility; most notably, Nigeria where investment is seven and a half times more volatile than output. However, when aggregating across income groupings the observed relative volatility of investment is consistent with that expected for the developing economies.

⁷ See Table 9 in Male (2010).

⁸ For the period 1980 to 2005, the average growth rates of GDP and GDP per capita in the Philippines were 2.86% and 0.59%, respectively, compared with regional averages of 5.05% for GDP and 3.13% for GDP per capita. See Table 2.2 for more information.

Fifthly, considering prices and inflation it is obvious that the Latin American countries exhibit the highest volatilities, with prices more than six times more volatile than output and inflation more than twenty-six times more volatile than output. Prices in the developed countries and in Africa are less volatile than output, whilst prices in the other regions are around 50% more volatile than output. Referring now to inflation, with the exception of the Latin American countries, on average the developing countries exhibit significantly less inflation volatility than the developed countries; however, this result is skewed by the high inflation volatilities in the UK and Japan.

Sixthly the money-related variables are examined. Neumeyer and Perri (2005) suggest that the real interest rate is significantly more volatile for developing economies than for developed countries. Examination of the absolute volatilities in Table 4(b) reveals that whilst for the real lending rate the North African, Latin American and Eastern European countries have higher volatilities than the developed countries. In the case of the real money market rate, only the Latin American countries have higher volatilities than the developed countries. Furthermore, examination of the relative volatilities in Table 5(a) reveals that, with just one exception, the relative volatility of real interest rates is lower in the developing countries than in the developed countries. For all countries, the volatility of the real interest rate is significantly greater than the volatility of output. The relative volatilities of both broad money and the broad money velocity indicator are similar amongst the developing and developed countries, only North Africa and Latin America have significantly greater relative volatilities of broad money. However, in developing countries it is important to additionally examine real domestic private sector credit. This is because, as discussed in Agénor *et al.* (2000), where equity markets are weakly capitalised private sector credit will have a significant influence on economic activity. Tables 5(a), (b) and (c) show the volatility of real domestic credit to be of a similar level to that of the developed countries, with slightly higher volatility in Latin America and Eastern Europe. This contradicts the finding of Rand and Tarp (2002) that private sector credit is on average less volatile than in the developed countries.

Finally, the trade-related variables are considered. Firstly, the trade balance is examined. From the existing stylised facts, the expectation is that the trade balance should be around three times more volatile than output, and the results in Tables 5(a), (b) and (c) are consistent with this. Additionally, the relative volatility of the trade balance in the developing countries is significantly greater than that of the developed countries. The only exceptions are the Eastern European countries, where the trade balance is, on average, just 0.6 times more volatile than output. The findings for the imports, exports and the terms of trade are fairly similar to those for the trade balance.

The volatility of the nominal and real effective exchange rates for the developing countries are similar to those for the developed countries, which is consistent with the finding of Rand and Tarp (2002). However, the Asian countries display significantly lower exchange rate volatility and moreover for these countries both the nominal and real exchange rates are less volatile than output. This is a significant finding, because one of the key features of international business cycles that has interested macroeconomists in recent years is the volatility and persistence of real exchange rates. Flood and Rose (1995) suggest that whilst the choice of exchange rate regime affects the volatility of the exchange rate, the volatility of output is stable across regimes. Therefore, where

economies maintain a fixed exchange rate regime, exchange rates will be less volatile than output. This is consistent with the Asian experience for Hong Kong, Malaysia and Pakistan; all of which have held fixed, or pegged, exchange rates for significant durations of the sample period. However, the Philippines, which has the lowest relative volatility, has held a free-float since 1983. Nonetheless, the low relative volatility can perhaps be explained simply by the extremely high output volatility experienced in the Philippines. Compared to the other Asian economies, the Philippines has the highest absolute volatility of exchange rates (6.1%), resulting from its free-float, however in relation to its output volatility of 18.0%, the relative volatility of the exchange rates is extremely low.

5.3. Cross-Correlations with Real Domestic Output

The degree of co-movement of the variables of interest (y_t) with real industrial (or manufacturing) production (x_t) is measured by the magnitude of the correlation coefficient $\rho(j), j \in \{0, \pm 1, \pm 2, \dots\}$. Following the reasoning of Agénor *et al.* (2000), the series is considered to be strongly contemporaneously correlated if $0.22 \leq |\rho(j)| < 1$, weakly contemporaneously correlated if $0.11 \leq |\rho(j)| < 0.22$ and contemporaneously uncorrelated with the cycle if $0 \leq |\rho(j)| < 0.11$. These values are selected because, given the average number of observations per country, the average standard error of the correlation coefficients, computed under the null hypothesis of no correlation, is 0.11.

Tables 6(a), 6(b) and 6(c) report the contemporaneous correlations for all the variables with output. Tables reporting the cross-correlations between domestic output and each of the variables with leads and lags are available in Appendix B.

(a) Industrial Country Business Cycles

The first relationship considered is whether output fluctuations in developing countries are positively correlated with economic activity in the main industrialised countries, as proxied by world output and world real interest rate. In particular, Agénor *et al.* (2000) suggest that relationship with the world real interest rate could be important because it is likely to effect economic activity in the developing country by both affecting domestic interest rates and by reflecting credit conditions in international capital markets.

From Table 6(a), it can be seen that there is a clear relationship, the contemporaneous correlation of domestic output with world output is positive for all the developing countries, with the sole exception of Jordan ($\rho(0) = -0.035$). The majority of countries peak at $j = 0$, or at least by $j = 4$, suggesting that output fluctuations in the industrialised countries are transmitted fairly rapidly to developing countries.

For world real interest rate, Table 6(a) shows a slightly less clear relationship. The contemporaneous correlation between domestic output and the world real interest rate is positive for most countries; however, it is negative for five countries and there is no significant relationship for six countries. The majority peak at $j = 0$, suggesting rapid transmission, but again there is more variation than for world output. Where there is a positive correlation, this may reflect the positive spill over effect of pro-cyclical interest rates in the industrialised countries on the developing country's output.

Table 6(a). Contemporaneous Correlation with Real Domestic Output

Country	CPI	CCPI	RW	BM	BMVI	RDC	GEX	GREV	FI	EXP	IMP	TB	TOT	RPC	RGFCF	RMMR	RLR	NEER	REER	WO	WIR
US	-0.47*	0.27*	0.41*	0.03	-0.69*	0.77*	-0.41*	0.59*	-0.70*	0.25*	0.58*	-0.31*	-0.25*	0.68*	0.87*	0.58*	0.58*	-0.16	-0.14	0.78*	0.55*
UK	-0.51*	0.23*	0.26*	0.10	-0.06	0.23*	-0.54*	...	...	0.23*	0.47*	-0.34*	-0.17	0.52*	0.51*	0.12	0.21	-0.23*	-0.34*	0.61*	0.44*
Japan	-0.35*	0.43*	0.53*	0.39*	-0.68*	0.36*	0.25*	...	...	0.42*	0.62*	-0.55*	-0.36*	0.37*	0.76*	0.31*	0.24*	-0.25*	-0.24*	0.82*	0.35*
Africa																					
Côte D'Ivoire	0.17	0.08	...	0.19	-0.74*	-0.14	...	...	...	-0.19	0.09	-0.21	0.19	...	...	0.10	0.23*	-0.06	-0.17	0.01	0.24*
Malawi	-0.24*	-0.41*	...	0.01	-0.53*	0.25*	0.09	0.03	0.08	0.13	0.26*	-0.10	0.06	...	...	...	-0.26*	0.43*	0.36*	0.13	-0.02
Nigeria	-0.26*	-0.22*	...	-0.31*	-0.53*	0.11	-0.55*	0.09	-0.25*	0.38*	-0.04	0.33*	...	...	...	...	0.38*	-0.09	-0.22*	0.30*	0.11
South Africa	-0.12	0.12	...	0.47*	-0.54*	0.39*	0.04	-0.43*	-0.28*	0.32*	0.71*	-0.56*	0.22*	0.56*	0.63*	0.15	0.13	0.01	-0.02	0.17	0.18
Senegal	0.12	0.02	...	0.07	-0.87*	-0.18	...	...	...	...	...	...	...	...	...	0.57*	0.45*	...	...	0.50*	-0.40*
North Africa																					
Israel	0.19	-0.43*	...	0.19	-0.49*	0.04	...	...	...	0.14	0.35*	-0.25*	0.13	0.25*	0.37*	...	-0.02	-0.23*	-0.12	0.04	0.24*
Jordan	-0.16	-0.14	...	-0.04	-0.91*	-0.06	-0.16	-0.70*	-0.28*	0.07	-0.03	0.09	...	...	...	0.17	0.35*	...	...	-0.04	0.73*
Morocco	-0.24*	-0.07	...	0.10	-0.66*	-0.06	0.29*	0.24*	0.13	0.13	-0.06	0.21	-0.14	...	...	0.18	0.03	-0.09	-0.29*	0.20	0.08
Tunisia	-0.15	-0.43*	...	0.34*	-0.53*	0.30*	...	...	...	0.31*	0.08	0.32*	...	...	...	0.43*	...	-0.09	-0.13	0.34*	0.18
Latin America																					
Argentina	0.60*	0.24*	...	0.60*	-0.79*	0.18	0.74*	0.71*	-0.39*	0.39*	0.74*	-0.69*	0.28*	0.71*	0.90*	...	-0.80*	...	...	0.61*	0.20
Barbados	-0.44*	-0.12	...	0.05	-0.69*	0.35*	0.20	0.20	0.02	0.07	0.38*	-0.15	...	...	...	...	0.20	...	...	0.45*	0.28*
Brazil	0.42*	0.40*	...	0.37*	-0.59*	0.28*	0.51*	0.53*	-0.14	0.16	0.58*	-0.52*	-0.32*	0.49*	0.64*	-0.76*	-0.74*	...	...	0.56*	-0.07
Colombia	-0.30*	0.23*	...	0.07	-0.48*	0.09	0.35*	0.17	0.12	0.20	0.40*	-0.19	0.17	0.64*	0.67*	0.30*	0.27*	0.26*	0.29*	0.28*	0.04
Chile	-0.01	-0.13	-0.05	0.45*	-0.52*	-0.14	...	...	...	0.58*	-0.20	0.52*	...	0.22*	-0.95*	-0.32*	-0.22*	0.11	1.00*	0.60*	0.31*
Mexico	-0.33*	-0.52*	0.28*	0.05	0.02	0.47*	-0.11	-0.31*	-0.09	0.35*	0.77*	-0.61*	...	0.56*	0.80*	-0.47*	-0.48*	...	...	0.33*	0.13
Peru	-0.39*	-0.05	...	-0.46*	-0.68*	0.17	-0.23*	0.15	-0.10	-0.04	0.67*	-0.55*	...	...	0.77*	...	-0.34*	...	...	0.26*	0.13
Trinidad	-0.22*	-0.15	...	-0.19	-0.83*	0.02	...	...	...	0.02	0.01	0.02	-0.09	...	...	...	-0.07	-0.13	-0.23*	0.17	0.11
Uruguay	-0.14	-0.04	...	0.36*	-0.40*	-0.20	0.36*	-0.37*	-0.21	0.50*	0.66*	-0.27*	...	...	...	0.31*	-0.36*	-0.27*	-0.12	0.33*	0.25*
Asia																					
Bangladesh	0.06	0.12	...	0.26*	-0.59*	0.33*	...	...	...	-0.01	0.31*	-0.27*	...	...	...	...	0.06	...	...	0.07	-0.17
Hong Kong	0.07	0.28*	0.41*	0.69*	-0.61*	0.29*	-0.21	-0.58*	-0.32*	0.64*	0.66*	-0.32*	-0.56*	0.63*	0.62*	0.11	0.33*	0.09	0.07	0.22*	0.35*
India	-0.40*	-0.10	...	-0.02	-0.16	0.44*	...	...	...	0.06	-0.45*	0.20	0.32*	...	...	0.42*	0.04	...	...	0.54*	0.47*
Korea, South	-0.48*	-0.25*	...	0.33*	-0.44*	0.19	-0.04	-0.39*	-0.28*	0.35*	0.53*	-0.32*	0.36*	0.32*	0.47*	-0.30*	-0.36*	...	...	0.21	0.24*
Malaysia	-0.07	0.15	...	0.02	-0.91*	-0.11	-0.21	-0.68*	-0.32*	0.55*	0.26*	-0.03	0.53*	-0.32*	-0.06	0.81*	0.75*	0.36*	0.32*	0.43*	0.18
Philippines	0.05	0.13	...	0.18	-0.93*	0.26*	-0.03	-0.89*	-0.20	0.10	0.59*	-0.15	0.45*	0.02	0.20	0.23*	0.08	0.28*	0.35*	0.09	-0.24*
Pakistan	0.13	0.24*	...	-0.07	-0.57*	0.00	...	...	...	0.24*	0.23*	0.03	0.05	...	...	0.00	...	-0.01	0.00	0.15	-0.02
Turkey	-0.13	-0.26*	...	-0.37*	-0.78*	0.65*	...	...	...	0.11	0.64*	-0.55*	0.08	0.67*	0.79*	-0.22*	...	...	...	0.16	-0.10
East Europe																					
Hungary	-0.59*	0.18	0.30*	-0.57*	-0.84*	0.42*	-0.63*	-0.87*	-0.61*	0.12	0.00	0.11	0.36*	-0.30*	0.01	...	-0.01	-0.34*	-0.69*	0.35*	0.48*
Lithuania	-0.10	0.03	...	0.41*	-0.94*	0.24*	0.44*	-0.90*	0.65*	-0.07	-0.01	-0.11	0.10	0.29*	...	-0.12	-0.02	...	...	0.20	0.23*
Macedonia	-0.25*	0.46*	0.24*	0.07	-0.35*	0.21	...	...	...	0.43*	0.27*	0.07	...	...	...	...	0.09	-0.15	-0.22*	0.12	-0.20
Romania	-0.62*	-0.28*	0.56*	-0.31*	-0.86*	-0.42*	-0.02	0.10	0.44*	0.58*	0.64*	0.01	...	-0.11	0.85*	...	...	...	0.29*	0.23*	0.14
Slovenia	0.58*	0.56*	0.34*	0.35*	-0.56*	-0.27*	0.27*	-0.64*	0.17	0.22	0.09	0.17	...	-0.59*	-0.63*	-0.04	0.25*	...	...	0.36*	0.12
Slovak Republic	0.13	-0.46*	0.00	0.38*	-0.59*	-0.46*	...	...	...	0.50*	0.55*	0.08	...	-0.10	0.04	0.22*	0.45*	0.02	-0.11	0.11	-0.14

Table 6(b). Summary of Contemporaneous Correlations with Real Domestic Output (by Region)

	CPI	CCPI	RW	BM	BMVI	RDC	GEX	GREV	FI	EXP	IMP	TB	TOT	RPC	RGFCF	RMMR	RLR	NEER	REER	WO	WIR
US,UK and Japan	-0.44*	0.31*	0.40*	0.16	-0.48*	0.46*	-0.23*	0.59*	-0.70*	0.30*	0.56*	-0.40*	-0.26*	0.52*	0.71*	0.34*	0.34*	-0.21	-0.24*	0.73*	0.45*
Africa	-0.07[§]	-0.08	...	0.08	-0.64*	0.09	-0.14	-0.10	-0.15	0.16	0.26*	-0.13	0.16[§]	0.56*	0.63*	0.28*	0.18	0.07	-0.01	0.22*[§]	0.02[§]
North Africa	-0.09[§]	-0.27*[§]	...	0.15	-0.65*	0.06	0.06	-0.23*	-0.08	0.16	0.08[§]	0.09[§]	0.00	0.25*	0.37*	0.26*	0.12	-0.13	-0.18	0.14[§]	0.31*
Latin America	-0.09[§]	-0.02	0.11	0.14	-0.55*	0.14	0.26*	0.15	-0.11	0.25*	0.44*	-0.27*	0.01	0.53*	0.47*	-0.19	-0.28*[§]	-0.01	0.24*	0.40*[§]	0.15[§]
Asia	-0.10[§]	0.04	0.41*	0.13	-0.62*	0.26*	-0.12	-0.64*	-0.28*	0.25*	0.35*	-0.17	0.18	0.26*	0.40*	0.15	0.15	0.18[§]	0.18[§]	0.24*[§]	0.09[§]
Eastern Europe	-0.14	0.08	0.29*	0.06	-0.69*	-0.05	0.01	-0.58*	0.16	0.30*	0.26*	0.06[§]	0.23*	-0.16[§]	0.06	0.02	0.15	-0.16	-0.18	0.23*[§]	0.11[§]
All Developing Countries	-0.10[§]	-0.03	0.26*	0.11	-0.62*	0.11	0.05	-0.23*	-0.09	0.24*	0.31*	-0.12[§]	0.12[§]	0.23*	0.36*	0.08	0.01	0.01[§]	0.02[§]	0.27*[§]	0.13[§]

Table 6(c). Summary of Contemporaneous Correlations with Real Domestic Output (by Income)

	CPI	CCPI	RW	BM	BMVI	RDC	GEX	GREV	FI	EXP	IMP	TB	TOT	RPC	RGFCF	RMMR	RLR	NEER	REER	WO	WIR
High	-0.44*	0.31*	0.40*	0.16	-0.48*	0.46*	-0.23*	0.59*	-0.70*	0.30*	0.56*	-0.40*	-0.26*	0.52*	0.71*	0.34*	0.34*	-0.21	-0.24*	0.73*	0.45*
Upper Middle	-0.08[§]	-0.04	0.26*	0.16	-0.57*	0.06	0.15	-0.21	-0.10	0.27*	0.39*	-0.11[§]	0.04	0.22*	0.34*	0.01	-0.04	0.00	0.07	0.30*[§]	0.17[§]
Lower Middle	-0.19[§]	-0.02	0.24*	0.03	-0.68*	0.14	-0.03	-0.30*	-0.11	0.17	0.25*	0.00[§]	0.15	0.02	0.49*	0.25*	0.04	-0.01	-0.07	0.16[§]	0.12
Low	-0.06[§]	-0.04	...	0.02	-0.57*	0.12	-0.23*	0.06	-0.09	0.10	0.07	0.05	0.15[§]	0.27*	0.15	0.07[§]	-0.01	0.24*[§]	0.03[§]

WO – world real output, WIR – world real interest rate. For other variable names, see Table 4(c).

Note that numbers marked in bold indicate weak contemporaneous correlation and numbers marked in bold with a * indicate strong contemporaneous correlation. All of the variables refer to the Hodrick-Prescott filtered cyclical component. Significant differences from the developed country benchmarks (the United States, United Kingdom and Japan) are denoted by § (p < 0.05) and § (p < 0.01).

Examination of Table 6(c) would seem to suggest that contemporaneous correlation between domestic output and the world real interest rate increases as economies become relatively more developed. This may reflect the fact that as economies develop, their domestic capital markets become more sophisticated and thus are more likely to be influenced by changes in international credit conditions.

Overall, findings for both of world output and world real interest rate are consistent with Agénor *et al.* (2000).

(b) Prices, Inflation and Real Wages

For the industrialised countries, there is a clear pattern of countercyclical prices and a substantial literature documenting this. For developing countries, however this pattern is not nearly so clear. Rand and Tarp (2002) report a large negative association between CPI and GDP, whilst Agénor *et al.* (2000) find a generally negative pattern with a few significant positive relationships in Chile, Mexico, the Philippines and Uruguay.

Table 6(a) reports significant countercyclical prices for the US, the UK and Japan, and similarly prices are countercyclical in eighteen of the developing countries, and strongly so in thirteen of these. However, prices are acyclical in six of the developing countries and procyclical in eight. In particular, Argentina, Brazil and the Slovak Republic have strongly procyclical prices. Thus, this supports the findings of Agénor *et al.* (2000) that there is not a consistent negative relationship for the developing countries.

There is a similar lack of consistency in the relationship between output and inflation in the developing countries. Looking at Table 6(a), inflation is strongly procyclical in the industrialised countries and in sixteen of the developing countries, whilst it is countercyclical in the remaining seventeen developing countries. Looking closer, however, there does appear to be a relationship between the CPI correlations and the inflation correlations for the developing countries; there is a tendency for those developing countries with countercyclical CPI to also exhibit countercyclical inflation. This is a significant difference from the pattern of procyclical inflation and countercyclical prices in the industrialised countries.

The identification of the pattern of price and inflation correlations with output is necessary for the correct classification of demand and supply shocks. Chadha and Prasad (1994), amongst others, identify that if fluctuations in output are attributable to demand shocks, then both prices and inflation should be procyclical. Conversely, if such fluctuations are attributable to supply shocks, both prices and inflation should be countercyclical. For many of the countries examined here, including the developed countries, it is therefore difficult to clearly identify whether business cycle fluctuations are driven by supply or demand shocks. However, for several of the developing countries there is a clear pattern of both countercyclical prices and inflation.⁹ Consequently, it is plausible that business cycles in these countries are driven by supply shocks. Conversely, both prices and inflation are strongly procyclical in Argentina, Brazil and Slovenia, suggesting that business cycle fluctuations in these countries are attributable to demand shocks.

⁹ Both prices and inflation are strongly countercyclical in Malawi, Nigeria, Mexico, South Korea and Romania.

The correlation between output and real wages shows much more consistency. In almost all the countries, both developing and developed, the contemporaneous correlation is positive suggesting procyclical real wages. The only exceptions in this case are Chile and the Slovak Republic, where real wages are acyclical. As discussed in Agénor *et al.* (2000), the identification of whether real wages are procyclical or countercyclical has important implications for the choice of theoretical model to represent developing country business cycles. The procyclical wages in this case suggest the application of either a New Keynesian model with imperfect competition and countercyclical mark-ups, or a real business cycle model.

(c) Consumption and Investment

Real private consumption is strongly procyclical for the OECD countries and for the majority of the developing countries in the sample. However, real private consumption is countercyclical for four developing countries, three of which are East European countries. With the exception of the East European countries, this is consistent with Rand and Tarp (2002) who find a robust positive relationship between output and both public and private consumption.

Similarly, investment is strongly procyclical for the majority of countries in the sample, and almost all of these peak at a zero lag, which is identical to the finding of Rand and Tarp (2002). Two significant exceptions to this are Chile and Slovenia with very strongly countercyclical investment.

(d) Public Sector Variables

Fiscal policy can either dampen or exacerbate business cycle fluctuations depending on its timing. To have a stabilising effect on the economy, government expenditure should be countercyclical, whilst government revenues should be procyclical. Examining Tables 6(a), 6(b) and 6(c) reveals that there is no consistent relationship between output and government expenditures, or government revenues, for either the developed or developing countries. The US and the UK both exhibit strongly countercyclical government expenditures, whilst Japan has strongly procyclical government expenditures. However, upon reducing the time series for the developed countries to 1980:1 to 2005:1, government expenditures in the US and UK remain strongly countercyclical, whilst becoming acyclical in Japan. The situation is worse for the developing countries, where it is even more critical for business cycle fluctuations to be smoothed, with evidence of strongly countercyclical expenditure in just three of the developing countries, whilst there is evidence of strongly procyclical expenditures in seven countries.

Furthermore, just six of the developing countries exhibit procyclical government revenues, whilst eleven of the developing countries have strongly countercyclical government revenues. Thus, the governments in these countries need to address their revenue sources to ensure these do not reinforce fluctuations in the business cycle. Agénor *et al.* (2000) similarly find countercyclical government revenues and suggest this is likely to result from the negative effects of increases in tax revenues; however, this is based on a sample of just four developing countries.

To measure the net effect of government expenditure and revenue on the domestic business cycle, the fiscal impulse is used. The fiscal impulse, as defined by Agénor *et al.* (2000), is the ratio of government expenditures to government revenue, and to be a stabilising influence on the business cycle it should be countercyclical. Eleven of the developing countries have significantly countercyclical fiscal impulses. However, five countries have significantly procyclical fiscal impulses, of which three are Eastern European countries.

(e) Money, Credit and Interest Rates

Monetary policy is an important tool in macroeconomic stabilisation. However, the question of whether changes in money actually cause output fluctuations remains a pertinent one, both for developed and developing countries.¹⁰ It is, thus, important to examine the relationship between the business cycle and monetary variables.

The first relationship is that between the business cycle and broad money.¹¹ Examination of Tables 6(a), (b) and (c) reveals that, on average, broad money is either weakly procyclical or acyclical. However, money is countercyclical in a number of developing countries; Hungary, Nigeria, Tunisia, Peru and Trinidad and Tobago. From the correlations between the business cycle and leads and lags of broad money, it is possible to both assess whether money leads or lags the cycle. Additionally, if money leads the cycle, it is important to assess the speed at which changes in money are transmitted to economic activity. Firstly, for the developed countries, money leads the cycle in both the US and Japan and innovations in money are transmitted fairly quickly; within one quarter for Japan and within three quarters for the US. However, broad money appears to lag the business cycle in the UK, thus suggesting that money is influenced by output, rather than influencing it. Secondly, excluding the countries for which money is countercyclical, this relationship is examined for the developing countries. This analysis reveals that money leads the cycle for eleven, is synchronous for four and lags the cycle for seven developing countries. For all of the countries in which money leads the cycle, monetary innovations are transmitted within three quarters.

To further examine whether *money causes output*, Granger causality tests of the cyclical components of broad money and output were performed. The results provide evidence that *money causes output* in a number of countries, including the US, Japan, Brazil, Chile, Côte D'Ivoire, Lithuania, South Africa and South Korea. Conversely, there was also evidence that *output causes money* in several countries; Hungary, Malawi, Turkey and Trinidad and Tobago. In all other countries there was no clear pattern of causality. However the results were often sensitive to the choice of lags; the results for four and eight lags are available in Appendix B. The Granger causality tests and the examination of whether money leads or lags the business cycle, provide some evidence to suggest that money does influence output in developing countries. Monetary shocks are, therefore, important sources of business cycle fluctuations.

¹⁰ For example, see Sims (1972, 1980), Christiano and Ljungqvist (1988), Hafer and Kutan (2001) and Rusek (2001)

¹¹ The results of correlations between output and the other monetary aggregates (reserve money, narrow money (M1) and quasi money) follow a very similar pattern to those for broad money; consequently this analysis follows Agénor *et al.* (2000) and concentrates solely on broad money.

Following Agénor *et al.* (2000), the broad money velocity indicator is used to examine the velocity of money. The contemporaneous correlations are strongly countercyclical for all countries, with the exception of the UK and Mexico. This exactly corresponds to the findings of Agénor *et al.* (2000).

Another monetary variable which has been found by Agénor *et al.* (2000) and Rand and Tarp (2002) to have an important influence on the business cycle in some developing countries is real domestic private sector credit. Since equity markets are weakly capitalised in developing countries, relative to the industrialised countries, domestic private sector credit is thought to fulfil an important role in determining investment and hence economic activity in these countries. From Tables 6(a), (b) and (c) it is apparent that there is no clear pattern of cyclicity between output and real domestic private sector credit amongst the developing countries. However, it is procyclical for eighteen of the thirty-two countries. In the developed countries, where private sector credit should play a less important role, it is strongly procyclical. To examine whether credit influences output or vice versa, it is necessary to examine whether credit leads or lags the business cycle. For the majority of countries credit lags the business cycle, thus suggesting that it is fluctuations in output that influence credit. There are just three countries in which credit is both procyclical and leads the cycle: Japan, Peru and Nigeria. Granger causality test reveal a similar picture, with either no clear pattern of causation or with output causing credit; the only two countries for which there is significant evidence that credit causes output are Chile and Japan.

Finally, when considering the impact of monetary policy on the business cycle, it is also necessary to examine the relationship between output and interest rates. This relationship was not considered in either Agénor *et al.* (2000) or Rand and Tarp (2002). However, Neumeyer and Perri (2005) find real interest rates to be mildly procyclical in developed countries and countercyclical in developing countries. This is based on results for Argentina, Brazil, Korea, Mexico, and the Philippines. Similarly, Uribe and Yue (2005) find real interest rates to be countercyclical in five developing economies:¹² Argentina, Brazil, Ecuador, Mexico and Peru.

Tables 6(a), (b) and (c) report the correlations between output and both the real money market rate and the real lending rate. Both real interest rate variables are procyclical in the developed countries, and strongly so in the US and Japan. However, the results for the developing countries are much more varied. On average real interest rates are weakly procyclical in Africa, North Africa, Asia and Eastern Europe and countercyclical in Latin America. This countercyclicity of interest rates may be explained by the use of interest rates to target inflation during the 1980s and early 1990s, when most of the Latin American countries experienced a combination of extremely high inflation rates and slow economic growth. Thus, the distinct countercyclical relationship that Neumeyer and Perri (2005) and Uribe and Yue (2005) document is not characteristic of most developing country business cycles. This finding is particularly significant as there have been several recent papers that incorporate this feature into theoretical models of emerging market business cycles, including Neumeyer and Perri (2005), Uribe and Yue (2005), Aguiar and Gopinath (2006) and Arellano (2008).

¹² Uribe and Yue (2005) find real interest rates to be acyclical in the Philippines and South Africa, the only other developing countries in their sample.

Examining whether the real interest rates lead or lag the cycle, it is evident that these lag the cycle by around three quarters in the developed countries, whilst they tend to lead the cycle in the North African and Eastern European countries. There is no clear pattern amongst the other regions. To further consider whether interest rates cause the business cycle, Granger causality tests were used. These revealed that real interest rates cause output in one third of the developing countries,¹³ whilst being caused by output in just four developing countries; for all the other countries, including the developed countries, there was no evidence of unidirectional causation. Thus, interest rates do appear to be an important source of business cycle movements in developing countries.

(f) Trade and Exchange Rates

The final correlation analysis concerns the relationship between the business cycle and trade related variables, including the trade balance, the terms of trade and exchange rates. Following Agénor *et al.* (2000), the trade balance is constructed as the ratio of exports to imports at current prices.

Firstly, imports and exports are strongly procyclical in the developed countries, and are correspondingly procyclical in the majority of the developing countries. The only significant exceptions to this are Chile and India which have weakly and strongly countercyclical imports respectively. However, the results for the trade balance are not as consistent; for the developed countries and sixteen of the developing countries the trade balance is countercyclical, whilst for seven countries it is procyclical, and strongly so in Chile, Nigeria and Tunisia. The procyclicality of the trade balance can be explained by the strong positive relationship between the business cycle and exports and the acyclicity of imports, which in combination will result in a positive trade balance during expansions and a negative trade balance during recessions. This is the opposite of the developed country case, where expansionary business cycle phases result in increased demand for imports and thus a negative trade balance. The close relationship between exports and the business cycle in these countries may extend from the implementation of export-led or outward-looking development strategies.

The terms of trade provide an interesting distinction between the developed and the developing countries. Terms of trade are countercyclical for the developed countries. However, just three of the developing countries are similarly countercyclical (Brazil, Morocco and Hong Kong); for the majority the terms of trade are strongly procyclical. This is similar to the findings of both Agénor *et al.* (2000) and Rand and Tarp (2002), although for somewhat smaller samples. Agénor *et al.* (2000) suggest that, under the assumption that the developing economies are too small to affect world prices, the procyclical relationship may reflect demand shifts that yield simultaneous increases in world prices and demand for the country's exports. As such, both the economy's terms of trade and output would increase.

The weak relationship between the exchange rate and the rest of the economy is well documented in the literature, and is known as the *exchange rate disconnect puzzle* following Obstfeld and Rogoff (2000). Thus, it is unlikely that there will be a clear pattern

¹³ Brazil, Chile, South Korea, Malaysia, Mexico, Nigeria, Peru, Senegal, Slovenia, South Africa and Turkey.

of correlations between output and exchange rates for the sample of developing countries. However, for completeness this relationship is considered.

For the developed countries, both the nominal and real effective exchange rates are countercyclical, although as expected there is no clear configuration between the developing countries. The only distinct pattern that emerges is that for most countries both nominal and real exchange rates exhibit the same cyclicity relationship. A similar pattern is observed by Agénor *et al.* (2000).

5.4. Cross-Correlation of Output between Countries

The final intention of this paper is to examine the degree of business cycle synchronisation by measuring pair-wise correlations, both between developing countries and between developing and developed countries. There is known to be a close relationship between industrialised country business cycles; for example, Backus, Kehoe and Kydland (1995) find strong positive correlations between US output and nine other industrialised country business cycles.¹⁴ However, the degree of synchronisation for developing country cycles is rather more varied. Kose *et al.* (2003) find that a “world factor” explains much of the variation in industrialised country business cycles, whilst developing country business cycle fluctuations tend to be country specific, particularly in Asia and Africa, and consequently they display little comovement with the rest of the world.

There is reason to believe that the business cycles of developing countries will be correlated with the business cycles of their major trading partners and investors. As discussed in Aruoba (2001), a procyclical and leading relationship is expected between the lender country’s business cycle and the receiving country’s cycle. However, the results show no clear relationship between the business cycles of Turkey and its lender countries. A similarly procyclical and leading relationship is to be expected between a developing country’s cycle and the countries that are the key recipients of its exports. If the purchasing country goes into a recession, their import demand will decrease and hence the developing country’s exports will decline stimulating the onset of a recession. However, Caldéron *et al.* (2007) find that whilst trade intensity is an important factor in increasing business cycle synchronisation amongst the industrialised countries, this is of significantly less importance in the synchronisation between developed and developing country cycles and between developing country cycles.

Table 7 details the cross-country correlations, and as expected there is very strong synchronisation of the US, UK and Japanese business cycles, whilst the degree of synchronisation for the developing countries is rather more varied.

Examining the correlation between the developed and developing country pairs, there is evidence of strong synchronisation for a large proportion of the developing countries, particularly within the Latin American and Asian regions. In most cases where there is a significant correlation, the developed country is one of the key purchasers of the developing country’s exports; for example, throughout the sample period the US was the main procurer of Colombia’s exports.

¹⁴ The industrialised countries include Australia, Austria, Canada, France, Germany, Italy, Japan, Switzerland and the UK.

Table 7. Cross-Correlations of Real Output between Countries

	US	UK	JP	AG	BB	BR	CB	CL	MX	PE	TT	UG	BG	HK	IN	KO	MY	PK	PH	TK	IV	MI	NG	SG	SA	IS	JO	MC	HN	LT	MK	RM	SK	SJ	
US	.	0.65*	0.62*	0.55*	0.30*	0.18	0.32*	0.43*	0.23*	0.05	0.04	0.34*	-0.08	0.37*	0.21	0.28*	0.45*	0.09	-0.08	0.20	0.09	0.05	0.17	-0.15	0.04	0.16	0.20	0.07	0.46*	0.06	0.23*	0.12	-0.29*	-0.01	
UK		.	0.46*	0.36*	0.17	0.35*	0.16	0.18	-0.07	0.01	-0.07	-0.01	-0.16	0.24*	0.27*	0.38*	0.40*	0.01	0.06	-0.06	0.10	0.01	0.16	-0.25*	-0.04	0.21	0.07	0.20	0.61*	-0.12	-0.07	0.42*	0.02	0.29*	
JP			.	0.50*	0.40*	0.45*	0.09	0.25*	0.27*	-0.13	0.00	0.17	-0.22*	0.16	0.28*	0.34*	0.48*	0.10	0.40*	0.27*	-0.07	0.21	0.30*	-0.17	0.23	0.06	0.06	0.21	0.21	-0.25*	0.01	0.37*	0.16	0.26*	
AG				.	0.34*	0.10	0.15	0.47*	0.51*	0.09	-0.02	0.58*	-0.05	-0.01	0.17	-0.11	0.32*	0.02	-0.21	0.63*	-0.10	0.41*	0.02	-0.22*	-0.34*	0.24*	-0.34*	0.11	0.21	0.08	0.23*	-0.26*	-0.12	-0.09	
BB					.	0.08	0.07	0.03	0.06	-0.11	0.19	0.16	-0.20	-0.10	0.37*	0.08	0.18	-0.10	-0.10	0.15	0.14	0.09	0.19	0.02	0.05	-0.07	0.12	0.14	0.26*	0.01	0.01	0.23*	0.03	0.22	
BR						.	0.12	-0.15	0.05	0.62*	-0.02	0.03	0.20	0.45*	0.10	0.22*	0.39*	-0.09	0.32*	-0.01	0.03	0.10	0.00	-0.20	0.42*	0.35*	0.21	0.03	0.30*	-0.18	-0.14	0.42*	0.09	0.41*	
CB							.	0.46*	0.09	0.42*	0.36*	0.44*	0.29*	0.31*	0.05	-0.07	0.20	0.24*	0.17	0.26*	0.25*	-0.01	0.03	0.16	0.19	0.11	0.31	-0.06	0.07	0.32*	-0.16	0.11	0.45*	0.17	
CL								.	0.06	0.15	0.19	0.52*	-0.15	0.42*	-0.12	0.03	0.20	0.07	0.17	0.20	0.10	0.05	0.31*	-0.12	0.01	-0.15	0.20	-0.12	-0.06	0.07	0.05	0.01	0.21	0.07	
MX									.	0.02	0.01	0.37*	-0.10	-0.21	-0.15	-0.21	0.04	0.13	-0.16	0.19	0.06	0.11	0.32*	-0.05	0.20	-0.08	0.01	0.02	-0.12	0.02	0.36*	-0.28*	-0.48*	-0.01	
PE										.	0.44*	0.46*	0.32*	0.25*	0.17	0.16	0.02	0.08	0.14	0.19	0.59*	-0.31*	0.03	0.05	0.13	0.25*	0.26*	-0.22*	0.15	-0.23*	-0.29*	0.12	0.27*	0.44*	
TT											.	0.32*	0.05	0.14	0.00	0.04	-0.05	0.19	-0.06	0.10	0.23*	-0.15	-0.06	0.21	-0.09	0.11	0.10	0.01	-0.13	0.02	-0.10	-0.09	0.26*	0.29*	
UG												.	0.18	0.38*	0.22*	0.02	0.00	0.07	-0.09	0.24*	0.40*	-0.11	0.17	0.06	0.21	0.13	0.20	-0.01	0.09	0.06	0.26*	0.03	0.07	0.24*	
BG													.	0.28*	0.08	0.02	0.07	0.23*	0.23*	0.08	-0.04	-0.16	-0.36*	0.07	0.24*	0.13	0.21	-0.07	0.12	0.20	-0.20	0.07	0.17	0.27*	
HK														.	0.16	0.50*	0.34*	-0.12	0.32*	-0.07	0.04	-0.12	-0.10	-0.20	0.35*	0.40*	0.16	-0.01	0.32*	0.04	-0.21	0.21	0.21	0.39*	
IN															.	0.32*	0.26*	-0.20	0.24*	0.13	0.12	-0.01	0.02	0.06	0.06	0.30*	0.13	0.11	0.47*	-0.22	-0.13	0.41*	0.25*	0.31*	
KO																.	0.36*	-0.13	0.49*	-0.12	0.03	-0.01	-0.11	-0.19	-0.04	0.23*	0.12	0.06	0.34*	-0.35*	-0.06	0.29*	-0.04	0.24*	
MY																	.	-0.03	0.43*	0.02	-0.10	0.03	0.05	-0.36*	0.49*	-0.05	0.02	0.12	0.42*	-0.30*	-0.02	0.44*	0.21	0.27*	
PK																		.	-0.06	0.27*	0.01	0.07	0.03	0.15	0.05	-0.08	0.10	-0.12	-0.13	0.11	0.09	-0.13	0.02	0.00	
PH																			.	0.02	0.14	0.00	-0.03	-0.15	0.43*	0.12	0.07	-0.04	0.03	-0.24*	-0.23*	0.48*	0.18	0.17	
TK																				.	0.14	0.25*	0.17	0.08	-0.09	0.23*	0.08	-0.12	-0.08	0.25*	0.11	-0.07	0.03	-0.19	
IV																					.	-0.20	0.16	0.07	-0.07	-0.01	0.10	-0.01	0.11	0.10	-0.13	0.02	-0.18	-0.01	
MI																						.	-0.05	0.03	-0.04	-0.08	-0.07	0.25*	-0.20	-0.22*	-0.10	-0.03	0.34*	0.20	
NG																							.	-0.01	0.10	-0.02	-0.20	0.12	0.06	-0.09	0.19	0.11	0.22*	0.15	
SG																								.	-0.33*	-0.15	0.12	0.05	-0.18	0.05	-0.08	-0.21	0.09	-0.13	
SA																									.	-0.15	-0.07	-0.06	0.35*	-0.21	-0.34*	0.63*	0.46*	0.31*	
IS																										.	0.13	-0.10	0.11	-0.07	0.13	-0.09	0.11	0.34*	
JO																											.	-0.03	0.24*	-0.29*	0.02	0.10	0.32*		
MC																												.	-0.09	-0.11	-0.22*	-0.08	0.07	-0.02	0.31*
HN																													.	0.03	-0.07	0.53*	0.07	0.26*	
LT																														.	0.04	-0.47*	-0.03	-0.20	
MK																															.	-0.28*	-0.16	-0.29*	
RM																																.	0.47*	0.24*	
SK																																	.	0.46*	
SJ																																		.	

Note that numbers marked in bold indicate weak contemporaneous correlation and numbers marked in bold with a * indicate strong contemporaneous correlation

However, examining the degree of synchronisation between developing country cycles reveals no clear picture. The results for Africa seem to concur with the findings of Kose *et al.* (2003), namely that fluctuations are country specific. However, the Asian countries appear to exhibit strong regional synchronisation, particularly when considering only the East Asian countries; the correlations for this sub-sample of countries are presented in Table 8. There are also a number of strong correlations between the Latin American countries, and particularly between the members of the Latin American Free Trade Association.¹⁵

Table 8. Cross-Correlations of Real Output between East Asian Countries

	JP	HK	IN	KO	MY	PH
JP	.	0.16	0.28*	0.34*	0.48*	0.40*
HK		.	0.16	0.50*	0.34*	0.32*
IND			.	0.32*	0.26*	0.24*
KO				.	0.36*	0.49*
MY					.	0.43*
PH						.

Finally, the patterns of business cycle synchronisation observed in this analysis are compared to those found using the concordance statistic in Male (2010). This reveals that whilst no country pair with a significant concordance statistic is found to have an insignificant correlation in this analysis, a large number of the strong procyclical correlations observed in Table 7 are not similarly significant in the concordance analysis. In particular, referring to the East Asian countries in Table 8, the only significant concordance statistics are between India and South Korea and between Malaysia and the Philippines. Thus, this suggests that the concordance statistic is a much more robust measure of business cycle synchronisation and furthermore, that observed patterns of business cycle synchronisation clearly depend on the choice of business cycle definition.

6 CONCLUSION AND SUMMARY OF STYLISTED FACTS

Identifying the characteristics and statistical properties (or stylised facts) of business cycles is essential as these often form the basis for the construction and validation of theoretical business cycle models. Furthermore, understanding the cyclical patterns in economic activity, and their causes, is important to the decisions of both policymakers and market participants. However, whilst there have been a number of research papers examining these stylised facts in the context of developing countries (e.g. Agénor *et al.*, 2000; Rand and Tarp, 2002; Neumeyer and Perri, 2005; Aguar and Gopinath, 2007), these have been based on very small samples and the results have consequently been subjective and dependent on the countries chosen for inclusion in the study.

Motivated by the importance of the stylised facts and the lack of consistency amongst previous researchers, this paper has made a significant contribution to the literature by both generalising the developing country stylised facts for a much larger

¹⁵ The seven members are Argentina, Brazil, Chile, Mexico, Paraguay, Peru and Uruguay.

sample of thirty-two countries, and constructing a more comprehensive set of stylised facts. The stylised facts emerging from this study are summarised below.

Firstly, output is on average twice as volatile in developing than developed countries. This contradicts the finding of Rand and Tarp (2002) who state that output is no more than 20% more volatile in developing countries.

Secondly, with the exception of the Latin American countries, the volatility of prices and wages are similar to those of the developed countries. There is no clear pattern of either pro- or countercyclicality of either prices or inflation amongst the developing countries. There is, however, a tendency for those developing countries with countercyclical CPI to also exhibit countercyclical inflation and vice versa. This is a significant difference from the pattern of procyclical inflation and countercyclical prices observed in the industrialised countries. Real wages, however, are procyclical for both developing and developed countries.

Thirdly, consumption and investment are significantly more volatile than in developed countries. Consumption is on average 30% more volatile than output, whilst investment is between two and four times more volatile than output. Both investment and consumption are procyclical, as observed in developed countries. The findings for consumption and investment are consistent with the previous literature.

Fourthly, government revenue and expenditure are significantly more volatile than in developed countries, and they are, on average, four times more volatile than output. There is less consistency in the correlation analysis; however the fiscal impulse is significantly countercyclical for the majority of the developing country correlations, which implies that fiscal policy is having a stabilising effect on business cycle fluctuations.

Fifthly, real interest rates are, on average, less volatile than in the developed countries; this is the opposite of the finding of Neumeyer and Perri (2005). On average real interest rates are weakly procyclical in Africa, North Africa, Asia and Eastern Europe and countercyclical in Latin America. Thus, the distinct countercyclical relationship that Neumeyer and Perri (2005) and Uribe and Yue (2005) document is not characteristic of most developing country business cycles. This finding is particularly significant as there have been several recent papers that incorporate this feature into theoretical models of emerging market business cycles, including Neumeyer and Perri (2005), Uribe and Yue (2005), Aguiar and Gopinath (2006) and Arellano (2008).

Sixthly, broad money is, on average, procyclical in developed countries and either weakly procyclical or acyclical in developing countries. There is evidence that money leads the business cycle in a number of developing countries, suggesting that money does influence output in developing countries, and thus that monetary shocks are important sources of business cycle fluctuations. The broad money velocity indicator is strongly countercyclical in all the developing countries, except Mexico, exactly corresponding to the findings of Agénor *et al.* (2000).

Seventhly, real private sector domestic credit is procyclical in most developing countries, as by Agénor *et al.* (2000) and Rand and Tarp (2002). However, it tends to lag rather than lead the business cycle, thus suggesting that it is fluctuations in output that influence credit rather than credit influencing the business cycle.

Eighthly, output fluctuations in developing countries are positively correlated with economic activity in the main industrialised countries, as proxied by world output and

world real interest rate. Findings for both of world output and world real interest rate are consistent with Agénor *et al.* (2000). Furthermore, examining the correlation between the developed and developing country pairs, there is evidence of strong synchronisation for a large proportion of the developing countries, particularly within the Latin American and Asian regions.

Ninthly, imports and exports are strongly procyclical in the developed countries and are correspondingly procyclical in the developing countries. However, there is no consistent relationship with the trade balance. The terms of trade provide an interesting distinction between the developed and the developing countries, being countercyclical for the developed countries and strongly procyclical for the majority of developing countries. This is similar to the findings of both Agénor *et al.* (2000) and Rand and Tarp (2002), although for somewhat smaller samples.

Tenthly, nominal and real effective exchange rates are countercyclical in developed countries. However, there is no clear configuration between the developing countries. The only distinct pattern that emerges is that for most countries both nominal and real exchange rates exhibit the same cyclicity relationship. A similar pattern is observed by Agénor *et al.* (2000). However, fluctuations in real exchange rates are persistent and volatile, which is consistent with the findings for the developed countries.

Finally, a central characteristic of developed country business cycles that has concerned macroeconomists in recent years is the persistence of output fluctuations. This analysis has found that the developing country business cycles are also characterised by significantly persistent output fluctuations. The magnitude of this persistence is, however, somewhat lower than for the developed countries. Furthermore, prices and nominal wages are significantly persistent in developing countries. This finding is important, because it justifies the use of theoretical models with staggered prices and wages for the modelling of developing country business cycles.

Together with the business cycle characteristics identified in Male (2010), these act to extend the existing knowledge of developing country business cycles and provide a significant generalisation of the stylised facts. This is important both for use in subsequent theoretical modelling and to inform the decisions of policymakers and market participants alike.

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APPENDIX A

A.1. COUNTRY CODES

AG = Argentina	JP = Japan	RM = Romania
BB = Barbados	KO = Korea, South	SA = South Africa
BG = Bangladesh	LT = Lithuania	SG = Senegal
BR = Brazil	MC = Morocco	SJ = Slovenia
CB = Columbia	MI = Malawi	SX = Slovak Republic
CL = Chile	MK = Macedonia	TK = Turkey
HK = Hong Kong	MX = Mexico	TT = Trinidad and Tobago
HN = Hungary	MY = Malaysia	TU = Tunisia
IN = India	NG = Nigeria	UG = Uruguay
IS = Israel	PE = Peru	UK = United Kingdom
IV = Cote d'Ivoire	PH = Philippines	US = United States
JO = Jordan	PK = Pakistan	

A.2. DATA

Table A.1 Variable Name Codes and IMF IFS Series Codes

VARIABLE	CODE	IMF IFS SERIES
PRODUCTION:		
MANUFACTURING	MP	66EY
INDUSTRIAL	IP	66
NOMINAL OUTPUT (Proxy)	NO	66*64
CPI	CPI	64
INFLATION	CCPI	64...X
WAGE	W	65
RESERVE MONEY	RES	14
M1	M1	34
QUASI-MONEY	QUASI	35
BROAD-MONEY	BM	34+35
(Velocity Indicator)	BMVI	34+35(index)/NO
DOMESTIC CREDIT	DC	32D
REAL DOMESTIC CREDIT	RDC	32D/64
GOVERNMENT EXPENDITURE	GEX	82
GOVERNMENT REVENUE	GREV	81
FISCAL IMPULSE	FI	82/81
EXPORTS	EXP	70
IMPORTS	IMP	71
TRADE BALANCE	TR	70/71
EXPORT UNIT VALUE	EXPU	74
IMPORT UNIT VALUE	IMPU	75
TERMS OF TRADE	TOT	74/75
PRIVATE CONSUMPTION	PC	96F
REAL CONSUMPTION	RPC	96F/64
GROSS FIXED CAPITAL FORMATION	GFCF	93E
REAL INVESTMENT	RGFCF	93E/64
MONEY MARKET RATE	MMR	60B
REAL MONEY MARKET RATE	RMMR	60B/64
LENDING RATE	LR	60P
REAL LENDING RATE	RLR	60P/64
NOMINAL EFFECTIVE EXCHANGE RATE	NEER	..NECE
REAL EFFECTIVE EXCHANGE RATE	REER	..RECE
REAL WORLD OUTPUT	WO	66(110)
REAL WORLD INTEREST RATE	WIR	60D(112)/64(110)

APPENDIX B

B.1. CROSS-CORRELATIONS WITH LEADS AND LAGS

Table B.1

Correlation between Real Domestic Output and World Real Output and World Real Interest Rate

	<u>World Output</u>					<u>World Real Interest Rate</u>				
	lag 8	lag 4	no lag	lead 4	lead 8	lag 8	lag 4	no lag	lead 4	lead 8
US	-0.508	-0.150	0.778	0.479	-0.214	-0.243	0.168	0.554	0.315	-0.011
UK	-0.507	-0.133	0.605	0.385	-0.045	-0.385	0.209	0.440	0.221	-0.047
Japan	-0.353	-0.109	0.815	0.370	-0.438	-0.006	0.281	0.351	0.058	-0.029
Africa										
Côte d'Ivoire	0.031	0.023	0.009	0.153	0.141	-0.132	0.046	0.235	0.187	0.066
Malawi	-0.053	0.144	0.127	0.050	-0.197	0.149	-0.015	-0.015	-0.012	-0.110
Nigeria	0.205	0.140	0.298	0.042	-0.137	0.078	0.372	0.113	-0.440	-0.661
South Africa	0.154	0.150	0.170	-0.126	-0.271	0.424	0.177	0.182	-0.159	-0.173
Senegal	0.547	0.716	0.502	-0.113	-0.435	-0.270	0.734	-0.403	-0.699	-0.275
North Africa										
Israel	-0.069	-0.104	0.043	0.145	-0.007	-0.137	0.008	0.238	0.153	0.017
Jordan	0.023	0.240	-0.035	-0.552	0.278	-0.020	0.203	0.729	-0.483	-0.147
Morocco	-0.040	-0.011	0.195	0.187	-0.086	-0.007	0.075	0.083	-0.004	-0.115
Tunisia	-0.041	0.494	0.341	0.009	-0.094	0.228	0.411	0.181	0.046	-0.099
Latin America										
Argentina	-0.067	-0.456	0.614	0.510	0.083	-0.064	-0.014	0.200	0.639	0.622
Barbados	-0.130	0.202	0.447	0.239	0.081	0.035	0.250	0.278	0.236	-0.038
Brazil	-0.145	0.024	0.557	-0.563	-0.465	0.692	0.260	-0.070	-0.377	-0.305
Columbia	-0.171	-0.062	0.279	-0.092	0.126	-0.170	-0.166	0.037	0.145	0.201
Chile	-0.289	0.077	0.602	0.208	-0.143	-0.083	0.110	0.308	0.173	0.055
Mexico	0.242	0.406	0.329	-0.154	-0.520	0.300	0.216	0.131	-0.003	-0.193
Peru	-0.369	-0.539	0.258	0.158	-0.255	-0.170	-0.161	0.130	0.127	0.058
Trinidad	0.075	0.033	0.171	-0.134	0.044	-0.137	-0.006	0.109	-0.093	0.114
Uruguay	0.265	0.238	0.334	0.050	-0.112	0.253	0.042	0.248	0.187	0.094
Asia										
Bangladesh	-0.318	-0.225	0.071	-0.102	-0.033	-0.269	-0.025	-0.166	0.014	0.128
Hong Kong	-0.074	-0.285	0.224	0.150	0.090	0.190	-0.019	0.350	0.084	-0.125
India	-0.161	0.183	0.540	0.324	0.048	0.064	0.441	0.467	-0.021	-0.265
Korea, South	-0.197	-0.252	0.214	0.341	-0.040	-0.161	0.038	0.237	-0.004	-0.053
Malaysia	-0.283	-0.178	0.429	0.258	-0.072	-0.002	0.238	0.182	0.037	0.044
Philippines	-0.186	-0.225	0.093	0.025	-0.253	0.086	0.055	-0.236	-0.184	0.055
Pakistan	-0.179	0.287	0.152	-0.199	-0.229	-0.115	0.192	-0.016	-0.042	0.037
Turkey	-0.052	0.068	0.164	0.075	0.042	-0.102	0.099	-0.097	0.178	0.501
East Europe										
Hungary	-0.327	-0.138	0.352	0.413	0.264	0.022	0.322	0.476	0.332	-0.107
Lithuania	-0.051	0.207	0.195	-0.269	0.214	-0.101	-0.144	0.229	0.192	-0.195
Macedonia	0.297	-0.089	0.115	0.144	-0.122	0.045	0.236	-0.196	-0.058	0.308
Romania	-0.322	-0.013	0.230	0.291	0.221	0.165	0.247	0.138	0.050	-0.028
Slovenia	-0.217	-0.048	0.361	-0.253	-0.389	0.206	-0.135	0.124	-0.064	-0.338
Slovak Republic	-0.274	-0.104	0.114	-0.492	0.180	-0.027	-0.134	-0.136	-0.298	0.018

Table B.2

Correlation between Real Domestic Output and Prices, Inflation and Real Wages

	CPI					Inflation					Real Wage				
	lag 8	lag 4	no lag	lead 4	lead 8	lag 8	lag 4	no lag	lead 4	lead 8	lag 8	lag 4	no lag	lead 4	lead 8
US	-0.172	-0.714	-0.465	0.238	0.556	-0.509	-0.477	0.270	0.573	0.185	...	...	...	...	...
UK	0.111	-0.459	-0.514	-0.049	0.441	-0.221	-0.392	0.230	0.302	0.227	...	...	...	...	...
Japan	0.018	-0.642	-0.351	0.217	0.108	-0.341	-0.328	0.430	0.191	-0.163	...	...	...	...	...
Africa															
Côte d'Ivoire	0.006	0.012	0.165	0.262	0.111	-0.019	-0.002	0.082	0.130	-0.174	...	...	...	...	...
Malawi	0.279	0.327	-0.235	-0.388	-0.264	0.135	-0.065	-0.409	-0.070	0.147	...	...	...	...	...
Nigeria	0.165	0.053	-0.256	-0.227	-0.098	-0.123	-0.030	-0.216	0.046	0.149	...	...	...	...	...
South Africa	-0.033	-0.196	-0.120	0.200	0.151	-0.048	-0.087	0.117	0.169	-0.096	...	...	...	...	...
Senegal	-0.054	0.230	0.116	-0.269	-0.035	-0.016	0.141	0.020	-0.315	0.057	...	...	...	...	...
North Africa															
Israel	0.073	0.267	0.190	0.174	-0.015	0.443	0.211	-0.426	-0.102	0.261	...	...	...	...	...
Jordan	0.033	0.016	-0.158	-0.234	0.017	-0.047	-0.050	-0.143	-0.046	0.102	...	...	...	...	...
Morocco	-0.039	-0.070	-0.236	0.031	-0.002	0.031	-0.063	-0.074	0.105	0.071	...	...	...	...	...
Tunisia	0.119	0.674	-0.149	-0.378	-0.142	0.421	0.213	-0.432	-0.097	0.083	...	...	...	...	...
Latin America															
Argentina	-0.323	0.068	0.595	-0.632	-0.267	0.081	0.113	0.239	-0.811	0.213	...	...	...	...	...
Barbados	0.204	-0.012	-0.443	-0.201	0.208	-0.008	-0.041	-0.124	0.166	0.280	...	...	...	...	...
Brazil	-0.164	0.081	0.421	0.350	0.149	-0.010	-0.008	0.400	0.275	0.317	...	...	...	...	...
Columbia	-0.171	-0.345	-0.302	0.147	0.118	-0.101	-0.046	0.225	0.094	-0.007	...	...	...	...	...
Chile	0.163	-0.138	-0.009	-0.025	-0.105	0.028	-0.344	-0.130	-0.100	0.442	0.041	0.371	-0.048	0.303	0.118
Mexico	0.011	-0.083	-0.330	-0.332	-0.010	0.251	-0.021	-0.516	-0.070	0.139	-0.115	-0.151	0.277	0.312	0.100
Peru	-0.085	-0.423	-0.387	-0.357	-0.076	-0.286	-0.076	-0.045	0.057	0.099	...	...	...	...	...
Trinidad	0.082	-0.055	-0.217	-0.208	-0.087	0.057	-0.110	-0.146	0.016	0.080	...	...	...	...	...
Uruguay	0.043	-0.307	-0.135	0.107	-0.147	0.312	0.352	-0.041	-0.444	-0.182	...	...	...	...	...
Asia															
Bangladesh	-0.035	-0.090	0.055	0.061	-0.061	0.006	-0.014	0.117	-0.049	0.060	...	...	...	...	...
Hong Kong	0.871	-0.696	0.074	-0.176	-0.582	-0.446	-0.540	0.275	-0.427	-0.113	-0.869	-0.621	0.405	0.751	0.683
India	0.048	-0.197	-0.398	-0.151	0.160	-0.084	-0.157	-0.099	0.265	0.179	...	...	...	...	...
Korea, South	0.143	-0.164	-0.482	-0.192	0.238	0.061	-0.300	-0.248	0.457	0.288	...	...	...	...	...
Malaysia	-0.036	-0.186	-0.071	-0.007	-0.031	-0.103	-0.059	0.150	0.039	0.042	...	...	...	...	...
Philippines	-0.120	-0.192	0.047	0.086	-0.080	-0.180	-0.079	0.127	0.060	-0.152	...	...	...	...	...
Pakistan	-0.340	-0.144	0.132	0.278	0.006	-0.264	0.191	0.238	0.111	-0.206	...	...	...	...	...
Turkey	-0.038	-0.014	-0.132	-0.192	0.079	0.079	0.048	-0.261	-0.039	0.008	...	...	...	...	...
East Europe															
Hungary	-0.017	-0.680	-0.591	-0.090	0.251	-0.338	-0.374	0.176	0.411	0.183	0.034	0.413	0.297	-0.122	-0.225
Lithuania	-0.152	-0.141	-0.095	-0.032	0.041	0.121	0.019	0.028	-0.310	-0.233	...	...	...	...	...
Macedonia	-0.157	-0.341	-0.253	0.031	0.330	0.138	-0.109	0.455	0.192	0.150	-0.276	0.579	0.244	-0.230	-0.394
Romania	0.612	-0.211	-0.617	-0.352	0.143	-0.137	-0.600	-0.278	0.243	0.345	-0.311	0.486	0.557	0.182	-0.134
Slovenia	0.077	0.097	0.579	0.337	0.061	0.082	-0.309	0.557	-0.340	-0.209	-0.245	-0.487	0.336	0.186	0.323
Slovak Republic	0.153	0.558	0.130	-0.476	-0.307	0.270	-0.039	-0.460	-0.406	0.099	-0.513	-0.450	0.000	0.539	0.430

Table B.3

Correlation between Real Domestic Output and Consumption and Investment

	<u>Real Private Consumption</u>					<u>Real Gross Fixed Capital Formation</u>				
	lag 8	lag 4	no lag	lead 4	lead 8	lag 8	lag 4	no lag	lead 4	lead 8
US	-0.113	0.617	0.675	-0.097	-0.493	-0.239	0.383	0.869	0.146	-0.500
UK	-0.323	0.152	0.518	0.264	-0.001	-0.327	0.032	0.510	0.494	0.007
Japan	-0.238	0.425	0.368	-0.084	-0.126	-0.506	0.056	0.764	0.338	-0.106
Africa										
Côte d'Ivoire	...	...	...	...	...	...	...	...	...	...
Malawi	...	...	...	...	...	...	...	...	...	...
Nigeria	...	...	...	...	...	...	...	...	...	...
South Africa	-0.508	0.039	0.564	0.332	0.183	-0.619	-0.060	0.631	0.605	0.108
Senegal	...	...	...	...	...	...	...	...	...	...
North Africa										
Israel	0.056	-0.065	0.250	0.100	-0.141	-0.010	-0.011	0.374	-0.060	-0.398
Jordan	...	...	...	...	...	...	...	...	...	...
Morocco	...	...	...	...	...	...	...	...	...	...
Tunisia	...	...	...	...	...	...	...	...	...	...
Latin America										
Argentina	-0.359	-0.187	0.707	0.685	-0.407	-0.121	0.206	0.897	0.474	-0.551
Barbados	...	...	...	...	...	...	...	...	...	...
Brazil	-0.112	-0.281	0.488	-0.061	0.071	-0.080	-0.309	0.642	-0.116	-0.262
Columbia	0.000	0.174	0.643	-0.298	-0.203	-0.397	0.013	0.666	-0.211	-0.074
Chile	0.781	-0.271	0.224	-0.574	0.876	0.152	0.853	-0.954	0.142	0.720
Mexico	-0.246	-0.230	0.563	0.290	0.081	-0.324	-0.109	0.802	0.218	-0.067
Peru	...	...	...	...	...	-0.152	0.166	0.771	0.355	-0.066
Trinidad	...	...	...	...	...	...	...	...	...	...
Uruguay	...	...	...	...	...	...	...	...	...	...
Asia										
Bangladesh	...	...	...	...	...	...	...	...	...	...
Hong Kong	-0.379	0.118	0.625	-0.002	-0.412	-0.253	-0.032	0.622	0.123	-0.239
India	...	...	...	...	...	...	...	...	...	...
Korea, South	-0.372	-0.280	0.322	0.414	0.179	-0.445	-0.163	0.469	0.434	0.035
Malaysia	0.030	-0.168	-0.316	0.025	0.065	-0.147	-0.629	-0.064	0.321	0.311
Philippines	-0.071	0.100	0.016	-0.014	0.181	-0.158	0.099	0.203	0.007	-0.057
Pakistan	...	...	...	...	...	...	...	...	...	...
Turkey	0.122	-0.111	0.665	-0.008	-0.072	0.072	-0.235	0.789	0.095	-0.074
East Europe										
Hungary	-0.176	0.322	-0.301	-0.379	0.554	0.366	0.199	0.008	-0.089	-0.075
Lithuania	0.285	0.079	0.287	-0.177	-0.441	...	...	...	...	...
Macedonia	...	...	...	...	...	...	...	...	...	...
Romania	-0.534	-0.587	-0.105	0.102	0.225	-0.640	0.294	0.845	0.634	0.051
Slovenia	0.460	0.260	-0.587	-0.016	-0.135	0.221	0.317	-0.633	-0.139	-0.017
Slovak Republic	0.008	-0.517	-0.095	0.352	0.106	-0.179	-0.467	0.039	0.453	0.232

Table B.4

**Correlation between Real Domestic Output and Government Expenditure, Government Revenue
and the Fiscal Impulse**

	<u>Government Expenditure</u>					<u>Government Revenue</u>					<u>Fiscal Impulse</u>				
	lag 8	lag 4	no lag	lead 4	lead 8	lag 8	lag 4	no lag	lead 4	lead 8	lag 8	lag 4	no lag	lead 4	lead 8
US	0.005	-0.193	-0.414	0.029	0.221	-0.481	-0.191	0.594	0.451	0.031	0.364	0.033	-0.695	-0.332	0.103
UK	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Japan	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Africa															
Côte d'Ivoire	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Malawi	-0.134	-0.064	0.092	0.003	0.097	0.047	-0.123	0.032	-0.133	-0.176	-0.135	0.016	0.076	0.057	0.150
Nigeria	0.111	-0.095	-0.547	0.239	0.237	0.219	-0.410	0.094	0.076	-0.244	-0.042	0.346	-0.254	0.118	-0.060
South Africa	-0.146	-0.115	0.040	0.149	0.057	0.012	-0.176	-0.431	-0.023	0.164	0.060	-0.165	-0.282	-0.136	0.142
Senegal	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
North Africa															
Israel	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jordan	-0.070	0.157	-0.159	0.123	0.032	0.000	0.373	-0.701	0.416	0.143	-0.150	0.273	-0.280	0.150	0.091
Morocco	-0.199	0.212	0.288	-0.258	-0.174	-0.145	0.262	0.237	-0.215	-0.136	-0.613	0.030	0.130	-0.309	0.525
Tunisia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Latin America															
Argentina	-0.457	0.106	0.737	0.124	-0.392	0.197	0.269	0.710	-0.174	-0.521	-0.379	-0.491	-0.386	0.348	0.348
Barbados	-0.165	0.070	0.202	0.131	0.030	-0.113	0.131	0.195	0.149	-0.098	-0.037	-0.046	0.020	-0.004	0.093
Brazil	-0.023	0.301	0.505	0.065	-0.467	-0.036	0.265	0.525	0.053	-0.468	0.019	0.228	-0.143	0.056	0.104
Columbia	-0.149	0.076	0.349	-0.373	0.129	-0.185	-0.184	0.167	-0.044	0.272	0.040	0.182	0.119	-0.208	-0.065
Chile	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mexico	0.300	0.141	-0.113	-0.277	0.052	0.083	-0.221	-0.311	-0.087	0.245	-0.125	-0.177	-0.093	-0.018	0.119
Peru	-0.089	-0.455	-0.234	-0.328	-0.441	-0.102	0.322	0.152	0.205	-0.190	-0.096	0.167	-0.097	0.117	0.248
Trinidad	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Uruguay	-0.323	-0.055	0.357	0.100	-0.153	-0.048	-0.364	-0.370	-0.043	0.233	-0.025	-0.432	-0.213	-0.066	0.257
Asia															
Bangladesh	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hong Kong	0.237	-0.230	-0.205	0.107	0.094	0.394	-0.087	-0.580	0.079	0.258	0.181	0.090	-0.320	0.025	-0.008
India	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Korea, South	-0.191	-0.037	-0.040	0.062	0.169	-0.111	-0.031	-0.391	0.070	0.254	-0.072	0.009	-0.280	-0.057	0.095
Malaysia	-0.004	-0.292	-0.211	0.043	0.153	0.166	-0.235	-0.684	0.002	0.294	0.261	-0.062	-0.318	-0.076	0.110
Philippines	-0.122	-0.082	-0.025	-0.027	0.045	0.255	-0.053	-0.887	-0.096	0.292	0.051	0.027	-0.198	-0.104	0.022
Pakistan	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Turkey	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
East Europe															
Hungary	0.207	0.139	-0.633	-0.138	0.529	0.302	0.211	-0.866	-0.248	0.599	0.479	0.101	-0.607	-0.191	0.446
Lithuania	-0.435	-0.959	0.440	0.747	0.882	-0.480	-0.747	-0.899	-0.387	0.436	-0.449	-0.805	0.648	0.174	0.823
Macedonia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Romania	0.661	0.218	-0.022	-0.087	-0.146	-0.146	-0.171	0.097	0.298	-0.100	-0.291	0.203	0.435	0.214	-0.552
Slovenia	-0.251	-0.258	0.272	0.459	-0.062	0.131	-0.061	-0.641	0.313	0.095	0.059	0.042	0.165	0.004	-0.167
Slovak Republic	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table B.5

Correlation between Real Domestic Output and Broad Money and the Broad Money Velocity Indicator

	<u>Broad Money</u>					<u>Broad Money Velocity Indicator</u>				
	lag8	lag4	no lag	lead4	lead8	lag 8	lag 4	no lag	lead 4	lead 8
US	0.017	0.392	0.026	-0.230	-0.096	0.478	0.297	-0.690	-0.393	0.116
UK	-0.230	-0.077	0.102	0.195	0.296	-0.149	-0.025	-0.143	0.307	0.501
Japan	-0.342	0.255	0.388	-0.012	0.016	0.277	0.359	-0.681	-0.205	0.414
Africa										
Côte d'Ivoire	0.329	0.192	0.196	0.098	-0.192	0.454	0.129	-0.735	-0.065	-0.029
Malawi	-0.289	0.222	0.071	-0.124	0.301	0.163	-0.207	-0.534	0.108	0.129
Nigeria	0.108	-0.124	-0.291	-0.139	0.000	-0.012	-0.267	-0.527	0.080	0.131
South Africa	-0.693	-0.177	0.466	0.575	0.340	-0.347	-0.354	-0.540	0.206	0.541
Senegal	-0.042	0.081	0.099	-0.313	0.189	0.230	0.151	-0.873	0.164	0.382
North Africa										
Israel	0.202	0.080	0.115	-0.126	-0.041	0.121	-0.239	-0.493	-0.017	0.206
Jordan	0.345	-0.021	-0.015	-0.158	-0.132	0.153	0.344	-0.909	0.436	0.135
Morocco	-0.149	0.059	0.098	-0.027	0.057	-0.059	0.263	-0.663	0.151	0.063
Tunisia	0.054	-0.283	-0.173	0.154	0.237	0.083	-0.177	-0.534	0.639	-0.097
Latin America										
Argentina	-0.357	-0.020	0.617	0.258	-0.281	-0.371	-0.183	-0.794	0.597	0.364
Barbados	-0.222	0.316	0.111	-0.052	0.291	0.014	0.145	-0.692	0.074	0.255
Brazil	0.046	0.279	0.388	0.006	-0.329	0.189	0.235	-0.592	0.409	0.141
Columbia	-0.268	-0.471	0.040	0.260	0.194	-0.107	-0.194	-0.481	0.188	0.176
Chile	-0.549	-0.177	0.447	0.592	0.045	0.052	-0.307	-0.518	0.604	0.424
Mexico	0.023	0.093	-0.029	-0.063	0.096	-0.075	0.056	0.015	0.134	0.133
Peru	-0.078	-0.338	-0.420	-0.476	-0.019	-0.006	0.184	-0.678	-0.211	0.475
Trinidad	0.106	-0.014	-0.177	-0.343	-0.067	0.069	0.129	-0.833	0.025	0.026
Uruguay	-0.274	0.182	0.332	0.136	-0.021	-0.090	-0.269	-0.398	-0.073	0.480
Asia										
Bangladesh	-0.070	0.044	0.201	-0.160	-0.214	0.198	0.398	-0.588	0.093	-0.294
Hong Kong	0.013	0.521	0.732	-0.185	-0.885	0.139	0.711	-0.606	-0.431	0.466
India	-0.070	-0.063	-0.018	0.031	0.214	0.019	-0.029	-0.162	0.024	0.200
Korea, South	-0.063	0.397	0.430	0.094	-0.189	0.004	0.094	-0.442	0.061	0.066
Malaysia	-0.162	-0.127	0.038	-0.049	-0.207	0.282	-0.039	-0.906	-0.050	0.254
Philippines	-0.256	0.017	0.167	0.087	0.004	0.268	-0.024	-0.926	-0.072	0.307
Pakistan	0.189	0.270	-0.081	-0.211	-0.009	0.374	0.219	-0.570	-0.214	0.064
Turkey	-0.100	0.156	-0.372	0.097	0.273	-0.250	0.165	-0.776	0.210	0.213
East Europe										
Hungary	0.679	0.120	-0.565	-0.711	0.128	0.473	0.013	-0.838	-0.637	0.104
Lithuania	-0.335	-0.418	0.407	-0.316	-0.235	0.013	0.217	-0.935	0.331	0.426
Macedonia	-0.289	0.222	0.071	-0.124	0.301	-0.232	0.561	-0.354	0.006	0.191
Romania	0.536	0.379	0.065	-0.263	-0.504	0.255	-0.573	-0.855	-0.070	0.683
Slovenia	0.158	0.076	0.304	0.482	0.033	0.074	0.093	-0.561	0.626	0.150
Slovak Republic	-0.057	0.212	0.383	0.153	-0.237	0.061	-0.109	-0.594	0.465	0.130

Table B.6

Correlation between Real Domestic Output and Credit

	<u>Real Domestic Credit</u>					<u>Nominal Domestic Credit</u>				
	lag 8	lag 4	no lag	lead 4	lead 8	lag 8	lag 4	no lag	lead 4	lead 8
US	-0.342	0.184	0.771	0.482	-0.213	-0.476	-0.164	0.655	0.670	0.044
UK	-0.314	-0.030	0.234	0.152	0.093	-0.245	-0.134	0.063	0.112	0.210
Japan	-0.255	0.529	0.362	-0.121	-0.024	-0.365	0.120	0.180	0.052	0.071
Africa										
Côte d'Ivoire	0.084	0.065	-0.136	0.065	0.000	0.105	0.074	0.009	0.248	0.094
Malawi	-0.139	-0.108	0.245	0.335	0.143	0.017	-0.002	0.059	0.209	0.034
Nigeria	-0.122	-0.028	0.109	0.086	0.036	-0.081	0.126	-0.056	-0.186	-0.037
South Africa	-0.658	-0.275	0.394	0.391	0.167	0.199	0.069	-0.200	-0.028	0.055
Senegal	0.179	-0.080	-0.177	0.132	0.062	-0.664	-0.350	0.367	0.471	0.225
North Africa										
Israel	-0.049	-0.349	0.042	0.282	0.243	-0.018	0.227	0.219	0.161	0.038
Jordan	-0.098	0.127	-0.061	0.215	0.091	0.209	0.238	-0.200	-0.032	0.065
Morocco	0.054	0.054	-0.057	-0.055	0.014	0.043	0.024	-0.134	-0.044	0.011
Tunisia	-0.359	-0.230	0.298	-0.119	0.228	-0.041	-0.280	-0.194	-0.149	0.064
Latin America										
Argentina	-0.604	-0.725	0.177	0.868	0.433	-0.347	-0.250	0.208	0.473	0.302
Barbados	-0.317	-0.106	0.354	0.370	-0.078	-0.255	-0.182	0.225	0.318	-0.002
Brazil	0.089	0.095	0.281	0.532	-0.448	0.025	0.333	0.476	0.066	-0.456
Columbia	-0.189	-0.339	0.094	0.321	0.146	-0.262	-0.471	-0.017	0.378	0.205
Chile	-0.169	-0.476	-0.143	0.353	0.118	-0.495	-0.422	0.112	0.398	0.115
Mexico	-0.298	-0.015	0.471	0.367	-0.149	-0.223	-0.072	0.217	0.270	-0.077
Peru	0.077	0.264	0.174	0.284	0.523	-0.088	-0.435	-0.418	-0.368	0.009
Trinidad	0.063	0.061	0.019	-0.096	-0.065	0.135	0.061	-0.086	-0.218	-0.091
Uruguay	0.005	-0.191	-0.196	0.065	0.422	-0.181	0.243	0.036	0.102	0.201
Asia										
Bangladesh	0.292	-0.151	0.333	0.172	0.101	-0.101	-0.259	0.024	0.061	0.048
Hong Kong	-0.499	-0.772	0.289	0.699	-0.463	-0.340	-0.568	0.330	0.362	-0.234
India	-0.026	0.171	0.437	0.112	-0.223	0.026	0.176	0.225	-0.075	-0.206
Korea, South	-0.351	-0.320	0.187	0.268	0.049	-0.073	-0.064	-0.025	0.178	0.183
Malaysia	-0.261	-0.496	-0.108	0.226	0.431	-0.232	-0.521	-0.124	0.206	0.336
Philippines	-0.364	-0.087	0.259	0.385	0.181	-0.016	0.102	0.057	-0.052	-0.120
Pakistan	0.218	0.189	0.000	-0.151	-0.142	-0.467	-0.205	0.299	0.375	0.129
Turkey	-0.224	-0.126	0.651	0.400	-0.123	-0.175	-0.086	0.538	0.411	-0.022
East Europe										
Hungary	-0.614	-0.132	0.415	0.050	0.006	-0.496	-0.404	0.293	0.216	0.237
Lithuania	-0.354	-0.300	0.239	0.228	-0.075	-0.259	-0.354	0.135	0.183	-0.095
Macedonia	-0.173	-0.227	0.207	0.026	-0.137	-0.061	-0.357	0.111	0.038	-0.010
Romania	0.007	-0.705	-0.422	0.834	0.863	0.280	-0.732	-0.434	0.851	0.563
Slovenia	0.157	0.141	-0.272	0.112	-0.134	-0.146	-0.354	-0.480	-0.176	0.521
Slovak Republic	-0.155	-0.404	-0.460	-0.082	0.549	0.322	0.198	0.031	0.236	-0.165

Table B.7

Correlation between Real Domestic Output and the Real Interest Rate

	<u>Real Money Market Rate</u>					<u>Real Lending Rate</u>				
	lag 8	lag 4	no lag	lead 4	lead 8	lag 8	lag 4	no lag	lead 4	lead 8
US	-0.410	-0.188	0.583	0.543	0.069	-0.440	-0.300	0.577	0.555	-0.002
UK	-0.500	-0.376	0.123	0.551	0.482	-0.461	-0.462	0.206	0.555	0.419
Japan	-0.032	-0.464	0.310	0.318	0.003	-0.525	-0.322	0.237	0.348	0.296
Africa										
Côte d'Ivoire	0.134	-0.049	0.099	-0.064	-0.069	-0.038	-0.136	0.226	-0.076	-0.131
Malawi	...	...	...	...	...	0.061	-0.099	-0.260	-0.153	0.242
Nigeria	...	...	...	...	...	-0.124	0.033	0.375	0.277	0.263
South Africa	-0.529	-0.551	0.153	0.513	0.346	-0.560	-0.561	0.132	0.497	0.290
Senegal	0.503	0.479	0.573	0.350	0.441	-0.592	0.557	0.448	-0.483	-0.167
North Africa										
Israel	...	...	...	...	...	0.214	-0.133	-0.024	-0.221	-0.178
Jordan	0.331	-0.343	0.172	0.144	-0.465	0.058	0.127	0.350	-0.330	0.009
Morocco	-0.163	-0.178	0.178	-0.138	0.008	0.073	0.133	0.034	0.276	0.071
Tunisia	-0.271	0.226	0.430	-0.423	0.113	...	...	...	...	...
Latin America										
Argentina	...	...	...	...	...	0.368	-0.208	-0.802	-0.332	0.439
Barbados	...	...	...	...	...	-0.261	-0.198	0.201	0.424	0.142
Brazil	0.798	-0.166	-0.760	0.034	0.300	0.609	-0.282	-0.739	0.346	0.734
Columbia	0.156	-0.399	0.300	0.325	-0.325	0.273	-0.380	0.274	0.445	-0.515
Chile	0.313	-0.311	-0.316	0.331	-0.079	0.035	-0.588	-0.218	-0.073	-0.139
Mexico	0.248	-0.037	-0.467	0.095	0.083	0.238	0.004	-0.475	0.144	0.165
Peru	...	...	...	...	...	-0.621	-0.246	-0.337	-0.076	0.356
Trinidad	...	...	...	...	...	0.180	-0.158	-0.069	-0.012	0.195
Uruguay	-0.167	-0.159	0.313	-0.172	-0.252	0.521	-0.007	-0.362	-0.218	-0.119
Asia										
Bangladesh	...	...	...	...	...	0.272	-0.109	0.060	-0.167	-0.031
Hong Kong	-0.198	0.104	0.106	0.210	0.026	-0.114	0.297	0.328	-0.523	-0.362
India	-0.517	-0.163	0.416	0.174	-0.140	-0.349	-0.468	0.042	0.434	0.218
Korea, South	0.068	-0.431	-0.296	0.399	0.248	0.264	-0.295	-0.357	0.337	0.259
Malaysia	-0.430	-0.118	0.805	0.086	-0.459	-0.296	-0.266	0.749	0.163	-0.408
Philippines	-0.208	-0.186	0.231	0.097	-0.145	-0.225	-0.257	0.077	0.338	0.007
Pakistan	-0.010	-0.011	-0.003	0.065	-0.020	...	...	...	...	...
Turkey	0.037	-0.129	-0.217	0.179	-0.099	...	...	...	...	...
East Europe										
Hungary	...	...	...	...	...	-0.338	-0.504	-0.010	0.299	-0.197
Lithuania	0.017	-0.107	-0.121	0.477	0.135	0.018	0.151	-0.023	0.442	0.379
Macedonia	...	...	...	...	...	-0.092	0.287	0.089	0.100	0.403
Romania	...	...	...	...	...	...	...	...	...	...
Slovenia	0.087	0.159	-0.044	-0.118	-0.341	-0.343	-0.216	0.253	-0.139	-0.266
Slovak Republic	-0.444	0.381	0.220	0.763	-0.364	-0.892	-0.532	0.448	-0.266	0.788

Table B.8

Correlation between Real Domestic Output and Imports and Exports

	<u>Imports</u>					<u>Exports</u>				
	lag 8	lag 4	no lag	lead 4	lead 8	lag 8	lag 4	no lag	lead 4	lead 8
US	-0.353	-0.223	0.583	0.356	-0.071	-0.498	-0.512	0.247	0.544	0.295
UK	-0.243	-0.192	0.471	0.223	-0.204	-0.123	-0.219	0.230	0.171	-0.081
Japan	-0.438	-0.051	0.621	0.364	-0.218	-0.422	0.365	0.422	0.446	0.017
Africa										
Côte d'Ivoire	0.397	0.016	0.091	0.142	0.323	0.238	0.026	-0.191	-0.013	0.037
Malawi	-0.289	-0.193	0.255	-0.009	-0.075	0.032	0.096	0.126	0.125	-0.146
Nigeria	0.001	-0.077	-0.035	0.130	0.193	-0.011	-0.116	0.381	0.005	-0.019
South Africa	-0.242	0.353	0.711	0.201	-0.137	0.087	0.585	0.322	-0.061	-0.277
Senegal	...	...	...	...	...	...	...	...	...	...
North Africa										
Israel	-0.223	-0.002	0.348	0.072	-0.156	-0.255	-0.060	0.138	0.039	0.053
Jordan	-0.105	0.103	-0.030	-0.107	-0.003	-0.102	-0.243	0.074	-0.034	0.103
Morocco	-0.068	0.087	-0.056	0.041	0.002	0.026	-0.093	0.130	-0.055	-0.108
Tunisia	-0.343	-0.002	0.077	0.084	0.202	-0.276	-0.106	0.310	0.105	0.149
Latin America										
Argentina	-0.350	-0.222	0.740	0.605	-0.389	0.554	0.107	0.390	-0.079	-0.504
Barbados	-0.069	0.068	0.375	0.066	-0.138	0.034	-0.013	0.065	-0.085	0.035
Brazil	-0.091	-0.201	0.581	0.066	-0.105	0.149	0.025	0.161	-0.025	-0.308
Columbia	-0.274	-0.144	0.396	0.063	0.249	-0.023	0.284	0.200	-0.126	0.265
Chile	-0.371	0.380	-0.202	0.288	-0.102	0.210	-0.310	0.581	-0.085	-0.306
Mexico	-0.307	0.303	0.766	0.168	-0.242	-0.123	0.329	0.347	0.063	-0.002
Peru	-0.525	0.015	0.667	0.218	0.041	0.113	0.011	-0.042	0.048	0.195
Trinidad	-0.142	-0.464	0.010	-0.092	0.162	-0.115	-0.291	0.024	0.182	-0.296
Uruguay	-0.203	0.218	0.656	0.246	-0.151	-0.358	0.084	0.500	0.143	0.143
Asia										
Bangladesh	-0.044	-0.243	0.305	-0.013	-0.192	-0.060	-0.057	-0.014	0.133	-0.128
Hong Kong	-0.288	-0.067	0.662	-0.019	-0.286	-0.230	-0.186	0.638	0.053	-0.339
India	-0.008	-0.255	-0.446	0.057	0.411	0.066	0.059	0.063	0.186	-0.093
Korea, South	-0.246	-0.087	0.529	0.197	-0.303	-0.142	-0.087	0.345	-0.143	-0.289
Malaysia	-0.261	-0.406	0.255	0.144	-0.095	-0.388	-0.151	0.547	0.067	-0.312
Philippines	-0.803	-0.726	0.590	-0.036	0.041	0.338	0.154	0.103	-0.446	-0.422
Pakistan	-0.246	-0.055	0.225	0.301	-0.103	-0.089	0.216	0.242	0.069	-0.073
Turkey	0.083	-0.080	0.641	-0.271	-0.144	0.102	-0.016	0.112	-0.040	-0.112
East Europe										
Hungary	0.286	0.002	0.001	-0.101	-0.114	0.034	-0.102	0.117	0.304	0.317
Lithuania	0.362	0.131	-0.007	-0.419	-0.139	0.042	0.301	-0.068	-0.547	0.016
Macedonia	-0.059	-0.016	0.265	-0.429	-0.035	-0.043	0.006	0.433	-0.109	-0.180
Romania	-0.068	0.507	0.640	0.372	-0.129	0.323	0.679	0.583	0.083	-0.325
Slovenia	0.398	-0.369	0.088	0.054	0.001	0.351	-0.609	0.220	0.177	0.085
Slovak Republic	0.048	-0.313	0.545	0.181	0.171	0.023	-0.048	0.502	0.180	0.313

Table B.9

Correlation between Real Domestic Output and the Trade Balance and the Terms of Trade

	<u>Trade Ratio</u>					<u>Terms of Trade</u>				
	lag 8	lag 4	no lag	lead 4	lead 8	lag 8	lag 4	no lag	lead 4	lead 8
US	-0.247	-0.403	-0.309	0.314	0.448	0.356	0.386	-0.006	-0.370	-0.261
UK	0.169	0.001	-0.343	-0.110	0.174	0.151	0.191	-0.172	-0.158	0.244
Japan	0.275	-0.244	-0.545	-0.154	0.330	0.425	0.239	-0.361	-0.276	0.029
Africa										
Côte d'Ivoire	-0.047	0.049	-0.209	-0.107	-0.230	0.083	0.080	0.193	0.155	-0.197
Malawi	0.215	0.204	-0.098	0.090	-0.057	0.090	0.275	0.058	0.047	-0.381
Nigeria	-0.009	-0.039	0.333	-0.090	-0.156	...	...	...	...	...
South Africa	0.344	0.072	-0.557	-0.290	-0.080	-0.205	0.026	0.221	-0.006	0.005
Senegal	...	...	...	...	...	...	...	...	...	...
North Africa										
Israel	0.068	-0.029	-0.253	-0.045	0.186	-0.008	0.072	0.133	-0.020	-0.126
Jordan	-0.034	-0.325	0.086	0.042	0.102	...	...	...	...	...
Morocco	0.091	-0.165	0.210	-0.086	-0.123	0.111	-0.145	-0.142	-0.007	-0.087
Tunisia	-0.055	-0.208	0.321	-0.069	0.049	...	...	...	...	...
Latin America										
Argentina	0.558	0.254	-0.692	-0.711	0.314	0.281	-0.089	0.284	-0.462	-0.519
Barbados	0.067	-0.058	-0.153	-0.123	0.122	...	...	...	...	...
Brazil	0.185	0.233	-0.515	-0.077	-0.062	0.175	0.147	-0.315	-0.096	-0.179
Columbia	0.202	0.294	-0.191	-0.127	-0.043	-0.002	0.237	0.170	-0.126	0.139
Chile	0.151	-0.439	0.523	-0.452	-0.036	...	...	...	...	...
Mexico	0.250	-0.092	-0.608	-0.146	0.277	...	...	...	...	...
Peru	0.526	-0.009	-0.554	-0.163	0.043	...	...	...	...	...
Trinidad	0.022	0.159	0.018	0.231	-0.340	0.219	0.139	-0.093	-0.176	-0.406
Uruguay	-0.036	-0.148	-0.273	-0.151	0.307	...	...	...	...	...
Asia										
Bangladesh	-0.004	0.177	-0.269	0.084	0.084	...	...	...	...	...
Hong Kong	0.284	-0.327	-0.317	0.204	0.010	0.416	-0.288	-0.555	0.276	0.078
India	0.092	0.140	0.203	0.044	-0.265	-0.405	0.046	0.321	0.394	-0.009
Korea, South	0.168	0.029	-0.322	-0.343	0.107	-0.035	0.349	0.362	-0.055	-0.004
Malaysia	0.106	0.328	-0.026	-0.265	-0.200	-0.052	-0.280	0.525	0.272	-0.596
Philippines	0.764	0.546	-0.152	-0.471	-0.472	0.249	0.672	0.451	-0.759	-0.487
Pakistan	0.111	0.220	0.032	-0.160	0.027	0.046	0.248	0.046	-0.166	-0.139
Turkey	-0.022	0.058	-0.545	0.249	0.078	-0.023	0.166	0.075	0.057	-0.041
East Europe										
Hungary	-0.231	-0.095	0.107	0.371	0.398	-0.261	0.238	0.357	0.235	-0.067
Lithuania	-0.531	0.258	-0.109	-0.272	0.337	0.199	0.052	0.101	-0.119	-0.263
Macedonia	0.048	0.021	0.074	0.518	-0.207	...	...	...	...	...
Romania	0.469	0.274	0.013	-0.304	-0.265	...	...	...	...	...
Slovenia	0.028	-0.477	0.171	0.171	0.128	...	...	...	...	...
Slovak Republic	-0.011	0.430	0.080	0.027	0.069	...	...	...	...	...

Table B.10

Correlation between Real Domestic Output and the Exchange Rate

	<u>NEER</u>					<u>REER</u>				
	lag 8	lag 4	no lag	lead 4	lead 8	lag 8	lag 4	no lag	lead 4	lead 8
US	0.133	-0.186	-0.164	-0.051	-0.007	0.039	-0.256	-0.144	0.101	-0.211
UK	-0.358	-0.437	-0.234	0.139	0.455	-0.194	-0.408	-0.342	0.077	0.504
Japan	0.189	-0.078	-0.247	-0.518	-0.086	0.224	-0.027	-0.242	-0.544	-0.121
Africa										
Côte d'Ivoire	0.088	0.066	-0.062	0.363	-0.087	0.199	0.065	-0.166	0.240	-0.102
Malawi	-0.300	-0.016	0.428	0.179	0.165	-0.218	0.161	0.364	-0.033	0.054
Nigeria	-0.137	-0.344	-0.092	-0.067	-0.007	-0.088	-0.293	-0.219	-0.161	-0.034
South Africa	-0.227	0.107	0.008	0.051	0.221	-0.203	0.087	-0.021	0.058	0.263
Senegal	...	...	...	...	...	...	...	...	...	...
North Africa										
Israel	-0.168	-0.334	-0.225	-0.141	0.010	0.005	-0.399	-0.115	0.126	-0.026
Jordan	...	...	...	...	...	...	...	...	...	...
Morocco	0.090	-0.093	-0.090	-0.144	0.071	0.201	-0.061	-0.290	-0.072	0.137
Tunisia	-0.073	0.097	-0.086	0.095	0.076	0.121	0.395	-0.128	-0.140	0.027
Latin America										
Argentina	...	...	...	...	...	...	...	...	...	...
Barbados	...	...	...	...	...	...	...	...	...	...
Brazil	...	...	...	...	...	...	...	...	...	...
Columbia	-0.199	0.383	0.263	0.225	-0.427	-0.371	0.228	0.292	0.354	-0.402
Chile	0.101	-0.458	0.110	-0.062	-0.320	-0.538	-0.182	0.998	0.048	-0.274
Mexico	...	...	...	...	...	...	...	...	...	...
Peru	...	...	...	...	...	...	...	...	...	...
Trinidad	0.328	0.145	-0.129	-0.144	-0.226	0.379	0.093	-0.229	-0.142	-0.219
Uruguay	-0.404	-0.512	-0.274	-0.037	0.081	-0.477	-0.413	-0.115	-0.085	0.028
Asia										
Bangladesh	...	...	...	...	...	...	...	...	...	...
Hong Kong	-0.046	-0.681	0.091	0.724	-0.083	-0.108	-0.356	0.069	0.381	-0.013
India	...	...	...	...	...	...	...	...	...	...
Korea, South	...	...	...	...	...	...	...	...	...	...
Malaysia	-0.393	0.017	0.359	0.119	-0.150	-0.446	-0.005	0.318	0.132	-0.077
Philippines	0.005	0.119	0.277	0.014	-0.039	-0.156	-0.038	0.354	0.067	-0.082
Pakistan	-0.085	0.170	-0.008	-0.212	-0.210	-0.131	0.196	-0.003	-0.194	-0.227
Turkey	...	...	...	...	...	...	...	...	...	...
East Europe										
Hungary	0.200	0.238	-0.339	-0.623	-0.243	0.422	-0.098	-0.688	-0.617	-0.014
Lithuania	...	...	...	...	...	...	...	...	...	...
Macedonia	0.094	0.373	-0.153	-0.051	-0.237	-0.424	-0.192	-0.216	0.139	0.094
Romania	...	...	...	...	...	0.159	0.186	0.285	0.034	-0.062
Slovenia	...	...	...	...	...	...	...	...	...	...
Slovak Republic	-0.241	0.631	0.018	-0.365	0.456	-0.447	0.383	-0.108	-0.200	0.189

B.2. GRANGER CAUSALITY TEST RESULTS

Table B. 11 Does Money Cause Output?

Null Hypothesis	Lags: 4			Lags: 8		
	Obs	F	P	Obs	F	P
AG_BM does not Granger Cause AG_MP	37	2.1919	0.0957	33	0.7861	0.6219
AG_MP does not Granger Cause AG_BM		0.7009	0.5979		4.4014	0.0057
BB_BM does not Granger Cause BB_IP	124	1.8252	0.1287	120	2.0067	0.0528
BB_IP does not Granger Cause BB_BM		0.1809	0.9479		1.3773	0.2152
BR_BM does not Granger Cause BR_IP	53	2.2823	0.0755	49	2.6625	0.0231
BR_IP does not Granger Cause BR_BM		0.1283	0.9714		0.8401	0.5748
BS_BM does not Granger Cause BS_IP	118	0.8785	0.4794	114	2.2999	0.0266
BS_IP does not Granger Cause BS_BM		4.3233	0.0028		1.4198	0.1979
CB_BM does not Granger Cause CB_MP	97	4.2270	0.0035	93	3.1572	0.0039
CB_MP does not Granger Cause CB_BM		2.4241	0.0540		0.8855	0.5328
CL_BM does not Granger Cause CL_MP	102	3.0685	0.0201	98	1.7621	0.0968
CL_MP does not Granger Cause CL_BM		2.2016	0.0748		2.0232	0.0538
HK_BM does not Granger Cause HK_MP	29	0.6264	0.6492	25	0.3913	0.8970
HK_MP does not Granger Cause HK_BM		0.6169	0.6555		0.9053	0.5543
HN_BM does not Granger Cause HN_IP	66	1.1843	0.3275	62	0.7322	0.6625
HN_IP does not Granger Cause HN_BM		5.3906	0.0009		1.9762	0.0716
IN_BM does not Granger Cause IN_IP	154	0.4939	0.7402	150	0.2843	0.9702
IN_IP does not Granger Cause IN_BM		0.0586	0.9936		1.0634	0.3926
IS_BM does not Granger Cause IS_IP	139	0.2616	0.9021	135	1.5388	0.1511
IS_IP does not Granger Cause IS_BM		1.0742	0.3720		1.6890	0.1080
IV_BM does not Granger Cause IV_IP	140	1.0431	0.3876	136	2.6862	0.0095
IV_IP does not Granger Cause IV_BM		1.1956	0.3158		1.2504	0.2761
JO_BM does not Granger Cause JO_IP	128	0.1866	0.9450	124	2.0027	0.0529
JO_IP does not Granger Cause JO_BM		1.4780	0.2132		0.7696	0.6302
KO_BM does not Granger Cause KO_IP	154	3.3582	0.0116	150	1.8056	0.0813
KO_IP does not Granger Cause KO_BM		1.3423	0.2571		1.6352	0.1206
LN_BM does not Granger Cause LN_IP	44	2.9966	0.0316	40	5.1691	0.0009
LN_IP does not Granger Cause LN_BM		1.1365	0.3554		1.4042	0.2471
MC_BM does not Granger Cause MC_MP	149	1.0551	0.3812	145	0.8227	0.5840
MC_MP does not Granger Cause MC_BM		0.7292	0.5735		0.7331	0.6621
MI_BM does not Granger Cause MI_IP	134	1.8497	0.1235	130	1.0075	0.4345
MI_IP does not Granger Cause MI_BM		4.7217	0.0014		2.6592	0.0103
MK_BM does not Granger Cause MK_IP	41	0.6490	0.6317	37	1.3384	0.2816
MK_IP does not Granger Cause MK_BM		0.5658	0.6892		0.9670	0.4881
MX_BM does not Granger Cause MX_IP	155	0.9671	0.4275	151	1.4275	0.1905
MX_IP does not Granger Cause MX_BM		0.2818	0.8894		0.8111	0.5940
MY_BM does not Granger Cause MY_IP	136	0.6341	0.6391	132	0.8908	0.5267
MY_IP does not Granger Cause MY_BM		1.1310	0.3449		0.5456	0.8199
NG_BM does not Granger Cause NG_IP	132	1.7859	0.1359	128	1.7390	0.0971
NG_IP does not Granger Cause NG_BM		0.7809	0.5397		0.5033	0.8516
PE_BM does not Granger Cause PE_IP	61	2.6658	0.0425	57	2.7583	0.0159
PE_IP does not Granger Cause PE_BM		9.8509	0.0000		4.6841	0.0004
PH_BM does not Granger Cause PH_MP	92	0.0595	0.9933	88	0.4091	0.9118
PH_MP does not Granger Cause PH_BM		0.5744	0.6820		0.3104	0.9597
PK_BM does not Granger Cause PK_MP	133	1.9957	0.0993	129	1.2513	0.2764
PK_MP does not Granger Cause PK_BM		1.2390	0.2979		0.6772	0.7107
RM_BM does not Granger Cause RM_IP	97	3.8949	0.0058	93	2.7233	0.0108
RM_IP does not Granger Cause RM_BM		4.5843	0.0021		3.0519	0.0050
SA_BM does not Granger Cause SA_MP	132	3.5500	0.0089	128	2.7599	0.0081
SA_MP does not Granger Cause SA_BM		2.1909	0.0739		1.6522	0.1182
SG_BM does not Granger Cause SG_IP	69	0.8743	0.4848	65	0.9980	0.4499
SG_IP does not Granger Cause SG_BM		1.3272	0.2703		0.7432	0.6533
SJ_BM does not Granger Cause SJ_IP	49	1.8644	0.1356	45	1.3989	0.2401
SJ_IP does not Granger Cause SJ_BM		0.3601	0.8355		1.2533	0.3065
SX_BM does not Granger Cause SX_IP	45	1.4592	0.2349	41	0.9902	0.4679
SX_IP does not Granger Cause SX_BM		1.7499	0.1605		0.4219	0.8964
TK_BM does not Granger Cause TK_IP	72	0.9036	0.4674	68	0.6996	0.6903
TK_IP does not Granger Cause TK_BM		5.2531	0.0010		2.3070	0.0341
TT_BM does not Granger Cause TT_IP	100	0.4171	0.7959	96	0.4817	0.8657
TT_IP does not Granger Cause TT_BM		2.6532	0.0380		2.5398	0.0163
TU_BM does not Granger Cause TU_IP	108	2.6560	0.0373	100	1.6618	0.1201
TU_IP does not Granger Cause TU_BM		1.7411	0.1470		1.0680	0.3935
UY_BM does not Granger Cause UY_MP	91	1.2846	0.2828	87	0.8196	0.5879
UY_MP does not Granger Cause UY_BM		1.4745	0.2175		0.7040	0.6869
JP_BM does not Granger Cause JP_IP	155	3.9066	0.0048	151	2.2055	0.0307
JP_IP does not Granger Cause JP_BM		1.6442	0.1663		1.3841	0.2089
UK_BM does not Granger Cause UK_IP	155	1.0114	0.4036	151	1.0596	0.3953
UK_IP does not Granger Cause UK_BM		0.6236	0.6464		0.8640	0.5487
US_BM does not Granger Cause US_IP	155	4.1516	0.0032	151	1.9296	0.0605
US_IP does not Granger Cause US_BM		0.7077	0.5879		0.9723	0.4604

Table B. 12(a)

**Does Credit Cause Output?
(Real Domestic Credit)**

Null Hypothesis	Lags: 4			Lags: 8		
	Obs	F	P	Obs	F	P
AG_RDC does not Granger Cause AG_MP	37	1.1727	0.3441	33	0.7980	0.6129
AG_MP does not Granger Cause AG_RDC		3.8289	0.0132		5.9729	0.0012
BB_RDC does not Granger Cause BB_IP	124	3.4717	0.0102	120	0.9761	0.4589
BB_IP does not Granger Cause BB_RDC		1.9546	0.1061		1.2587	0.2734
BR_RDC does not Granger Cause BR_IP	48	0.3070	0.8716	44	1.4607	0.2177
BR_IP does not Granger Cause BR_RDC		0.9963	0.4212		4.3665	0.0018
BS_RDC does not Granger Cause BS_IP	41	1.3018	0.2903	37	1.8592	0.1245
BS_IP does not Granger Cause BS_RDC		2.5047	0.0616		0.7665	0.6356
CB_RDC does not Granger Cause CB_MP	97	2.8641	0.0278	93	2.6339	0.0133
CB_MP does not Granger Cause CB_RDC		2.3315	0.0620		0.9268	0.4995
CL_RDC does not Granger Cause CL_MP	102	2.6193	0.0399	98	2.7016	0.0109
CL_MP does not Granger Cause CL_RDC		2.0302	0.0965		1.3854	0.2154
HK_RDC does not Granger Cause HK_MP	41	3.2913	0.0228	37	1.9455	0.1087
HK_MP does not Granger Cause HK_RDC		0.1304	0.9702		0.4897	0.8492
HN_RDC does not Granger Cause HN_IP	66	2.0716	0.0965	62	1.8288	0.0964
HN_IP does not Granger Cause HN_RDC		0.5141	0.7256		0.5928	0.7786
IN_RDC does not Granger Cause IN_IP	154	1.5708	0.1852	150	1.5600	0.1428
IN_IP does not Granger Cause IN_RDC		2.2546	0.0661		2.7494	0.0077
IS_RDC does not Granger Cause IS_IP	95	1.6683	0.1647	91	1.6046	0.1381
IS_IP does not Granger Cause IS_RDC		1.7859	0.1390		1.5711	0.1482
IV_RDC does not Granger Cause IV_IP	140	0.3075	0.8726	136	0.2742	0.9732
IV_IP does not Granger Cause IV_RDC		1.6794	0.1585		1.0368	0.4125
JO_RDC does not Granger Cause JO_IP	112	4.4628	0.0023	108	3.9781	0.0004
JO_IP does not Granger Cause JO_RDC		13.7641	0.0000		8.1485	0.0000
KO_RDC does not Granger Cause KO_IP	136	1.0423	0.3881	132	0.8627	0.5502
KO_IP does not Granger Cause KO_RDC		0.8725	0.4825		0.6887	0.7008
LT_RDC does not Granger Cause LT_IP	45	1.6244	0.1893	41	1.0931	0.4014
LT_IP does not Granger Cause LT_RDC		0.2931	0.8806		1.0735	0.4135
MC_RDC does not Granger Cause MC_MP	149	0.2047	0.9354	145	0.8914	0.5258
MC_MP does not Granger Cause MC_RDC		0.3468	0.8459		0.4115	0.9123
MI_RDC does not Granger Cause MI_IP	94	0.5014	0.7348	90	1.6930	0.1146
MI_IP does not Granger Cause MI_RDC		2.7621	0.0327		1.1868	0.3188
MK_RDC does not Granger Cause MK_IP	41	0.2328	0.9178	37	0.4281	0.8903
MK_IP does not Granger Cause MK_RDC		0.9719	0.4365		1.3709	0.2678
MX_RDC does not Granger Cause MX_IP	113	1.6358	0.1708	109	1.4936	0.1703
MX_IP does not Granger Cause MX_RDC		2.5917	0.0408		1.4449	0.1886
MY_RDC does not Granger Cause MY_IP	136	3.6070	0.0081	132	1.7051	0.1045
MY_IP does not Granger Cause MY_RDC		0.3481	0.8450		0.9868	0.4501
NG_RDC does not Granger Cause NG_IP	132	0.3944	0.8123	128	0.6896	0.7000
NG_IP does not Granger Cause NG_RDC		0.2829	0.8886		0.3765	0.9311
PE_RDC does not Granger Cause PE_IP	59	6.0709	0.0005	55	2.6011	0.0225
PE_IP does not Granger Cause PE_RDC		6.9774	0.0002		1.1384	0.3609
PH_RDC does not Granger Cause PH_MP	92	0.5952	0.6671	88	0.5730	0.7966
PH_MP does not Granger Cause PH_RDC		0.2773	0.8919		0.2514	0.9789
PK_RDC does not Granger Cause PK_MP	133	1.6816	0.1584	129	1.2129	0.2979
PK_MP does not Granger Cause PK_RDC		2.9627	0.0223		1.2409	0.2821
RM_RDC does not Granger Cause RM_IP	30	0.4113	0.7985	26	1.7973	0.2001
RM_IP does not Granger Cause RM_RDC		2.7090	0.0579		21.0137	0.0001
SA_RDC does not Granger Cause SA_MP	132	2.3210	0.0605	128	2.2046	0.0322
SA_MP does not Granger Cause SA_RDC		1.2723	0.2845		0.9675	0.4652
SG_RDC does not Granger Cause SG_IP	69	2.8512	0.0313	65	0.8758	0.5434
SG_IP does not Granger Cause SG_RDC		2.3851	0.0611		2.9076	0.0100
SJ_RDC does not Granger Cause SJ_IP	49	0.7213	0.5825	45	1.1337	0.3721
SJ_IP does not Granger Cause SJ_RDC		1.8064	0.1466		1.3684	0.2529
SX_RDC does not Granger Cause SX_IP	45	2.0129	0.1134	41	1.3703	0.2589
SX_IP does not Granger Cause SX_RDC		0.3641	0.8325		0.7728	0.6300
TK_RDC does not Granger Cause TK_IP	72	2.6562	0.0409	68	1.2435	0.2938
TK_IP does not Granger Cause TK_RDC		1.6383	0.1757		1.3754	0.2297
TT_RDC does not Granger Cause TT_IP	100	3.2870	0.0145	96	2.0557	0.0503
TT_IP does not Granger Cause TT_RDC		1.3359	0.2627		1.4137	0.2038
TU_RDC does not Granger Cause TU_IP	45	1.2773	0.2970	41	1.0062	0.4571
TU_IP does not Granger Cause TU_RDC		1.3316	0.2770		0.7972	0.6107
UY_RDC does not Granger Cause UY_MP	83	1.2132	0.3125	79	1.0595	0.4029
UY_MP does not Granger Cause UY_RDC		0.9454	0.4427		1.2317	0.2961
JP_RDC does not Granger Cause JP_IP	155	5.5683	0.0003	151	2.7293	0.0081
JP_IP does not Granger Cause JP_RDC		0.4164	0.7966		0.5385	0.8258
UK_RDC does not Granger Cause UK_IP	155	1.6511	0.1646	151	1.3621	0.2188
UK_IP does not Granger Cause UK_RDC		0.4979	0.7373		0.5228	0.8377
US_RDC does not Granger Cause US_IP	155	6.6815	0.0001	151	3.3792	0.0015
US_IP does not Granger Cause US_RDC		2.9220	0.0232		2.8620	0.0057

Table B. 12(b)

**Does Credit Cause Output?
(Nominal Domestic Credit)**

Null Hypothesis	Lags: 4			Lags: 8		
	Obs	F	P	Obs	F	P
AG_DC does not Granger Cause AG_MP	37	0.3035	0.8731	33	0.7991	0.6121
AG_MP does not Granger Cause AG_DC		0.8295	0.5178		0.6133	0.7545
BB_DC does not Granger Cause BB_IP	124	3.2328	0.0149	120	1.5521	0.1486
BB_IP does not Granger Cause BB_DC		0.9066	0.4626		0.7188	0.6745
BR_DC does not Granger Cause BR_IP	53	3.3618	0.0174	49	2.6349	0.0243
BR_IP does not Granger Cause BR_DC		0.2835	0.8871		0.6132	0.7601
BS_DC does not Granger Cause BS_IP	118	1.9449	0.1081	114	2.2338	0.0312
BS_IP does not Granger Cause BS_DC		0.6721	0.6127		0.5992	0.7765
CB_DC does not Granger Cause CB_MP	97	3.1355	0.0185	93	2.6758	0.0120
CB_MP does not Granger Cause CB_DC		1.8365	0.1289		0.7383	0.6574
CL_DC does not Granger Cause CL_MP	102	2.3271	0.0620	98	2.5009	0.0176
CL_MP does not Granger Cause CL_DC		2.2861	0.0659		2.0422	0.0515
HK_DC does not Granger Cause HK_MP	41	2.7077	0.0476	37	2.0321	0.0949
HK_MP does not Granger Cause HK_DC		0.0917	0.9844		0.1693	0.9927
HN_DC does not Granger Cause HN_IP	66	2.7322	0.0377	62	1.3197	0.2585
HN_IP does not Granger Cause HN_DC		0.5488	0.7006		0.9269	0.5038
IN_DC does not Granger Cause IN_IP	154	0.6305	0.6415	150	0.7963	0.6068
IN_IP does not Granger Cause IN_DC		2.8665	0.0253		3.0677	0.0033
IS_DC does not Granger Cause IS_IP	136	2.5895	0.0398	132	2.3372	0.0230
IS_IP does not Granger Cause IS_DC		1.7144	0.1508		2.7985	0.0072
IV_DC does not Granger Cause IV_IP	140	0.1976	0.9393	136	0.3279	0.9539
IV_IP does not Granger Cause IV_DC		2.6618	0.0355		1.7771	0.0882
JO_DC does not Granger Cause JO_IP	128	12.9022	0.0000	124	5.9984	0.0000
JO_IP does not Granger Cause JO_DC		7.5532	0.0000		3.2757	0.0022
KO_DC does not Granger Cause KO_IP	154	0.3222	0.8627	150	0.5214	0.8388
KO_IP does not Granger Cause KO_DC		1.6915	0.1551		0.6170	0.7624
LT_DC does not Granger Cause LT_IP	45	0.7241	0.5812	41	1.1135	0.3891
LT_IP does not Granger Cause LT_DC		0.6323	0.6427		0.6405	0.7363
MC_DC does not Granger Cause MC_MP	149	0.5549	0.6958	145	0.8869	0.5296
MC_MP does not Granger Cause MC_DC		0.1803	0.9483		0.3072	0.9621
MI_DC does not Granger Cause MI_IP	134	0.2532	0.9073	130	1.1946	0.3086
MI_IP does not Granger Cause MI_DC		1.3353	0.2606		0.8893	0.5280
MK_DC does not Granger Cause MK_IP	41	0.4352	0.7822	37	0.8128	0.5999
MK_IP does not Granger Cause MK_DC		0.7109	0.5905		0.5169	0.8298
MX_DC does not Granger Cause MX_IP	155	3.1106	0.0172	151	2.0187	0.0487
MX_IP does not Granger Cause MX_DC		1.1839	0.3204		1.4209	0.1932
MY_DC does not Granger Cause MY_IP	136	4.0124	0.0042	132	1.7562	0.0929
MY_IP does not Granger Cause MY_DC		0.1902	0.9431		1.0658	0.3920
NG_DC does not Granger Cause NG_IP	132	0.0396	0.9970	128	0.1487	0.9965
NG_IP does not Granger Cause NG_DC		0.4715	0.7566		0.5472	0.8185
PE_DC does not Granger Cause PE_IP	61	7.5592	0.0001	57	3.5090	0.0037
PE_IP does not Granger Cause PE_DC		16.3311	0.0000		2.4440	0.0296
PH_DC does not Granger Cause PH_MP	92	1.3542	0.2570	88	0.8161	0.5908
PH_MP does not Granger Cause PH_DC		0.4616	0.7637		0.1375	0.9972
PK_DC does not Granger Cause PK_MP	133	0.8667	0.4860	129	0.6921	0.6978
PK_MP does not Granger Cause PK_DC		1.6867	0.1572		0.9096	0.5113
RM_DC does not Granger Cause RM_IP	30	0.7726	0.5552	26	2.6874	0.0812
RM_IP does not Granger Cause RM_DC		3.3325	0.0291		6.6317	0.0052
SA_DC does not Granger Cause SA_MP	132	2.2363	0.0689	128	1.9980	0.0531
SA_MP does not Granger Cause SA_DC		1.8296	0.1274		1.0249	0.4217
SG_DC does not Granger Cause SG_IP	69	2.7171	0.0379	65	1.1832	0.3288
SG_IP does not Granger Cause SG_DC		3.5130	0.0121		3.2098	0.0053
SJ_DC does not Granger Cause SJ_IP	49	0.6962	0.5991	45	1.7006	0.1423
SJ_IP does not Granger Cause SJ_DC		1.9350	0.1234		1.3526	0.2597
SX_DC does not Granger Cause SX_IP	45	1.8227	0.1458	41	1.3564	0.2648
SX_IP does not Granger Cause SX_DC		0.2993	0.8765		0.9289	0.5110
TK_DC does not Granger Cause TK_IP	72	2.7031	0.0382	68	1.5041	0.1791
TK_IP does not Granger Cause TK_DC		2.4131	0.0582		1.4044	0.2174
TT_DC does not Granger Cause TT_IP	100	3.3857	0.0125	96	1.6833	0.1155
TT_IP does not Granger Cause TT_DC		1.8859	0.1196		2.1078	0.0446
TU_DC does not Granger Cause TU_IP	109	1.7445	0.1462	101	1.5616	0.1488
TU_IP does not Granger Cause TU_DC		1.8981	0.1166		1.0491	0.4066
UY_DC does not Granger Cause UY_MP	91	1.0391	0.3922	87	0.7973	0.6068
UY_MP does not Granger Cause UY_DC		1.0711	0.3762		1.0621	0.3995
JP_DC does not Granger Cause JP_IP	155	1.6363	0.1682	151	1.9825	0.0532
JP_IP does not Granger Cause JP_DC		1.2097	0.3092		0.9662	0.4652
UK_DC does not Granger Cause UK_IP	155	0.9722	0.4247	151	1.0190	0.4248
UK_IP does not Granger Cause UK_DC		0.3609	0.8361		0.8623	0.5501
US_DC does not Granger Cause US_IP	155	2.3756	0.0547	151	1.5882	0.1339
US_IP does not Granger Cause US_DC		4.3207	0.0025		3.1956	0.0024

Table B.13(a)

**Do Interest Rates Cause Output?
(Real Lending Rate)**

Null Hypothesis	Lags: 4			Lags: 8		
	Obs	F	P.	Obs	F	P
AG_RLR does not Granger Cause AG_MP	37	2.5503	0.0612	33	0.7682	0.6353
AG_MP does not Granger Cause AG_RLR		1.0727	0.3886		1.7859	0.1540
BB_RLR does not Granger Cause BB_IP	92	1.1281	0.3489	88	0.5418	0.8211
BB_IP does not Granger Cause BB_RLR		1.9602	0.1082		1.4952	0.1744
BR_RLR does not Granger Cause BR_IP	29	2.9483	0.0457	25	0.3305	0.9309
BR_IP does not Granger Cause BR_RLR		2.4338	0.0810		2.3153	0.1282
BS_RLR does not Granger Cause BS_IP	41	0.8238	0.5198	37	1.1363	0.3824
BS_IP does not Granger Cause BS_RLR		0.0645	0.9920		0.0266	1.0000
CB_RLR does not Granger Cause CB_MP	73	2.1617	0.0833	69	1.1212	0.3648
CB_MP does not Granger Cause CB_RLR		2.8167	0.0323		1.8840	0.0825
CL_RLR does not Granger Cause CL_MP	117	3.4036	0.0116	113	2.6644	0.0110
CL_MP does not Granger Cause CL_RLR		1.4565	0.2205		2.5780	0.0136
HK_RLR does not Granger Cause HK_MP	53	2.4805	0.0576	49	1.0988	0.3896
HK_MP does not Granger Cause HK_RLR		0.5299	0.7144		1.0697	0.4082
HN_RLR does not Granger Cause HN_IP	62	1.4750	0.2229	58	0.7464	0.6506
HN_IP does not Granger Cause HN_RLR		0.9333	0.4518		0.7533	0.6448
IN_RLR does not Granger Cause IN_IP	101	1.1012	0.3608	97	1.1111	0.3648
IN_IP does not Granger Cause IN_RLR		1.3893	0.2438		0.6418	0.7403
IS_RLR does not Granger Cause IS_IP	100	2.5025	0.0477	96	1.3338	0.2393
IS_IP does not Granger Cause IS_RLR		2.1866	0.0767		1.4537	0.1878
JO_RLR does not Granger Cause JO_IP	49	1.8919	0.1307	45	1.6623	0.1522
JO_IP does not Granger Cause JO_RLR		0.8875	0.4802		0.6361	0.7407
KO_RLR does not Granger Cause KO_IP	95	3.4601	0.0114	91	2.0991	0.0464
KO_IP does not Granger Cause KO_RLR		1.5287	0.2010		1.1020	0.3718
LT_RLR does not Granger Cause LT_IP	44	0.2455	0.9104	40	1.9184	0.1059
LT_IP does not Granger Cause LT_RLR		2.0217	0.1127		2.5242	0.0393
MC_RLR does not Granger Cause MC_MP	97	0.6200	0.6494	93	1.0390	0.4148
MC_MP does not Granger Cause MC_RLR		2.7917	0.0310		2.8541	0.0079
MI_RLR does not Granger Cause MI_IP	94	1.3636	0.2534	90	0.6823	0.7056
MI_IP does not Granger Cause MI_RLR		1.9953	0.1025		1.8011	0.0906
MK_RLR does not Granger Cause MK_IP	40	0.4654	0.7606	36	0.2930	0.9597
MK_IP does not Granger Cause MK_RLR		0.7094	0.5917		1.7901	0.1418
MX_RLR does not Granger Cause MX_IP	45	3.3696	0.0193	41	1.4169	0.2399
MX_IP does not Granger Cause MX_RLR		1.2720	0.2990		0.6382	0.7381
MY_RLR does not Granger Cause MY_IP	112	1.6633	0.1642	108	1.3939	0.2098
MY_IP does not Granger Cause MY_RLR		1.0707	0.3749		0.7222	0.6714
NG_RLR does not Granger Cause NG_IP	132	6.0214	0.0002	128	3.2750	0.0022
NG_IP does not Granger Cause NG_RLR		0.8248	0.5118		2.0939	0.0422
PE_RLR does not Granger Cause PE_IP	54	2.5363	0.0530	50	4.0388	0.0020
PE_IP does not Granger Cause PE_RLR		0.8948	0.4750		1.0248	0.4374
PH_RLR does not Granger Cause PH_MP	93	2.5444	0.0454	89	1.4673	0.1844
PH_MP does not Granger Cause PH_RLR		2.5775	0.0432		1.4322	0.1981
SA_RLR does not Granger Cause SA_MP	155	3.6299	0.0075	151	4.2528	0.0001
SA_MP does not Granger Cause SA_RLR		1.8537	0.1217		2.7803	0.0071
SJ_RLR does not Granger Cause SJ_IP	49	3.0739	0.0268	45	1.9369	0.0937
SJ_IP does not Granger Cause SJ_RLR		0.8194	0.5205		0.6069	0.7642
SX_RLR does not Granger Cause SX_IP	45	1.8110	0.1481	41	1.9402	0.1001
SX_IP does not Granger Cause SX_RLR		1.3277	0.2784		1.7012	0.1496
TT_RLR does not Granger Cause TT_IP	80	0.5110	0.7278	76	0.3060	0.9609
TT_IP does not Granger Cause TT_RLR		2.1218	0.0870		1.7530	0.1051
UY_RLR does not Granger Cause UY_MP	83	1.6154	0.1794	79	1.0618	0.4013
UY_MP does not Granger Cause UY_RLR		2.1595	0.0819		1.0463	0.4121
JP_RLR does not Granger Cause JP_IP	155	1.1276	0.3459	151	1.8110	0.0802
JP_IP does not Granger Cause JP_RLR		2.2665	0.0648		1.3851	0.2085
UK_RLR does not Granger Cause UK_IP	151	2.3375	0.0582	147	1.7144	0.1008
UK_IP does not Granger Cause UK_RLR		2.0298	0.0934		2.8466	0.0060
US_RLR does not Granger Cause US_IP	155	4.4765	0.0019	151	2.4205	0.0179
US_IP does not Granger Cause US_RLR		11.9227	0.0000		6.1030	0.0000

Table B.13(b)

**Do Interest Rates Cause Output?
(Real Money Market Rate)**

Null Hypothesis	Obs	Lags: 4		Obs	Lags: 8	
		F	P		F	P
BR_RMMR does not Granger Cause BR_IP	47	3.2568	0.0158	44	2.3502	0.0462
BR_IP does not Granger Cause BR_RMMR		0.3939	0.8498		0.1748	0.9925
CB_RMMR does not Granger Cause CB_MP	36	1.1471	0.3622	33	1.3281	0.2985
CB_MP does not Granger Cause CB_RMMR		3.7649	0.0112		3.2476	0.0215
CL_RMMR does not Granger Cause CL_MP	108	3.1562	0.0111	105	2.0903	0.0450
CL_MP does not Granger Cause CL_RMMR		0.5763	0.7180		0.3907	0.9229
HK_RMMR does not Granger Cause HK_MP	40	1.2139	0.3276	37	0.9144	0.5247
HK_MP does not Granger Cause HK_RMMR		2.7178	0.0393		1.5793	0.1934
IN_RMMR does not Granger Cause IN_IP	126	0.1518	0.9791	123	0.4254	0.9035
IN_IP does not Granger Cause IN_RMMR		3.3790	0.0069		1.9291	0.0630
IV_RMMR does not Granger Cause IV_IP	109	1.1866	0.3213	106	1.9999	0.0554
IV_IP does not Granger Cause IV_RMMR		0.5506	0.7375		0.4709	0.8736
KO_RMMR does not Granger Cause KO_IP	109	4.2491	0.0015	106	3.1829	0.0032
KO_IP does not Granger Cause KO_RMMR		2.4734	0.0373		1.0935	0.3753
LT_RMMR does not Granger Cause LT_IP	40	0.3097	0.9031	37	0.2350	0.9793
LT_IP does not Granger Cause LT_RMMR		1.3994	0.2538		1.4240	0.2466
MX_RMMR does not Granger Cause MX_IP	91	3.7132	0.0045	88	2.6524	0.0132
MX_IP does not Granger Cause MX_RMMR		0.6033	0.6976		0.5065	0.8476
MY_RMMR does not Granger Cause MY_IP	135	4.5021	0.0008	132	2.2458	0.0289
MY_IP does not Granger Cause MY_RMMR		1.3283	0.2565		0.6479	0.7359
PH_RMMR does not Granger Cause PH_MP	92	1.7247	0.1383	89	1.2474	0.2847
PH_MP does not Granger Cause PH_RMMR		0.3277	0.8949		0.1337	0.9975
PK_RMMR does not Granger Cause PK_MP	132	1.6681	0.1474	129	2.4206	0.0189
PK_MP does not Granger Cause PK_RMMR		1.6644	0.1483		0.7709	0.6290
SA_RMMR does not Granger Cause SA_MP	154	3.3202	0.0072	151	2.9908	0.0041
SA_MP does not Granger Cause SA_RMMR		2.1976	0.0578		2.8731	0.0055
SG_RMMR does not Granger Cause SG_IP	68	4.5966	0.0014	65	2.9993	0.0082
SG_IP does not Granger Cause SG_RMMR		0.8447	0.5238		0.7734	0.6277
SJ_RMMR does not Granger Cause SJ_IP	45	1.5947	0.1881	42	0.9741	0.4781
SJ_IP does not Granger Cause SJ_RMMR		0.9264	0.4760		0.8499	0.5694
TK_RMMR does not Granger Cause TK_IP	70	8.6879	0.0000	67	6.2854	0.0000
TK_IP does not Granger Cause TK_RMMR		0.2995	0.9112		0.3641	0.9345
TU_RMMR does not Granger Cause TU_IP	44	0.0907	0.9932	41	0.9006	0.5316
TU_IP does not Granger Cause TU_RMMR		1.2652	0.3021		1.3107	0.2852
JP_RMMR does not Granger Cause JP_IP	154	4.0262	0.0019	151	2.8529	0.0058
JP_IP does not Granger Cause JP_RMMR		2.6660	0.0246		1.3680	0.2161
UK_RMMR does not Granger Cause UK_IP	128	3.7452	0.0035	125	2.6230	0.0115
UK_IP does not Granger Cause UK_RMMR		6.1153	0.0001		5.1332	0.0000
US_RMMR does not Granger Cause US_IP	154	2.0440	0.0760	151	1.6788	0.1091
US_IP does not Granger Cause US_RMMR		5.4516	0.0001		3.2145	0.0023

Notes: IP – real industrial production, MP – real manufacturing production, BM – broad money, DC – domestic private sector credit, RDC – real domestic private sector credit, RMMR – real money market rate, RLR – real lending rate

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Queen Mary, University of London**

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**School of Economics and Finance
Queen Mary, University of London
Mile End Road
London E1 4NS
Tel: +44 (0)20 7882 5096
Fax: +44 (0)20 8983 3580
Web: www.econ.qmul.ac.uk/papers/wp.htm**