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Yield Spreads and Real Economic Activity: The Case of New Zealand and Australia

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YIELD SPREADS AND REAL ECONOMIC ACTIVITY - THE CASE OF AUSTRALIA AND NEW ZEALAND

I. Introduction

A. Background and Organization of the Paper

There is a growing body of evidence that suggests that yield spreads, that is, the differences between interest rates of alternative financial assets, have considerable predictive power for future developments in real output. For the United States, Laurent (1988 and 1989), Stock and Watson (1989), Bernanke (1990), Estrella and Hardouvelis (1991), Bernanke and Blinder (1992), and Friedman and Kuttner (1992) all find that yield spreads predict output well.

This paper studies the predictive power of yield spreads for the case of Australia and New Zealand. A joint study of these countries is worthwhile because both experienced similar transformations from a highly regulated financial environment to an essentially market-determined system. This allows for the study of yield spreads during periods that are characterized by substantial differences in the institutional setting.

Two conceptually different spreads can be distinguished. First, there are spreads that are taken from different points along the maturity spectrum. Second, there are spreads that are constructed from two interest rates on financial instruments with identical maturity but differ with respect to the issuer. The most interesting case here is the difference in yield between paper issued by the government, public paper,

and privately issued paper. Both spreads are considered in this paper.

The paper proceeds as follows. The next section explains how the different spreads are constructed. Section II provides a brief summary of the institutional settings in the two countries before and after deregulation. The third section reviews why yield spreads are useful as predictors of output. Section IV presents the empirical findings and Section V concludes.

B. Defining the Spreads

Spreads taken from different points along the maturity spectrum are in the following called term spreads. They are constructed by subtracting the shorter rate from the longer rate. The difference between public and private paper is in the following referred to as the public - private or bill - private spread. It is constructed by subtracting the private rate from the public rate. Given these conventions and the theoretical models of section III, an increase in the spreads signals an expansion of output, while a decrease is a sign for an impending economic slowdown.

II. The Institutional Setting

A. The Financial Sector and the Conduct of Monetary Policy Prior to the Reforms

The financial sector in both New Zealand and Australia was heavily regulated in the pre-reform period. The Reserve Banks of both countries imposed four different types of direct

controls on the activities of the banking sector, especially the trading banks, with a view towards controlling the volume of credit (and in New Zealand also its sectoral allocation).

First, the Reserve Banks issued guidelines concerning the growth of total bank lending either by imposing explicit credit growth targets as in NZ or by negotiating ceilings on lending growth with the trading banks as in Australia. Second, interest rates in the financial sector were administered by the Reserve Banks and kept low in order to control the expansion of total loan volume. Artificially low interest rates prevented the trading banks from financing loans through deposit expansion. The third type of direct controls placed restrictions on the composition of assets held by trading banks. A certain fraction of a bank's assets had to be held in the form of government securities. In practice, the Reserve Bank attempted to ease or tighten monetary policy by varying the reserve asset ratio. The market for foreign exchange was tightly controlled in both countries up to the period of financial deregulation. The exchange rate was set but adjusted frequently in order to avoid large swings in the flow of short-term capital.

The tight regulation imposed on the banking sector led to the rise of the non-bank financial sector whose activities went largely uncontrolled by the monetary authorities. The changing structure of the financial sector, spurred by huge flows of funds from the banking to the non-banking sector, caused the effectiveness of monetary policy to wane. This phenomenon along with the fact that either Reserve Bank saw

itself unable to pursue an independent monetary policy as it was compelled to monetize government budget deficits and defend a fixed exchange rate eventually led to a call for reforms.

B. Financial Reforms and the New Monetary Policy

The reforms undertaken in the early to-mid 1980s led to a complete restructuring of the financial sector and to a redesign of the conduct of monetary policy. In both countries the dismantling of direct controls over entry to the banking sector led to the establishment of foreign-owned banks, and the floating of the exchange rate gave rise to an active foreign exchange market. All interest rate controls and reserve asset ratios were removed. In essence, the focus of monetary policy shifted from direct controls to a market-oriented approach to control the liquidity of the financial sector.

An integral part of the new monetary policy is the conduct of open market operations to affect the cost or availability of reserves to the financial sector. While the implementation of monetary policy in Australia does not differ dramatically from that in New Zealand - in both countries the fulcrum of monetary policy rests on the conduct of open market operations - there are a few subtle differences. For the most part, the Reserve Bank of Australia has used the short-end of the yield curve as its operating target. In contrast the Reserve Bank of New Zealand has attempted to exercise monetary control through a quantity variable such as settlement cash

balances or primary liquidity. Trading banks are not subject to required reserves in New Zealand while in Australia trading banks keep Non-callable Deposit Accounts, a form of required reserves, at the Reserve Bank. In New Zealand any deposits held with the Reserve Bank draw interest. Another difference concerns the structure of the cash market. In New Zealand trading banks deal directly with the Reserve Bank while in Australia money market dealers serve as an intermediary between the Reserve Bank and trading banks. Lastly, by statutory law the primary responsibility of the Reserve Bank of New Zealand is to keep a tight lid on inflation(0-2 percent range). The Reserve Bank of Australia's ultimate goal is not as narrowly defined but the Bank has repeatedly underscored its objective to target a nominal variable such as inflation or nominal income.

III. Theoretical Justifications for the Use of Yield Spreads as Predictors of Real Economic Activity

A. Term Spreads

Most authors argue that the predictive power of term spreads is due to the fact that they measure the stance of monetary policy, as approximated by a short term rate, relative to a longer term market interest rate (Estrella and Hardouvelis, 1991, Laurent, 1988 and 1989). This explanation assumes at least implicitly the pure expectations theory of the term structure, according to which the long term rate is an average of expected future short term rates plus a constant term premium. An inverted yield curve indicates that the

federal funds rate is currently high relative to its expected future level. Put differently, compared to the expected future level, monetary policy is currently tight. This relative current tightness of monetary policy will lead to a slowdown in real economic activity in the future. Alternatively, a positively sloped yield curve signals increases in future real output growth. Hence yield spreads are positively correlated with real output growth.

Laurent (1989) points out that the spread is a better predictor for output than the funds rate alone, because the longer rate captures other financial conditions. The spread gives a better picture of the stance of policy than the funds rate alone, because it measures policy in the context of overall financial conditions, approximated by the long rate.

The theory of segmented markets is the basis for the explanation of the predictive power of the spread advanced by Harvey (1988 and 1991). He argues that the consumption capital asset pricing model (CCAPM) is consistent with the observed relationship between the yield spread and real output.

Interest rates are linked to expectations about future economic growth via the hedging behavior of agents. In this view, the spread measures consumers' forecasts about the economy. A negative spread is an indication that consumers expect an economic slowdown. In order to smooth their consumption pattern, they will hold bonds that provide a payoff during the slowdown. This increased demand for bonds of a certain maturity will drive down their interest rates.

B. Public - Private Spreads

Variations in the public - private spread have been linked to a number of underlying factors. The most important explanations relate the movement of the public - private spread to variations in default risk and to variations in monetary policy. Friedman and Kuttner (1992) and Bernanke (1990), among others, review these arguments.

The first argument is based on the idea that public, but not private debt, is free of default risk. The public - private spread measures variations in default risk and is an indicator for perceived changes in overall business conditions. It predicts the future development of the economy because it contains information about the likelihood of a recession, which is positively correlated with default risk. Bernanke does not find this explanation convincing. He argues that in the United States defaults on prime commercial paper are very rare and that it is not likely that those defaults can explain the observed large swings in the public - private spread.

Bernanke argues instead that the public - private spread records variations in monetary policy. A decrease in the public - private spread is an indication of tightening monetary policy. He assumes that public and private bills are imperfect substitutes in bank portfolios.[1] As a consequence, public and private interest rates react differently to monetary policy.

If the central bank raises short term interest rates in

[1] See Cook (1981) for an analysis that supports this view.

order to tighten monetary policy, the cost of funds to banks rises. Banks can react to this in three ways. First, they can issue CDs or other managed liabilities; second, they can increase the rates on their outstanding loans or reduce the amount of loans; and third, they can reduce their holdings of government securities. Since CDs and commercial paper are close substitutes and since financing via commercial paper is an alternative to loan financing, both these actions will put upward pressure on commercial paper rates.

The third option, the sale of T-bills would counteract this development but Bernanke argues that, compared to the other two, this effect is small because T - bills are valuable to banks for a number of reasons unrelated to yield. They can be used to satisfy margin as well as capital adequacy requirements among other things.

To summarize, monetary policy is captured in the spread, because public and private rates are imperfect substitutes. A tightening of policy has a stronger effect on private than on public rates, because banks value public securities for reasons unrelated to yield. Even under different institutional features, this argument will be valid whenever banks consider public and private paper to be imperfect substitutes and have a preference for public paper.

IV. Empirical Evidence

A. Data and Econometric Issues

Due to the significant changes in the operating procedure of the Reserve Banks in Australia and New Zealand, two sample periods are estimated separately, an early period during which markets are highly regulated, and a late period, characterized by financial deregulation. For Australia, the early period is 69:III - 82:IV, and the late period is 83:I - 93:III. In New Zealand the two respective periods are 77:III - 84:IV and 86:II - 92:IV. All data is quarterly.

The measure of real output is industrial production.[2] Annualized cumulative growth rates of industrial production are calculated according to the following formula:

$$IP_{t,t+k} = \frac{400}{k} \log \frac{IP_{t+k}}{IP_t}, \quad for\ k = 1..8, \qquad (1)$$

where k is the forecasting horizon in quarters and IP_{t+k} denotes the level of industrial production during quarter t+k.

Three different spreads are constructed, the difference between the bond rate and the bill rate, the difference between the bond rate and the money market rate, and the difference between the bill rate and the private rate. The first two spreads are taken from different points along the term structure of interest rates. The last spread focuses on the difference in the issuer of the paper, the government versus private companies, holding the maturity constant. Recall that spreads taken from different points of the

[2] Similar results, which are not reported in the paper, are obtained when GDP is used as a measure of output.

maturity spectrum will be referred to as term spreads, while the spread between government and private paper will be referred to as the bill - private spread or the public - private spread. All six spreads are pictured in Graphs 1 - 6.

The bond rate is a long term rate on government bonds. The bill rate is the 90-day rate on government bills, or in the late sample period in New Zealand the 90-day rate on Reserve Bank bills. The money market rate is an overnight interbank rate. The private rate is a 90-day rate on private debt. All data and its sources are documented in appendix 1.

The regression equations have the following form:

$$IP_{t,t+k} = a_0 + a_1 \, Spread_t + \epsilon_t. \qquad (2)$$

The use of a forecasting equation with a horizon of k quarters creates econometric problems. The sampling interval is longer than the forecasting horizon for all cases where k>1. The overlapping of forecasting horizons induces a moving average error term of order k-1 which affects the consistency of the OLS standard errors. To correct the standard errors for this serial correlation, the procedure of Newey and West (1987) is used.

B. Spreads as Predictors of Real Output

The theoretical models presented in section III predict a positive relationship between the spreads and output growth. a_1 is therefore expected to be positive.

Table 1 shows the regression evidence for Australia, Table 2 for New Zealand. For each country the predictive

power of the bond rate - money market rate and the bond rate - bill rate spread is in general quite similar. Qualitatively identical results are obtained when either of these two term spreads is used. Quite different results however are obtained for the bill - private spread.

In Australia the term spreads do not predict output well during the early sample period. The coefficient on the spread is either insignificant or it is not of the expected sign. The measure of in-sample forecasting accuracy, $\bar{R}^2$, is rather low. The maximum for the bond - money market spread is 9% at k=8; for the bond - bill spread it is 13% at k=3.

A different picture emerges for the late sample period. In 15 of the 16 cases, a_1 has the expected positive sign and is statistically significant. For both term spreads, the maximum $\bar{R}^2$ is obtained for k=8, being 42% and 36%, respectively.

These results are in accordance with the findings by Lowe (1992) who employs a number of different measures of output and a different definition of the term spread. He also obtains the result that in Australia term spreads are not useful as predictors of output in the early period but are good indicators after deregulation.

The pattern of the public - private spread is quite different from that of the term spreads. The public - private spread is a good predictor of output in the early period but not in the late period. In the early period, a_1 is statistically significant and of the expected sign in all eight cases. $\bar{R}^2$ is highest at k=4, where it is 26%. In the

late period, a_1 is not statistically significant in most cases and also not of the expected sign. The maximum $\overline{R}^2$ is 9%, reached at k=7.

In New Zealand term spreads are not useful as predictors of real output. This result is independent of the sample periods and the associated operating procedures. For the early sample period, data on the money market rate is unavailable. Therefore only results for the bond - bill spread are reported. a_1 is never statistically significant, and $\overline{R}^2$ is either negative or zero. During the late sample, a_1 is positive and significant for k=2 and k=3 for both term spreads but $\overline{R}^2$ is rather low at 3% and 8%, respectively.

Compared to Australia, the public - private spread behaves qualitatively similar in New Zealand. It predicts output well in the pre-regulation period but not in the post-regulation era. In the early period, a_1 is positive and statistically significant except for k=1. The highest $\overline{R}^2$ is at 33% for k=4. Thus the predictive power of the public - private spread was highest at the four year horizon in both New Zealand and Australia. As in Australia, the public - private spread does not predict output well for the late period in New Zealand. $\overline{R}^2$ is either zero or negative and the coefficient on the spread is mostly not statistically significant.

To summarize, the following main results emerge. Term spreads are good predictors of output in Australia after deregulation but not before. The public - private spread

predicts output well before but not after deregulation. In New Zealand term spreads are not useful in predicting output, irrespective of the sample period. Just like in Australia, the public - private spread predicts output well before but not after deregulation.

C. A Closer Look at the Rates

This section analyzes the correlations between the individual rates used to construct the spread and, in addition, examines the predictive power of single interest rates rather than spreads. This serves two purposes. First, it helps to explain some of the findings about the spreads, and second, it addresses the question of whether spreads hold information about output growth that is not contained in the individual interest rates alone.

Correlations between the interest rates are reported in Table 3 for Australia and in Table 4 for New Zealand. As expected, all interest rates are correlated positively. There are, however, noticeable differences in correlations between the early and the late sample period. Of particular interest are the correlations between the rates that make up the three different spreads.

Most noticeable is the increase in the correlation between the bill rate and the private rate in New Zealand. The coefficient of correlation is 0.521 in the early period and jumps to 0.988 in the late period. In Australia the correlation also increases in the late sample period, but the change from 0.934 to 0.988 is not as dramatic. The increases

in correlation suggest an explanation for the loss of predictive power of the public - private spread in the late period that is consistent with the institutional changes discussed in section II.

During the early period, interest rates on public securities were managed in both countries by the government on the advice of the Reserve Bank while private interest rates were largely uncontrolled and market-determined. In the late period, on the other hand, all interest rates were market-determined. The strong predictive power of the public - private spread in the early period is possibly due to the fact that this spread picks up the movement of the market determined private rate relative to the controlled public rate. While movements in the private rate are related to developments in the economy, the public rates do not contain any information. After deregulation, the two interest rates of the same maturity are exposed essentially to the same market forces and therefore contain the same information. The spread no longer contains any independent information. This explanation suggests that the private rate alone should be useful as a predictor for real output, particularly in the early period.

A similar argument holds for the term spread in Australia. The correlation between the bond rate and both short-term interest rates falls significantly in the late period. The correlation between the bond rate and the money market rate falls from 0.953 to 0.719, while the correlation between the bond and the bill rate drops from 0.961 to 0.792.

Before deregulation, there is not much independent information in the different public rates, since all of them were set at artificially low levels by the policy maker. Since deregulation, market forces have determined interest rates and, in accordance with the theory of the term structure of interest rates, they contain independent information about expected future rates. This explains the increase in the predictive power of the term spread in the late period. It also raises the question of how well individual public rates predict economic activity.

The above analysis suggests an analysis of the private rate, as well as other rates alone as predictors of output. Tables 5 for Australia and Table 6 for New Zealand provide this evidence. For the same sample periods, the money market rate, the bill rate, the bond rate, and the private rate are entered separately in an equation predicting output growth. Again the standard errors are corrected for the moving average error induced by the overlapping of forecasting horizons.

The prediction equation is now

$$IP_{t,t+k} = a_0 + a_1 \, Rate_t + \epsilon_t. \qquad (3)$$

Economic theory, based on models that allow for real effects of monetary policy, suggests a negative sign on a_1. A monetary tightening, measured as an increase in the interest rate, leads to a reduction in output.

For both Australia and New Zealand, the private rate alone is a good predictor for output growth in the early

period. In fact, if the ability to forecast is measured by $\overline{R}^2$ the private rate is superior to the spread. At k=4, again the optimal forecasting horizon, $\overline{R}^2$ is 40% for the rates compared to 33% for the spread in New Zealand, and 39% compared to 26% in Australia. This result supports the idea that the public - private spread in the early period is only a proxy for movements in the private rate. Although the predictive power of the private rate is reduced in the late period, it is still statistically significant in New Zealand for k=2 to 4, with a maximum $\overline{R}^2$ of 23%, and significant in Australia for k=3 to 8. The maximum $\overline{R}^2$ is now 21% at k=8.

In New Zealand none of the other interest rates predict output well in the early period. Given the high correlation between the private rate and the bill rate in the late period, it is not surprising that the bill rate predicts output as well as the private rate during that period. The two other rates, the money market rate and the bill rate, predict output with similar accuracy. For all rates, 4 quarters is the optimal prediction horizon.

In Australia the private rate is the best predictor for output in the early period, but the other rates also have some predictive power. The optimal forecasting horizon is either 4 or 5 quarters, and $\overline{R}^2$ varies from 39% for the private rate to 14% for the money market rate.

The private rate retains some of its predictive power in the late period, but now both the money market rate and the bill rate are superior predictors. The optimal forecasting

horizon is now either 7 or 8 quarters and $\bar{R}^2$ varies from 36% for the bill rate to 21% for the private rate. The bond market rate is worthless as a predictor for output in the late period. a_1 is never statistically significant and $\bar{R}^2$ is always negative.

The evidence on the interest rates suggests caution in interpreting the predictive power of yield spreads for output. In the case of the public - private spread, the spread is only a proxy for movements in the public rate in the early period. In the late period, the public and the private rate both have predictive power for output individually but contain essentially the same information. As a consequence, the difference between the two does not have any predictive power.

The case is not quite as clear for the term spreads. In the late period in Australia, the term spread is preferred over the individual rates based on the criterion of in-sample forecasting accuracy. Still, even for this sample, short term interest rates are not much inferior as predictors for output. In New Zealand, rates are clearly preferable to term spreads. Rates have some predictive power for output while term spreads have none.[3]

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[3] It is conceivable that the predictive power of interest rate spreads hinges on the extent of the volatility in the interest rates. Table 7 contains summary measures of the different interest rates in Australia and New Zealand for the 85:4-93:9 period. There is an obvious pattern in the data. The variances of all three interest rates in New Zealand are roughly twice the size the variances of the rates in Australia. By comparison, differences in the means seem to be modest.

V. Summary

Overall, the case for yield spreads as predictors of real output is weak. In both countries the public - private spread has predictive power in the highly regulated environment of the pre-reform period. However, the predictive power of the spread is largely due to movements in the private rate relative to the controlled public rate. In fact the private rate alone is a better predictor of output than the spread. Once the financial environment changes and public rates become market-determined, the public - private spread loses all of its predictive power while the individual rates retain some ability to predict output.

Neither in Australia nor in New Zealand is there any support for the theories, presented in Section III.B, involving the public and private interest rates. Since deregulation, the two rates have moved essentially in concert. As a result, movements in neither interest rate appear to contain independent information about monetary policy or perceptions of risk.

In New Zealand term spreads have no predictive power for real output while interest rates alone have some predictive power after deregulation. Based on the New Zealand experience, theories that hold that spreads between rates of different maturities contain information about the stance of monetary policy or information about the future state of the economy are not confirmed.

The best case for the use of term spreads as predictors of real output can be made in Australia after deregulation.

The term spreads are better predictors of output than individual interest rates. This is in accordance with the theories presented in section III.A.

Table 1: Australia, $IP_{t,t+k} = a_0 + a_1 Spread_t + \epsilon_t$

		Bond Rate - Money Market Rate		Bond Rate - Bill Rate		Bill Rate - Private Rate	
k	nobs	a_0 a_1	$\bar{R}^2$	a_0 a_1	$\bar{R}^2$	a_0 a_1	$\bar{R}^2$
Early Sample (69:III - 82:IV)							
1	54	2.86 (1.36) -0.87 (0.80)	-0.01	0.19 (0.09) 0.99 (0.69)	-0.01	4.70 (2.49) 1.90 (2.03)	0.06
2	54	3.85 (1.89) -1.41 (1.58)	0.01	-1.28 (0.56) 2.22 (1.48(	0.06	5.28 (4.01) 2.16 (3.84)	0.16
3	54	3.82 (2.23) -1.41 (2.10)	0.03	-1.65 (0.73) 2.48 (1.69)	0.13	5.15 (4.60) 2.10 (5.47)	0.23
4	54	3.96 (3.11) -1.49 (3.55)	0.05	-0.76 (0.40) 1.80 (1.49)	0.09	4.81 (4.36) 1.90 (5.81)	0.26
5	54	3.73 (2.96) -1.31 (3.40)	0.06	0.12 (0.08) 1.18 (1.35)	0.04	4.18 (3.76) 1.49 (4.56)	0.21
6	54	3.34 (2.66) -1.05 (2.64)	0.04	0.47 (0.39) 0.93 (1.34)	0.03	3.69 (3.24) 1.19 (3.54)	0.17
7	54	3.54 (3.01) -1.12 (2.61)	0.07	0.86 (0.78) 0.65 (1.10)	0.01	3.32 (2.98) 0.96 (3.08)	0.13
8	54	3.53 (2.97) -1.14 (2.17)	0.09	0.98 (0.98) 0.56 (1.19)	0.01	2.89 (2.93) 0.70 (3.00)	0.08
Late Sample (83:I - 93:III)							
1	42	3.26 (3.01) 0.83 (1.99)	0.08	3.38 (3.06) 0.64 (1.39)	0.03	1.82 (1.20) -1.88 (1.30)	0.03
2	41	3.21 (3.26) 0.84 (2.97)	0.16	3.29 (3.24) 0.76 (2.24)	0.10	2.22 (1.32) -1.88 (1.30)	0.02
3	40	3.19 (3.25) 0.86 (3.19)	0.24	3.25 (3.21) 0.86 (2.74)	0.19	2.08 (1.15) -1.98 (1.56)	0.04
4	39	3.21 (3.47) 0.85 (3.49)	0.28	3.26 (3.41) 0.89 (3.20)	0.24	2.02 (1.13) -1.96 (1.55)	0.05
5	38	3.13 (3.72) 0.80 (3.85)	0.33	3.18 (3.66) 0.85 (3.61)	0.29	1.96 (1.18) -1.80 (1.51)	0.06
6	37	3.07 (3.98) 0.79 (4.04)	0.39	3.14 (3.93) 0.82 (3.81)	0.33	1.81 (1.23) -1.83 (1.90)	0.08
7	36	3.05 (4.16) 0.74 (3.46)	0.41	3.12 (4.17) 0.78 (3.41)	0.35	1.75 (1.31) -1.75 (2.25)	0.09
8	35	3.02 (4.19) 0.68 (2.97)	0.42	3.10 (4.31) 0.72 (2.79)	0.36	2.06 (1.50) -1.27 (1.57)	0.05

Table 2: New Zealand, $IP_{t,t+k} = a_0 + a_1 Spread_t + \epsilon_t$

		Bond Rate - Money Market Rate		Bond Rate - Bill Rate		Bill Rate - Private Rate	
k	nobs	a_0 a_1	$\bar{R}^2$	a_0 a_1	$\bar{R}^2$	a_0 a_1	$\bar{R}^2$
Early Sample (77:III - 84:IV)							
1	30	-	-	3.00 (1.01) 0.00 (0.00)	-0.04	11.50 (2.29) 1.98 (1.45)	0.09
2	30	-	-	4.73 (2.00) -0.66 (0.84)	-0.03	12.24 (3.15) 2.05 (2.13)	0.22
3	30	-	-	4.48 (1.86) -0.49 (0.58)	-0.03	12.13 (4.02) 2.01 (2.95)	0.31
4	30	-	-	4.35 (1.84) -0.46 (0.54)	-0.03	11.07 (4.06) 1.78 (3.47)	0.33
5	30	-	-	4.72 (1.80) -0.77 (0.69)	-0.02	9.67 (4.24) 1.51 (4.51)	0.28
6	30	-	-	4.74 (1.80) -0.81 (0.69)	0.00	8.42 (4.08) 1.23 (3.74)	0.28
7	30	-	-	3.62 (2.02) -0.25 (0.34)	-0.03	6.64 (3.65) 0.82 (2.54)	0.18
8	30	-	-	3.72 (2.33) -0.36 (0.51)	-0.02	4.68 (3.90) 0.39 (1.69)	0.04
Late Sample (86:II - 92:IV)							
1	26	-0.72 (0.31) 0.44 (1.06)	-0.03	-0.14 (0.06) 0.78 (1.75)	-0.01	-1.49 (0.73) -1.86 (1.41)	-0.03
2	25	-0.91 (0.53) 0.56 (1.76)	0.03	-0.33 (0.19) 0.85 (2.13)	0.08	-1.75 (1.19) -0.46 (0.71)	-0.04
3	24	-0.71 (0.40) 0.54 (1.84)	0.03	-0.16 (0.08) 0.80 (2.04)	0.08	-1.58 (1.02) -0.25 (0.46)	-0.04
4	23	-0.79 (0.42) 0.46 (1.50)	0.02	-0.25 (0.12) 0.70 (1.68)	0.07	-1.59 (1.04) -0.07 (0.13)	-0.05
5	22	-1.33 (0.75) 0.21 (0.75)	-0.03	-0.97 (0.49) 0.37 (0.93)	-0.01	-1.62 (1.22) 0.79 (1.64)	-0.03
6	21	-1.67 (1.08) 0.07 (0.31)	-0.05	-1.53 (0.87) 0.13 (0.41)	-0.05	-1.75 (1.56) 0.45 (0.95)	-0.04
7	20	-2.08 (1.96) -0.02 (0.12)	-0.06	-2.17 (1.82) -0.06 (0.26)	-0.05	-1.98 (2.59) 0.39 (0.89)	-0.04
8	19	-2.38 (3.23) -0.15 (1.30)	-0.02	-2.60 (3.21) -0.23 (1.35)	0.01	-1.97 (3.90) 0.65 (1.88)	0.00

Table 3: Correlation Matrix for Australia				
Early Sample Period (69:III - 82:IV)				
	Money Market	Bill	Bond	Private
Money Market	1.000			
Bill	0.938	1.000		
Bond	0.953	0.961	1.000	
Private	0.854	0.934	0.871	1.000
Late Sample Period (83:I - 93:III)				
	Money Market	Bill	Bond	Private
Money Market	1.000			
Bill	0.973	1.000		
Bond	0.719	0.792	1.000	
Private	0.961	0.988	0.837	1.000

Table 4: Correlation Matrix for New Zealand				
Early Sample Period (77:III - 84:IV)				
	Money Market	Bill	Bond	Private
Money Market	-			
Bill	-	1.000		
Bond	-	0.828	1.000	
Private	-	0.521	0.631	1.000
Late Sample Period (86:II - 92:IV)				
	Money Market	Bill	Bond	Private
Money Market	1.000			
Bill	0.960	1.000		
Bond	0.911	0.924	1.000	
Private	0.976	0.988	0.952	1.000

Table 5: Australia, $IP_{t,t+k} = a_0 + a_1 Rate_t + \epsilon_t$

k	nobs	Money Market Rate a_0 a_1	$\bar{R}^2$	Bill Rate a_0 a_1	$\bar{R}^2$	Bond Rate a_0 a_1	$\bar{R}^2$	Private Rate a_0 a_1	$\bar{R}^2$
Early Sample (69:III - 82:IV)									
1	54	8.28 (2.22) -0.85 (1.89)	0.05	8.39 (2.33) -0.84 (1.99)	0.07	10.54 (2.31) -0.95 (2.04)	0.07	10.18 (2.90) -0.88 (2.58)	0.11
2	54	7.99 (2.63) -0.80 (2.13)	0.09	9.32 (3.54) -0.94 (2.87)	0.16	10.66 (3.02) -0.95 (2.62)	0.13	11.38 (4.43) -0.98 (3.67)	0.25
3	54	7.38 (2.74) -0.73 (2.38)	0.11	8.97 (4.13) -0.90 (3.45)	0.23	9.91 (3.30) -0.87 (3.09)	0.17	10.98 (5.34) -0.95 (4.29)	0.35
4	54	6.75 (2.72) -0.65 (2.62)	0.13	8.05 (4.16) -0.78 (3.83)	0.25	9.23 (3.40) -0.80 (3.45)	0.20	9.89 (5.49) -0.84 (4.58)	0.39
5	54	6.25 (2.61) -0.58 (2.53)	0.14	7.11 (3.77) -0.66 (3.76)	0.23	8.43 (3.23) -0.71 (3.27)	0.21	8.50 (5.11) -0.69 (4.75)	0.35
6	54	5.56 (2.37) -0.49 (2.19)	0.12	6.21 (3.23) -0.55 (3.22)	0.20	7.35 (2.88) -0.59 (2.81)	0.19	7.30 (4.27) -0.57 (4.25)	0.30
7	54	4.59 (2.03) -0.36 (1.69)	0.08	5.28 (2.77) -0.43 (2.56)	0.15	6.27 (2.54) -0.48 (2.31)	0.15	6.18 (3.56) -0.45 (3.41)	0.23
8	54	3.83 (1.80) -0.27 (1.33)	0.05	4.57 (2.53) -0.35 (2.14)	0.12	5.32 (2.26) -0.38 (1.91)	0.11	5.20 (3.16) -0.35 (2.82)	0.17

Late Sample (83:I - 93:III) (Continuation of Table 5: Australia)									
1	42	7.26 (1.99) -0.30 (0.96)	0.00	9.18 (2.48) -0.46 (1.48)	0.03	3.65 (0.55) 0.00 (0.00)	-0.02	6.35 (1.67) -0.21 (0.71)	-0.01
2	41	9.05 (2.94) -0.44 (1.71)	0.06	10.45 (3.73) -0.56 (2.32)	0.11	6.52 (0.94) -0.23 (0.42)	-0.02	8.37 (2.59) -0.37 (1.46)	0.03
3	40	10.06 (3.48) -0.52 (2.12)	0.12	11.13 (4.25) -0.61 (2.61)	0.18	6.33 (0.83) -0.22 (0.37)	-0.02	9.34 (3.05) -0.44 (1.87)	0.08
4	39	10.79 (3.96) -0.58 (2.50)	0.16	11.68 (4.83) -0.65 (2.93)	0.23	6.29 (0.84) -0.22 (0.37)	-0.02	10.11 (3.49) -0.49 (2.26)	0.12
5	38	10.85 (4.27) -0.59 (2.72)	0.20	11.67 (5.29) -0.65 (3.14)	0.27	4.86 (0.74) -0.12 (0.22)	-0.03	10.26 (3.80) -0.51 (2.54)	0.14
6	37	11.03 (4.22) -0.60 (2.72)	0.23	11.96 (5.09) -0.68 (3.11)	0.33	3.20 (0.53) 0.00 (0.00)	-0.03	10.46 (3.64) -0.53 (2.46)	0.17
7	36	11.14 (3.97) -0.61 (2.52)	0.26	11.89 (4.54) -0.67 (2.77)	0.36	1.85 (0.30) 0.10 (0.19)	-0.03	10.79 (3.45) -0.55 (2.31)	0.19
8	35	10.78 (3.42) -0.58 (2.10)	0.25	11.30 (3.93) -0.62 (2.35)	0.35	-2.47 (0.35) 0.42 (0.74)	-0.01	10.95 (3.27) -0.56 (2.11)	0.21

Table 6: New Zealand, $IP_{t,t+k} = a_0 + a_1 Rate_t + \epsilon_t$

k	nobs	Money Market Rate a_0 a_1	$\bar{R}^2$	Bill Rate a_0 a_1	$\bar{R}^2$	Bond Rate a_0 a_1	$\bar{R}^2$	Private Rate a_0 a_1	$\bar{R}^2$
Early Sample (77:III - 84:IV)									
1	30	-	-	8.62 (0.50) -0.56 (0.35)	-0.03	10.20 (0.56) -0.59 (0.42)	-0.03	30.23 (3.06) -1.89 (2.53)	0.10
2	30	-	-	12.32 (1.18) -0.88 (0.86)	0.00	17.69 (1.58) -1.18 (1.30)	0.02	34.27 (4.86) -2.14 (4.21)	0.33
3	30	-	-	8.96 (1.13) -0.54 (0.66)	-0.02	12.63 (1.45) -0.75 (1.00)	0.00	30.94 (6.37) -1.91 (5.59)	0.36
4	30	-	-	8.94 (1.67) -0.55 (0.90)	-0.01	12.50 (1.97) -0.75 (1.27)	0.01	28.32 (5.83) -1.73 (5.55)	0.40
5	30	-	-	7.30 (1.68) -0.41 (0.77)	-0.02	11.77 (1.73) -0.71 (1.11)	0.01	23.80 (4.56) -1.43 (4.05)	0.33
6	30	-	-	1.28 (0.27) 0.18 (0.36)	-0.03	4.26 (0.84) -0.09 (0.19)	-0.03	15.59 (3.57) -0.87 (2.75)	0.16
7	30	-	-	-1.04 (0.24) 0.41 (0.91)	0.01	-1.14 (0.28) 0.35 (0.95)	-0.01	8.93 (2.89) -0.40 (1.77)	0.03
8	30	-	-	-0.22 (0.01) 0.32 90.85)	0.00	0.44 (0.10) 0.21 (0.53)	-0.02	4.74 (1.65) -0.12 (0.53)	-0.03

Late Sample (86:II - 92:IV) (Continuation of Table 6: New Zealand)									
1	26	5.17 (1.09) -0.46 (1.58)	0.01	6.59 (1.31) -0.55 (1.74)	0.02	13.35 (1.27) -1.15 (1.37)	0.04	6.20 (1.20) -0.52 (1.64)	0.01
2	25	6.53 (1.59) -0.57 (2.41)	0.16	7.91 (1.91) -0.66 (2.73)	0.21	17.01 (2.91) -1.45 (3.60)	0.30	8.04 (1.93) -0.66 (2.78)	0.21
3	24	6.44 (1.51) -0.54 (2.35)	0.16	7.75 (1.78) -0.63 (2.61)	0.21	16.17 (2.55) -1.35 (3.20)	0.28	8.01 (1.81) -0.64 (2.65)	0.21
4	23	6.12 (1.28) -0.51 (2.00)	0.17	7.47 (1.53) -0.60 (2.25)	0.22	15.94 (2.37) -1.32 (2.98)	0.32	7.91 (1.61) -0.62 (2.33)	0.23
5	22	3.45 (0.68) -0.34 (1.24)	0.06	4.66 (0.86) -0.41 (1.40)	0.10	12.72 (1.59) -1.07 (2.02)	0.21	5.58 (1.03) -0.47 (1.60)	0.13
6	21	1.49 (0.32) -0.21 (0.88)	0.00	2.31 (0.44) -0.26 (0.94)	0.02	9.90 (1.17) -0.86 (1.51)	0.14	2.98 (0.55) -0.30 (1.03)	0.04
7	20	-0.92 (0.31) -0.07 (0.46)	-0.05	-0.86 (0.24) -0.07 (0.40)	-0.05	4.16 (0.66) -0.45 (1.07)	0.02	-0.38 (0.10) -0.10 (0.53)	-0.04
8	19	-2.59 (1.21) 0.03 (0.31)	-0.06	-2.80 (1.14) 0.04 (0.35)	-0.05	1.78 (0.40) -0.28 (0.91)	-0.01	-2.24 (0.83) 0.01 (0.08)	-0.06

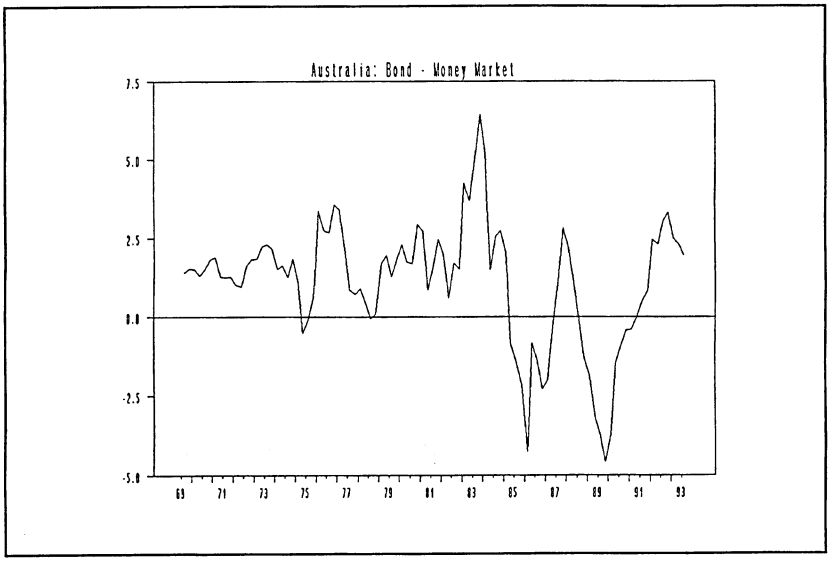
Notes to Tables 1, 2, 5, and 6:

1. Quarterly observations.
2. Numbers in parenthesis are T-statistics. They are corrected according to the method of Newey and West.

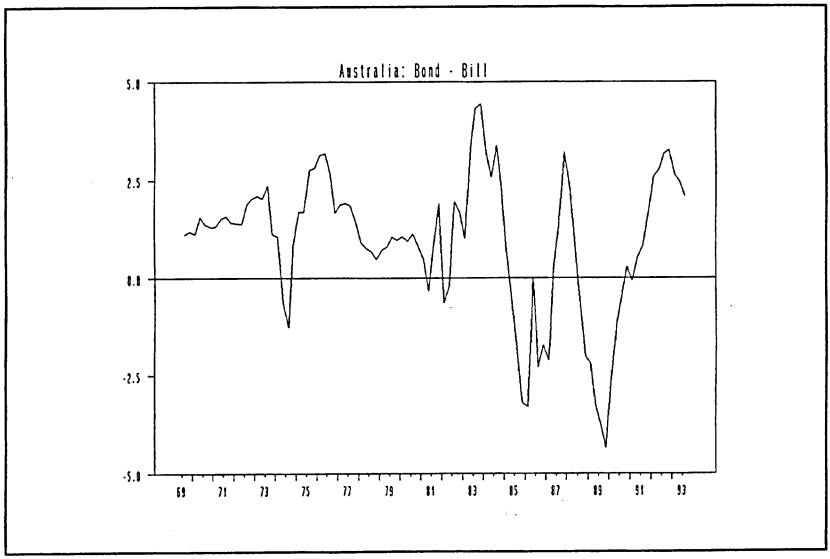
Table 7: A Comparison of Interest Rates after Deregulation						
	Australia			New Zealand		
	Call Rate	Bill Rate	Bond Rate	Call Rate	Bill Rate	Bond Rate
Mean	12.34	12.16	12.01	13.97	14.43	12.71
Variance	16.43	17.06	4.60	30.88	34.39	11.35
Varia-bility	.47	.61	.18	2.71	1.42	.21

Notes:

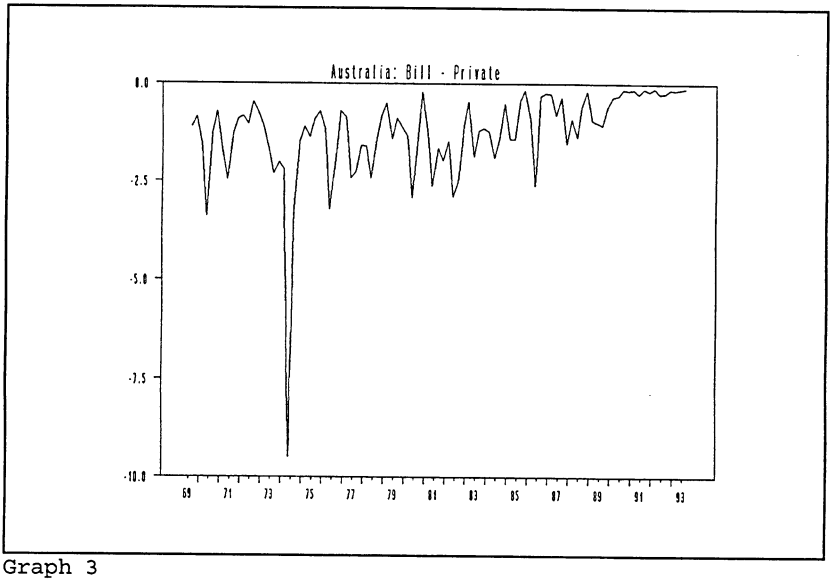
1. Monthly data from 85:4 - 93:9 is used for both countries.
2. Mean = Sample mean.
3. Variance = Sample variance.
4. Variability = Average of squared first differences.



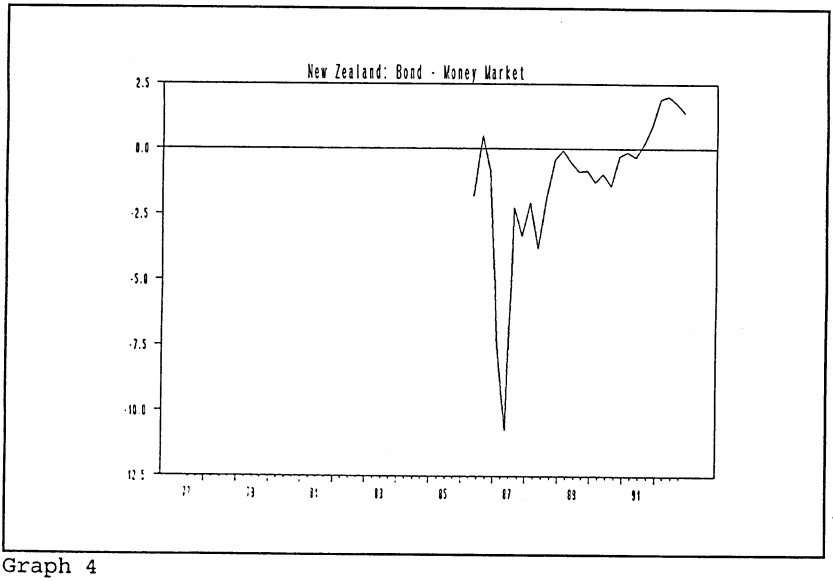
Graph 1



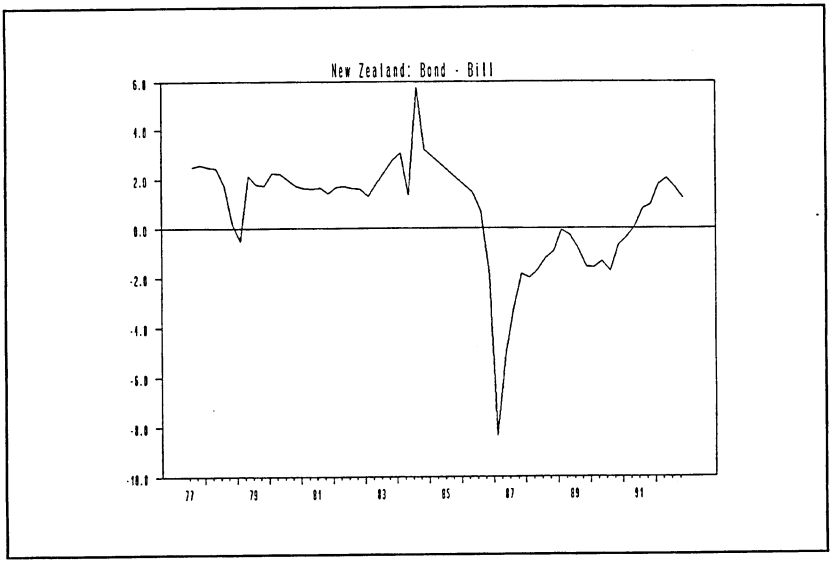
Graph 2



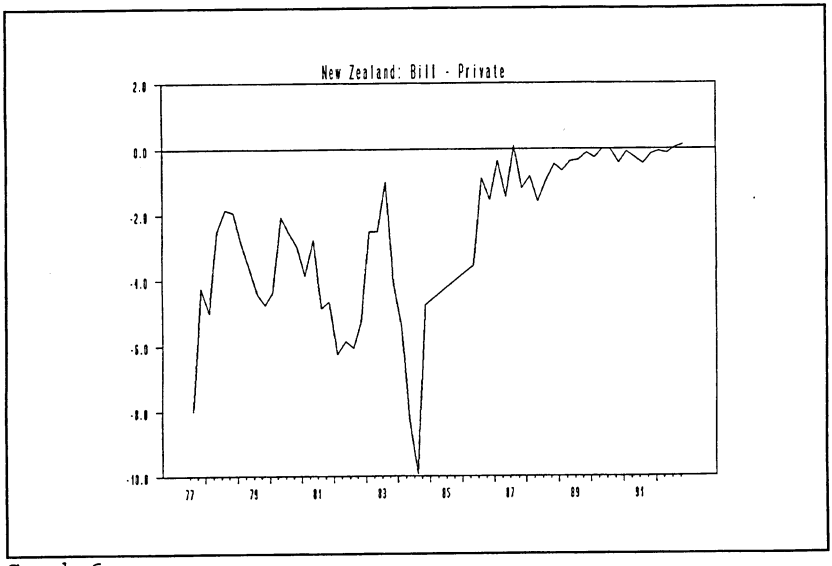
Graph 3



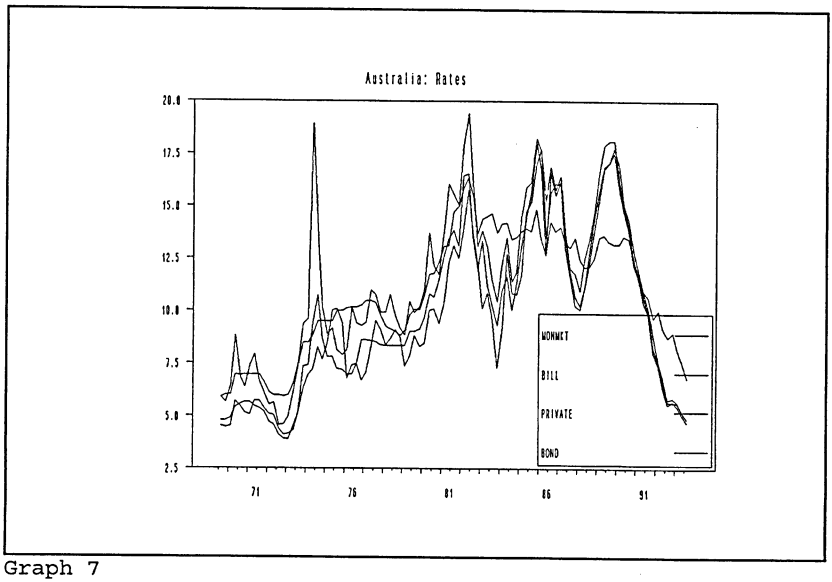
Graph 4



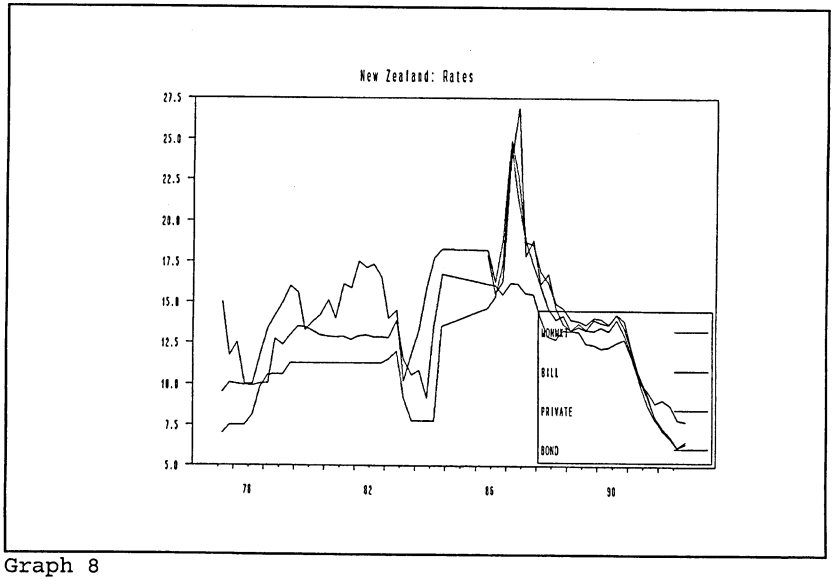
Graph 5



Graph 6



Graph 7



Graph 8

DATA APPENDIX

New Zealand:

Output: Industrial Production, seasonally adjusted
(source: IFS)

Interest Rates: Public Rates:
Money Market Rate
90-day Treasury Bill Rate (early period)
90-day Reserve Bank Bill Rate (late period)
10-year Bond Rate
(source: Reserve Bank of New Zealand)

Private Rates:

90-day Commercial Bill Rate (early period)
(source: Broadbank Commercial Bill Index)
90-day Commercial Bill Rate (late period)
(source: Reuters)

Australia:

Output: Industrial Production, seasonally adjusted
(source: IFS)

Interest Rates: Public Rates:
Money Market Rate
13-week Bill Rate
15-year Bond Rate
(source: IFS)

Private Rate:
90-day Bank Accepted Bills
(source: Reserve Bank of Australia)

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