

# RESEARCH DISCUSSION PAPER

FINANCIAL DEREGULATION AND THE  
MONETARY TRANSMISSION MECHANISM

*Jerome Fahrer  
and Tom Rohling*

*RDP 9008*

RESEARCH DEPARTMENT

RESERVE BANK OF AUSTRALIA



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## ABSTRACT

Major changes to the Australian financial system occurred in the 1980s that were potentially important for the effects of monetary policy on economic activity. Using vector autoregressive econometric techniques we find that, in fact, the deregulation of the financial system has made very little difference to the reduced form relationships between interest rates, employment growth, inflation and the growth rate of real credit. We find that interest rates are an important determinant of both the business cycle and inflation, with credit being much less influential. We also find that monetary policy reacts to unexpected movements in real variables but does not react to unexpected changes in the rate of inflation.



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# FINANCIAL DEREGULATION AND THE MONETARY TRANSMISSION MECHANISM

Jerome Fahrer and Tom Rohling

## 1. Introduction

The rapid and virtually complete deregulation of the Australian financial system in the 1980s has once again raised the question of the relationships between financial variables and the real economy. The substantive issue is whether, post-deregulation, any stable leading relationships can be found between financial variables and the real economy. This question has been central to changes in the implementation of monetary policy in Australia in recent years, for example, the abandonment of monetary targeting in 1985 in favour of the more eclectic approach that has since characterized monetary policy.<sup>1</sup> One notable aspect of that approach has been a growing recognition that the financial sector's assets, rather than its liabilities, may be pivotal in the monetary transmission mechanism.<sup>2</sup>

These issues have only recently, however, been scrutinized with Australian data (Bullock, Morris and Stevens, (1989), Stevens and Thorp, (1989)). Using simple correlations and vector autoregressions, these papers concluded that financial aggregates tended to lead real activity prior to deregulation, but after deregulation the causality has been reversed. No clear causal

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<sup>1</sup> For an official assessment, see Grenville (1990). For an academic assessment, see Milbourne (1990).

<sup>2</sup> The importance of credit in the transmission of monetary policy to the real economy has been recognized, in the United States, for several years. For a recent contribution, see e.g. Bernanke and Blinder (1989).

relationships between interest rates and activity were identified. In this paper we extend that analysis by considering the effects of *unexpected* shocks to financial and other variables. In particular, we examine whether deregulation has altered the dynamic effects of shocks to growth rates of real credit and employment, the 90-day bank bill rate and inflation.

We find that deregulation has made very little difference to the relationships among these variables. The only changes worth noting are that post-deregulation, the reaction of monetary policy to unexpected growth in real credit is much more pronounced, while its reaction to unanticipated inflation is now virtually non-existent.

The rest of the paper is organized as follows: in Section 2 we discuss the policy and institutional settings which form the background of this study while in Section 3 we discuss methodological issues. The results are reported in Section 4 and conclusions are drawn in Section 5.

## **2. Policy and Institutional Background**

Up until the early 1980s the Australian financial system was heavily regulated and monetary policy operated mainly through a panoply of direct controls. The major instruments were the use of ceilings on the growth of bank lending, restrictions on deposit and lending rates, and the use of the Statutory Reserve Deposit (SRD) arrangement in conjunction with the Liquid Assets and Commonwealth Government Securities (LGS) convention. In addition, exchange rates were set by the authorities and international capital movements were subject to a number of controls. Under the SRD arrangement, trading banks were required to hold a certain percentage of their total Australian deposit base with the Reserve Bank. The LGS convention was an agreement between the Reserve Bank and the trading banks whereby the trading banks agreed to maintain a certain proportion

of their deposits as liquid assets, mainly Commonwealth Government securities.

A tightening of monetary policy during this period was implemented by a number of quantitative measures e.g., changes in the SRD ratio, or imposing ceilings on bank lending. Alternatively, open market operations were used to sell government securities. Because banks' deposit rates were controlled, the sale of securities to the non-bank public reduced the liquidity of banks and thus restricted their ability to lend by attracting funds out of their deposit base. Bank credit was thus rationed, with lending rates unable to increase to clear the market. However, the effectiveness of this set of policies gradually became eroded as the excess demand for credit was diverted to other financial institutions which were not subject to the controls faced by banks. These non-bank financial institutions generally charged higher interest rates than banks and so, to an certain extent, a quasi-price rationing of credit took place.

Since the floating of the Australian dollar in December 1983, the Reserve Bank has used interest rates as the operating instrument of monetary policy. The Bank uses open market operations to buy or sell securities to a specific group of financial institutions, viz., the authorised money market dealers. Their main function is to manage banks' exchange settlement funds. If the Reserve Bank seeks to tighten monetary conditions, it sells securities to these dealers who finance their purchases by bidding for funds from other financial institutions. This leads to an increase in cash rates, and subsequently to increases in other interest rates, such as the 90 day bank bill rate.<sup>3</sup>

A critical feature of the new arrangements is that since the banking system must settle with the central bank in "cash", there

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<sup>3</sup> For a more detailed explanation of Reserve Bank operations, see Grenville (1990) or Carmichael (1990).

will always be a demand for central bank liquid assets. Thus the monetary authorities can exert influence over short term interest rates and affect the real economy directly through the interest sensitive components of aggregate demand. The question remains open, however, whether monetary policy affects the real economy any differently, in a reduced form sense, under deregulation. One possibility is that, since monetary policy now affects the entire financial system, its effects on the real economy are enhanced. Another possibility, however, is that the only effect of deregulation is to increase the amount of intermediation done by banks at the expense of non-bank financial institutions. This certainly distorts some of the monetary aggregates, rendering them inoperable as intermediate targets of monetary policy. It does not, however, necessarily change the relationship between the amount of credit extended by the financial system as a whole and the real economy.

### 3. Methodology

One way of examining the macroeconomic effects of deregulation is to construct a structural model which reflects the effects of financial liberalisation. However, the precise nature of these structural changes is unclear, and only recently has much thought been devoted to this question; see e.g. Blundell-Wignall et al. (1990). We view this modelling exercise as a topic worthy of future research. In this paper, however, we are content to model the reduced form effects of deregulation. We do this by constructing a four-equation vector autoregression. We estimate this dynamic reduced form and then examine the properties of its moving average representation i.e. the impulse responses and variance decompositions.<sup>4</sup>

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<sup>4</sup> Wold's representation theorem states that a stationary autoregressive process  $y_t = b(L)y_t + u_t$  can be written as the vector moving average process  $y_t = a(L)u_t + E(u_t)$  where the coefficients of the matrix  $a(L)$  are functions of the estimated autoregressive parameters  $b(L)$ .  $a(L)$  at lag 0 is the identity matrix.  $u_t$  is the forecast error (innovation) of the autoregression



The four endogenous variables that comprise the VAR are the 90-day bank bill rate, the rate of growth of employment, the inflation rate (measured by the growth rate in the Consumer Price Index) and the rate of growth of total real credit in the financial sector. These are graphed in Figures A and B, below.

The 90-day bank bill rate is our proxy for monetary policy. Although monetary policy was implemented essentially through quantity controls pre-deregulation, periods of tightening (easing) were often accompanied by increases (decreases) in interest rates (see Battellino and McMillan, (1989)). In a deregulated environment, changes in cash rates are soon reflected in corresponding changes to the 90-day bank bill rate. Thus we are confident that changes to the bill rate can be interpreted as reflecting changes to the stance of monetary policy both before and after deregulation even though the method of implementing that policy has changed completely. Our measure of credit is the sum of all advances and bank bills. The rate of employment growth is our proxy for real activity.

An important feature of VAR modelling requires discussion. This is that, while a VAR is just a set of reduced form equations, the impulse response functions and variance decompositions are sensitive to the ordering of the variables in the VAR. In effect, a recursive structure is implicitly imposed on the contemporaneous variables in the model, and so the VAR is by no means a mere atheoretical representation of the data. This kind of structure is,

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given information at  $t - 1$ . In other words, each variable is expressed as the sum of current and past innovations (shocks) of all the variables in the system. The dynamic path of the effects of an innovation to a variable on another variable is the impulse response function. The variance decomposition of the  $k$ -step ahead forecast is the proportion of the total forecast variance of one component of  $y_{t+k}$  associated with shocks to the MA representation of another variable.

Figure A  
The Inflation Rate and the  
Growth Rate of Employment (12 months ended)

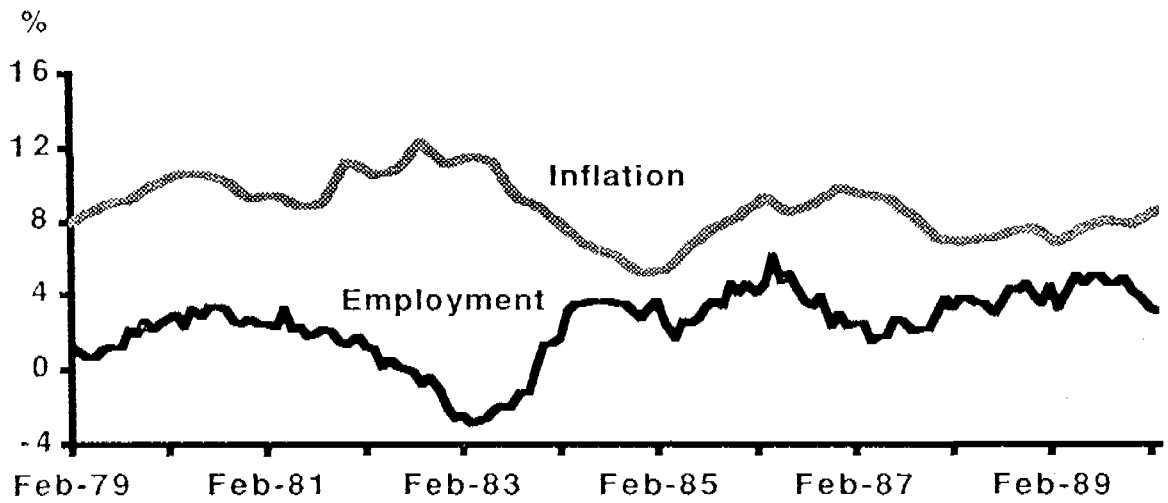
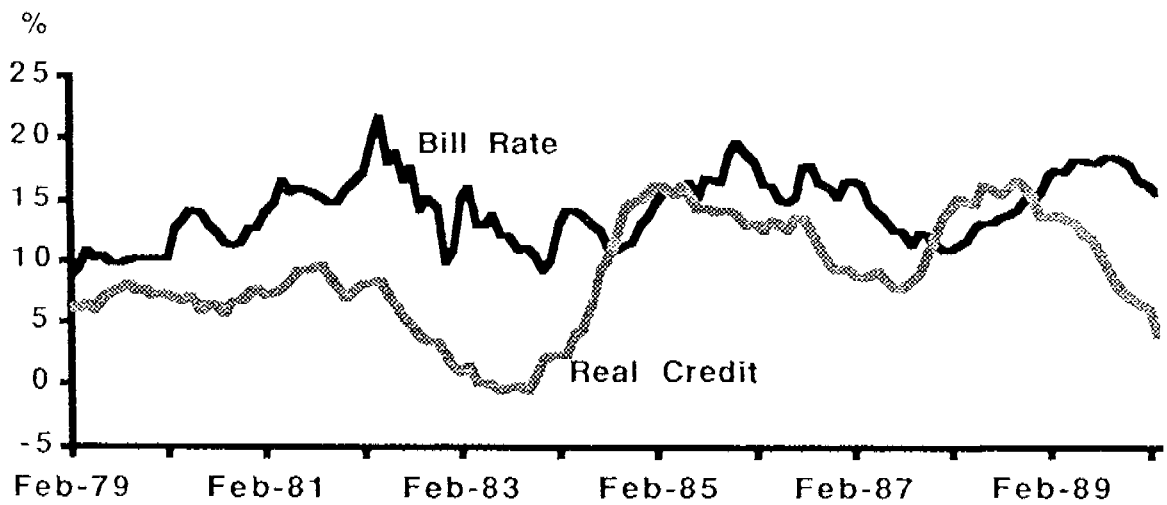


Figure B  
The 90-Day Bank Bill Rate and  
Growth of Real Credit (12 months ended)



of course, very restrictive. There seems to be no completely satisfactory way of resolving this problem but, at the very least, we need to be explicit about the assumptions we are embedding in the model. We place the variables in the following order: the 90-day bank bill rate, the growth of employment, inflation and the growth of real credit. Thus we are assuming that the bill rate is contemporaneously exogenous to the rest of the variables in the model, the bill rate and the growth of employment are together exogenous to the other variables, etc..

Our analysis divides the data into two sub-periods; from 1978:2 to 1984:8 and from 1984:9 to 1990:3. Since deregulation occurred progressively over a number of years, no single date can unambiguously divide the regulated and deregulated periods. Our (admittedly arbitrary) choice is August 1984, the time when all remaining bank deposit controls were removed. This allowed banks to compete for short term funds in the overnight money market for the first time.

Six lags of each variable appear in the VARs, which are estimated consistently and efficiently by ordinary least squares. The parameter estimates, while of no intrinsic interest, are available on request from the authors. The data are monthly and, except for the bill rate, are measured as log differences. Details about data construction and sources can be found in the Appendix.

## **4. Results**

### **(a) Granger-Causality**

Vector autoregression models are a convenient way to test Granger-causality between variables. Table 1 presents the Granger-causality results of the four equations in our model. The figures are the marginal significance levels for the hypothesis that all 6 lags of the given right hand side variable can be excluded.

Table 1  
Granger-Causality Tests: Marginal Significance Levels

Pre-deregulation

	Bank Bill Rate	Employ. Growth	Inflation Rate	Real Credit Growth
Bank Bill Rate	0.000	0.839	0.307	0.911
Employ. Grth.	0.153	0.415	0.302	0.797
Inflation Rate	0.044	0.048	0.000	0.140
Real Credit Grth.	0.186	0.184	0.245	0.498

Post-deregulation

	Bank Bill Rate	Employ. Growth	Inflation Rate	Real Credit Growth
Bank Bill Rate	0.000	0.196	0.954	0.109
Employ. Grth.	0.036	0.312	0.445	0.121
Inflation Rate	0.137	0.374	0.000	0.938
Real Credit Grth.	0.225	0.101	0.071	0.732

Table 1 is read as follows: the dependent variables are listed on the left side of each row. The explanatory variables are listed at the top of each column. A small value indicates a statistically significant variable.

Using the five percent level of significance as a benchmark, the only variables to Granger-cause other variables are the bill rate and employment growth, which both lead inflation. This effect disappears, however, after deregulation. In the post-deregulation period, the bill rate Granger-causes employment. The general message that we take from the Granger-causality tests is that deregulation appears not to have made a great deal of difference to the reduced form relationships between these variables. This result might simply reflect the possibility that these tests lack power, and so we now turn to alternative examinations of the data.

### **(b) Impulse Response Functions**

In this Section, we analyze the effects of an unanticipated shock to a particular variable on all the variables in our model. Impulse response functions trace the effect of a one standard deviation shock to a variable on the time path of all the variables in the system. These are shown in Figures 1-16. The vertical axes refer to monthly growth rates, while the horizontal axes denote elapsed time (in months). For ease of comparison the impulse to a particular variable has been standardised so that the shock is the same size both before and after deregulation.

#### **(i) The 90-Day Bank Bill Rate**

Figures 1-4 show the impulse responses following a shock to the bank bill rate. Figure 1 shows the time path of the bill rate itself. The path of the bill rate decays slowly pre-deregulation and somewhat more quickly in the post-deregulation period. Figure 2 shows that the bill rate shock causes the growth rate of employment to fall by around 0.0005 (or 0.6 per cent in annualised terms) both before and after deregulation, for about two years. The effect on inflation appears to be negligible (Figure 3), while the growth rate of real credit tends to fall, quite substantially, especially in the post-deregulation period.

IMPULSE RESPONSES OF A ONE STANDARD DEVIATION SHOCK TO THE  
 90- DAY BANK BILL RATE  
 PRE-DEREGULATION ——— POST-DEREGULATION - - - -

FIG 1: 90-DAY BANK BILL RATE

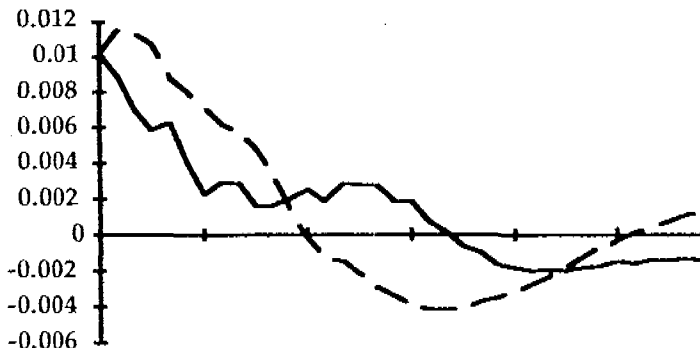


FIG 2: EMPLOYMENT GROWTH RATE

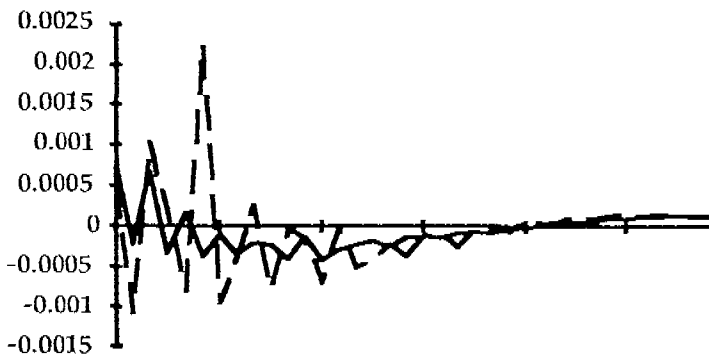


FIG 3: INFLATION RATE

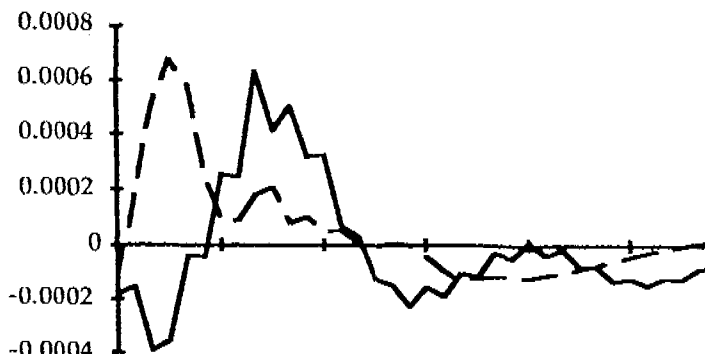
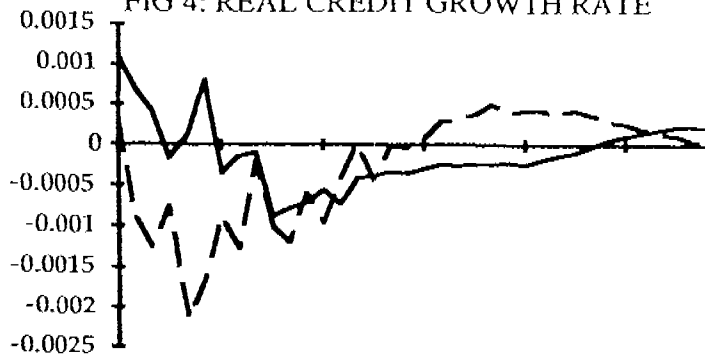


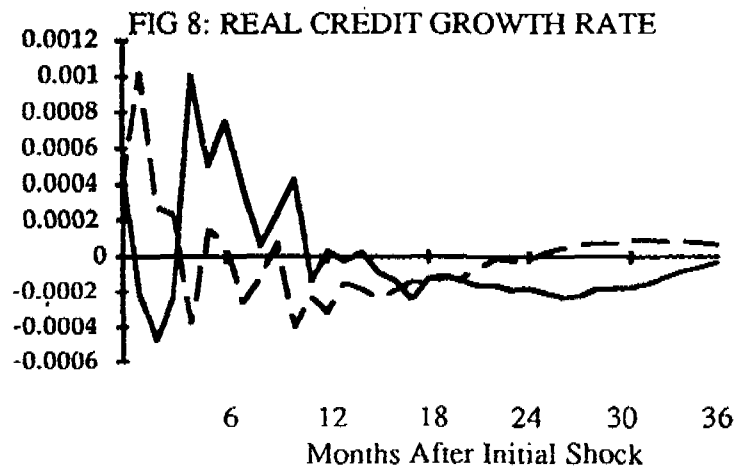
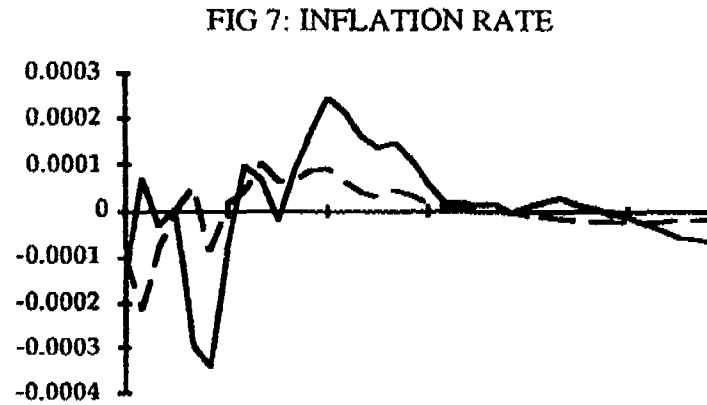
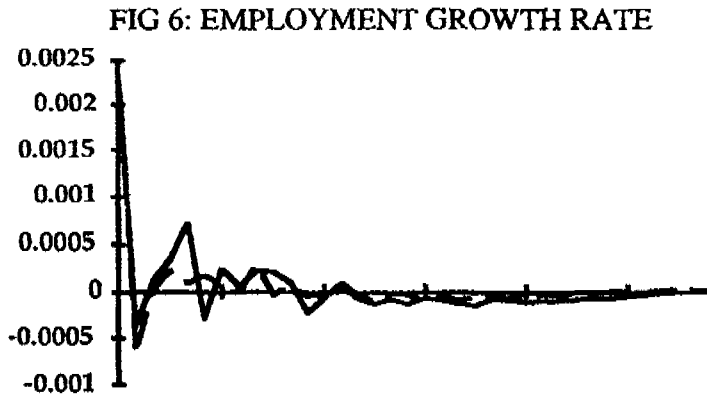
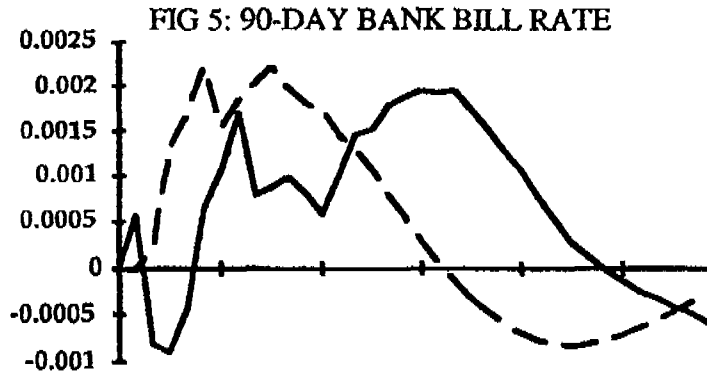
FIG 4: REAL CREDIT GROWTH RATE



6 12 18 24 30 36  
 Months After Initial Shock

IMPULSE RESPONSES OF A ONE STANDARD DEVIATION SHOCK TO THE  
EMPLOYMENT GROWTH RATE

PRE-DEREGULATION ——— POST-DEREGULATION - - - -



IMPULSE RESPONSES OF A ONE STANDARD DEVIATION SHOCK TO THE INFLATION RATE

PRE-DEREGULATION ——— POST-DEREGULATION - - - - -

FIG 9: 90-DAY BANK BILL RATE

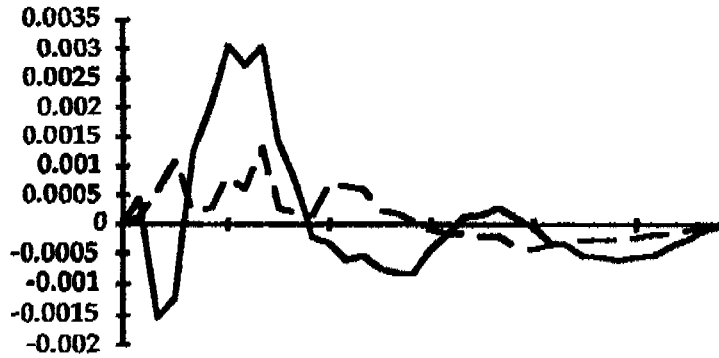


FIG 10: EMPLOYMENT GROWTH RATE

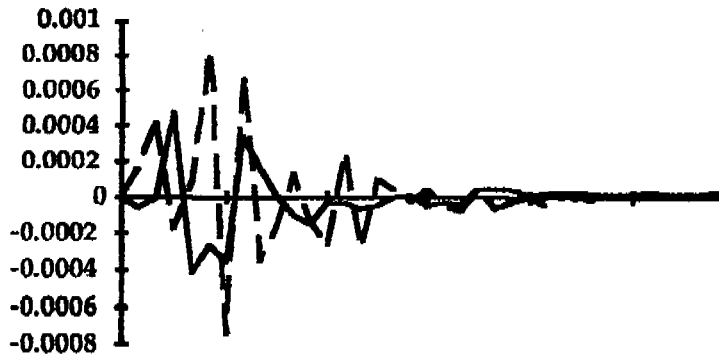


FIG 11: INFLATION RATE

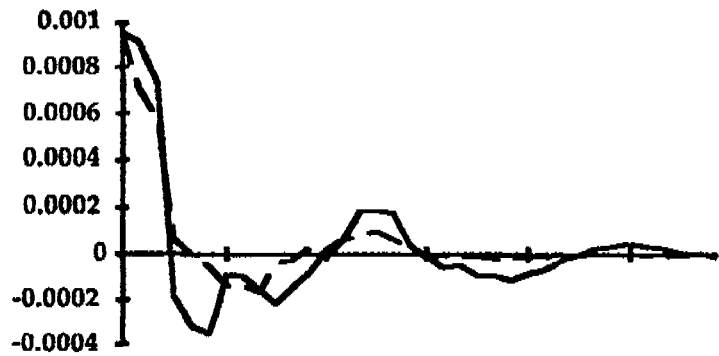
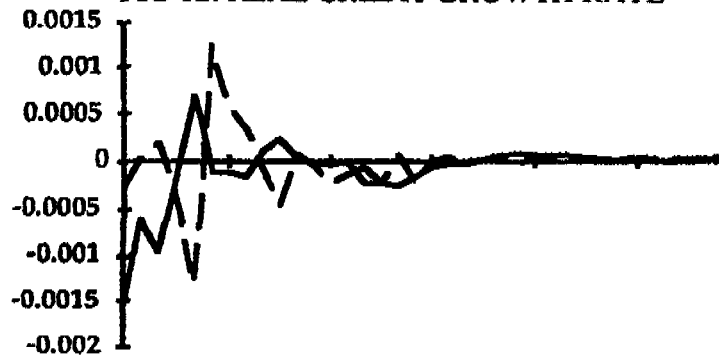


FIG 12: REAL CREDIT GROWTH RATE



6 12 18 24 30 36  
Months After Initial Shock



IMPULSE RESPONSES OF A ONE STANDARD DEVIATION SHOCK TO THE  
REAL CREDIT GROWTH RATE

PRE-DEREGULATION ——— POST-DEREGULATION - - - - -

FIG 13: 90-DAY BANK BILL RATE

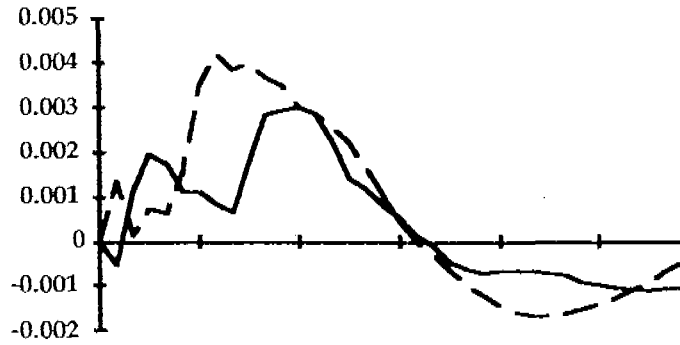


FIG 14: EMPLOYMENT GROWTH RATE

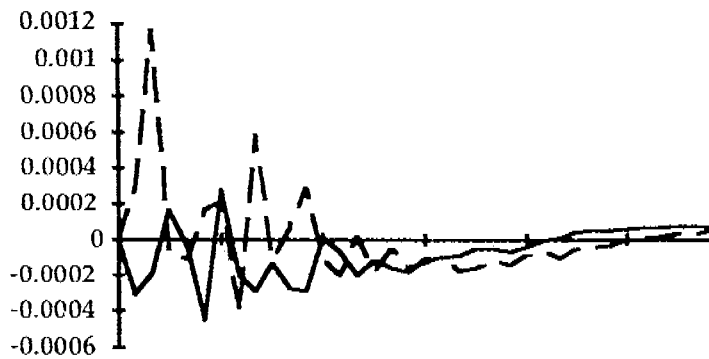


FIG 15: INFLATION RATE

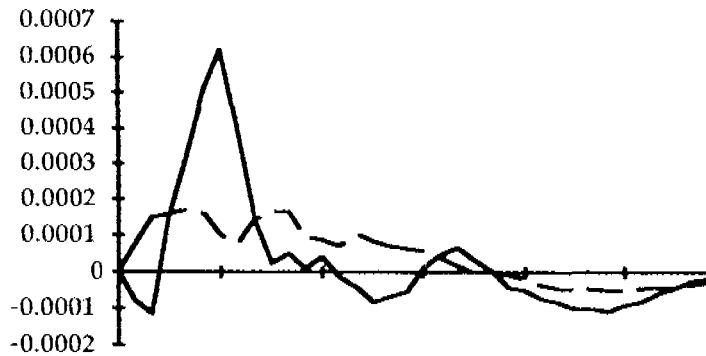
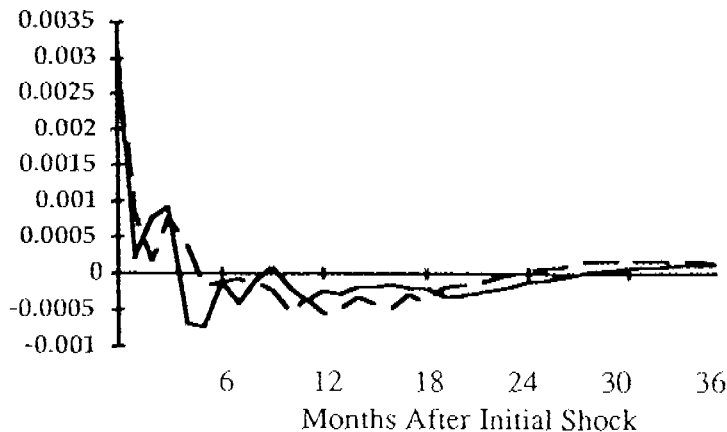


FIG 16: REAL CREDIT GROWTH RATE



## (ii) The Employment Growth Rate

Figure 5 shows that a positive shock to the employment growth rate leads to a tightening of monetary policy both pre and post-deregulation. This tightening appears to be more sustained in the pre-deregulation period. Figure 6 shows that the effect of the shock to employment growth on itself disappears immediately after the initial impulse. The effect on inflation is almost non-existent, (Figure 7), which is not surprising since the shock lasts for only one period. Some increase is evident in the growth rate of real credit, shown in Figure 8, but this effect is relatively short-lived, no doubt due to the effects of the higher interest rates.

## (iii) The Inflation Rate.

A one per cent annualised shock to the inflation rate leads to a modest tightening of monetary policy (an increase in the bill rate, Figure 9) pre-deregulation, but not post-deregulation. The effect on employment (Figure 10) is similar to that following the bill rate shock, suggesting that it is the response of monetary policy, rather than the inflation shock, *per se*, which is driving the response of employment. The inflation rate itself exhibits a damped cycle (Figure 11) as does the growth rate of real credit, as shown in Figure 12.

## (iv) Real Credit Growth.

Figure 13 shows that a shock to the growth rate of credit elicits a sustained tightening of monetary policy in both periods. As a result, the growth rate of employment is lower (Figure 14) especially pre-deregulation. The response of employment growth to the credit shock does not lend support to the view proposed by Bernanke and Blinder (1989) that credit is important in driving the business cycle. If credit matters, it seems to be only through the effects of the monetary policy reaction function.

The effect on inflation is very small, both before and after deregulation, while the growth rate of real credit actually becomes negative after about six months. This effect is again due to the reaction of monetary policy.

The salient features of the impulse responses can be summarized as follows. First, interest rates seem to have about the same effect on the real economy in both the pre-deregulation and post-deregulation periods. Second, any positive effect of a credit shock to the real economy is more than offset by the reaction of monetary policy. Third, the reaction of monetary policy to a shock to the real economy is far greater than to a shock to the inflation rate. Fourth, real credit growth responds positively to a shock to the real economy, at least until the effects of the monetary policy reaction are felt.

### (c) Variance Decompositions

Equivalently, these data can be analyzed using variance decompositions. The forecast error variance of each variable, at each time horizon, is decomposed into contributions of innovations of all of the variables in the model. These are shown in Tables 2-5.

#### (i) The 90-Day Bank Bill Rate (Table 2)

In the pre-deregulation period, very little of the forecast error variance of the bill rate is attributable to other variables in the system. After 36 months, the bill rate still explains over 70.0 per cent of its own forecast variance; the inflation rate and the rate of growth of employment each explain about 7.5 percent. Credit explains 12.0 percent of the variance. Post-deregulation the contribution, after 36 months, of the inflation rate falls to negligible levels while that of employment increases slightly. The influence of credit increases markedly, explaining nearly 30 percent of the variance after 36 months. The predominant

Table 2

## Variance Decomposition of the 90-Day Bank Bill Rate

Percentage of the forecast error variance explained by shocks to:

## Pre-deregulation

Forecast Month	Bank Bill Rate	Employment Growth Rate	Inflation Rate	Real Credit Growth Rate
1	100.0	0.0	0.0	0.0
6	93.5	0.7	2.9	2.8
12	81.5	2.2	8.9	7.4
18	76.2	4.3	8.1	11.4
24	73.7	7.4	7.7	11.1
36	73.3	7.3	7.4	12.0

## Post-deregulation

Forecast Month	Bank Bill Rate	Employment Growth Rate	Inflation Rate	Real Credit Growth Rate
1	100.0	0.0	0.0	0.0
6	90.4	6.6	0.5	2.5
12	63.0	12.1	0.8	24.1
18	57.1	13.5	0.9	28.6
24	59.1	12.8	0.8	27.2
36	56.5	13.3	0.9	29.4

Table 3

## Variance Decomposition of the Employment Growth Rate

Percentage of the forecast error variance explained by shocks to:

## Pre-deregulation

Forecast Month	Bank Bill Rate	Employment Growth Rate	Inflation Rate	Real Credit Growth Rate
1	9.7	90.3	0.0	0.0
6	15.8	75.0	5.3	4.0
12	17.9	67.5	7.6	7.1
18	20.9	64.2	7.2	7.8
24	21.0	63.8	7.2	8.0
36	21.6	63.1	7.1	8.2

## Post-deregulation

Forecast Month	Bank Bill Rate	Employment Growth Rate	Inflation Rate	Real Credit Growth Rate
1	0.9	99.1	0.0	0.0
6	17.8	67.2	4.3	10.7
12	18.8	59.3	8.6	13.4
18	20.1	57.2	9.1	13.5
24	20.0	56.8	9.1	14.0
36	20.2	56.6	9.1	14.1

Table 3

## Variance Decomposition of the Employment Growth Rate

Percentage of the forecast error variance explained by shocks to:

## Pre-deregulation

Forecast Month	Bank Bill Rate	Employment Growth Rate	Inflation Rate	Real Credit Growth Rate
1	9.7	90.3	0.0	0.0
6	15.8	75.0	5.3	4.0
12	17.9	67.5	7.6	7.1
18	20.9	64.2	7.2	7.8
24	21.0	63.8	7.2	8.0
36	21.6	63.1	7.1	8.2

## Post-deregulation

Forecast Month	Bank Bill Rate	Employment Growth Rate	Inflation Rate	Real Credit Growth Rate
1	0.9	99.1	0.0	0.0
6	17.8	67.2	4.3	10.7
12	18.8	59.3	8.6	13.4
18	20.1	57.2	9.1	13.5
24	20.0	56.8	9.1	14.0
36	20.2	56.6	9.1	14.1

Table 4

## Variance Decomposition of the Inflation Rate

Percentage of the forecast error variance explained by shocks to:

## Pre-deregulation

Forecast Month	Bank Bill Rate	Employment Growth Rate	Inflation Rate	Real Credit Growth Rate
1	3.5	2.3	94.2	0.0
6	9.7	6.6	72.3	11.4
12	26.2	5.5	50.2	18.1
18	27.3	8.2	47.6	16.9
24	28.2	8.1	47.1	16.6
36	29.0	8.1	45.8	17.1

## Post-deregulation

Forecast Month	Bank Bill Rate	Employment Growth Rate	Inflation Rate	Real Credit Growth Rate
1	0.7	2.3	97.0	0.0
6	21.2	6.0	66.2	6.6
12	20.5	7.5	60.8	11.2
18	19.7	8.5	59.0	12.8
24	20.5	8.4	58.2	12.8
36	20.9	8.6	57.0	13.5

Table 5

## Variance Decomposition of Real Credit Growth Rate

Percentage of the forecast error variance explained by shocks to:

## Pre-deregulation

Forecast Month	Bank Bill Rate	Employment Growth Rate	Inflation Rate	Real Credit Growth Rate
1	8.5	1.8	17.6	72.2
6	12.0	8.6	20.2	59.1
12	18.4	11.4	17.8	52.4
18	22.1	10.9	17.3	49.7
24	22.6	11.0	16.8	49.5
36	23.2	11.9	16.4	48.5

## Post-deregulation

Forecast Month	Bank Bill Rate	Employment Growth Rate	Inflation Rate	Real Credit Growth Rate
1	0.3	2.0	0.5	97.2
6	16.4	11.1	11.5	60.9
12	21.4	11.6	11.9	55.1
18	21.2	12.3	11.4	55.1
24	21.7	12.3	11.2	54.8
36	22.4	12.3	10.9	54.4



influence is still, however, the forecast variance of the bill rate itself.

(ii) The Employment Growth Rate (Table 3)

Deregulation has had very little effect on the determinants of employment's forecast error variance. The largest influence comes from itself, with the bank bill rate contributing about 20 percent, demonstrating that shocks to monetary policy can have significant and long-lasting effects on the real economy.

The effect of inflation is about half that of interest rates, while real credit growth has a relatively small effect explaining about eight percent of the variance pre-deregulation and about 14 percent afterwards.

(iii) The Inflation Rate (Table 4)

Deregulation does not seem to have had much of an affect on the forecast variance of the inflation rate. The bank bill rate contributes a great deal to the variance in the pre-deregulation period (nearly 30 per cent after 36 months) and makes a somewhat smaller but still significant contribution post-deregulation. The effect of employment is unchanged while the contribution of credit is slightly smaller post-deregulation. By far the greatest contribution, in both periods, comes from the inflation rate itself, even after 36 months. This suggests that an inflation shock is difficult to remove, probably due to inertia in the expected inflation rate.

(iv) Real Credit Growth (Table 5)

The variance decomposition of credit also does not change much in the post-deregulation period. The bill rate explains about 20 percent of the forecast error variance, in both periods.

Employment growth and inflation have small but not negligible effects.

## 5. Summary and Conclusions

The aim of this paper has been to investigate how deregulation has affected the relationships between financial variables and the real economy. Our evidence points to the following conclusions:

(i) the deregulation of the financial system has made very little difference to the reduced form relationships between interest rates, employment growth, inflation and the growth rate of real credit;

(ii) interest rates are an important determinant of both real activity and inflation;

(iii) the growth rate of real credit, on the other hand, does not appear to play much of a role in driving the business cycle. The effects of unexpected credit growth on real activity are more than offset by the resultant tightening of monetary policy. Credit growth responds positively to positive shocks to real activity but, again, this effect is more than offset by the interest rate effect;

(iv) the reaction of monetary policy is primarily to real variables, viz., the growth rates of employment and real credit. By contrast, the reaction of monetary policy to unexpected inflation was weak pre-deregulation and has since become virtually non-existent.

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## Appendix

### Data Sources and Methods

#### (a) Employment

Total employment consists of full time and part time employment. Seasonally adjusted monthly data are obtained from ABS Cat. No. 6203.0. Data are available from February 1978.

#### (b) Inflation

The inflation rate is the log change in the Consumer Price Index, ABS Cat. No. 6401.0. Monthly values are obtained by geometrically interpolating the quarterly values. The series has been adjusted for the introduction of the Medicare program in the March quarter of 1984.

#### (c) Financial Variables

Data are obtained from the May and June 1990 Reserve Bank of Australia (RBA) Bulletin. Differences to other Bulletin figures for the same series reflect revisions.

##### (i) Interest rates

Data for the yield of 90-Day bank accepted bills of exchange (the Bank Bill rate) are from the RBA Bulletin, Table F.1, various issues.

##### (ii) Credit

Credit (Table D.5 RBA Bulletin, various issues) is loans and advances by all financial institutions included in the broad money aggregate plus bank bills outstanding.

Credit has been adjusted for the following major breaks:

(a) Feb 1983: the inclusion of Cash Management Trusts added \$1493 million.

(b) July 1984: The identification of double counting between NBFIs removed \$3001 million.

(c) July 1987: The inclusion of Primary Industries Bank of Australia added to credit.

(d) Jan. 1989: The inclusion of The Australian Resource Development Bank of Australia and the Commonwealth Development Bank added to credit.

The monthly growth rates of credit were adjusted in the month of each break. The last published figure available, March 1990, was taken as the best indicator of the true level of the aggregate, and previous months figures for the aggregate were then calculated using the adjusted growth rate series. The new adjusted levels series were then seasonally adjusted using X-11.

The data are available from the authors upon request.

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