

Economic Notes

The following are summaries from recent Discussion Papers.

WHAT IS THE APPROPRIATE FOREIGN PRICE INDICATOR OF NEW ZEALAND'S IMPORT PRICES?

Discussion Paper G92/10

Ian Corfield and Ray Brooks

The aim of the paper is to identify for each of our four main trading partners (Australia, Japan, the UK and the US) the foreign price index which is the best indicator of New Zealand's import prices (in New Zealand dollars). The paper considers five foreign price indices: CPI, GDP deflator, Producers' Price Index (PPI) - all goods, PPI - manufactures, and an export price index.

Initially, the paper tests the restrictions implied by purchasing power parity but these are rejected. Instead, a restriction of 100 per cent exchange rate pass-through is imposed and accepted as being consistent with the data. The results from the main section of the analysis indicate that the most appropriate foreign price indicator for each of the trading partners is:

- Australia - export price index;
- Japan - PPI (all goods)
- UK - PPI (manufactures)
- US - export price index

An interesting result is the relationship between the price of New Zealand's imports (in world price terms) and world CPIs. With the exception of the UK, the level of 'imported inflation' is considerably less, on average, than world CPI inflation. Two conclusions can be drawn from the result. The first is that world CPI inflation is a poor indicator of the level of inflation New Zealand imports in world price terms, as world CPI inflation overstates New Zealand's import inflation. The second conclusion, which follows on from the first, is that because of the lower level of 'imported inflation', the Reserve Bank's goal of price stability is attainable with less upward pressure on the nominal exchange rate than is indicated by observing the inflation rate of world CPIs.

BANKS, TRANSACTIONS AND INFLATIONARY DYNAMICS OF FINANCIAL INNOVATION

Discussion Paper G92/11

Arthur Grimes

Innovations to transactions technologies in the banking system, such as credit cards and electronic funds transfer, have recently proceeded rapidly. This paper analyses the

impact of these innovations on the time path of the price level. To perform the analysis, a model in which banks play a role in transactions is developed, leading to an insight about the benefits to depositors provided by banks.

In the model, as is typically the case, people receive income at discrete times, while they would like to consume continuously. In a world with money but no banks, and no other sources of credit, a person's consumption is constrained by the amount of money they hold, until they next receive income. However, the introduction of a bank can alleviate this cash constraint.

Banks accept a person's income as a demand deposit, which the person can withdraw on demand to pay for their consumption. Even if a person has exhausted their own deposits, a bank with positive deposit balances from other depositors will be willing to lend the person money, to tide them over until their next income arrives. The establishment of this transactions role for banks, allowing depositors to borrow and lend at different times, enables people to both smooth and increase their consumption over time, enhancing their welfare.

When banks introduce a new transactions technology, which enables people to maintain their consumption pattern with lower average money balances, depositors will spend their surplus money balances. Given a fixed supply of goods to consume, the price level will rise in response to this higher demand. Indeed, the price level initially rises above its new long-run equilibrium. This inflation 'overshooting' result reflects the preference of people to consume relatively more now than in the future.

These results demonstrate the difficulties that monetary authorities face in using monetary aggregates to control inflation during a period of financial innovation, as such innovations can lead to fluctuations in inflation without any changes in the money supply.

DISCOUNT POLICY AND BANK LIQUIDITY: IMPLICATIONS FOR THE MODIGLIANI-MILLER AND QUANTITY THEORIES

Discussion Paper G92/12
Arthur Grimes

The Reserve Bank may influence monetary conditions and exert monetary control through a number of alternative levers. One of these levers is the discount margin (over market interest rates): the penalty charged to banks when they discount or sell Reserve Bank Bills to settle their accounts at the Reserve Bank. For example,

an increase in the discount margin gives banks an incentive to bid more aggressively for wholesale deposits and to increase interest rates charged on loans.

The paper develops a micro-economic model to illustrate the importance of discount policy for monetary policy. Of direct interest to the Reserve Bank is the effectiveness of discount policy in controlling prices. The paper addresses the implications of discount policy for two opposing policy models: the quantity theory of money and the Modigliani-Miller theory for open market operations. The quantity theory asserts that the price level is proportional to the level of cash or base money and is unaffected by the supply of

government bonds. The Modigliani-Miller theory asserts that government financing decisions do not affect the price level or any real variable - for example, an open market operation in government bonds, does not affect the price level.

A generic result of the model is that when banks are able to discount Reserve Bank bills for liquidity, neither the quantity theory of money nor the Modigliani-Miller theorem holds. The interpretation of this result is that Reserve Bank bills and cash are substitutable, albeit imperfectly. In these circumstances the price level is determined by the supplies of both cash and Reserve Bank bills. For example, an open market purchase of Reserve Bank bills will in general raise the price level but by an amount which is less than proportionate to the increase in cash.

The paper also addresses implications for monetary policy in the special case where the Modigliani-Miller theory for open market operations does hold. Under these special circumstances, banks may never need to discount Reserve Bank bills. However, the price level can still be controlled by changing the interest rate on bank cash reserves.

THE INTER-BANK MARKET: IMPLICATIONS FOR CENTRAL BANK POLICY

Discussion Paper G92/13

Arthur Grimes

Every business day, vast numbers of financial transactions are undertaken between banks and their customers. At the end of each day, the net claim on each bank is determined and banks must settle these claims using their accounts held at the Reserve Bank. The nature of the settlement process affects bank liquidity and is an integral part of monetary policy. For example, if banks were prohibited from borrowing or lending to each other to settle their accounts, then banks which end the day with negative balances would have to settle their accounts by discounting or selling Reserve Bank bills (to the Reserve Bank) to obtain cash. Alternatively, an (ex-post) inter-bank market may exist, whereby banks are able to settle their accounts by borrowing cash from other banks. New Zealand, unlike some other countries, has a well developed ex-post inter-bank market.

This paper develops a bank asset choice model to examine the effect of the inter-bank market on monetary policy and the price level. A basic result is that, *inter alia*, the introduction of an inter-bank market increases each bank's access to liquidity at the end of the banking day. In turn, this reduces each bank's demand to hold liquid reserves and has the effect of unambiguously raising the price level. Once the inter-bank market is in place, however, the Central Bank is generally able to determine the price level through its choice of monetary policy settings.

A related question addressed in the paper is the relative effectiveness of an inter-bank market or a Central Bank loan facility in overcoming liquidity problems due to a sudden 'run' by the public to withdraw bank deposits. Here, an important distinction can be made between a run on an individual bank and a system-wide bank run. In the former case of a run on an individual bank, the withdrawn deposits are usually redeposited in another bank. In a well functioning inter-bank market, these deposits could be lent back to the original bank provided the bank is solvent. Thus Central Bank intervention may not be necessary in these circumstances to maintain the existence of a solvent bank. In the latter

case of a system-wide bank run, however, there is a net withdrawal of deposits from the banking system. In this case the inter-bank market is unable to replenish bank liquidity, so that Central Bank intervention to inject cash is required to maintain the soundness of the system.

OPTIMAL PUBLIC DEBT STRUCTURE

Discussion Paper G92/15

Arthur Grimes

- Any organisation with outstanding debt must consider how to structure that debt. Its choices include the maturity structure of the debt, the currencies of its denomination, and the type of instruments employed (such as floating rate versus fixed rate instruments and nominal versus inflation-indexed debt). These choices are as important for the public sector as they are for private sector firms. Indeed, some peculiar features of government - such as its size and its power to tax - mean that public sector debt structure decisions involve more complex considerations than faced by private firms.

In this paper the above issues of how to structure public debt in an optimal manner are examined from an analytical perspective. The existing literature is surveyed and the results are extended. The most important result is that, as in the private sector case, public debt should be structured so as to hedge the entities' (in this case, the government's) cash flows.

For instance, consider the case where government has a source of revenue that is perfectly positively correlated with the return on a particular debt security. That security will be a useful component of public debt since when revenue is low, debt servicing costs will also be low. An appropriately sized exposure to the security by government would allow the government's overall cash-flows (including its debt-servicing costs) to be immune to variations in this revenue stream.

If, instead, the security was not included as part of the public debt (and if no other hedging operation was undertaken), government would have only two other choices in these circumstances, if it did not wish to raise its overall debt level. The first would be to cut expenditure in response to the revenue shortfall, but this would be costly for the previous recipients of the expenditure. Alternatively, government would have to raise taxes; not only is this costly to taxpayers but also it increases the distortions in the economy associated with the tax system. Neither of these two unpalatable options has to be exercised when the appropriate hedging opportunity is utilised through inclusion of the security within the public debt structure. As a result of the interaction between public debt servicing costs and other expenditures and tax revenues, optimal structuring of the public debt is an integral part of the design of optimal tax and government expenditure policies.

The paper extends existing analysis of the optimal design of public debt and the tax structure to the case where different tax rates can be set on income from financial assets and other income. It demonstrates, under certain simplifying assumptions, that the government can also hedge its income by setting differing tax rates on these two sources of income. In this case, public debt would not have to be structured taking hedging

considerations into account. However such an undertaking would not result in an optimal tax design and so is inferior to the adoption of an optimal tax policy (for the structure of taxes on financial and other income) in conjunction with a hedging approach to structuring public debt.

DOES DEMAND AFFECT MARKUPS? A STUDY OF PRICING BEHAVIOUR IN NEW ZEALAND

Discussion Paper G92/16
David Rae and Jason Wong

The Reserve Bank has a direct interest in monitoring inflationary pressures that may emerge over the business cycle. One area of particular interest is whether markups of prices over costs are likely to rise as the economic recovery progresses. Previous work at the Bank has failed to find any significant link between demand and markups, and other work in New Zealand has given basically similar results. This paper revisits the issue.

Part of the reason why markups may have previously appeared constant over the business cycle is that the changes are hard to see: changing markups may have been swamped by high inflation. This makes it difficult to split price changes into those caused by overall cost inflation and those that are caused by changes in markups. To overcome this difficulty the authors take three different approaches, with all three giving a relatively consistent answer: markups appear to be pro-cyclical.

The first approach is to study the behaviour of markups in each of nine manufacturing industries. A general model of markups is estimated for each industry and then the contribution of demand proxies are tested. The results suggest that some industries have significantly pro-cyclical markups, others have relatively constant markups, and one industry has strongly counter-cyclical markups. The overall finding is that markups are less sensitive to demand in the highly concentrated industries, such as paper products, chemicals, and metals. There is also some evidence that exchange rate changes are passed through to prices more slowly than are foreign price changes.

The second approach is to model pricing in aggregate manufacturing. First, the paper shows that a simple cost-plus model of pricing does not fit the facts. Although it does fairly well from 1978 to 1986, the cost-plus model breaks down dramatically in the second half of the 1980s. The capacity utilisation rate (the proxy for the business cycle) is both positive and significant in the equation explaining prices in aggregate manufacturing. But it has only recently become significant: the sensitivity of markups to demand has risen steadily throughout the 1980s. The estimates suggest that, from trough to peak over the typical business cycle, a rise in markups may push output prices up around one percent.

The third approach looks for feedbacks within the price system. The price system in the Bank's Model XII is a cost-plus model with a clear chain of causality running through it: input prices feed through to output prices, and output prices in turn feed through to consumer prices. But if markups are sensitive to demand then this link should be reversed: consumer prices should affect output prices, which should in turn affect input prices. Tests on the price system show these feedbacks to be statistically significant.

Each piece of evidence when taken by itself is subject to some doubt. This is because data limitations prevent a thoroughly consistent and robust model of markups being built. But when viewed together the different approaches seem to give a consistent answer and it is this result that provides some confidence in the conclusions.

TESTING AND ESTIMATING COINTEGRATING RELATIONSHIPS: A SURVEY

Discussion Paper G93/1
Jason Wong

Economic theory often relates to long-run equilibrium relationships between variables, eg, long-run links between money, output and prices; consumption and income; nominal wages and prices, to name a few. Time series of such variables often grow together over time and do not diverge for long periods. Variables of this nature are said to be cointegrated.

The econometric theory of cointegration is relatively young, dating back to the early 1980s. But over the last decade the topic has received considerable attention both in empirical and in theoretical research. Cointegration theory has led to some fundamental changes in the way applied econometric work is carried out.

The paper is in two parts. First, it surveys econometric tests for cointegration. A test for cointegration is essentially a test for a long-run relationship between a set of variables. Secondly, the paper surveys the estimation of cointegrating relationships. If cointegration exists, then estimates of the cointegrating coefficients provide a useful test of economic theory. Simulation studies which have compared the various techniques are also surveyed, to provide the reader with a guide as to which techniques work well in practice.

