
The Reserve Bank's process for forecasting business investment

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The Reserve Bank pays close attention to trends in business investment, due to its importance in contributing to inflationary pressure and the economy's long-run productive capacity. This article discusses the components of business investment, and how the Reserve Bank forecasts them.

1 Introduction

Investment in new capital goods is central to the long-run health of the New Zealand economy. Without investment, the capital stock would become run down, and be insufficient to support the production of goods and services which we demand to maintain our standard of living. Changes in business investment can also have significant effects on inflationary pressure. In the short term, high levels of investment may heighten inflationary pressure due to the increased demand for resources necessary to produce investment goods, whereas, in the long run, investment also increases the potential output of the economy.

When a firm purchases a new capital asset or structure which is used to produce output, this is classified as business investment, a component of expenditure on Gross Domestic Product. All businesses, however small, carry out investment. For a small firm, a significant investment may be the purchase of a desktop computer, whereas, for a large company, it may be an entire factory.

Because business investment is a volatile component of expenditure on GDP, it is important for the Reserve Bank to forecast it as accurately as possible. While there are a number of indicators that provide useful information, economic judgement, which is based on both economic theory and more qualitative information sources such as the views of individual firms, is also important in arriving at the final projection for business investment.

This article begins by discussing the components of business investment in section 2, and the Reserve Bank's approach to forecasting business investment is discussed in section 3.

2 Business investment and its components

The Reserve Bank forecasts business investment, residential investment and non-market (i.e. central government) investment separately. This is because each of these categories of investment is carried out by different sectors of the economy, and consequently, each category is driven by distinct factors.

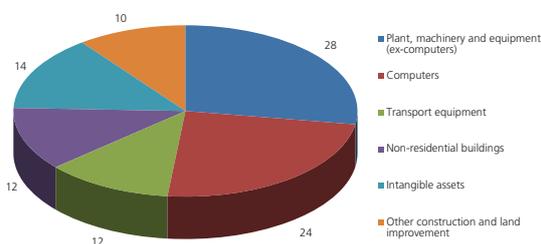
In the national accounts, investment is described as gross capital formation, and is comprised of residential investment (i.e. new house construction and residential additions and alterations), changes in inventories, and investment in other fixed assets. At the Reserve Bank, we separate investment in other fixed assets into business investment and non-market investment. While the majority of business investment is carried out by the business sector, the category also includes investment carried out by state-owned enterprises and local government authorities.¹ Total nominal business investment in the year ended December 2008 was \$21.9 billion, or 12 percent of expenditure on GDP.

At the Reserve Bank, we also consider the components of business investment separately. Figure 1, overleaf, illustrates the relative size of each of the six major components of business investment.

These components are now discussed in turn. Figures 2 to 7, overleaf, plot the components of business investment as a share of GDP.

¹ This is the definition of business investment that is going to be adopted by the Reserve Bank once the transition to the new macroeconomic model, KITT, is completed (see section 3 for more details). Previously, local government authority investment was included in non-market investment.

Figure 1
Components of business investment
 (% of total business investment)



- ***Plant, machinery and equipment investment (excluding computers)***

Statistics New Zealand publishes an estimate of plant, machinery and equipment (PME) investment, which captures investment in equipment used in the production process in industries including manufacturing, construction, agriculture and mining. Examples of PME investment include farm vehicles and machinery, construction machinery and electric-power generating machinery. Another recent, significant example of PME investment was an oil rig. At the Reserve Bank, we separate out computer investment from this component, because it has shown a different trend over history (see below). PME investment (ex-computers) is the largest component of business investment, accounting for around 28 percent of total business investment. This component fluctuates with the business cycle, around a relatively stable share of GDP, in both nominal and real terms.

- ***Computer investment***

Computer investment is comprised of computer hardware used by firms. Because almost all computing equipment used in New Zealand is manufactured offshore, the Reserve Bank uses imports of data processing equipment as a proxy for this component. This series is quality adjusted by Statistics New Zealand, using a computer price index produced by a United States government agency. According to these estimates, the value of computer investment has been a relatively stable share of nominal GDP, while the real share has been increasing. This reflects rapidly improving computing technology, resulting in better value for money. There is little of evidence that computer investment follows the business cycle.

- ***Transport equipment investment***

This component is comprised of vehicles used for commercial purposes, and includes commercial vehicles, aircraft, ships and rail vehicles. Commercial vehicles include trucks, but also passenger motor vehicles purchased by businesses, such as fleet vehicles, rental vehicles and taxis. Although commercial vehicles account for the majority of transport equipment investment, investment in large aircraft can result in sizeable fluctuations in this component. The majority of transport equipment is imported, although some heavy vehicle assembly and body manufacture, aircraft manufacture and ship building takes place in New Zealand. Over the past 20 years, transport equipment investment has fluctuated around a relatively stable share of GDP.

- ***Non-residential investment***

Non-residential investment is comprised of the construction of office buildings, industrial buildings and other categories such as accommodation buildings. The upturn in new construction activity over the past five years or so was driven by new office and accommodation building activity, while spending on new factories remained virtually unchanged. Office construction currently makes up around 45 percent of non-residential investment, although this is significantly higher than the average proportion of non-residential investment over the past 20 years. Non-residential investment has the most pronounced cycle of all the business investment components.

- ***Intangible asset investment***

Intangible asset investment includes both software investment and mineral exploration activity. Software development comprises about 90 percent of total intangible asset investment. Statistics New Zealand divides software investment into three categories. “Off-the-shelf software” is mass-produced software purchased by firms, “customised software” is individualised software developed especially for the client, and “own account software” is in-house produced software. Similar to computer investment, the real software investment share of GDP has been increasing, while it has been flat as a nominal share, due to technological progress bringing down the quality-adjusted price of software.

Business investment components' share of real and nominal GDP

'Core' (non-trending) components

Figure 2
Plant, machinery and equipment investment
(ex-computers)

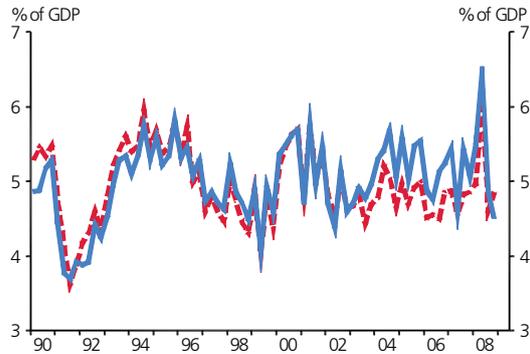


Figure 3
Transport equipment investment

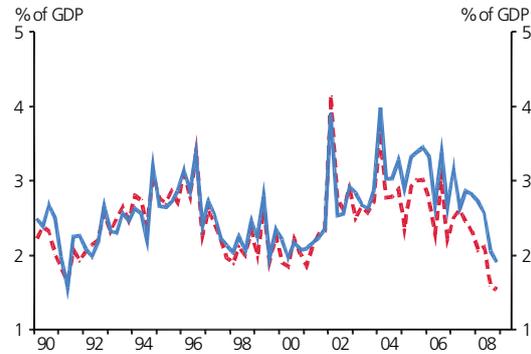


Figure 4
Non-residential investment

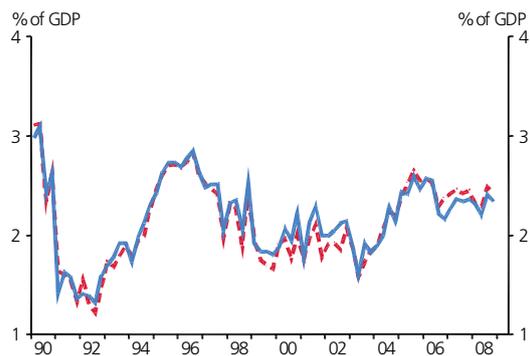
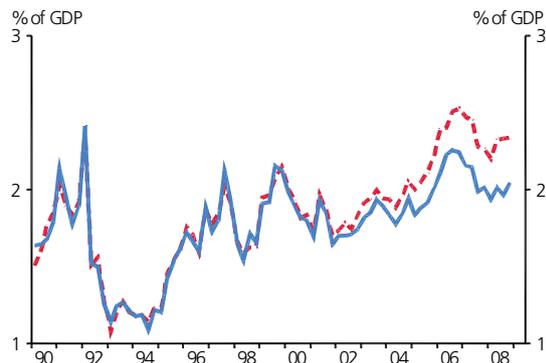


Figure 5
Other construction and land improvement
investment



Trending components

Figure 6
Intangible asset investment

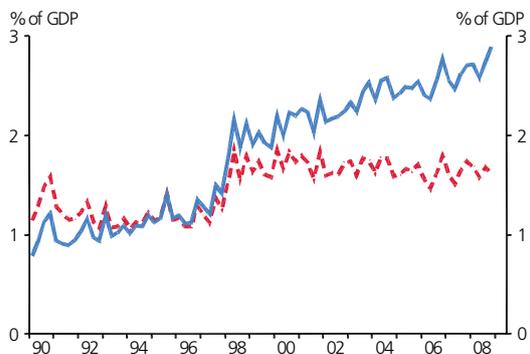
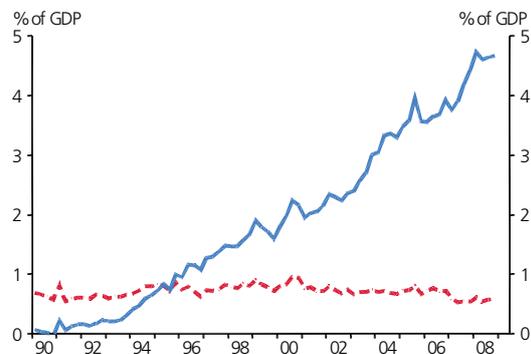


Figure 7
Computer investment



Note: Blue lines show real shares of GDP and red lines show nominal shares of GDP.
Sources: Statistics New Zealand, RBNZ Estimates.

Mineral exploration accounts for the remaining fraction of intangible asset investment and drives the majority of its volatility, because large projects start and finish at irregular intervals.

- **Other construction and land improvement investment**

Other construction encompasses construction associated with civil engineering, including major earthmoving activities.

Land improvement covers investment spending that is designed change the purpose of the land, so that its productivity can be enhanced. An example of land improvement investment is converting land previously used for a forest plantation into land suitable for use as a dairy farm.

This component is cyclical around a stable share of GDP.

It is important to note that a single investment project can be divided into several components of business investment. For example, a new factory might involve both non-residential investment (the factory building) and PME ex-computers investment (the new machinery installed inside the factory).

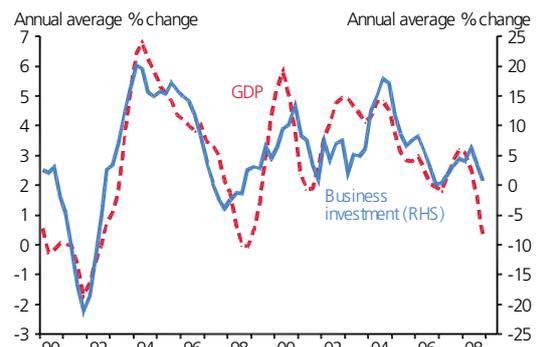
Typically we combine non-trending components (PME ex-computers, transport equipment, non-residential, and other construction and land improvement investment) to produce a “core” business investment series. We use this series to compare the current and projected investment cycles to past cycles, because the core business investment series does not have an upward trend over history.

3 Forecasting business investment

It is important for the Reserve Bank to accurately forecast business investment because of its impact on the business cycle. Although business investment comprises only around 12 percent of aggregate GDP, it is approximately five times as volatile as GDP. During periods of rising demand, business investment generally increases faster than GDP, and vice versa. Therefore, to accurately forecast economic activity, it is crucial to forecast business investment as accurately as possible.

The business investment cycle is reasonably well correlated with the aggregate economic cycle (figure 8). More specifically, when demand is strong, business investment tends to be above trend. This is because increasing demand generally results in firms utilising their productive capacity to a greater extent. As a result, to take advantage of rising demand, some firms will invest in new productive capacity. On the other hand, during an economic downturn, falling demand will release spare productive capacity, thus reducing firms’ incentive to invest. The Reserve Bank’s overall activity forecast thus provides significant guidance for the business investment forecast. In addition, business investment is much more volatile than aggregate demand, increasing by more than GDP during an upturn, and declining by a greater amount during a recession (figure 8).

Figure 8
GDP growth and the business investment cycle



Sources: Statistics New Zealand, RBNZ estimates.

This ‘pro-cyclicality’ of business investment amplifies business cycles, and makes a significant contribution to changes in output through the business cycle. However, given that it is estimated that business investment has a significant imported content, of around 50 percent, changes in business investment have a less than one-for-one impact on output.

The process for forecasting business investment can be divided into the near-term forecast and the medium-term forecast. In the near term, indicators such as imports of capital equipment and vehicle registrations data provide some guidance as to likely business investment. In the medium term, i.e. a year or more ahead of the latest official data, the Reserve Bank’s economic model, and overall judgment, play a greater role in forecasting business investment.

The volatility of business investment means that forecast errors for this component of GDP are larger than for all the other components of expenditure on GDP that the Reserve Bank forecasts. However, the significant import content of business investment tends to reduce, to some degree, the effects on GDP forecasts of uncertainty in forecasting business investment.

Forecasting business investment in the near term

To forecast business investment in the near term, i.e. up to two to three quarters ahead of official GDP data, we use several economic indicators. These include capital goods imports data, capital goods price indices, and the exchange rate. We also visit a number of businesses and related organisations to obtain up-to-date information about economic activity and investment expectations. Each of these sources of information is now discussed in turn.

- **Capital imports**

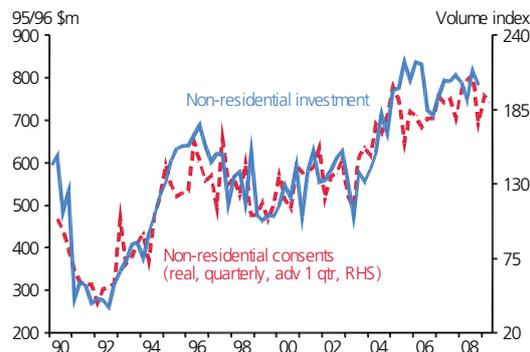
The nominal amount of New Zealand's capital goods imports are published monthly by Statistics New Zealand. Monthly imports data provide a timely indication for the PME ex-computers, transport equipment, and computer investment components of business investment. However, a limitation of this data is that price changes result in nominal capital imports differing from real capital imports by varying and unpredictable amounts. For instance, an increase in the price of trucks will result in higher nominal capital imports of transport equipment, all else equal, even though the real amount of transport equipment imported is unchanged. However, this difficulty is mitigated to some extent by the quarterly capital goods price index series, which we use to deflate nominal capital imports. We also analyse exchange rate movements to help us get a picture of real capital imports. For example, for a given volume of nominal capital goods imports, a depreciation of the exchange rate will typically result in a higher value of capital goods imports, because most imports of capital equipment are denominated in foreign currency.

- **Building consents and other information relating to non-residential investment**

Non-residential consents indicate the value of newly approved buildings, and are published monthly by Statistics New Zealand. We remove components of non-residential consents that are dominated by government investment, such as education buildings, to arrive at a measure of "market" non-residential consents. Since all new building projects must be approved by the local council, and a consent issued, consents have historically proved to be a reliable indicator for trends in non-residential investment. However, sometimes consented projects may not come to fruition, for a variety of reasons, such as the developer losing access to finance. There is generally a lag of at least one quarter between changes in consents and changes in construction activity. Additionally, the volatile nature of monthly consents data, combined with the "lumpy" nature of large building projects, means that we must often interpret this data with caution. The changing cost of commercial construction will clearly affect the amount of real construction activity implied by a given level of consents. We use the capital goods price index for non-residential investment to adjust market non-residential consents to remove the effect of price changes as far as possible (figure 9), overleaf.

We also look at other information to gauge the medium-term outlook for non-residential investment. Office vacancy rates and capitalisation rates (the yield that the property generates) published by commercial real estate agencies can provide an indication for new construction activity in the medium term. For example, if vacancy rates are low and capitalisation rates are high, developers are likely to be encouraged to develop new buildings. There is usually a lag of several quarters between the start of development planning and construction. Property valuations that are provided by property investment trusts listed on the stock-market also provide us with a timely insight into the sector. For example, if a listed property trust devalues its portfolio of office property, this could reflect overall office building values in a city. In turn, this is likely to reduce the incentive to construct new office buildings, all else equal.

Figure 9
Non-residential investment and real non-residential consents



Sources: Statistics New Zealand, RBNZ estimates.

- **Vehicle registrations**

Heavy vehicle and tractor registrations usually provide a reliable indication as to transport equipment investment in the quarter when the vehicle is registered, or the subsequent quarter. Registrations are in volume terms, and are therefore not affected by price changes. Occasionally, registrations are unreliable for indicating actual transport equipment investment because the lags between registration and investment can vary. For instance, in June 2008, truck dealers registered around twice the normal number of trucks normally registered in any given month, possibly because of an imminent change in heavy vehicle regulations. As noted above, capital imports of motor vehicles also provide information as to likely transport investment in the near term.

- **Business visits**

As well as considering traditional economic indicators, Reserve Bank staff also visit businesses across the country throughout the year. The Reserve Bank visits leaders of around 50 different firms and business-related bodies, such as trade unions, employer associations, and industry groups in April, July, and September, and also conducts telephone interviews in early February. The organisations chosen for each round of business visits are designed to broadly reflect the sectors and industries that make up the economy. We typically make repeat visits to some contacts every one to three years, to help ensure consistency. The visits provide very useful “real-time” information about how businesses

are seeing sales trends, and how they are reacting to the business environment in terms of their investment plans. If businesses are seeing things markedly differently to what is being suggested by the economic data, or other surveys, we may incorporate this information into the business investment forecast. Business contacts can provide the timeliest information of a turning point in the economic cycle, since economic data, by its nature, lags actual economic activity. On the other hand, the number of organisations we visit is low, and it is not possible to cover more than a few firms in any given industry, at best. Therefore, we are fairly cautious in generalising our contacts’ specific comments to general macroeconomic conditions.

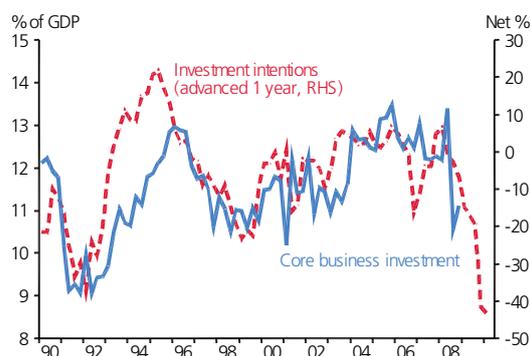
Forecasting business investment beyond the near term

While we find the economic indicators described above helpful for forecasting business investment in the near term, we cannot rely on these indicators to inform us about the likely level of investment more than two or three quarters ahead. In the medium term, other drivers, such as surveyed investment expectations and the demand outlook, become more important. For instance, imports of capital goods did not decrease significantly over the second half of 2008, suggesting that PME ex-computers investment would tend to hold up in that period. However, evidence of tight credit conditions meant that the outlook over the medium term at that point looked less positive.

An important indicator for business investment in the medium term is provided by firms’ investment intentions, which are obtained from surveys of business opinion. The two most important business opinion surveys in New Zealand are the Quarterly Survey of Business Opinion (QSBO) published by the New Zealand Institute of Economic Research (NZIER), and the monthly National Bank Business Outlook (NBBO) survey. Because firms’ investment decisions are based on their future sales and profitability expectations, investment is highly related to confidence levels. When a firm expects that an investment will yield a positive return, taking into account the firm’s cost of debt and equity capital, it is likely to make the investment if it can access the required funds.

The relationship between surveyed investment intentions and core business investment has been fairly close over the past 20 years (figure 10). Therefore, we pay close attention to surveyed investment intentions, and may revise our projection for business investment when surveyed intentions change significantly. The investment intentions series gives a long lead for changes in actual investment, which is helpful.

Figure 10
Core business investment and QSBO investment intentions



Sources: NZIER, Statistics New Zealand, RBNZ estimates.

Further out in the forecast horizon, after a year or so, the relationships inherent in the Reserve Bank's macroeconomic models become much more important for generating the projection for business investment. For example, the Reserve Bank's current core macroeconomic model, FPS, relates business investment to the strength of the economy, the level of interest rates, and the level of investment required to achieve a 'desired' capital to output ratio, where that desired ratio is a long-run function of the cost of capital and assumed productivity growth (Delbrück et al, 2008). These factors on their own would typically produce forecasts for business investment that are more 'jumpy' than observed over history. To correct for this, FPS imposes adjustment costs to slow down the response. As discussed in an accompanying article in this edition (Lees, 2009), the Reserve Bank is soon to adopt a new model, KITT, for use in our forecasting process. In KITT, the tradable good sector produces business investment by combining capital, labour and imported goods. Business investment adds to the capital stock which is a key input to the production of an intermediate good, used widely throughout the productive sectors in the model.

The macroeconomic models that we use in generating economic forecasts reflect certain assumptions about the way the New Zealand economy works, and the typical business cycle. However, macroeconomic models cannot include all factors that affect business investment, and additionally, no two business cycles are ever the same in reality. Therefore, we must make judgements about whether the forecast the model generates for business investment over the medium term is reasonable or not, given the unique factors present at the time that the model cannot capture. For example, KITT does not capture the effects of changes in credit availability on business investment, which is an important factor to consider during the current business cycle.²

References

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Lees, K (2009) 'Introducing KITT: The Reserve Bank of New Zealand's new DSGE model for forecasting and policy design', *Reserve Bank of New Zealand Bulletin*, 72(2).

Reserve Bank of New Zealand (2007) 'Finance and Expenditure Select Committee Inquiry into the Future Monetary Policy Framework: Submission by the Reserve Bank of New Zealand' – Supporting Paper A11.

² For detailed information about the Reserve Bank's process for finalising economic projections, and determining monetary policy, see: Reserve Bank of New Zealand (2007).