

The macroeconomic impacts of a foot-and-mouth disease outbreak: an information paper for Department of the Prime Minister and Cabinet

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Prepared by the Reserve Bank of New Zealand and the [Treasury](#)¹

This memorandum provides a scenario analysis of the likely macroeconomic impacts of a limited foot-and-mouth disease (FMD) outbreak in New Zealand. It is worth stressing at the outset that it is not a forecast, nor a 'central' scenario, but an exercise to gauge broad magnitudes and to trace through the likely shocks to several key macro variables based on a set of plausible events.

In any projection there are uncertainties to deal with, but there are more than usual in this exercise. Factors that are crucial in determining the magnitude of the economic impact – such as trading partner reactions to trade resumption, the spread, containment, and eradication of the outbreak, and the second round effects on the financial sector – are not explicitly captured by our models, nor are there any directly relevant precedents to guide us.²

In our scenario the cumulative loss in nominal GDP is around \$6 billion after 1 year, and around \$10 billion after 2 years.³ The loss will continue to increase because potential output is permanently lower. This is twice as large as the initial MAF estimate, but is explained by the additional macroeconomic effects such as the slump in domestic demand, and by accounting for limited storage capacity and trading partner behaviour. What is not accounted for is the impact of such an event on the financial sector. It is expected, however, that taking these effects into account would mean that the impact on the economy would be larger (although the significant monetary policy easing would limit the impact to some extent by making debt servicing easier and so on).

Table 1: cumulative impact on exports and nominal GDP

		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Loss in nominal export values	Cumulative \$m	-1250	-1900	-2650	-3450	-4300	-5100	-5150	-5100
	Cumulative % of annual nominal exports	-3	-5	-6	-8	-10	-12	-12	-12
Loss in nominal GDP	Cumulative \$m	-1600	-3100	-4650	-6100	-7600	-9050	-9950	-10650
	Cumulative % of annual nominal GDP	-1	-3	-4	-5	-6	-7	-8	-8

¹ The authors of this report were Aron Gereben and Ian Woolford from the RBNZ, and Melleny Black from the Treasury. We thank Ashley Lienert, Bernard Hodgetts, Renee Philip, and Angela Huang from the RBNZ, and the Tax Forecasting team and Bruce White from the Treasury for their work on the modelling scenarios and for drafting the technical paper that this report has drawn on.

² The macroeconomic scenario was created using the Reserve Bank's Forecasting and Policy System (FPS), and the fiscal impact modelling was carried out using the Composite version of the Treasury's Long Term Fiscal Model.

³ A large part of the reduction in nominal GDP is the result of lower inflation. Real GDP is only 3.5 billion lower at the end of the period.

Assumptions

The scenario was based on the assumption of an FMD outbreak that initially occurs in pigs through waste food, and then spreads from pigs to sheep or cattle. The outbreak is contained within the North Island, allowing trade from the South Island to resume earlier, and farmers do not vaccinate the animals.

In order to simulate this outbreak scenario in a highly aggregated macroeconomic model such as FPS, we specified shocks in the main macroeconomic variables (export volumes and prices, exchange rate, wealth, risk premium etc.) that are broadly consistent with our hypothetical outbreak scenario. The following sections summarise the shock assumptions.

Export volumes

The impact on dairy export is assumed to be rather muted. Dairy products are mainly unaffected by the FMD, however, trading partners would impose an export ban for a relatively short period. We assumed that dairy exports effectively stop for around six weeks and, as there are storage capacity constraints, there will be a limited amount of product that is permanently lost.

The impact on meat (beef and sheep) export is assumed to be significantly longer, as export restrictions in FMD-free trading partners may last up to 6-12 months. Opportunities to divert exports to FMD-endemic markets is rather limited, as the total market size is relatively small, and export prices would suffer a significant decline. In addition, the storage capacity for meat is constrained. Based on consultations with industry experts, we assumed that about one month worth of meat can be stored either in cool stores or on the farms, and any further losses are permanent, but the actual impact would depend on when it occurred in the growing season.

In terms of total export volumes of goods and services, these add up to a loss of 8 per cent on an annual basis. Figure 1a illustrates the impact of the outbreak on dairy, meat and figure 1b on total export volumes.

Figure 1a: The impact on dairy and meat volumes

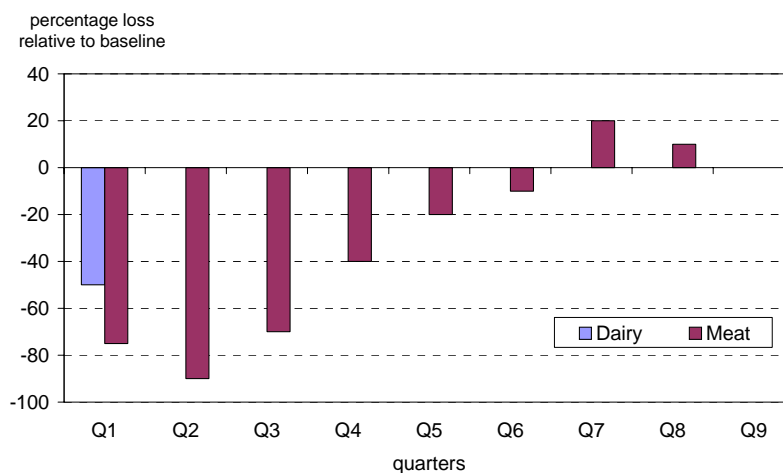
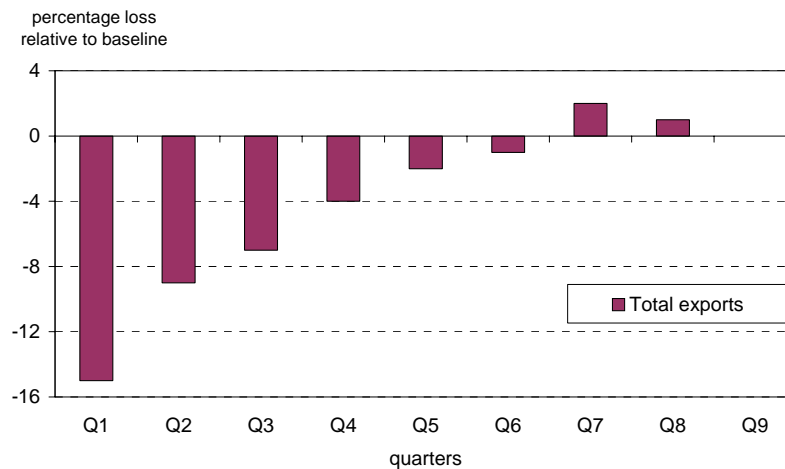
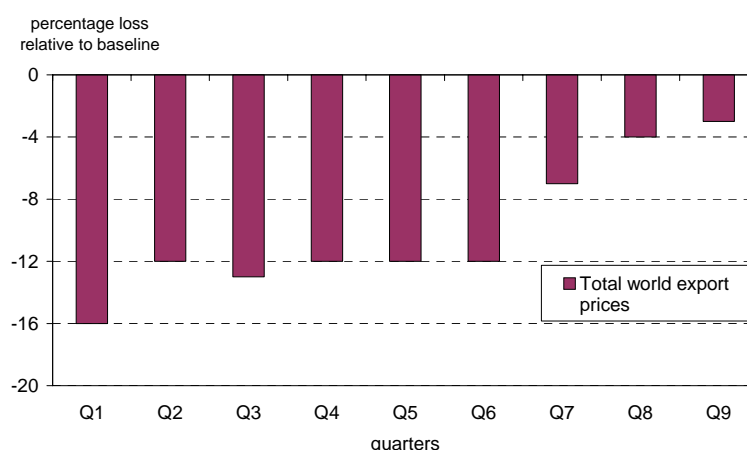


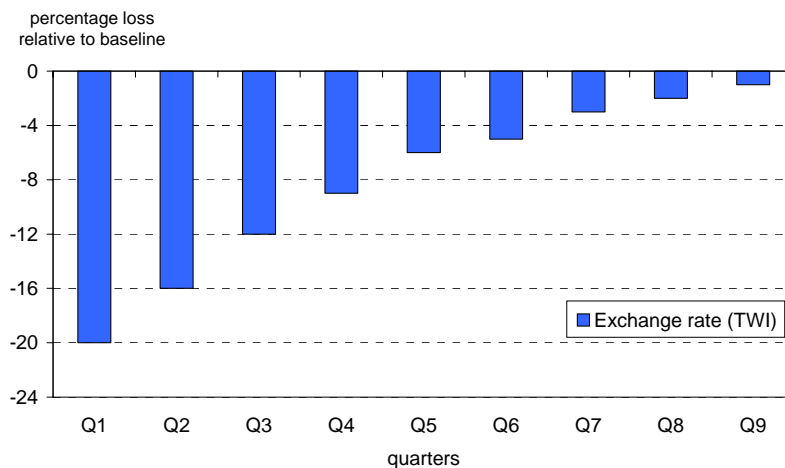
Figure 2b: The impact on total export volumes

Export prices and the exchange rate

The outbreak is assumed to result in a long-lasting decline in export prices, arising from several effects. Initially, export prices decline as a very limited amount of the meat products are diverted towards low-value FMD-endemic export markets, where prices are significantly lower than on our traditional markets. Secondly, even when the FMD-free markets reopen to New Zealand exporters, there would be a significant reputation loss, which would result in decline in the premium that New Zealand lamb and beef products currently enjoy on the European and other markets. All in all, we assume that prices would begin to return towards baseline after 6 quarters, but would not reach their baseline level until at least 4 years.

Figure 3: The impact on the export price of goods and services

While the sign of the exchange rate shock is clear, the magnitude is very difficult to estimate with any certainty. However, it is likely that there would be a large initial drop in the New Zealand dollar, in the order of around 20 per cent in the first quarter. The exchange rate is expected to remain below the baseline for around two and a half years.

Figure 4: The impact on the exchange rate

Risk premium, business confidence and wealth

We have assumed a 50 basis point increase in the risk premium on New Zealand dollar assets, as a result of foreign investors becoming more reluctant to invest in New Zealand in times of high uncertainty.

Our assumptions also include a temporary downturn in business confidence, which has the effect of reducing investment in productive capacities. The loss of investment is assumed to result in a permanent decline in the capital stock and the long-term potential output of the economy. However, the significant monetary policy easing helps to underpin confidence after the initial shock.

Finally, we have assumed that reduction in the wealth of the households, which in turn causes a deterioration of the net foreign asset position of the country by 2.5 per cent.

Impact of the shock on the key macro variables

On the basis of the assumptions discussed above, the following section discusses the reaction of the key model variables.

Output and employment

The shock reduces the real GDP of the New Zealand economy by 4 percent relative to the potential output in the first quarter of the shock. The recovery of the output happens within 5 quarters, with a modest bounce-back above the potential output occurring after that period. In terms of nominal GDP, the cumulative loss is around 6 billion dollars in the first year, rising up to 10 billion dollars by the second year. A significant part of the loss in terms of nominal GDP occurs as a result of lower inflation. Also, as we assumed a permanent decline in potential output, the accumulated nominal GDP loss (relative to the no-FMD case) continues to increase as time passes.

The outbreak also causes a reduction in jobs. According to our model, unemployment would rise by 1 per cent and would be above its baseline for about two years. This corresponds to around 15000-20000 jobs. However, it may be that this is a point where the model may underestimate somewhat the potential impacts of the shocks, as it is designed to capture economy-wide fluctuations rather than sector-specific shocks. It is, however, designed to capture the confidence of economic agents in the economy, and the sharp, but temporary, nature of the shock may mean that the employment impact is rather muted. If farms and employers in the related industries expect a longer lasting decline in output than the one currently assumed, then the number of layoffs would be significantly higher.

Inflation, interest rates and monetary policy

As a result of the significant decline in aggregate demand, inflation would fall by around 1.5 percentage points, despite the large depreciation of the exchange rate. As the exchange rate shock is temporary, we do not expect a significant pass-through to tradable price inflation. The monetary policy reaction function embedded in FPS suggests a cut in the OCR of around 200-250 basis points in each of the first two quarters after the initial outbreak, and a gradual tightening after that. As a result, the 90-day interest rates would bottom around 1-2 per cent. Long-run real interest rates would decline by around 50 basis point, where the increase caused by the higher risk premium would be counter-balanced by the effects of monetary policy easing.

Real investment and international investment position

Another implication of the outbreak is a decline in investment. At the model's time horizon, it not only means firms delaying investment, but also some firms cancelling investment projects. On the short run, this results in a 20 per cent drop in investments, where on the long run the investment is around 6 per cent below the baseline. As a consequence, the level of both permanent potential output and the capital stock are lower than their baseline for a relatively long period of time.

As a result of the assumed decline in household wealth, a net decline of 2.5 per cent in the net foreign assets can be expected. Combined with the effect of the fall in export prices and volumes, an additional overseas borrowing of 8 billion dollars would be necessary.

Fiscal policy response

The fiscal scenario for a Foot and Mouth disease outbreak presented in this section is based upon the economic scenario provided by the Reserve Bank. Consequently, the fiscal estimates reflect the magnitude of the impact of an outbreak encapsulated in that economic scenario.

The impact of a Foot and Mouth disease outbreak on the Crown's overall fiscal position is likely to be significant. Both revenue and expenditure tracks are forecast to deteriorate for several years following the outbreak. This scenario has assumed that revenue policies are unchanged and that the change in expenditure policy is limited to meeting operational, compensatory and welfare spending, which current legislation provides for. Reductions in the operating balance would lead to increasing gross and net debt.

Percentage point change in key variable to GDP ratios under the FMD scenario

	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10
Revenue	-0.6%	-1.1%	-0.5%	-0.7%	-0.3%	0.0%	0.1%	0.1%
Expenses	1.4%	1.5%	0.9%	1.0%	1.3%	1.5%	1.7%	1.9%
Operating balance	-2.0%	-2.6%	-1.4%	-1.7%	-1.6%	-1.4%	-1.6%	-1.8%
Gross debt	3.1%	5.9%	6.5%	8.4%	9.8%	11.0%	12.5%	14.1%
Net debt	2.7%	5.4%	6.2%	8.0%	9.4%	10.6%	12.0%	13.5%

In estimating the fiscal impact of a foot and mouth disease outbreak it is necessary to separate out the effects on revenue from those on expenditure. Direct spending resulting from the Foot and mouth outbreak itself, which is proportional to the number of farms affected, dominates the expenditure track in this scenario because of the small size of the assumed increase in unemployment. The impact on revenue will have a weaker link to the magnitude of the outbreak, but will be affected by the length of time trade restrictions are placed on New Zealand agricultural products by other countries, during which agricultural firms are unable to undertake normal operations.

Fiscal impact assumptions
Revenue

The Treasury Tax Forecasting team undertook explicit forecasts of the impact on tax revenue out to March 2006. Based on the economic tracks provided by the Reserve Bank, they estimate the following impact on the tax take:

Year ended	March-03	March-04	March-05	March-06
Total change in tax revenue (Million \$)	-665	-1340	-720	-1010

Significant lags exist in the estimated impact of a foot and mouth disease outbreak on the tax profile. This is a result of both timing issues with the payment of taxes and a cumulative effect in the tax-forecasting model as the tax payments expected increase off the previous years level.

The long-term fiscal model also estimates the likely decline in earnings by Crown entities and State owned enterprises, as a result of the less buoyant economic environment.

Expenditure

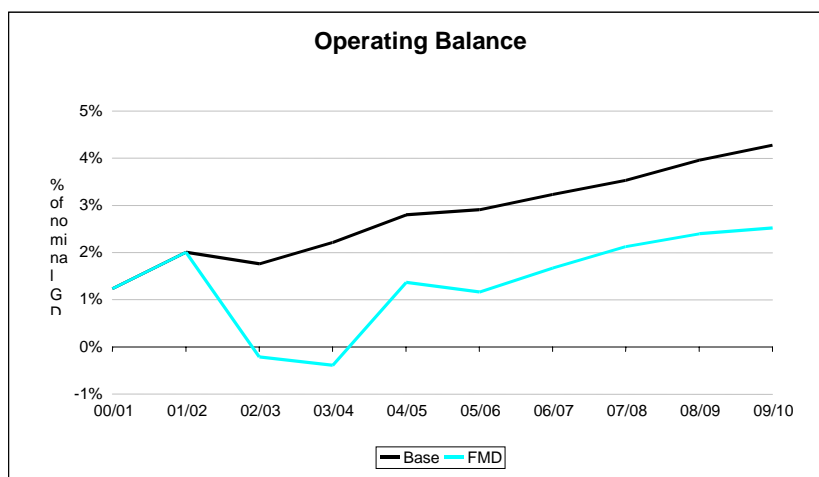
One-off Government expenditure of \$200 million has been assumed in 2002/03. This is more than sufficient to cover operations and compensation provisions set out in the Bio-security Act 1996 and the establishment of a “Special assistance to the Rural sector” programme, as provided for under the Social Security Act 1964.

The fiscal model makes appropriate adjustments in expenditure for those costs related to the economic outlook such as unemployment benefit payments and financing costs. All other Government expenditure tracks remain as set out in the *Pre Election Fiscal and Economic Update 2002*.

Impact on the Crown Accounts

Operating balance

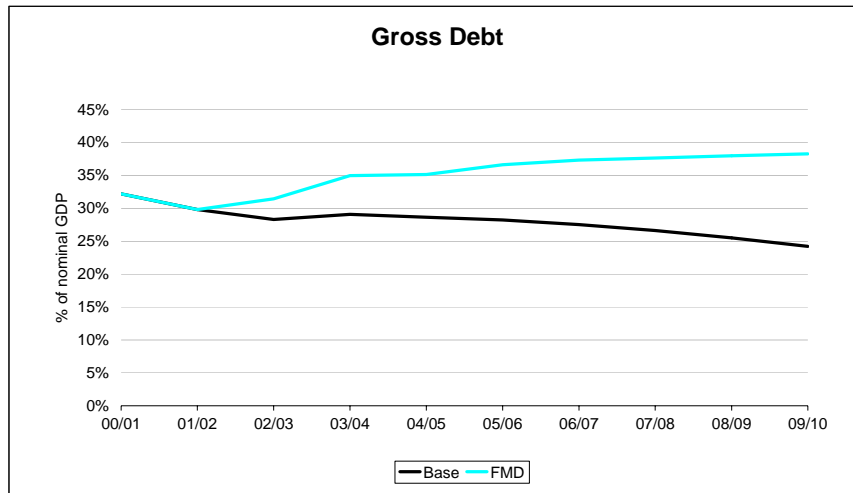
The hypothetical foot and mouth outbreak would have a significant impact upon the Crown operating balance. The fall in the operating balance to a low of -0.4% of nominal GDP in 2003/04 is due to both a decline in Government revenue and increased spending. Crown revenue would be expected to decline by approximately 1.1% of GDP in 03/04 returning to comparable levels to the base case scenario in 2007/08⁴. Crown expenditure is estimated to increase by 1.5% of GDP in 2003/04 compared to the base case scenario. Higher unemployment and financing costs, combined with lower nominal GDP, cause expenditure as a proportion of GDP to be persistently above the level of the base scenario. Overall, the operating balance estimate under the foot and mouth outbreak scenario remains significantly below the base case in both the forecast and projection periods.



⁴ This result is reflective of the change in assumptions made to return the tax to GDP ratio to more “normal” levels in order to ensure some form of “bounce back” occurs.

Sovereign issued gross debt

The reduction in operating balances throughout the forecast and projection period reduces the availability of funds for debt repayment, while operating deficit in 02/03 and 03/04 increase the requirement for borrowed funds. The loss of operating surpluses reduces the Government's ability to maintain the forecast gross debt levels, which increase to 38.3% of GDP in 2009/10.



Net debt

Reflecting the significant increase in gross debt, net debt rises to 25.6% of GDP in 2009/10, compared to a projected 12.1% under the base case scenario.

