

# We're all in this together: the transmission of international shocks to open economies<sup>1</sup>

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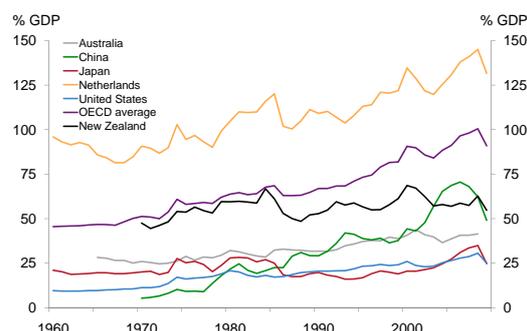
As economies have become more integrated, the importance of understanding how shocks in one country can affect the stability of others has grown. This article provides a summary of the 13 papers presented at the conference held in December 2010 by the Reserve Bank of New Zealand and the Australian National University's Centre for Applied Macroeconomic Analysis, titled "The transmission of international shocks to open economies". The papers use a variety of methods to address some common themes, including directions for open economy modelling, the changing nature of emerging market economies (EMEs), the transmission of shocks during the recent global financial crisis, and the implications of being a small open economy for monetary policy. The different methodologies and topics provide a broad overview of the issues facing researchers and policy makers in open economies.

## 1 Introduction

In December 2010, the Reserve Bank of New Zealand and the Australian National University's Centre for Applied Macroeconomic Analysis (CAMA), hosted a conference titled "The transmission of international shocks to open economies". As economies have become more integrated, the importance of understanding how shocks (unanticipated changes in economic variables) in one or more countries can affect the stability of others has grown. The recent global crisis has also brought into sharp relief the connectedness between different economies – financial disruptions centred in the US spread beyond US borders and led to a global recession. It was appropriate to hold such a conference in New Zealand, given that our small size and trade and financial openness to the rest of the world make us vulnerable to international shocks. On the trade side, the share of exports plus imports to GDP in New Zealand has been higher than 50 percent since the 1970s (see figure 1). However, New Zealand's key vulnerability to international shocks may well lie in our financial interconnectedness and reliance on external funds. Figure 2 shows net international investment positions (NIIP) as a share of GDP for selected OECD countries in 2009, where NIIP reflects the balance of total external assets held by New Zealand residents less total liabilities owed to non-residents. New Zealand has one of

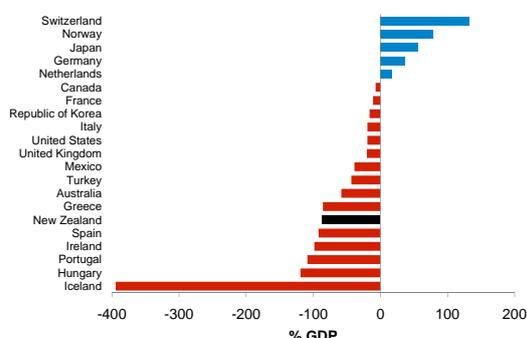
the more negative NIIPs in the OECD, making us relatively more vulnerable to, for example, changes in international risk appetite.

Figure 1  
Trade (exports + imports) as a percent of GDP



Source: World Bank estimates

Figure 2  
Net international investment position (percent of GDP) in 2009\*



Source: IMF, Stats NZ, author's calculations.

\* In the few cases where the data was only available in USD, end-of-period exchange rates were used to convert the data into national currency. The figure shown for Australia is from 2008, as 2009 estimates were not available from the IMF.

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The December conference brought together a wide range of economists from universities and central banks all over the world, and the papers presented analysed the transmission of shocks using a variety of techniques.

The remainder of this article summarises the key themes discussed throughout the conference. In section 2, we focus on Tommaso Monacelli's keynote address and discuss potential improvements in models of optimal monetary policy in the context of an open economy. Section 3 is centred on Ayhan Kose's keynote speech and looks at the changing nature of EMEs; we then discuss the global implications of this change. Section 4 looks at whether the recent economic turmoil has signalled a change in how shocks are transmitted globally, with conflicting evidence presented in two of the papers. Section 5 details the responses of open economies to some specific shocks; namely, world demand and domestic productivity shocks. In section 6 we examine the implications of being a small open economy for monetary policy. Section 7 looks at the importance of regional factors when modelling small open economies. Section 8 concludes.

## 2 Directions for open economy modelling

In his keynote address, Tommaso Monacelli discussed ways that we can improve models of 'optimal' monetary policy (policy that maximises the welfare of individuals) in open economies. He discussed two directions in particular: an improved understanding of how firms in open economies set the prices of tradable goods, and the inclusion of "financial frictions" into models in an endogenous way.

In the standard small open economy model, two key assumptions are made.<sup>2</sup> The first is that the prices of tradable goods are set in the producer's currency (PCP – producer currency pricing), so that movements in the exchange rate do not result in deviations from the 'law of one price' (the proposition that identical goods expressed in the same currency should trade at the same price across national markets). The second assumption is that domestic and international financial markets are frictionless, in that

there are no credit constraints or asymmetric information problems between lenders and borrowers. In much of the literature, these frictions are seen as important in determining fluctuations in economic activity.

In a closed economy model, optimal monetary policy usually involves stabilising domestic inflation and the output gap using interest rates. In an open economy model with PCP and frictionless financial markets, particular specifications of the model result in the same optimal policy – one that solely targets domestic objectives. However, empirical evidence suggests that PCP is not an accurate description of pricing behaviour (in New Zealand, for example, prices of most commodity exports in particular are clearly not set or denominated in New Zealand dollars). Studies such as Gopinath and Rigobon (2008) find that exchange rate movements seem to be only weakly reflected in import prices, instead of matching them one-for-one as would be expected under PCP. This has led to a trend in the modelling literature towards 'local currency pricing' (LCP), where prices are set by exporters in the currency of the importing country. This means that deviations from the law of one price may arise, as prices are set directly in the local currency of the consuming country instead of being set in the producer's currency and then converted into local currency (in which case, movements in the exchange rate would be completely reflected in price fluctuations facing consuming countries).

Because deviations from the law of one price are inefficient within this modelling framework, the welfare of individuals in the economy is lowered (for example, they may be paying relatively more for imported goods than they would in the case where exchange rate movements are perfectly reflected in domestic price adjustments). Optimal monetary policy needs to take this into account when setting interest rates, given the impact of interest rates on exchange rates. LCP can occur at two levels: at the consumer level and at the border. The current typical modelling setup includes LCP at the consumer level (prices at the supermarket, for example). However, recent empirical research suggests that import prices at the border may be even less responsive to exchange rate movements than at the consumer level (Gopinath and Rigobon, 2008), potentially as a result of there being more predetermined contracts. Monacelli argued that we need

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<sup>2</sup> Leduc, Corsetti & Dedola (2010a).

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to understand these two price-setting behaviours better, so that we can more accurately model the effects that exchange rates can have on domestic economies.

Monacelli's second suggestion was that we need to improve the way in which we model financial frictions, so that we can better understand their impact on transmission mechanisms. Although financial frictions are being increasingly incorporated into economic models, most of these frictions are introduced exogenously. For example, the researcher may directly reduce the value of collateral in the model, bringing borrowers closer to their borrowing constraints. Monacelli argued that researchers need to endogenise these financial frictions, so that optimal monetary policy in good times internalises the probability that financial frictions will become more severe. Over the last decade there have been many advances in models that address 'good' and 'bad' times separately. However, Monacelli argued that the aim should be to have one model in which bad times arise as endogenous, natural responses to certain events or trends in good times.

### 3 The importance of EMES in the transmission of international shocks

One of the themes to emerge throughout the conference was the changing nature of emerging market economies (EMEs) over the last several decades, and the significance of this for shock transmission both to and from these countries.<sup>3</sup> China and India, in particular, have gone from being relatively closed economically to being significantly more integrated into the world economy. In population terms, these two economies are the largest in the world. Changes and shocks in these countries are important for commodity exporters such as New Zealand, both through direct exports and indirect trade through countries like Australia. The state of EMEs is also important for countries that have traditionally had large manufacturing sectors, such as the US and many European countries, who now find

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<sup>3</sup> Some notable EMEs are China, India and Brazil. A full list of countries deemed to be 'EMEs' can be found in Kose and Prasad (2010), pp. 175-176.

themselves competing with cheaper imports from countries like China. In his keynote speech, largely based on Kose and Prasad (2010), Kose argued that we should use the global financial crisis as a lens to think about how EMEs have developed and where their place in the world is post-crisis. How EMEs develop will have important implications for the transmission of international shocks, and there are many directions that research on this topic can take.

Between 2003 and 2007, the GDP growth rate of EMEs exceeded that of advanced countries by over five percentage points. During the global financial crisis, there was debate as to whether EMEs could maintain this relatively high rate of growth post-crisis. In fact, the gap between EMEs and developed nations widened further in 2008 and was near seven percentage points by 2009. As a group, EMEs have fared the crisis very well, better in most cases than advanced economies.<sup>4</sup> Kose argued that there are two broad explanations for this resilience: gradual structural change coming out of the Asian financial crisis in the late 1990s and policy-related factors.

Since the Asian financial crisis, EMEs have become more diversified, larger, and more open. They have also strengthened their global linkages, both financial and trade. Although EMEs are trading more overall, primarily as a result of export-led growth strategies, an increasing share of this trade is with other EMEs. In their previous work, Kose and his co-authors find that the importance of global factors for EMEs has been decreasing over time.<sup>5</sup> However, the importance of EMEs for the world economy is increasing. In terms of policies, EMEs are becoming less dependent on foreign financing overall. In addition, the composition of foreign financing is shifting away from debt (denominated in foreign currencies) and towards foreign direct investment. EMEs have also accumulated huge buffers of foreign exchange reserves, which Kose and Prasad (2010) argue has resulted from export-led growth strategies and the desire to self-insure against sudden capital outflows.

Kose described several lessons he feels can be taken from the resilience of EMEs during the crisis. Firstly, it is important

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<sup>4</sup> Although EMEs on the whole were resilient during the crisis, Kose and Prasad (2010) note that there were also considerable differences between them.

<sup>5</sup> Kose and Prasad (2010), p. 95.

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to create room for policy flexibility in good times to assist during bad times. Secondly, although countries should enjoy the benefits of financial flows, they need to be wary of too much short-term debt (this is not simply an issue for EMEs, and is being addressed with respect to banks in New Zealand by the implementation of the Core Funding Ratio).<sup>6</sup> Thirdly, countries need to better understand the benefits and costs of accumulating large foreign reserves; EMEs have gone from holding \$0.5 trillion of foreign reserves in 1990 to roughly \$5 trillion in 2009.<sup>7</sup> Fourthly, countries need to have a growth strategy that is balanced between domestic and external demand, to limit the vulnerability to rapid changes in import demand from other nations. Finally, countries need to have deep and effectively regulated financial systems; this is particularly important for EMEs in limiting the impact of volatility in capital flows.

Kose felt that the key lesson for advanced economies to come out of the resilience of EMEs during the recent crisis is that advanced economies should be expanding their trade and financial linkages with EMEs. As EMEs have become larger and their per capita incomes have increased, they have become less reliant on demand in advanced economies. In conjunction with their decreasing reliance on foreign financing, this has led to a gradual divergence of EME business cycles from advanced economy business cycles (Kose and Prasad, 2010). This divergence suggests that advanced countries should enhance their relationships with EMEs in order to diversify their export base and benefit from the growth potential of EMEs. The growing importance of EMEs in the world economy also has implications for global policy. Kose and Prasad (2010) argue that there needs to be more policy coordination across countries, especially in regards to financial institutions with cross-border operations. In addition, Kose believes that EMEs should have strengthened representation at international financial institutions. Kose and Prasad (2010) argue that, in the absence of reforms to improve the stability of the global monetary system, EMEs will continue to accumulate foreign exchange reserves in order to self-insure against financial crises, with implications for macroeconomic imbalances.

The focus of one of the papers presented at the conference was the transmission of international shocks to one EME in particular – Turkey. Alp and Elekdağ use an open economy dynamic stochastic general equilibrium (DSGE) model to perform a counterfactual experiment on how policies introduced in Turkey after 2001 affected the country's response to the recent crisis. Three reforms are included in the model: the complete overhaul of the Turkish banking sector in an attempt to reduce the overall risk profile of the economy; the abandonment of the fixed exchange rate regime in favour of a floating rate regime; and the implementation of an active inflation targeting monetary policy regime. The model allows the authors to quantitatively estimate how different the impact of the global financial crisis would have been had these policies not been put in place. They estimate that the combination of these policies added approximately ten percentage points to annual GDP growth in Turkey during the crisis.

#### 4 Has the recent crisis signalled a new era of shock transmission?

The recent economic crisis has been the largest global event of its kind since the Great Depression that began in 1929. A relevant issue for researchers and policy-makers is whether the size and reach of the recent financial crisis indicates a fundamental shift in how shocks are transmitted between international economies.

One paper that addresses this issue is Eickmeier, Lemke and Marcellino. This paper attempts to quantify the impacts of major US financial shocks on advanced countries using a Time-Varying Factor-Augmented Vector Autoregressive Model (TV-FAVAR). This model takes time series data for over 200 variables (including measures of productivity, prices, trade, and monetary and fiscal policies) from nine different countries (the G7 with the addition of Spain and Australia)<sup>8</sup> and uses a statistical technique known as 'principal components' to estimate the underlying common factors that best explain the fluctuations across the data. How these common factors behave through time is then

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<sup>6</sup> See Hoskin, Nield and Richardson (2009).

<sup>7</sup> Kose and Prasad (2010), p. 162.

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<sup>8</sup> It should be noted that this analysis does not include China or other emerging Asian economies.

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examined using a vector autoregressive (VAR) model, where each factor is related to contemporaneous and past values of other factors. This large setup allows the authors to capture complex interactions between the nine economies over the period examined (1971 to 2009). The authors also allow key parameters, including those defining the size of the common shocks, how one factor is affected by others, and how movements in the factors directly affect the variables, to vary over time. This enables the model to accommodate any large shocks or potential structural changes in the economy.

US financial shocks in the model are defined as unexpected changes in the Financial Conditions Index (FCI), developed by Hatzius, Hooper, Mishkin, Schoenholtz and Watson (2010).<sup>9</sup> Eickmeier *et al* find that positive shocks to the US financial system (including, for example, increases in the stock price index and bank credit) have large, positive impacts on growth in the remaining eight countries, and that the converse is also true. The authors also find that the transmission of US financial shocks to GDP growth in the European countries has increased gradually since the 1980s, consistent with increased financial integration. This paper finds that the transmission mechanism of the recent US financial crisis shock did not differ substantially from shocks observed over previous financial crisis episodes; the exceptionally deep worldwide recession was instead driven by the sheer size of the negative shock and the increased propagation of that shock to Europe. Unsurprisingly, the recent financial crisis is the largest shock in the sample. The recent US financial shock explains 30 percent of the variation in GDP growth in the other countries on average between 2008 and 2009, compared to a role for US financial shocks of less than 10 percent on average between 1971 and 2007. The model also indicates that the effects of this negative financial shock on global GDP growth were dampened by strong countercyclical fiscal policy reactions.

While Eickmeier *et al* look at the transmission of FCI shocks to GDP growth in other countries, Fry, Hsiao and Tang examine the transmission of shocks between international equity markets in a comparative study of seven crises between 1997 and 2010. In contrast to Eickmeier *et al*, Fry *et al* find

that the recent global financial crisis was different to and more widespread than any of the other crises in the sample. Given that countries are more directly connected in financial markets than in terms of their GDP, this divergence in results may not be particularly surprising. The analysis in Fry *et al* focuses on the degree of contagion in 12 equity markets over the period, using daily data. The authors argue that there is evidence of contagion if the correlations between shocks in different countries increase in a predefined crisis period. This paper uses three different tests for contagion, one examining changes in correlations and the other two looking at changes in 'coskewness' (the extent to which volatility in one equity market affects the average level of another equity market, or vice versa). Using these tests, the authors find that the global financial crisis was different to all other crises in the past two decades, with a substantially higher degree of contagion indicated by all three tests. For example, the authors find that the other crises that began in the US, namely the Long Term Capital Management crisis of 1998 and the bursting of the dot com bubble in 2000, exhibited very little contagion.

The distinguishing feature of the recent crisis, relative to other recessions in recent decades, was the extent to which it intensified through the core of the financial sector. Kamber and Thoenissen use a stylised two-country DSGE model with banks to study how banking sectors can affect the transmission of international shocks. They find that the presence of a bank in the model does not alter the standard mechanism by which shocks are transmitted across borders. However, they do find that the banking sector can have significant effects on the business cycle characteristics of the model when it is an independent source of shocks. If the shocks are uncorrelated between the two countries, the authors find little evidence of spillover. For there to be a synchronised decline in economic activity in the model there needs to be a highly integrated financial system.

The authors consider two different bank ownership structures, one with foreign-owned, locally incorporated banks and one with foreign-owned, globally-integrated banks. In this model, locally incorporated banks are those that are operated locally (in that they use local labour and accumulate capital locally) but are owned by foreigners, so

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<sup>9</sup> This FCI summarises 45 different US financial variables, including stock prices, house prices, interest rates, exchange rates and credit aggregates.

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that profits accrue to the foreign economy (as is the case for New Zealand's largest banks). When banks are globally integrated, the foreign-owned domestic bank is completely financed by the foreign bank. In the case with locally incorporated banks, the authors find that a negative shock to the domestic banking sector results in a recession in the domestic economy and a modest output expansion in the foreign economy as it experiences capital inflows, being now more attractive than the domestic economy. When there are globally-integrated banks, negative shocks to the banking sector result in large and persistent declines in output in both the domestic and foreign economies. These results imply that we need to further our understanding of the effects that bank ownership structures have on the international transmission of shocks, and suggest that the increased global integration of financial sectors leading up to the recent crisis may have enhanced the transmission of banking sector shocks between countries.

## 5 Shocks to open economies and their effects: some examples

There are many types of international shocks, including financial, real and nominal shocks. For example, the growth in global trade (figure 1) has increased the importance of understanding how shocks to world demand affect open economies. New Zealand's exports make up over 30 percent of our GDP.

Two papers in particular analyse the impacts of world demand shocks. Karagedikli and Thorsrud estimate a FAVAR model to examine the transmission mechanisms through which international and regional shocks affect the New Zealand economy. As in Eickmeier *et al*, the FAVAR approach enables the authors to use a large dataset (363 variables from 28 countries) in order to estimate common underlying factors, which are consequently placed into a Value At Risk model. Karagedikli and Thorsrud structure the FAVAR model so that each of the underlying factors is specific to the world, regional or domestic economy. The model is also structured so that the domestic economy is too small to affect the regional or world economies and the regional economy is too small to affect the world economy. By using New

Zealand data for the domestic economy, Australian data for the regional economy, and a combination of data from 26 other countries (including the US, UK, China and Japan) for the world economy, the authors are able to examine the transmission of shocks to New Zealand in particular.

Karagedikli and Thorsrud look at a number of shocks, one of which is a positive shock to world demand. In this model, an increase in world demand leads to an increase in world inflation, which results in an increase in domestic headline inflation<sup>10</sup> as the prices of tradable goods increase. In response, the domestic interest rate increases.<sup>11</sup> After about one year, non-tradable inflation (and thus headline inflation) declines, most likely as a result of the higher domestic interest rate. Overall, both GDP and consumption in the domestic economy fall, although not noticeably so, for over a year. The authors suggest that this may be coming from several sources. One source is the rise in tradable prices that leads to a fall in demand due to income effects (people can no longer afford to buy as much). Another source is the high world inflation that increases the cost of imported intermediate goods for production (such as oil). The authors also argue that the high domestic interest rate following the increase in inflation puts downward pressure on domestic activity. In addition, all of these effects are reinforced by the indirect effects of the Australian economy on New Zealand, given that the world demand shock also affects the region. A similar result is obtained in Buckle, Kim, Kirkham, McLellan and Sharma (2002), where the authors find that a positive shock to world activity generates an eventual decrease in New Zealand's GDP. In that paper, the effect occurs because, although the shock increases both export and import prices, the negative impact of the higher import prices on New Zealand GDP outweighs the positive impact of the rise in export prices.

The negative effect of a positive world demand shock on New Zealand GDP and consumption in Karagedikli and Thorsrud's model can in part be explained by the nature of the 'world demand shock' itself. This is a shock to the

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<sup>10</sup> **Headline inflation is the combination of both tradable and non-tradable inflation, and is targeted by the central bank.**

<sup>11</sup> **The world interest rate also increases in response to higher world inflation.**

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common underlying world demand factor, and so can be thought of as an increase (or decrease) in demand across the 26 countries. It is not a shock to the demand for one good, such as dairy, or in one country that imports New Zealand goods. By contrast, a sudden increase in the world demand for dairy products would not by itself lead to higher world inflation or higher tradable goods inflation in New Zealand. However, it would increase the value and volume of our dairy exports, and so we would expect New Zealand GDP and consumption to increase. Because Karagedikli and Thorsrud use data from 26 countries, the shock to the common world demand factor means that the combined increase in inflation across all of the countries is large enough to require a contractionary interest rate response in New Zealand and decreases how much people can purchase at the higher prices. However, the overall result deviates from what the authors initially expected, and suggests avenues for further research. No such mechanism is incorporated in the Reserve Bank's own forecasting models.

Another paper that considers the effects of world demand shocks on open economies is by Claus. This paper uses a DSGE model to examine the effects of information asymmetries between borrowers and lenders. Information asymmetries in this model arise because only borrowers can costlessly observe their actual returns from production (funded by borrowing). In response to this, lenders increase the return that they demand on borrowed funds, which reduces overall investment, capital and output. The effects of these information asymmetries are exacerbated in small open economies, for several reasons. First, access to risk-free foreign bonds in international capital markets increases the opportunity cost of lending to risky domestic borrowers, so lenders demand a premium to do so. Second, returns in international capital markets are influenced by movements in the exchange rate. Finally, small economies tend to have a large number of small firms that are more affected by asymmetric information than large firms, because of economies of scale in acquiring and monitoring information. Claus finds that a positive foreign demand shock leads to an increase in exports and output in the small open economy. This leads to inflationary pressures, a consequent increase in the interest rate as monetary policy tightens,

and a consequent appreciation of the real exchange rate. In this model, an appreciation of the real exchange rate now implies an expected real depreciation in the future. As a result, domestic lenders want to buy foreign bonds now and sell them once the exchange rate has depreciated, increasing their expected return. This increases the opportunity cost of lending to domestic borrowers, so lenders will demand a higher premium to do so. The presence of asymmetric information in an open economy results in a larger decrease in investment and a smaller increase in output in response to a positive world demand shock than the model without asymmetric information.

There has been intense debate in recent years around how to explain the marked widening in the US current account and trade deficits. Some authors and commentators have argued that monetary or fiscal policy shocks (for example, the substantial loosening of monetary and fiscal policy after 2000) explain most of this deterioration in the external position of the US. Others focus on East Asian exchange rate policies, while others again have focused on the role of technology and productivity shocks (for example, the dot-com bubble in the late 1990s). The paper presented by Jacob and Peersman uses a two-country DSGE model, calibrated for the US on the one hand and a group of 16 OECD economies on the other, to shed some light on these issues and especially on the type of US productivity shocks that might be expected to have affected the US trade balance. They find that traditional total factor productivity shocks, that affect the efficiency with which capital and labour are combined to produce output, have had relatively little impact on the cyclical behaviour of the trade balance in the US. By contrast, they find that shocks to the so-called 'marginal efficiency of investment' (MEI) in the US may have played a very important role in explaining movements in the trade balance. These MEI shocks can be thought of as changes in the efficiency with which savings can be transformed into physical capital and hence capture a number of phenomena, including attitudes to risk and the way in which the financial system operates.

Improvements in the MEI materially increase US demand for investment goods and widen the US trade deficit, which is also consistent with the disproportionate share of capital

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goods in US foreign trade (imports and exports). Jacob and Peersman's results, emphasising the role of MEI shocks, and secondarily of risk premium shocks, appear to go some way in explaining developments in the US trade balance over the past three decades. However, there are two important caveats. First, the paper looks at MEI shocks emanating from the United States only, and not at the role of either common global shocks or those emanating from other advanced economies. And secondly, while much of the policy focus in the last decade has been on the large surpluses in emerging Asia as the counterpoint to deficits in the US (and countries like New Zealand and Australia), for data reasons the calibrations in Jacob and Peersman's paper are limited to a sample that includes only advanced economies.

## 6 Monetary policy in a small open economy

Several papers examine the implications of being a small open economy on monetary policy. Leduc, Corsetti and Dedola study optimal monetary policy in an open economy DSGE model. In their model, real exchange rate misalignments (here defined as deviations from an "efficient" real exchange rate that arises in a hypothetical, frictionless economy)<sup>12</sup> and demand imbalances (when the price of consumption is not higher in the economy whose agents value it more) arise from the dual role of exchange rates as both relative prices in the goods market and asset prices in financial markets. The authors find that when demand for tradable goods is highly price elastic (consumers are happy to substitute between foreign and domestic goods), it is optimal for monetary policy to focus solely on domestic objectives (low inflation and the output gap). This is not because there are no misalignments, but because these misalignments are not large enough to warrant significant deviations of monetary policy from domestic objectives. When the elasticity of trade is low, these misalignments are sizable and it becomes optimal for both countries to cooperate (instead of adopting a 'beggar-thy-neighbour' policy, where interest rates are

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<sup>12</sup> This definition of exchange rate misalignment is in contrast to the concept of an 'equilibrium exchange rate', traditionally studied by international policy makers, that is based on a notion of long-term external balances.

set to benefit one country at the expense of another) and use monetary policy to lean against the real exchange rate misalignment. However, the implications from this paper are not particularly applicable to New Zealand monetary policy, given that we are a small country with an independent central bank and are unlikely to be able to induce cooperation with central banks in larger open economies.<sup>13</sup>

Lipinska and Haberis examine the monetary policy of a central bank in a small open economy when it is faced with a zero lower bound (ZLB) on interest rates at home and abroad. The authors focus on a situation where there is a large global shock that pushes the nominal interest rates to zero. When the large foreign economy is at the ZLB, its central bank is unable to stabilise the output gap (at least using the interest rate instrument). Since the foreign output gap will be non-zero, it will create inefficient fluctuations in the domestic output gap and domestic inflation. Whether these effects are positive or negative within this model depends on the degree of substitutability between foreign and domestic goods. The ZLB at home limits the extent to which the domestic central bank can stabilise the economy in response to the global shock and the spillover from the foreign economy. In addition, the choices of the central banks to either set optimal policy rates each period or commit to a future path of policy rates in the first period will influence the size of the spillover. These choices will also affect how long the central banks stay at the ZLB and the speed at which interest rates are increased once they are raised above the ZLB.

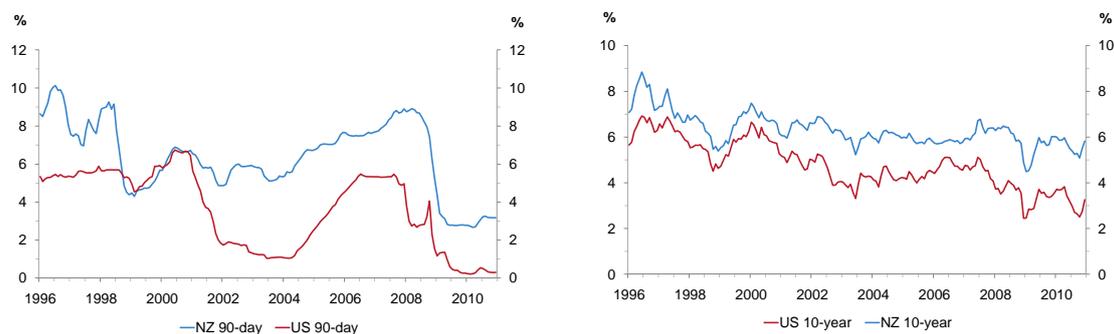
Although not directly addressed in this paper, it is likely that a small open economy will still be affected by the presence of a ZLB in larger economies even if it is not at the ZLB itself. Such a situation is relevant for New Zealand, where the Official Cash Rate has not fallen below 2.5 percent. The inability of the foreign central bank to stabilise its output gap and inflation will still have spillover effects on the small economy. Although the domestic central bank will be

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<sup>13</sup> It is not mentioned in the paper whether a small country could still achieve the same welfare improvements by setting monetary policy in response to a large economy's monetary policy. The model in Leduc *et al* assumes that the two economies are of the same size, so adjustments would need to be made in order to address this question.

Figure 3

Short-and long-term nominal interest rates New Zealand and the US



Source: MarketWatch

able to use monetary policy to respond to these spillover effects, the environment in which it does this is unusual. Usually, for example, a lowering of the policy rate would lead to an exchange rate depreciation and a consequent improvement in relative competitiveness. However, when foreign economies are at the ZLB, a lower domestic interest rate will still be higher than foreign rates, limiting the scope for such an exchange rate depreciation to occur.

Kulish and Rees investigate the independence of the yield curve in a small open economy.<sup>14</sup> Long-term nominal interest rates in a number of inflation-targeting small open economies tend to move very closely with those in the US, more so than short-term nominal interest rates, and have done so for the last 15 years. This can be seen in figure 3 as the case for New Zealand; the 10 year bond rates in New Zealand and the US move together a lot more closely than the 90-day rates. This observation leads some to argue that there has been a decoupling of the short-end of the yield curve from its long-end such that, contrary to the 'expectations hypothesis', fluctuations in long rates are not substantially driven by changes in expected short rates. This in turn may suggest that the strength of monetary policy in these small open economies has lessened. The authors use a small open economy DSGE model to demonstrate that the high comovement of the US long-term nominal interest rates with the small open economy's long-term nominal interest rates does not require a decoupling of the short- and long-ends of the yield curve. This result tends to confirm policy-makers' judgement that small open economies still have control over

monetary policy in that actual and expected movements in domestic short-term rates are reflected in long-term rates, both of which have an impact on aggregate demand.

## 7 The importance of regional factors when modelling small open economies

Many of the current small open economy models have only two representative countries, one large (that may represent the rest of the world) and one small. However, two papers at the conference find that factors at the regional level are also important in the transmission of international shocks. Australia has long been recognised as having an important influence on the New Zealand economy. For example, Neely and Rapach (2008) find that the relative influence of regional factors on New Zealand's inflation rate has increased in the period 1979-2006 compared to the period 1951-78.<sup>15</sup> In Karagedikli and Thorsrud's FAVAR model previously discussed in section 3, the authors provide further support for this argument by showing that the Australian region is important for the transmission of various shocks to New Zealand, both directly and indirectly through the reinforcement of world shocks. In this model, the region is assumed to be driven by underlying world factors as well as regional factors. By including factors at a regional level the authors are able to examine the transmission of shocks to

<sup>14</sup> For more information on yield curves, see Krippner (2010).

<sup>15</sup> Coleman and Karagedikli (2010) also find that releases of macroeconomic news in Australia have substantial impacts on the NZ/US bilateral exchange rate, as well as the AU/NZ bilateral exchange rate.

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New Zealand in more detail, given that they can explicitly account for Australia. In particular, Karagedikli and Thorsrud find that the underlying regional inflation factor explains 15 and 17 percent of the variation in domestic non-tradable inflation and domestic wages respectively.

Canova and Ciccarelli use a VAR model to analyse cyclical fluctuations in the Mediterranean basin over the last two decades. The authors find that a model that divides the Mediterranean basin into three regional blocks fits the data the best. Fluctuations in the Eastern and Southern Mediterranean countries differ from those in the major European Mediterranean countries in terms of volatility, persistence, and synchronisation within the region. However, although a model with regional factors fits the data best, country-specific factors remain important. Canova and Ciccarelli find that the importance of national components does not appear to have diminished over time, except during the recent crisis, that was unusually large and synchronised across countries.

## 8 Conclusion

The 13 papers presented at the December conference cover a wide range of topics relating to the international transmission of shocks, and there is also significant variation in the types of methods or models used to address this topic. These methods help advance understanding of how international shocks are transmitted to open economies, such as New Zealand. Naturally, there are many more issues relating to international shock transmission that were not covered at the December conference, including the extraordinary drop in trade volumes seen during the recent crisis, shocks to funding liquidity and issues surrounding sovereign debt. The recent global financial crisis highlights the importance of understanding how international shocks are transmitted across borders, and the issues examined at the conference are likely to become even more relevant for policy-makers to the extent that the world becomes more integrated. The research agenda opened up by the recent recession and financial crisis is likely to keep researchers occupied for decades to come; debates around the Great Depression, for example, are still not fully resolved.

## Conference programme

### *Thursday 16 December 2010*

"The changing international transmission of financial shocks: Evidence from a classical time-varying FAVAR", Sandra Eickmeier (Deutsche Bundesbank), Wolfgang Lemke (European Central Bank and Deutsche Bundesbank) and Massimiliano Marcellino (European University Institute, Bocconi University and CEPR).

"Shocked by the world! Introducing the three block open economy FAVAR", Özer Karagedikli (RBNZ) and Leif Anders Thorsrud (Norges Bank).

"Keynote address: Resilience and growth amid global turmoil", Ayhan Kose (International Monetary Fund).

"Financial intermediation and the international business cycle", Güneş Kamber (RBNZ) and Christoph Thoenissen (Victoria University).

"The role of monetary policy during the global financial crisis: The Turkish experience", Harun Alp (Central Bank of the Republic of Turkey) and Selim Elakdağ (Central Bank of the Republic of Turkey and International Monetary Fund).

"Dissecting the dynamics of the US trade balance in an estimated equilibrium model", Punnoose Jacob (Gent University) and Gert Peersman (Gent University).

"Demand imbalances, exchange rate misalignment and monetary policy", Sylvain Leduc (Federal Reserve Bank of San Francisco), Giancarlo Corsetti (Cambridge University, University of Rome III and CEPR) and Luca Dedola (European Central Bank and CEPR).

### *Friday 17 December 2010*

"The yield curve in a small open economy", Mariano Kulish (Reserve Bank of Australia) and Daniel Rees (Reserve Bank of Australia).

"The effects of asymmetric information between borrowers and lenders in an open economy", Iris Claus (Inland Revenue, New Zealand).

"Keynote address: The New Keynesian approach to

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exchange rate policy analysis: Looking forward”, Tommaso Monacelli (Innocenzo Gasparini Institute for Economic Research, Bocconi University).

“A comparison of seven crises”, Renee Fry (CAMA), Yu Ling Hsiao (CAMA) and Chrismin Tang (CAMA and La Trobe University).

“Policy trade-offs and international spillover effects at the zero bound”, Anna Lipinska (Bank of England) and Alex Haberis (Bank of England).

“Club Med? Cyclical fluctuations in the Mediterranean basin”, Fabio Canova (Center for Research on the Economies of the Mediterranean, CEPR and CREI) and Matteo Ciccarelli (European Central Bank).

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Neely, Christopher J and David E. Rapach, (2008) “International comovements in inflation rates and country Characteristics”, Federal Reserve Bank of St. Louis *Working Paper Series*, Working Paper 2008-025D.