

# The debt to income ratio as a prudential tool: Response to the Reserve Bank of New Zealand Consultation Paper

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## About Tailrisk Economics

Tailrisk economics is a Wellington economics consultancy. It specialises in the economics of low probability, high impact events including financial crises and natural disasters. Tailrisk economics also provides consulting services on:

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## Part one: Introduction

On June 8, 2017 the Reserve Bank of New Zealand released a consultation paper seeking feedback on serviceability restrictions such as debt to income (DTI) limits being added to its macro-prudential toolkit.

The consultation paper outlines the Reserve Bank's view on these issues. It stated that the Bank would not implement a DTI policy in current market conditions, but that it considered that DTI limits could be a useful option in the future. This paper is a response to the Bank's request for feedback.

Our paper is necessarily complex because the consultation paper addresses at least four intertwined issues, and it is not always clear what is motivating the policy directions.

- Banks' assessments of borrower risk results in 'excessively risky' lending, which raises micro-prudential concerns for individual banks.
- New Zealand house prices are excessively high, raising the risk of a subsequent sharp retraction. Something should be done to restrain house price rises, if not now, then possibly in the future.
- New homebuyers are being shutout of the market by investors, so an intervention should primarily be directed against investors.
- Overall household debt to income levels are becoming excessively high, raising more general macroeconomic stability concerns.

Our main conclusion is that DTI limits approach is misconceived. There are simpler, and less distortionary, ways of targeting 'excessive' house price rises, which appears to be the primary motivation, and to ensure that bank balance sheets are appropriately resilient. In the latter respect the DTI is a clumsy tool, which will have many perverse effects. It is more likely to reduce national welfare than enhance it.

The paper is structured as follows:

Part two: Sets out the key conclusions from the analysis.

Part three: Sets up the discussion with a description of alternative debt servicing 'burden' indicators, and an explanation of their properties.

Part four: Provides some background on the use of debt servicing limits in other countries.

Part five: Addresses what the Bank sees as flaws in the banks' debt serving assessment methodologies, and in particular its the claim that high DTI loans are excessively exposed to interest rate increases, creating a systemic risk.

Part six: Looks at the evidence that high DTI loans are excessively risky.

Part seven: Discusses the logic of applying a DTI limit to investor loans.

Part eight: Discusses arguments that a DTI limit is a necessary part of a supervisory tool kit.

Part nine: Presents a review of the Bank's cost benefit analysis.

Part ten: Discusses some implementation issues.

Part eleven: Presents an alternatives approach to the DTI.

## Part two: Key conclusions

1. Requiring banks to apply a prescribed minimum test interest rate to affordability assessments is a simple, less distortionary, alternative to DTI limits. It would provide the Reserve Bank with an interest rate policy tool that can be directed to imbalances in the housing market.
2. Despite the Bank's claims to the contrary, there is no substantive evidence that higher DTI loans are 'excessively' risky. But there is significant evidence that DTIs do not predict loan defaults, or reduce the likelihood or severity of crises. For example, the European Systemic Risk Board found, in a recent assessment of GFC performance, that DTI levels did **not** have any "*relevant effect either on the prediction of the crisis or on the depth of the crisis*". The DTI is a poor risk measurement metric that will, perversely, tend to target some better quality loans. It ignores the more sophisticated and proven affordability assessments frameworks already used by New Zealand banks.
3. DTI are not a necessary part (complementary to the LVR restrictions) of a macrostability toolkit.
4. Higher future interest rates do not pose a material housing lending systemic risk, providing the conduct of monetary policy is competent.
5. The application of the DTI limit to investor loans is misconceived and will generate perverse outcomes, because DTIs are only designed to deal with owner occupier borrowers. The DTI metric implicitly assumes that household essential living expenses, which are an important part of an affordability assessment, increases in line with income, which is simply wrong. The effect of the policy could be to impose an effective LVR limit as low as 30 percent on professional investors. No other country has imposed DTI restrictions on investor loans.
6. Our assessment of the net welfare impact of the DTI policy, is that it is negative.

## Part three: The choice of debt service indicator

There are three main indicators of debt servicing capacity that are often used to describe a borrower's debt servicing burden.

### 1. The debt (or loan) to income ratio (DTI)

The debt-to-income ratio can be defined as the ratio of mortgage debt (plus other debt) to pretax, or post tax, income. The measure proposed by the Reserve Bank is on a gross basis. The key features of the DTI are that it is invariant to the current level of mortgage rates and ignores information about the borrower's living expenses. The implicit assumption is that borrowers with the same income have the same living expenses, regardless of family size, and that necessary living expenses are proportionate to income. Borrowers' taxation positions are also ignored.

### 2. The debt servicing ratio (DSR)

The debt servicing ratio can be defined as the proportion of disposable (after tax), or pre-tax income, that is used to service the mortgage (both interest and principal payments). The DSR uses the current (at origination) interest rate but, as above, ignores information about the borrower's living expenses and makes no allowance for interest rate increases.

### 3. Income surplus amount or ratio

The net income surplus metric relates to the amount of income the borrower has left over after deducting interest and principal, (including an interest rate buffer to account for future interest rate increases), other committed expenditures (for example student loans), and an estimate of 'essential' living expenses. It can be expressed as an absolute dollar amount or as a ratio of the total committed expenses to net income.

There is no common, accepted, terminology for this metric. In this paper we use surplus income (SI) when referring to the dollar level of the surplus, and servicing ratio (SR) when referring to the ratio of the expenditure to the borrower's income.

The logic behind the surplus income approach is that it is not the borrower's actual spending at the time of the borrowing that matters, but a measure of irreducible, or essential, living expenses. This is the number that will matter if the borrower comes under loan servicing pressure. Discretionary expenditure can be cut to pay the mortgage, but not basic living expenses.

The key feature of the surplus income approach is that it allows higher income borrowers to borrow more relative to the DSR or DTI approaches, because essential living expenses do not increase in line with income. It also takes account of expenditure by household size, so other things being equal, a single person can borrow more than a borrower with other household members to support.

The surplus income concept is basically the methodology used by New Zealand banks. Rather than always estimating essential living expenses for each borrower, banks typically use a standardised expenditure amount based on family size, which is adjusted upwards for some other commitments. Importantly as noted above, debt servicing is calculated using a higher 'test' interest rate, not the actual interest rate that the borrower will pay. Banks typically use a buffer margin of around two percentage points. This provides a buffer not just against future interest rate increases, and also some protection against expenditure and income shocks.

### **Calculating the metrics**

To illustrate the calculation of the different debt serving metrics, assume that a borrower has a gross income of \$120,000; net income of \$100,000; a loan of \$700,000 (with interest and principle coming to 6.5 percent of the loan value). The buffer interest margin is 2 percentage points, and essential household expenses are \$30,000 p.a.

#### ***Income surplus***

The calculated surplus income (SI) is  $\$100,000 - \$59,500 (.085 * \$700,000) - \$30,000 = \mathbf{\$10,500}$ .

And the servicing ratio (SR) =  $\$59,500 + \$30,000 / \$100,000 = \mathbf{0.895}$

The borrower's basic positive cash flow position (determined by the actual principle and interest payment of 6.5 percent and the minimum expenditure estimate) is \$24,500. Of course, many borrowers will spend much of this surplus when things are going well, but that is the position they will be in if they come under mortgage servicing stress.

In addition, the borrower's real equity position can be expected to improve over time. Loan repayments of 1.5 percent improve equity by an initial \$10,500 per year (an amount that increases each year), and the real value of the loan will fall by 1.5 percent with ongoing inflation, for another \$10,500 improvement.

#### ***DTI***

Loan/gross income =  $\$700,000 / \$120,000 = 5.83$

#### ***DSR***

(Interest and principal payment rate)\* loan/ income =  $.065 * (\$700,000 / \$120,000) = 0.379$ .

On the surplus income metric the loan is acceptable. On the DTI metric it is well over the cutoff of 5, which the Reserve Bank believes is somehow excessively risky.

### Servicing burden with different incomes

To illustrate the difference between the DTI and the SR with different income levels, we consider a second loan with the following characteristics.

Loan	\$300,000
Gross Income	\$65,000
Net income	\$58,000
Committed expenditure	\$30,000
Surplus income ratio	0.96
DTI	4.62

On the surplus income approach the high income loan is the lower risk with a SR of 0.9 compared to 0.96 for the low income loan, which is marginal. On the DTI metric, however, the low income loan, with a DTI of 4.62, would be relatively 'safe', but the high income loan with a DTI of 5.8 would be risky. In the Reserve Bank's view, the borrower would be 'overstretched', despite having surplus income of \$24000 after meeting essential living and debt servicing costs.

However, the DTI based risk assessment does not not accord with banks' experiences. Higher income borrowers have lower average default rates because they are in more secure jobs and are less exposed to unemployment, which is the key risk to lending performance.

These perverse outcomes become more pronounced when single person household borrowers are considered. The surplus income approach will take account of the single persons lower expenses, but the DTI will not.

## Part four: International supervisory use of DTI limits

In the November 2016 Financial Stability Review the Reserve Bank specifically identified the UK, Ireland, Norway and Singapore as having DTI ratio restrictions, and said "*At least 10 advanced economies apply a limit on high-DTI lending*" citing a box in a recent IMF Ireland FSAP technical report as the source.

The relevant facts are as follows:

### **Singapore has a debt serving ratio based regime, not a debt to income ratio.**

Singapore introduced a total debt servicing ratio (TDSR) regime in 2013. It requires banks to:

- take account of the servicing cost of other loans

- apply a specified interest rate (3.5% at the introduction of the regime) when calculating the TDSR
- discount the variable component of income by 30 percent or more.

The TDSR limit is 60 percent.

## Norway

Norway introduced a debt to income limit of 6 on 1 January 2017. The limit expires on 30 June 2018. This is a temporary limit designed to help cool house prices rises.

## “At least 10 advanced economies” do not have DTI limits

The cited box is presented below. It is clear that seven of the countries have debt service to income ratio, not debt to income, limits.

### Use of Limits on LTV, LTI, DTI (or Debt-Service-To-Income) Ratios

	Advanced Economies	Emerging Market Economies	Total
Limits on LTV ratio	Canada (2007), Estonia (2015), Finland (2010), Hong Kong SAR (1991), Ireland (2015), Israel (2012), Korea (2002), Latvia (2007), Lithuania (2011), Netherlands (2011), New Zealand (2013), Norway (2010), Singapore (2010), Sweden (2010)	Brazil (2013), Bulgaria (2004), Chile (2009), China (2001), Colombia (1999), Hungary (2010), India (2010), Indonesia (2012), Lebanon (2008), Malaysia (2010), Poland (2013), Romania (2004), Thailand (2003), Turkey (2011)	28
Caps on DSTI ratio (including LTI caps)	Canada (2008), Estonia (2014), Hong Kong SAR (1997), Korea (2005), Ireland (2015, LTI), Lithuania (2011), Netherlands (2007), Norway (2010, LTI), Singapore (2013), United Kingdom (2014, LTI)	China (2004), Colombia (1999), Hungary (2010), Latvia (2007), Malaysia (2011), Poland (2010), Romania (2004), Thailand (2004)	18

Source: IMF staff calculation.

Note: Parentheses show the year a jurisdiction introduced currently imposed measures; changes tracked since 1990.

## Implied DTI Limits

It is possible to roughly back out implied DTIs for countries with DSR based limits. We have calculated the implied DTIs for the seven advanced countries in table one, applying, where possible, the relevant regulatory rules for compliance with the DSR limits (i.e. a required rather than actual interest rate). The estimates should be regarded as approximate.

**Table one: Actual and implied DTI limits**

Explicit DTI	DTI Limit	Notes
UK	4.5	Speed limit of 15 percent
Ireland	3.5	Speed limit of 20 percent
Norway	6	Temporary measure



<b>Implied DTI</b>		
Canada	6	Insured loan limit. Higher implied limits may apply to non-insured loans
Estonia	10	
Hong Kong	10-12	Investor limit of 10
Korea	9	Tighter limits can be applied to higher priced area subject to 'speculative' demand (currently Gangnam –limit of 6)
Lithuania	8	
Netherlands	A range up to 6 depending on income	The Dutch apply a complex expenditure/servicing based metric. This is the only effective regulatory constraint on borrowing as the LVR limit is 101 %
Singapore	12	See above for detail

The outliers on this list are Ireland and the UK, which have actually imposed DTI limits. In both cases the DTI limits were set to reflect new borrowers' DTI outcomes at the time, and so were not intended to have a material impact on borrowers. Irish house prices had fallen by over 50 percent, so it was possible to purchase a house with a low debt to income limit. Since then house prices have recovered by 40 percent, and the policy will be becoming more and more constraining, and will be making it more difficult for the Irish to clear out their stock of non-performing housing loans.

## Part five: Micro-prudential arguments for the DTI

### Do Banks get servicing assessments wrong?

In the consultation document it is just assumed that the banks' servicing assessment methodologies must be wrong because they can generate high DTIs. However, in an earlier

Bank paper by Hayden and Skilling<sup>1</sup> there is a discussion of how serviceability assessments should be done and by implication, why banks' assessments should be overridden. From their modeling of household expenditure survey (HES) data:

*We also observe significant differences in modelled essential expenses across income groups. Within all family types, essential expenses are more than **twice** as high among households in the top income quartile relative to households in the bottom income quartile. **This might suggest that origination tests which rely on measures of essential expenditure that are invariant to the households income could significantly overstate the extent to which high income households would be able to cut back on expenses in a stress scenario** (our emphasis).*

However, it suggests no such thing. The authors have simply **assumed** that the lowest quartile expenditure in each income bracket is irreducible, essential, expenditure. All the HES data is showing is that people with higher incomes spend more on recurring items than those on lower incomes in **normal** times, and that there is a distribution of expenditure amongst people with the same income level. This does not necessarily tell us anything about how the high income earners would react if they came under mortgage servicing pressure. If the low income earners can survive on much less, then so, to a degree, can the erstwhile high income earner (Pack-and-Save rather than Moore Wilsons; no new clothes or restaurant meals, etc.).

The Bank's assumption that the lower spending quartile is the right irreducible expenditure number makes a material difference to an assessment of household 'stress'. The table below is taken from the 2015 paper. It shows that the assessment of essential income for high income households (with two adults and two children) is \$48,000 compared to \$29,300 for the average family.

Table A1: Modelled essential expenses by sub-group based on the HES (dollars)

	2007			2010			2013		
	All families	Low income families	High income families	All families	Low income families	High income families	All families	Low income families	High income families
Single person with no children	7,954	5,786	14,043	9,315	6,713	16,443	9,741	6,160	16,660
Single person with one child	11,079	8,005	19,593	10,820	8,138	18,892	12,343	10,921	21,872
Single person with two or more children	12,493	10,256	21,969	13,710	10,086	23,003	13,362	11,212	28,580
Couple with no children	17,439	13,645	28,915	20,401	14,850	30,695	21,302	15,024	34,879
Couple with one child	21,525	16,024	32,736	22,505	13,382	36,758	23,246	16,549	37,630
Couple with two children	23,931	18,012	36,059	27,822	18,624	41,913	29,329	17,872	48,139
Couple with three or more children	24,523	15,330	41,978	26,874	19,429	41,804	29,679	18,654	47,156
Multi-family households	19,779	12,907	34,208	21,276	15,136	34,823	23,880	16,963	41,781

Note: Low (high) income families refers to families within the bottom (top) income quartile for that family type. The column for all families displays values that would apply assuming that essential expenditure differed by household type, but not income quartile. Multi-family households include all households where a resident of the house is unrelated to the household head, and represent approximately six percent of the sample.

<sup>1</sup> Ashley Dunstan and Hayden Skilling, 2015 'Vulnerability of new mortgage borrowers prior to the introduction of the LVR speed limit: Insights from the Household Economic Survey' AN2015/02

The possibility that some higher income households might have somewhat higher 'essential' expenses than the average borrower may have a degree of validity, and to varying degrees banks do take account of some higher expenditure components. However, there is no perfect approach here, and it is important to understand that debt servicing affordability is just one of several indicator banks use to assess: (1) how likely it is that borrowers will come under servicing pressure in the future, and (2) how they will perform when they are under stress. Typically, risk analysts find that the debt servicing burdens (however measured) is not a strong driver of losses on residential mortgage portfolios (for evidence on this point see below). So it is unlikely that differences between alternative debt servicing methodologies will make much difference to an overall measure of portfolio risk.

A second point to note is that if that banks have been badly wrong with their surplus income metric, then this should have shown up somewhere in the data. In particular, we might expect to see that higher income borrowers have had unexpectedly high default rates because they are 'advantaged' relative to the DTI metric (if that were the better test of servicing capacity). There does not appear to be any evidence of this.

### **Vulnerability to interest rate increases**

The Bank argues that high DTI borrowers are excessively exposed to interest rate increases and that this has systemic implications.

There are two relevant discussions of this issue. On page 17 of the consultation paper (see below) there is an illustration of how two almost identical borrowers with DTIs of 6 would be affected by a range of interest rate increases. It suggests that typical borrower would not have sufficient income to cover essential living expenses if interest rates were to increase to 8 or 9 percent.

The first problem with this analysis is that the examples are the 'worst case' of a borrower on a DTI of 6, rather than typical borrower. \$97,000 is about the lowest income a borrower can have to obtain a loan of \$585,000, on a DTI of 6. Most borrowers with a DTI of 6 will not have borrowed to the maximum their bank will permit and so will have a further buffer against interest rate increases. Second, it implies that borrowers with lower DTIs will not have an issue with large interest rate increases. This is not the case. All borrowers who have borrowed to the maximum that banks will allow, will only have a 2 percentage point interest rate buffer, and so will, naturally, be more likely to come under pressure with larger interest rate increases.

The second analysis appeared in the May 2017 Financial Stability Review. It presents the results of a simple stress test of current owner-occupier borrowers assuming an increase in mortgage rates to 7 percent and 9 percent, using data from the Household Expenditure Survey. It is assumed that borrower's essential income is the bottom quartile of the relevant income band.

Even with the Bank's higher essential income spending estimates for higher income borrowers, the results do not suggest that the interest rate increases will pose a material systemic problem.

**Table 1: Debt servicing ratios and residual income of high-DTI owner-occupiers (borrowers with DTI between 5 and 8)**

	First-home buyer	Other owner-occupier
% of total mortgage lending since October 2016	5.7	15.8
<b>Debt</b>	584,900	584,200
<b>Income</b> (average, before tax)	97,200	97,400
<b>Debt servicing ratio</b> (average, % of before tax income)		
5.0%	39	39
6.0%	44	43
7.0%	49	48
8.0%	53	53
9.0%	58	58
<b>Residual income</b> (average, after tax and debt service)		
5.0%	36,400	39,000
6.0%	32,000	34,600
7.0%	27,300	29,900
8.0%	22,500	25,111
9.0%	17,500	20,000

Source: Debt-to-income returns from 5 major NZ banks, average over December quarter 2016.

Note: The residual income cells are shaded as follows: Green = covering over 125% of modelled essential expenditure; Yellow = covering between 100% and 125% of essential expenditure; Red = not covering essential expenditure. See main text for details on how essential expenditure was modelled.

It is estimated that 4 percent of borrowers, representing 6 percent of the overall owner-occupier mortgage book by value, will come under pressure with a 2 percent increase in mortgage rates. With a 4 percentage point increase, 7 percent of borrowers, and 18 percent of recent borrowers would come under stress. It is stated that half of borrowers with a DTI of over 5 will come under severe stress if the interest rate increases to 7 percent. But as the Bank notes this group accounts for 3 percent of all owner occupier borrowers

The Bank's results will, substantially, be an artefact of the their higher essential expenditure assumption. As noted above, on the banks' expenditure assumptions a two percentage point increase should be manageable by most borrowers. It would have been useful if the analysis had also been done using an average essential expenditure assumption.

A major gap in the analysis is that it covers just owner occupiers. It does not address investors who account for a large part of high DTI lending and who are the prime target of the policy. Our analysis (see below) suggests that many investor's will be reasonably robust to interest rate increases.

## What is the risk of a systemically critical interest rate shock?

A critical consideration is the risk that interest rate increases will have systemic implications. The Bank suggests that this risk is high.

*New Zealand is particularly vulnerable to a sharp rise in mortgage rates as the banking system funds a large proportion of its mortgage credit from offshore wholesale markets. The cost of this funding can increase sharply if there is an unexpected increase in global interest rates or a change in investor risk appetite, and banks are likely to pass on the higher funding costs to customers through higher mortgage rates.*

This statement is misleading. New Zealand has an independent monetary policy, and a floating exchange rate. The Reserve Bank, and not international wholesale markets, determines the New Zealand cash rate and ultimately New Zealand mortgage rates. There will only be substantial rises in mortgage rates if the Reserve Bank wants them to increase. In this respect New Zealand's situation is fundamentally different to Eurozone countries and countries with fixed exchange rates, which can be subject to a sharp interest rate increases if there is capital flight<sup>2</sup>.

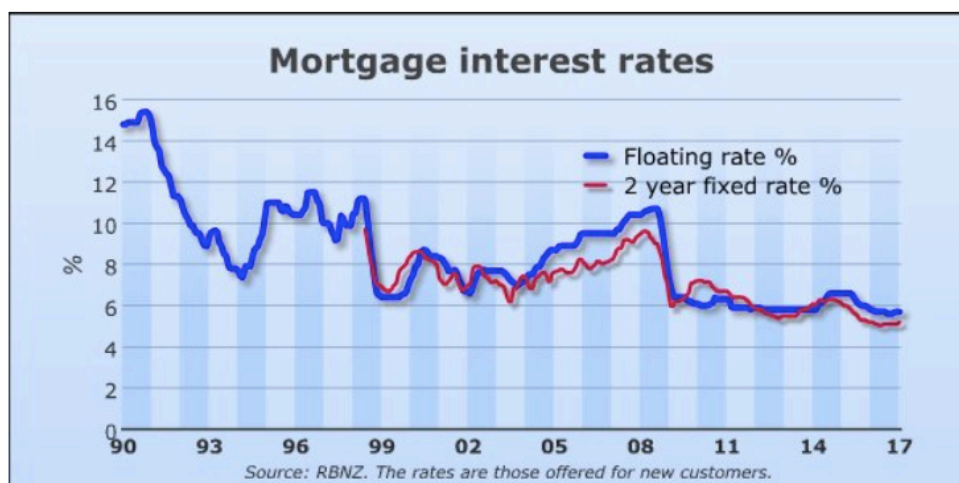
There will, eventually, be an upturn in the monetary policy cycle, and mortgage rates will rise. This may place some pressure on some borrowers, who will have to cut back on their spending, or even have to sell their house. But this is not a systemic concern, it is how monetary policy is meant to work, dampening economy activity as people change their behaviour in response to the interest rate increases.

There could be a risk that this adjustment process could get out of hand, prompting a sharp drop in house prices that could have systemic consequences, but the prospect of this is small.

- First, there is the magnitude of a future interest rate rise. The following is the historical interest rate track. Over 1994 to 1996 the increase in the floating interest rate was about 3.5 percentage points from the low point in the cycle (however the floating rate number probably overstates the average increase as most borrowers would have been on term loans, which are less volatile). The increase in the two year rate from 2004 to 2008 was more in the order of 2.5 percentage points. This is not too far off the amount of 'protection' banks are currently building into their test rates. And as the Bank's own work suggests even a rise of 4 percentage points would not put too many people in a stress situation.

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<sup>2</sup> This issue is discussed in a 2011 Reserve Bank Bulletin article by David Hargreaves; and Elizabeth Watson 'Sudden stops, external debt and the exchange rate' The article argues that "a disruption to New Zealand's access to external funding could be less disruptive due to the country's freely-floating exchange rate and the fact that the external debt is, in effect, denominated primarily in New Zealand dollars (NZD). The nature of New Zealand's exports suggests that an exchange rate depreciation would help to adjust New Zealand's trade balance relatively rapidly, which would assist in placing the country's net foreign liabilities on a more sustainable path and rebuilding market confidence in New Zealand investments."



- Monetary policy cycle interest rate increases don't occur overnight. It can take years for the full upturn to unfold. In that time most new borrower's debt servicing capacities will have improved. They will have repaid some of the loan (not trivial in a low interest rate environment), while income will typically have increased by more, in absolute terms, than living expenses.
- Borrowers can protect themselves by shifting to fixed rate borrowing. The upturn in the monetary policy interest rate cycle would be well signalled, and past history is that borrowers respond to prospective interest rate increases by shifting to fixed rate mortgages.
- New Zealand borrowers have a proven record of resilience to previous monetary tightening cycles. While some borrowers might have been placed under stress there is no evidence that there was a material impact on bank's losses.
- Financial stability will only be threatened if there is a large number of borrowers who can not service their loans, **and** if there is a material fall in house prices. If house prices hold up through the interest rate cycle then borrowers who come under servicing pressure will generally be able to resolve their problem by selling the house. A systemic problem only starts to arise if the interest rate increases cause a large fall in house prices. However, if this did occur then RBNZ could readily respond by reducing the OCR. It is almost inconceivable that a large house price shock would not feed through into broader economic activity, and into the inflation rate, which would naturally require a monetary policy response. Mortgage interest rate would fall and the pressure on borrowers' servicing capacity would be relieved.

### Assessment

The Banks apparent conclusion that the banks' debt servicing methodologies are so broken that it should be partially replaced by a DTI measure, that takes no account of borrower

expenditure at all, is an overreaction to what is, at most, a relatively small technical issue. The Bank's conclusion that higher DTI borrowers expose the system to 'excessive' systemic risk is overstated.

## Part six: Evidence on the DTI as a risk discrimination metric

### Evidence presented or alluded to in the consultation document

The Bank makes the following statement on the role of the DTI as a driver of loan defaults.

*More generally, empirical studies of severe housing market downturns support our view that both ability to pay (represented by DTI) and LVR are important determinants of loan default. Factors determining ability to pay – such as regional unemployment, loan-to-income ratios and interest rate structure – played a significant role in the rise in mortgage defaults after the GFC in Ireland and the US.*

### The US experience in the GFC

#### 1. Mian Sufi 2009

*One study (Mian and Sufi (2009)) exploits variation across US areas (zip codes) and shows that areas that were reliant on subprime lending (which was hard to obtain in the mid 1990s, but became much more available in the years leading up to the GFC) appeared to experience the biggest increase in credit supply over that period.*

*Those areas had relatively large increases in mortgage credit (despite relatively low income growth) and the biggest increase in mortgage defaults during the economic downturn that followed. In other words, the sharp increases in credit availability (relative to income) during the boom appeared to worsen mortgage defaults after the downturn. This suggests regulatory standards that prevented the sharp easing in lenders' standards would have helped alleviate the severity of the crisis.*

The purpose of the Mian Sufi study was to demonstrate that the expansion in US subprime lending, prior to the GFC, was due a degradation in lending standards, rather than being a rational response to better income and house price prospects. There is no assessment of the DTI as a default or loss predictor, or even any mention of the DTI.

The consultation paper alludes to further evidence, and two are referenced in a recent RBNZ Bulletin article (Thorley 2016). The relevant passage from this article reads:

*There is also evidence from the US that borrowers with a high debt to income (DTI) ratio are more likely to default than those with a low DTI ratio because their ability to meet mortgage repayments are more vulnerable to income shocks or higher interest rates (Amromin and Paulson, 2009, and Demyanyk and Van Hemert, 2011).*

Neither of cited studies dealt directly with debt to income ratios<sup>3</sup>. However, both did provide some information on the role of **debt service ratios** in explaining mortgage defaults in the GFC. The Amromin and Paulson paper looked at differences in the prime and sub-prime markets. They found that the debt servicing ratio did **not** have an impact on delinquency rates for prime borrowers, and that there was only an economically minor impact for subprime loans.

The Demyanyk and Van Hemert paper analysed just subprime mortgage delinquency rates in the GFC. They found *“The four explanatory variables with the largest (absolute) marginal effect and thus the most important for explaining cross-sectional differences in loan performance are the FICO score, the combined loan-to-value ratio, the mortgage rate, and the house price appreciation.”*

The debt servicing ratio was statistically significant, but, again, explained only a very small part of the deterioration in loan performance.

The Bank suggests that New Zealand bank underwriting standards mean that not all New Zealand lending is prime, hence it is relevant to take into account the US subprime experience.

*Origination standards in the US before the financial crisis were probably significantly worse in some ways than in New Zealand today, perhaps partly because the way in which risky mortgages were securitised led to them being passed to owners who were not aware of the risks. However, securitisation was a much smaller (although growing) proportion of the Irish mortgage market prior to the crisis (see Godfrey 2011). Finally, while New Zealand does not have a class of lending described as ‘sub-prime’, as shown in the next section, it is clear that debt service ratios have become substantially larger for some NZ borrowers than would be allowed in a prime loan in the United States.*

The sole argument here is that New Zealand banks might approve some loans with a DSR that is higher than the 43 (it is actually 45) percent DSR cut off for Fannie Mae acceptances. However, all this demonstrates, as explained above, is that New Zealand banks are using a more sophisticated servicing metric than Fannie Mae. The New Zealand high DSR loans may have a robust servicing capacity. Further, the DSR is just one of several metrics used by Fannie May (including the FICO<sup>4</sup> score, DSR and LVR) that determine whether a loan is eligible for acceptance. On the LVR side, Fannie May has a 97 percent LVR limit. New Zealand banks do not operate in that very low equity end of the market. In any event, given lower US mortgage rates, the implied Fannie May DTI limit is probably similar to that of New Zealand banks.

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<sup>3</sup> Note that in the US literature the acronym DTI is frequently used to describe the DSR. DTI was used in these papers but they meant DSR.

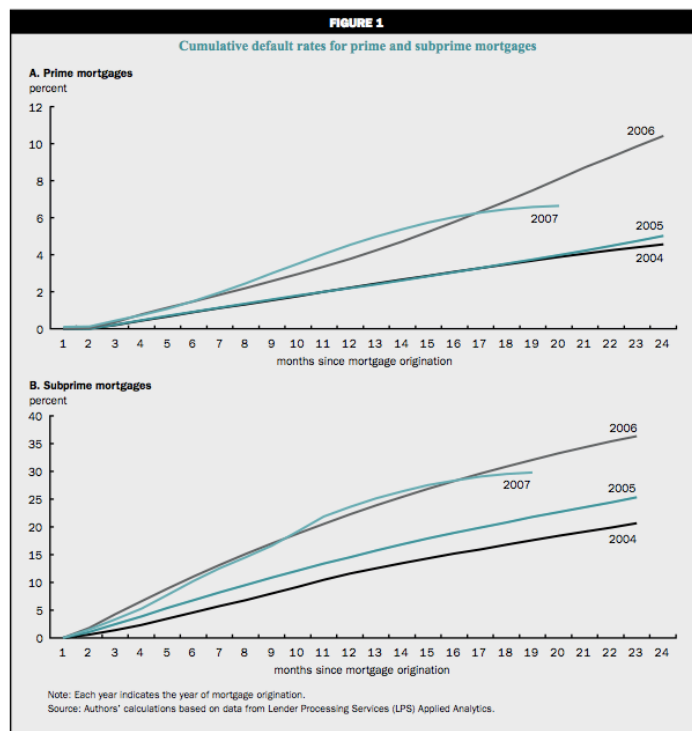
<sup>4</sup> The FICO score is a personal credit score developed by FICO, previously known as Fair Isaac Corporation a US credit scoring bureau. Similar scoring methodologies have been developed by New Zealand banks to assess mortgage loans.



More generally, the distinction between prime and subprime is not a precise one in the US market. The key determinants are generally the LVR, FICO score and documentation standards. Debt servicing generally does not appear in the mix.

A relevant fact from US papers is that there was little difference in average pre-GFC DSR ratios (1 to 2 percentage points) between subprime and prime loans. So debt servicing as measured at application, on either the DSR or DTI metrics, was not the cause of the US housing meltdown, and it is unlikely that a DTI constraint would have made much difference.

Prime and subprime origination standards do lead to very different default outcomes, as the following figure from Amromin and Paulson illustrates. The most relevant data, to compare with the current New Zealand bank experience, are the pre-GFC results. The 2004-5 default rates at 12 months from origination, is about 2 percent for prime loans, but 8 to 10 percent for subprime loans.



There is no publicly available comparable data (delinquencies by months from origination) for New Zealand banks, but their delinquencies rates are likely to have been materially lower than the US prime experience.

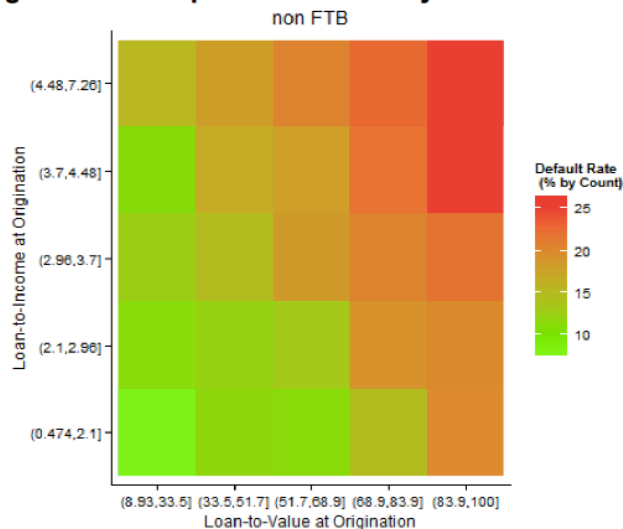
New Zealand banks' loans are so different from US subprime loans that 'lessons' should not be drawn from the US subprime experience without great care.

## The Irish experience

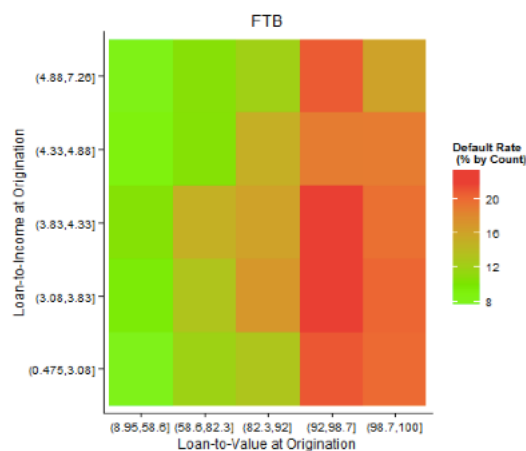
*Hallissey, Kelly and O'Malley (2014)) shows how default rates rose for owner occupiers (excluding first home buyers) as the initial LVR and loan to income ratio of the borrower rose. This suggests that in debt serviceability policy would tend to complement LVR limits in reducing credit risk on mortgage lending.*

The 'heat map' presented does show some relationship between DTI and non-performing loans for non-first time borrowers.

**Figure 2: Heatmap of default rates by LVR and LTI for Irish borrowers**



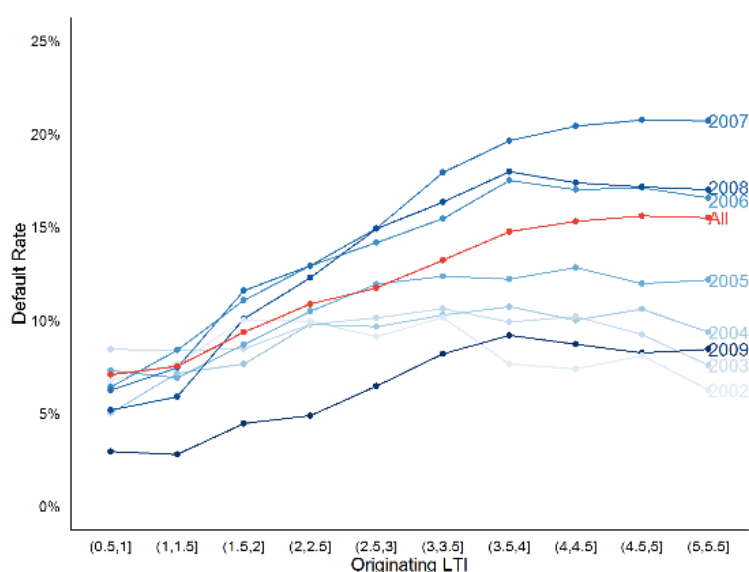
What is not presented is a second heat map (below) for first time buyers, which shows **no** relationship between nonperforming loans and DTIs. The first two left hand columns (with origination LVRs of less than 83percent) are most relevant to New Zealand.



**Figure 4: Heatmap of Default Rates by LTI and LTV for FTB**

The third and most relevant, figure in the paper, which was also not presented by the Bank, shows that there is **no** relationship between non-performing loans and DTIs, once the DTI level gets above about 3.5. Importantly, the Irish evidence provides no support for the Bank's trigger point of 5. There is further confirmation of the limited DTI impact in the Kelly , O'Malley and O'Toole paper cited by the Bank. They found that a one unit increase in the DTI (i.e. say from 2 to 3) increased the default rate by 0.6 percentage points. In the context of the Irish default experience, where default rates ranged up to 20 percent, this is not a significant difference, and in any event, is explained by the impact on low, not high, DTI cohorts.

Figure 3: Credit risk and originating LTI by year



it is not a surprise that there is a relationship between default rates and DTIs when DTIs are low. A borrower with a DTI of one, has a small loan, and given the fall in interest rates would have had a very low servicing burden. With a loan multiple of two three times income, debt servicing would have had some impact on the household budget, and so on the decision to default.

The lack of a relationship above 3.5 is also not a surprise and may be explained, in part, by the fact that higher DTI borrowers had higher incomes. In addition unemployment was the biggest driver of default and the data suggests that once a borrower becomes unemployed the size of the debt burden doesn't matter much, past a certain level.

Caution needs to be taken in interpreting the Irish data, however. During the GFC Irish banks could not foreclose on defaulted borrowers, so essentially payment became voluntary (giving the borrower a free option on future house price increases). Investors and subsequent owners may have been more inclined to exploit this possibility than owner-

occupiers. This factor is not relevant in New Zealand where banks' right to foreclose is legally robust

## **Other evidence on the DTI default relationship**

Publicly available evidence on the DTI default relationship is slim, and is limited to performance in unemployment shocks. Both the Central Bank of Ireland and the Bank of England have introduced DTI based quantitative controls, but neither produced any evidence on the efficacy of the DTI as a risk management tool. Similarly, the Swedish Riksbank<sup>5</sup>, in a recent, lengthy discussion paper on the subject, did not discuss or reference any evidence on the matter.

The following is a discussion of the evidence that we have been able to find.

### **European Systemic Risk Board**

In 2015<sup>6</sup> a working group of the European Systemic Risk Board analysed the impact of various contributors to the likelihood and severity of housing crises in the GFC, for all EU countries. They found that high pre-crisis LTV levels amplified vulnerabilities, but that DTI levels did **not** have any *"relevant effect either on the prediction of the crisis or on the depth of the crisis"* (p.76). The ESRB is a proponent of DTI limits, so it is likely that they tried hard to find a relationship. The evidence simply wasn't there.

### **Banque of France**

A second study is a Banque de France paper<sup>7</sup>. Using an extensive set of unit loan records from a major French bank it investigates the relationship between defaults and LVRs and the DSR. The debt servicing ratio has a close relationship with the DTI so there is some useful information here.

There was, generally, the expected positive relationship between the LVR and defaults, but there was no consistent relationship between DSRs and default rates. The highest DSR bucket actually had the lowest default rates over the full data period, and in the GFC. The 25-33 percent DSR default rate was below the 33-36 percent rate for most of the period, although the rates came together in the downturn.

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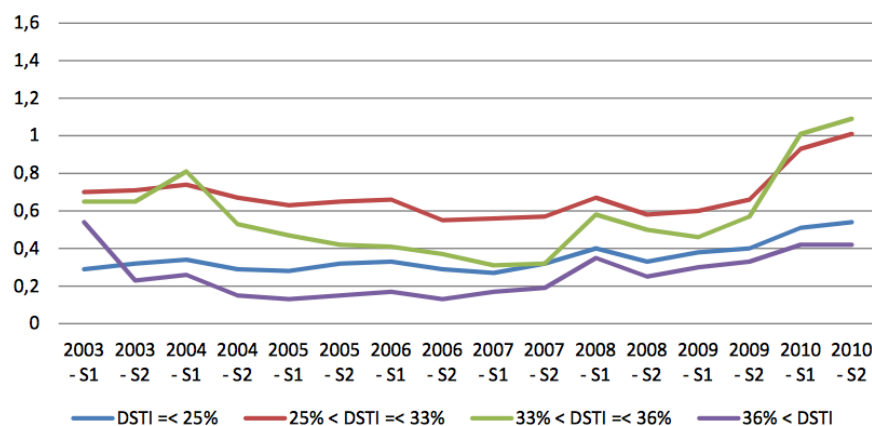
<sup>5</sup> 'An Analysis of the debt-to-income' limit as a policy measure' Economic Commentaries No.8 2015

<sup>6</sup> "Report on Residential Real Estate", ESRB Expert Group on Real Estate, 2015 ESRB

<sup>7</sup> Michel Ditch et Cécile Welter-Nicola 'Do LTV and DSTI caps make banks more resilient?' Debates économiques et financiers N°13

What was probably going on here, is the high DSR loans were disproportionately made to high income borrowers who had good cash flow margins at origination, and a lower probability of becoming unemployed.

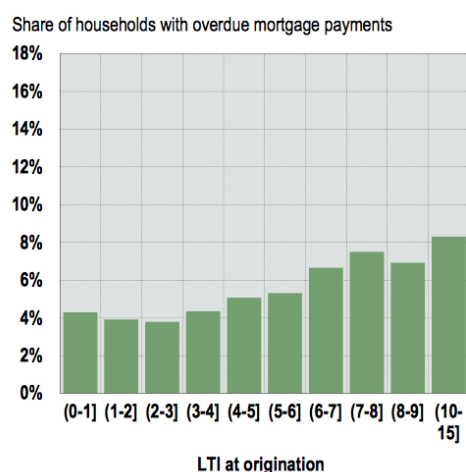
### Annual defaulty rate by DSTI class



### Lithuanian bank report

A report on the Lithuanian banking system<sup>8</sup> may be of limited interest, as the structure and culture of the Lithuanian financial system is doubt different to New Zealand's, and it is difficult to interpret the outputs without more information. Nevertheless, it does at least show a link between the DTI and a measure of loan delinquency, though there is no really significant uplift once the limit of 5 is passed. Possibly the relationship reflects the fact that Lithuanian home owners borrowed heavily in foreign currency. Borrowers with high DTIs would have been more likely to have negative equity after the local currency devalued, and so be more likely to default.

#### LTI at origination



Sources: NŲFIS and Bank of Lithuania calculations.  
Notes: Only loans that were granted in 2006-2008. Loan was categorised as overdue if a payment was overdue for more than 60 days during any quarter up to Q4 2013.

<sup>8</sup> Tomas Garbaravicius 2015 'Experience with DSTI in Lithuania' Lietuvos Bankas.

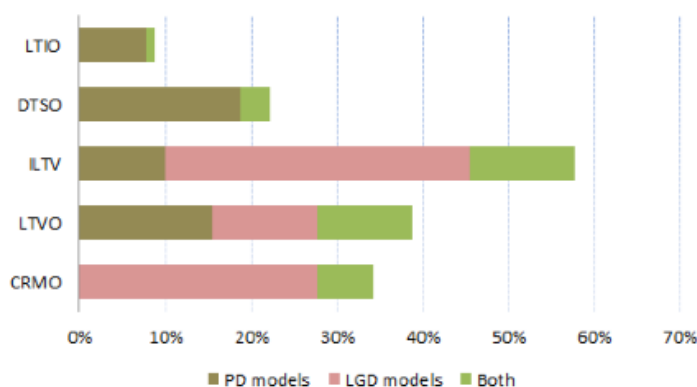
## European Banking Authority report

In 2014 the EBA issued its fourth report on the consistency of risk weighted assets generated by European banks' advanced models. The report sets out some quantitative information from its drill down into residential mortgage modelling. The most relevant for this discussion are reported below. Note that a loan to income, rather than a debt to income, metric is used, but this difference would not have had a material impact on the reported results.

### ***LTI was not frequently used in risk modeling***

Only about 7 percent of banks used the LTI metric for probability of default modeling.

Figure 3: Percentage<sup>15</sup> use of the variables in the PD/LGD/both estimation:



Source: EBA data collection (reference date: December 2012), EBA calculation

### ***LTI has only a weak impact on default rates***

The table below shows only a weak relationship between LTIs and risk weights, which suggests that LTIs are not an important risk driver. Also, the depicted relationship will possibly overstate the true relationship because:

- Only the results of banks that used the LTI are reported. Other banks that did not use it may have found that it had little or no predictive power.
- LTIs will be positively correlated with LVRs, so the reported relationship will, to an extent, reflect the influence of the LVR, which is a stronger driver of default rates.

Even if the relationship between the LTI and risk weights was robust, the risk weight estimates are showing that the high LTI loans are still low risk. Note that If New Zealand calibrations were used, the risk weights would be more than 50 percent higher, but this still leaves them in the low risk category. The main takeout from this table is that there is no obvious upswing in risk, at or about the 5 LTI level.

#### LTI/RW relationship

LTI Bucket	Risk weight %
0-1	12
1-2	11
2-3	11
3-4	12
4-5	13
5-6	14
6-7	16
7-8	18

#### Assessment

The conclusion from our assessment of the Bank's, and other evidence, of the relationship between DTIs and risk, is that it is clear that there is no material evidence that higher DTI loans are riskier.

## Part Six: Application to investment lending

The distinctive feature of the Bank's proposals is that they extend to investor loans, and that the major impact of the policy is expected to be on investors. 8800 investors are expected to be prevented from purchasing a property, but only 2300 owner occupiers.

Both the Bank of England and the Central Bank of Ireland apply LTI limits to banks' aggregate owner occupier lending, but not to investor lending (referred to as buy-to-let). The Bank of England has the legal capacity to apply DTI limits to investor lending, but has not done so, because the retail DTI limits do not readily translate to investor lending. Instead the Bank requires banks to meet minimum qualitative standards in their affordability assessments. In addition, banks are required to apply a 2 percentage point stress test to the interest cost assessment, and the test rate must be at least 5.5 percent. Where buy-to-let borrowers rely on other income to support the loan, account must be taken of taxation and living costs. This is basically the methodology that New Zealand banks apply to retail investment lending. There are no further quantitative restrictions such as times interest cover. This is left to individual bank's assessments.

## Justification for limits on investor lending

The Reserve Bank's justification for including investor lending is:

*Given it is possible for investors to get into financial difficulty when borrowing at high DTIs, it seems reasonable to apply the rules to all residential mortgages.*

In itself this is not a serious justification. It is theoretically possible for all borrowers at almost any DTI to get into financial difficulty.

The Bank provides the following evidence to support its position.

*Investors have a greater tendency to default even if they are able to service loans, making investor default rates more sensitive to LVR than for owner-occupiers (see RBNZ (2016)). However, there is also evidence that ability-to-pay factors play a **strong** (our emphasis) role in driving investor default rates, and it is likely that the income servicing investor loans is more correlated with the value of the underlying security. Kelly and O'Malley (2014) find that investor default rates are highly sensitive to regional unemployment rates in Ireland. Kelly and O'Toole (2016) find that the size of debt payments in relation to rental income is a strong predictor of post-GFC default rates on buy-to-let loans in the United Kingdom.*

## Evidence presented in RBNZ 2016 consultation paper

The Bank's overview is set out in paragraphs 18 and 19.

*18. Rising investor defaults pose significant risks to the financial system, with a growing body of international evidence suggesting that loss rates on investor lending are significantly higher than owner-occupiers during severe housing downturns. There are caveats to applying evidence from other economies to New Zealand, including that mortgage origination standards can vary significantly across countries and time. These problems are mitigated by focusing on the differential between default rates for investors and owner-occupiers identified in international studies. Moreover, the tendency for higher investor default rates is consistent with a range of structural characteristics of investor loans in New Zealand.*

*19. Detailed studies of the post-GFC experiences of Ireland (Kelly (2014)) and the UK (McCann (2014)) have found significantly higher default rates on loans to investors than owner-occupiers. This differential remains significant even after controlling for other relevant characteristics, such as LVR, loan vintage, and regional unemployment.*

The 'growing body' of international evidence, in support of the Bank's conclusion that investor housing loans are riskier, consists of just the two cited papers (McCann 2014 and Kelly 2014). The Bank did not cite an earlier Central Bank of Ireland paper by Lydon and McCarty<sup>9</sup> that concluded, that after accounting for difference in portfolio composition, there

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<sup>9</sup> Lydon, R., and Y. McCarthy (2011), *What Lies Beneath? Understanding Recent Trends in Irish Mortgage Arrears*, Central Bank of Ireland Research Technical Paper, No 14/RT/11. which showed that adjusting for LVRs, investor loans were no riskier than owner occupier loans.



was no difference in owner occupier and investor default rates, or a Fitch paper that came to the same conclusion for the UK.

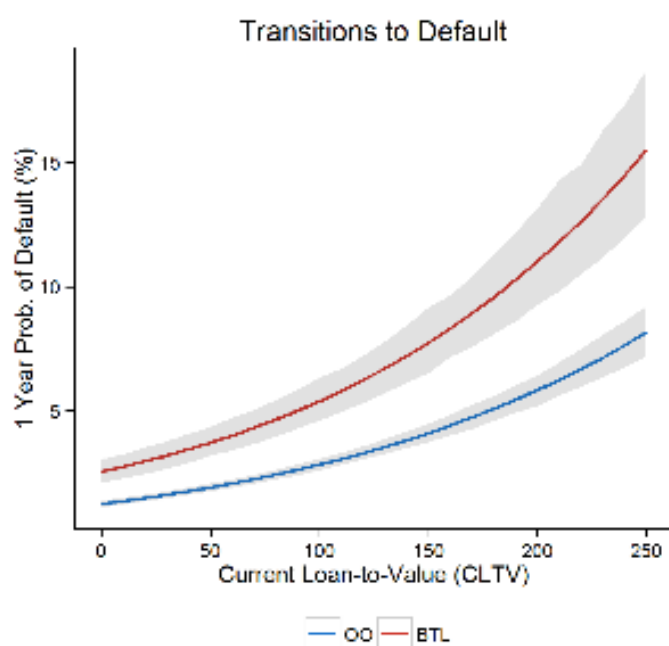
### ***Kelly and O'Malley A Transitions-Based Model of Default for Irish Mortgages***

In this paper loan default equations for owner-occupier and investor loans are estimated separately. The LVR coefficient for former is 1.0063 and for BTL loans 1.0069.

The authors of the paper do not draw any conclusions about the relative performance of owner occupier and investor loans from the very small difference in the coefficients. In fact they say they are the same.

*An increase of one percentage point in the current LTV level results in a 0.6 per cent increase in the hazard rate of loans from performing to default for **both** (our emphasis) OO and BTL loans.*

However, a figure appears in rear of the paper (shown below), without any explanation as to how it was derived, and what relationship it has to the estimated models. The only reference in the text is that it shows the non-linearity of the effect between LVR and default rates, which is necessarily true as the model was estimated in logs.<sup>10</sup>



However, the Bank reproduced the figure in its investor loan consultation document and made the following comments.

<sup>10</sup> What was probably done here is that they took the average default rate for both portfolios and ran the nonlinear LVR curves through them. Thus the figure does not control for LVR composition, which as the Lyndon and McCarthy paper demonstrated, explains the observed difference in portfolio performance.

*‘Figure 7 highlights these points by showing the empirical relationship between LVR and probability of default (PD) for investors and owner-occupiers during the GFC in Ireland. The relationship implies that an investor starting the crisis with an LVR of 60 would see their PD rise by around 55 percent if house prices fall by 50 percent. PD rises substantially more if LVR at origination is instead 75 percent, which is similar to typical levels amongst more leveraged New Zealand investors. The same scenario for house prices would now result in an increase in PD of around 75 percent – close to double the rate of owner-occupiers at the same LVR.’*

Figure 7. does not show the empirical relationships as the Reserve Bank claims. The empirical relationships are captured in the model coefficients. And even if the results were robust, that should be a source of comfort rather than concern when applied to New Zealand. Currently PDs in New Zealand are very low for investor and non-investor loans (under 0.2 percent) so a 55 percent rise to around 0.3 percent with a house price fall of 50 percent would be innocuous.

More generally, the Irish literature has very limited relevance to New Zealand. All of the data is tainted by the flaw in the Irish repossession law, which meant that borrowers could default without the risk of eviction. Actual default rates will reflect differing responses to the incentives this flaw generated as well as more traditional risk drivers.

#### ***McCann 2014 ‘Modelling default transitions in the UK mortgage market’***

The McCann study is not a study of the UK mortgage market as the title suggests. It is a study of the experience of the three major Irish headquartered banks in the UK lending market (with just a two percent share of the market), in the GFC. An earlier paper<sup>11</sup> on the UK market as a whole showed no difference between owner-occupier and buy-to-let loans default rates.

Further, the McCann paper notes that the Irish banks’ credit standards were ‘more relaxed’ than the market as a whole with a much higher proportion of high LVR loans so the results are probably not representative of the UK experience.

The study does find some evidence of higher default rates for buy-to-let loans (the coefficient on the BYL dummy in a joint estimated equation is 0.357 percentage points). This is not a large number, and it may be the result of those banks aggressive pursuit of lending volume in the buy-to-let market, and the consequent erosion of underwriting standards. Loans were being made with no margin at all between rental income and loan serving costs, so higher defaults would be expected.

McCann puts the higher BTL default rate down to a stronger incentive for strategic default for investors, who are not putting their homes on the line. This mostly doesn’t apply to New Zealand small investors, because the bank will typically have security over both the investment and owner-occupier securities.

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<sup>11</sup> Mistropoulos and Zaid 2009 ‘Relative indicators of default risk among UK residential mortgages’ Fitch

### ***Kelly and O'Malley***

This paper did find that investor default rates were linked to unemployment rates, as would be expected, for both investors and non-investors. A one percentage point increase in unemployment was associated with a 9.7 percent increase in the default rate for but to let borrowers. The increase for owner-occupiers was 7.5 percent.

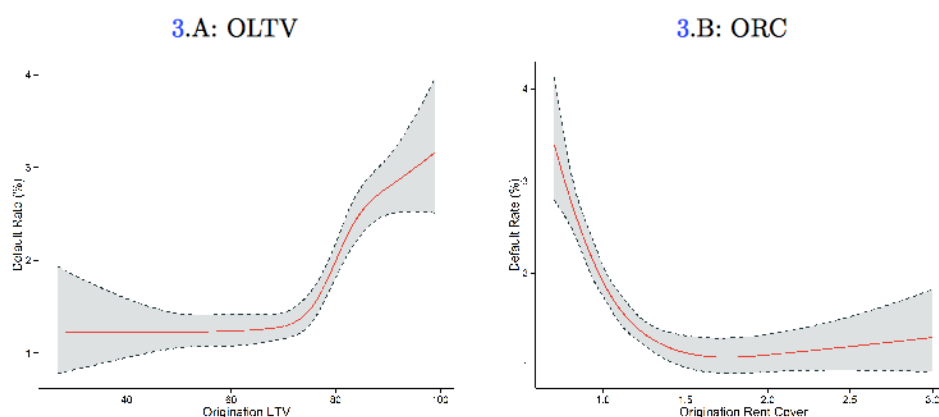
It is not clear what might have been driving this difference in unemployment default rate sensitivities. Some possibilities are:

- As explained above Irish banks could not foreclose on defaulted borrowers, so essentially payment became voluntary (giving the borrower a free option on future house price increases). Investors may have been more inclined to exploit this possibility than owner-occupiers.
- Some (about 20 percent) borrowers had both owner occupier and investor loans. It was conjectured in one of the Central Bank of Ireland papers that these borrowers may have favored servicing the residential property loan over the investment loan. This is not a consideration in New Zealand where banks generally take security over both the home and the investment.
- Investors were more 'deeply underwater' than owner occupiers because they had higher starting LVRs, and would have had a stronger incentive to strategically default. This factor would not have been fully captured by the model structure, which did not explicitly consider strategic defaults.

### ***Kelly and O'toole***

The description of the results in this paper as showing a 'strong' relationship between the size of debt payments and defaults for buy-to-let loans is misleading. The authors found that there was a relationship between defaults and times interest cover (net rents divided by interest payments) up to a ratio of 1.50, but no relationship above that. The graphed relationship is shown on the right hand side of the figure below. Given typical interest rates and rental yields in the UK, a times interest ratio of 1.5 is currently equivalent to a DTI limit of about 15. It would have been lower, perhaps around 10, prior to the GFC, but still well above 5.

Figure 3: RSC Fit of Mortgage Default



The only reasonable conclusion that can be drawn from the literature is that it does not support the contention that investor loans, with a DTI of 5 or more are, in a meaningful sense, excessively risky.

### The DTI produces perverse outcomes when applied to investors

The Banks apparent concern that ‘speculative’ investors pose a systemic risk is misplaced.

First, investors are limited to an LVR of 60 percent, which puts them in the Reserve Bank’s lowest LGD risk bucket. They cannot leverage up in a way that would systematically result in unduly high bank losses in a downturn.

Second, in most cases the loss will be borne by the investor, not by the bank. High income wage and salary earners, who have been tempted to buy an investment property to leverage up on the property boom, will tend to fall into this class. The bank will have security over the investment and the borrowers’ home, reducing the risk that the borrower will walk away in the event that they get into a negative equity position.

Third, there is the case of professional investors with multiple properties. For advanced banks these should fall into the ‘income producing real estate’ (IPPE) category, and attract risk weights of 70 to 115 percent. As the IPRE risk weights have been calibrated to much riskier commercial property loans, and are much higher than those applying to retail residential mortgage loans, any additional risk should be well covered by the additional capital requirement.

The DTI restriction will, however, generate perversely restrictive outcomes for this group.

Consider a large professional investor in the following situation:

Housing investment assets	\$5 million
Loan	\$2.5 million
Net yield on assets	6%
Interest rate	5%
Times interest coverage	2.4
LVR	50%
Debt to income	8.3

The loan has an LVR of 50 per cent, and a times interest coverage ratio of 2.4 (banks generally require a minimum ratio of 1.25 on business property loans, and often require a higher number depending on other loan characteristics). It is a very good risk, and much better than the bulk of banks' commercial lending. However, with a DTI of 8.3, it is identified, by the Reserve Bank, as extremely high risk. To meet a DTI limit of 5, the investor would be restricted to an LVR of 30 percent.

If the logic of DTI metric were to be extended to other property based lending - commercial property and farms - then they would be similarly be identified as extremely high risk, unless they had very low LVRs. There would few new farming or property investment loans that would have a DTI of under 5.

This explains why the Bank of England and Central Bank of Ireland have not applied their DTI restrictions to investor loans, and why the former has imposed servicing assessment requirements that generate an implicit DTI limit of around 12-13.

The Reserve Bank's logical mistake here is that the owner-occupier DTI implicitly embeds a living cost assumption, which, when applied to a borrower with multiple properties assumes that he has multiple living expenses. This obviously does not make sense.

Another example of a perverse outcome is the more common case of a homeowner who decides to buy an investment property. We assume here that the interest rate and net yield on the investment property are both 5 percent, so the investment is slightly cash flow negative because of principle repayments. The investor initially has a \$1,000,000 home and debt of \$200,000, and then funds a \$750,000 investment property with debt.

After the investment the borrower still has a very strong positive cash flow, and the LVR of 54 percent places it in the RBNZ's lowest risk category for LGD purposes. The borrower is obviously robust to interest rate and rental income shocks. However, the DTI of 5.8 would put the loan in the 'high risk' category. This assessment is plainly wrong. The example also shows that the Bank's 'concern' with the impact of rising interest rates is misplaced. After a 3 percent interest rate rise the investor's surplus income is \$71,000.

The before and after accounting and risk metrics are set out below.

<b>Pre housing investment</b>	
Home	\$1000000
Debt	\$200000
Income	\$125000
Essential expenses	\$30000
Interest & principal @6.5%	\$13000
Surplus income	\$82000
DTI	1.6
LVR	20%
Impact of 3 percent interest rate increase	\$6000
<b>Post investment</b>	
Investment property	\$750000
Additional loan	\$750000
Surplus income	\$83000
DTI	5.8
LVR	54%
Impact of three percent interest rate increase (net of tax)	\$21000

## Part Seven: Implementation Issues with the DTI

The obvious disadvantages of a DTI based regime are that:

- It requires banks to build new compliance frameworks which will be complex and expensive to implement.
- It will inevitably beget a complex sets of rules as 'avoidance' issues and anomalies arise.
- It does not appropriately discriminate by borrower risk.
- Many first time buyers will be excluded from homeownership in more expensive markets, although the bank tries to argue that this affect will be somewhat limited.
- Single person households will be disadvantaged.
- As with any quantitative restriction there will be ways around it, for at least for some borrowers. Borrowers with well placed parents may be able to draw on their resources, which means the main bite of the policy will be on those without

parental support. The Bank may be comfortable with this. In its analysis of the impact of the policy it gives the sense that it almost encouraging owner-occupiers to take avoidance action.

- The policy will have perverse effects on investor borrowers. It seems that the Bank does not care about this. It wants to be able to impact on house price, and picking on investors, no matter how illogical the policy, is the more politically acceptable way to do it. Investors can be demonised. First time homeowners get more sympathy.

Some of the impacts will be less obvious.

### **Impact on government support for low-income borrowers**

Currently banks can take into account the accommodation supplement for lower income borrowers. If, say, the borrower were entitled to a supplement of \$70 a week then this can fund additional borrowing of around \$50,000. With a DTI ratio of 5, the borrower can only borrow an additional \$17,500.

### **Purchasers of new homes**

An exemption will apply to new homes. However, this poses its own risks. Demand for new housing will be artificially boosted, increasing prices, which will eventually bring a supply response. If the property bubble bursts, there is a risk that the price of newly completed houses will fall much more sharply than the market as a whole (this is what happened in the US and Ireland in the GFC). The effect of the new house exemption, then, is to exempt the riskiest lending class.

### **Impact on resilience – unintended consequences**

The main rationale for of quantitative controls is that they improve banking system resilience and the Bank cites the reduction in above 80 percent LVR lending as evidence of such an improvement. This assessment is misplaced. It is not just the risk of a bank's loan portfolio that determines resilience, but the amount of capital held against those risks. Banks loans to businesses, for example, are much riskier than residential mortgages, but these loans do not necessarily make a diversified bank less resilient than a pure mortgage bank, because the risk weights applied to business loans are higher than housing loan risk weights. Conceptually, the advanced bank capital framework is designed so the capital assigned to exposures matches the risk of the exposure so all loans are equally 'resilient'. A reduction in riskier lending should leave bank resilience unchanged.

However, it is possible that the LVR controls could have had a negative impact on resilience, because capital might have fallen by more than the risk. For example, if the effect of the restriction was to shift a loan from an LVR of, say 82 percent, to 79.9 percent, then, other things being equal, the loan will be slightly less risky. But for an advanced bank the capital requirement will have fallen by at least 14 percent. The reason is that the loss given default estimate used in the risk weight calculation will have fallen (for a non-property investor) from 33.25 percent to 28.5 percent. As the LVR will also be a driver of the probability of default, which also affects the risk weight, there will be a further fall in the risk weight

through this mechanism. Overall, the risk to capital balance is likely to have deteriorated because of the tendency of loans to bunch just below the regulatory LVR limit, when the implied assumption in the risk weight model is that loans are evenly distributed over LVR buckets.

This effect will be most pronounced for investor loans, which are subject to a 60 percent LVR limit. The effect of an investor shifting from an LVR of, say, 75 percent to 59.9 percent is to reduce the LGD from 31 to 12.5 percent (and hence the risk weight), a fall of 60 percent.

With the DTI limits the inadvertent impacts on resilience could include:

- Replacing loans on existing homes with riskier loans on new houses
- Reducing the share of low risk, or well capitalised, investment loans in a bank's portfolio
- Reducing the share of loans to lower risk, higher income earners, and single person households in a bank's portfolio.

## Part eight: A necessary part of a supervisor's tool kit?

Some of the discussion around the use of the DTI is based on the premise that the DTI is a 'necessary' part of a supervisory toolkit, and a natural complement to the LVR restrictions. The logic here is that the DTI deals with the probability of default, while the LVR deals just with loss given default. So to adequately control risk, quantitative controls have to be applied to both. The following passage from a recent speech by the Reserve Bank's Deputy Governor captures this thinking:

*We regard a DTI instrument as complementary to the LVR speed limits. Limits on DTIs reduce the likelihood of a mortgage borrower defaulting, in response to interest rate or unemployment shocks, while lower LVRs help to reduce the risk of banks facing losses arising from a default. They are not just two types of hammer hitting the same nail.*

But this thinking is flawed.

First, it assumes that the DTI is a critical driver of the probability of default. But as already explained at several points in this paper, this is not the case. Default rates are explained by a number of variables, including the LVR, and debt servicing, however defined, is typically not a strong contributor. This minor role may seem counterintuitive, but it can be explained as follows:



- Borrowers are already screened by banks to ensure that their servicing burden is sustainable. Once a borrower has met this test the marginal benefit from a lower debt servicing burden is limited. When borrowers' servicing capacities are not effectively screened, for example with low 'low-docs' lending in the US subprime debacle, default and loss rates can increase sharply.
- The major driver of defaults is unemployment. This will present borrowers, with a range of pre-unemployment servicing burdens, with a servicing challenge. It may not matter much whether the loan is \$300,000 or \$350,000 if the income that supports the servicing has been lost.
- Borrower's servicing burdens will evolve from the time of origination for a variety of reasons, so the origination serving measure may not be as good indicator of the borrower's capacity when there is a stress event.
- Many other factors besides the servicing burden impact on whether the borrower will default. For example, they may be able to sell the house and clear the loan (the probability of which will be a function of the LVR ); they may be better or worse money managers; they may be draw on other resources to different degrees (family, asset sales et.); and they may be more or less determined to make sacrifices that will allow them to hold on to their house. When assessing loan banks use models that try to proxy some of these variables. For example, employment stability may be predictive of the probability of default and a bank's model might capture this variable. A borrower with a stable employment history would attract a lower risk weight. However, it would not make much sense for the Reserve Bank to require banks to impose a minimum employment period on borrowers to reduce risk.

Second, it is not the PDs and LGDs in isolation that matter. It is the borrower's risk weight, which is a combination of the PD and the LGD. The key driver of the residential mortgage risk weights driver is the LVR, so if there has to be a quantitative restriction then, this is the more obvious candidate. The risk weights in the proposed, more risk sensitive proposed Basel standardised housing model are based on just the LVR. A DSR factor was also considered, but was dropped, because the relatively small differences in risk sensitivity was not worth the complexity.

The other line of argument, made in the consultation paper, is that DTI policies may be more effective in restraining credit growth than LVR restrictions.

*International studies including Kuttner and Shim (2013) and Cerutti et al (2015) have looked at the effectiveness of macroprudential policies such as DTI and LVR limits in restraining credit growth. Generally these studies, including those two and most of those discussed in Cerutti et al's summary of the literature, appear to find that LVR and serviceability limits both have significant impacts on credit growth. Since they reduce credit availability to relatively high risk borrowers, this is consistent with the policies also reducing the riskiness of household balance sheets.*

The 'relative effectiveness' literature is mostly meaningless. There is no dispute that effective constraints on the ability to borrow will reduce credit growth, but the assessments of the relative effectiveness of the LVR and debt servicing limits, do not control for the calibration of the limits. If the LVR is set at a weakly binding level, and the debt servicing

control is more restrictive, then naturally the debt servicing control will appear to be more effective. But, in principle, either control can be set of a level that will generate a desired impact on bank credit growth. If a very strong impact is wanted then the maximum LVR could be set at, say 30 percent, or the debt to income ratio at 2. But that in itself does not prove that one control is better than the other, or that both are 'necessary'.

### **Assessment**

The argument that a DTI restriction is 'necessary' complement to LVR restrictions does not stand up to scrutiny.

## **Section nine: Cost benefit analysis assessment**

The cost benefit analysis is complex and (necessarily) relies heavily on judgments. It is intended, mainly, to give a sense of the possible order of magnitude of the costs and benefits. This assessment of the analysis focusses on the key inputs that drive the conclusion that there are positive net benefits from the introduction of DTI limits, and in the same spirit, is intended just to broadly present the case that the net benefits are more likely to be negative than positive.

### **Benefits From Lower risk of crises**

#### **Probability of housing crisis event**

The probability of a housing crisis (loosely defined as 40-50 percent fall in house prices) is largely based on analysis in Brooke et al (2015) that discusses how the probability of a financial crisis during a 'peak' risk environment is considerably larger than the typical probability of a financial crisis. For example, with capital ratios set to 11 percent, Brooke finds the chance of a financial crisis in typical times is around 0.5-0.7 percent, while it is around 3-4 percent in peak conditions. From this starting point the consultation paper adopts the higher number of 5 percent as a more conservative assessment .

The problem with the Brooke numbers is that they have little to do with the current probability of a housing crisis in New Zealand. They are based on an assessment of the probability of UK banks market values breaching a capital trigger point given (the then current) share price volatility and rate of credit growth.

However, an assumption on the probability of a housing crisis has to be made, so the issue is whether the 5 percent figure (or a 25 percent chance of the next 5 years) is about right, given the current high level of house prices. This is very much a matter of opinion, but the 5 percent looks too high, and we have used a 2.5 percent assumption.

### **From housing crisis to financial crisis**

It is then assumed that there is a 30 percent chance that a housing crisis will develop into to a financial crisis. This generates a probability of a financial crisis of 1.5 percent.

*The stress test evidence leads us to assume that a relatively small proportion (30%) of severe housing crises in New Zealand would lead to bank insolvency and a financial crisis, even if house prices fall substantially further than the 15% threshold used by JST (2015).*

There is no obvious evidence in recent New Zealand stress test results that would lead to a conclusion that the housing crisis would lead to bank insolvency and a financial crisis. The stress tests have shown that regulatory capital ratios were not breached, let alone the banks becoming insolvent, even given some unrealistically conservative assumptions. For bank insolvency to occur credit losses would have to be a multiple higher than estimated in the stress tests. If the additional losses were concentrated in the housing portfolio alone, then losses would have to be in the order of 10 percent (compared to the RBNZ's assessment of 2 percent) This substantially higher than has ever been recorded in any housing 'crisis'. On the magnitude of losses in housing crises a recent Norge Bank paper<sup>12</sup> provides a useful perspective. It shows that that housing has generally been a relatively small contributor to losses in 'housing crises', with the main culprit being commercial property lending. A BIS paper<sup>13</sup> makes the same point with respect to the US GFC experience.

A more realistic assessment that the risk of a financial crisis would be in the order of 15 percent.

### **The cost of housing and financial crises**

The costs of housing and financial crisis are assessed at 10 and 20 percent of GDP, respectively. For working purposes we have used the same figures.

### **Impact of the DTI policy on the risk and cost of crisis**

This is the more critical part of the analysis. It is assumed that the probabilities of crises would fall from 5 to 3.5 percent for housing crises and 1.5 to 1 percent for a financial crisis. The costs of crises is assumed to fall by 20 percent.

The support for these assessments is flimsy. The cited, supporting, papers do not actually analyse the growth of housing credit as such, or the quality of the housing lending. Rather, in the first paper the variable of interest is aggregate mortgage lending – which includes commercial lending, which dominated banks balance sheets for much of the data period.

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<sup>12</sup> Krach- Sorensen K. and Solhem H. 2014 'What do banks lose money on during crises?' Staff Memo 3/14

<sup>13</sup> Antiniades A. 2015 'Commercial Bank Failures During The Great Recession: The Real (Estate) Story' BIS working paper No. 530

The second paper just deals with the growth of broad credit and monetary aggregates. The post-war crisis events identified mostly related to the GFCs, and the causes, in most cases, related to bank illiquidity, and non-housing losses. The authors have done little more than note that these crises were preceded by strong growth in bank housing lending and so assumed that housing must have been the cause. There is no serious analysis of causation.

The Reserve Bank numbers are not a very realistic assessment of the systemic risk consequences of the proposals. To understand why, consider the effect on investor lending, which is the major impact of the policy.

8800 loans with a LVR of under 60 percent (and substantially less for professional investors) for existing homes will not be made. These are low risk loans. The Banks assertion that that they high risk, on the basis of a high DTI, is simply wrong. They will be replaced, at least in part, by:

- Loans to owner-occupiers at LVRs of up to 80 percent.
- Loans to investors for new housing units. There are no limits on the LVR and DTI of these loans, but new home loans and probably the most vulnerable in a downturn.

Both sets of loans will be riskier than those they replace.

Investors may also divert their investments to the commercial property sector. These loans will be materially riskier than the residential investment loans. This will put pressure on yields, increasing the risk of a more substantial price retraction, in the kind of event associated with a housing crisis.

Some investors will not purchase a property. But this does not necessarily mean that the banking system will necessarily be more resilient. Banks exposures will be lower, but so will be the capital held against those risks.

On the price side the Bank expects a house price fall of 2-5 percentage points. It is difficult to say what difference this would make to the probability and severity of a future-housing crisis. The answer is probably not very much.

Given these considerations, our overall assessment is that the probability of a future crisis falls from 2.5 percent to 2.25 percent.

On the cost of crisis side there will be some positives and negatives as discussed above. We have assumed a cost reduction of 10 percent. The summary calculations are set out below. The savings is 5.7 basis points of GDP compared to the Bank's estimate of 24 basis points.

	Risk housing crisis pre policy	Risk of financial crisis pre policy	Cost of housing crisis %	Cost of financial crisis %	Cost per annual b.p.	
<b>Pre policy</b>	.02	.005	10	20	30	
<b>Post policy</b>	.018	.0045	9	18	24.3	
<b>Policy benefit</b>					5.7	

### **Cost of the intervention**

As the Bank notes, it is difficult to place a value on cost of the regulatory distortions. We have taken the Bank's figures but add the following.

#### **Cost of reduction in 'top-up' loans.**

The Bank has assumed that this cost will be very low (just 15 percent of the cost of the distortion due to the cost of homeownership). This cost can be better measured by assuming that funds can be raised through alternative, more expensive sources (credit cards, hire purchase etc.) We put this additional cost at 7.5 percent on borrowings of \$300 million.

#### **Cost of restrictions on investors**

The Bank says that the cost of the restrictions on investors will be low because they will be able to rearrange their portfolios to maintain a preferred risk/return profile. To the extent that this is true, this will probably obviate the purpose of the DTI intervention. The risk will just be shifted elsewhere. To the extent that investors do not have viable options, because existing housing is their preferred business model, then there will be a welfare loss. If say 5000 investors are affected and the cost is 1 percent of the value of the investment then the annual cost would be around \$30 million.

#### **Impact of house price changes**

The Bank suggests that the effect of house price changes is not relevant. There will be winners and losers, but these are just transfers between New Zealanders. This assumption does not hold for foreign buyers. For illustrative purposes have assumed that 1000 foreign buyers benefit from a \$40000 per house reduction for a loss to New Zealanders of \$40 million.

#### **Distortions to owner-occupier preferences**

Given the sacrifices homeowners seem to be willing to make to buy their own home, the estimate of 20 percent of house rents may be on the low side. A higher figure could be justified but it would not make a material difference to the overall assessment of costs and benefits. We are also somewhat skeptical of the extent that new homebuyers will be able to continue to purchase a home by buying a cheaper home. The effect of the policy will be to

increase the price of low priced homes (relative to higher priced homes and perhaps absolutely).

### **Administrative costs**

These are assumed to be \$20 million per year.

Our estimate of total additional annual cost about \$165 million or 7 b.p of GDP.

### **Annual Net benefits b.p. of GDP**

	RBNZ	Our assessment
Reduce crises	0.25	0.06
Welfare cost	-0.07	-0.07
GDP reduction	-0.10	-0.10
Additional welfare costs		-0.07
Net benefit	.08	-0.21

### **Other considerations**

The impact on macroeconomic stability is a valid positive factor, but difficult to demonstrate in a formal cost benefit analysis. The DTI may have this positive effect, but this will be very small, as the aggregate effect on total borrowing will be small. The key issue is whether there are more efficient macrostability tools that will have the same outcome. A more efficient option is suggested in part eleven below.

The DTI may also have a signalling effect. It is telling the market that the Bank will act if house prices get out of hand. The benefit is not the estimated impact on house prices, which is quite small, but on buyers' expectations that price increases will be ongoing. The measures might just be the straw that breaks the back of the upward house price spiral, and if that does not work, the market would know that the dose could be strengthened. Again, the point here is not that DTI restrictions might have this effect, but whether there are more efficient ways of sending the signal.

### **Assessment**

The Bank has not demonstrated that a DTI restriction will have a net social benefit or that it is the most efficient way to address the perceived problems. Our broad assessment is that the welfare loss will be 0.2 percent of GDP.

At the least, the Bank's assessment falls well short of the cost benefit test set out in the Deputy Governor's speech.

*We focus our attention on areas where there is strong justification for regulation based on clear market failure and where the benefits to society of regulation are expected to well exceed the costs.*

## Part eleven: Alternatives to DTI restrictions

An assessment of the alternatives to the DTI depends on what purpose the policy intervention is meant to serve. If the objective is to increase system resilience to the heightened risk as a severe house price crash, then it is hard to so past a targeted capital adequacy response.

- It can be applied to the whole loan book, not just to banks' new lending, so the system becomes 'more resilient' more quickly.
- It can be applied to the existing capital adequacy regime and should not require any major system builds.
- It is arguably more equitable. All relevant borrowers will bear the cost of higher capital, if that is passed on to borrowers, not just those who are shut out of the market by quantitative controls.

However, the Reserve Bank wishes to have a comprehensive review of the capital adequacy regime, and does not have an appetite for interim changes that would just target the mortgage lending risk issue.

The second purpose is to improve banks' risk assessment. It is argued in this paper that the DTI doesn't achieve that.

The third purpose is to shock borrower demand, in an attempt to break an upward momentum in house prices, which could possibly have serious and unpredictable consequences should the bubble burst. This is may be a legitimate concern and objective (though possibly not lawful), but there is a much simpler way to achieve it than the DTI limit.

### **A required test rate option**

The Reserve Bank could require banks to use a required test interest rate. It can be used to replicate a monetary policy tightening. This is the approach taken by APRA, and by the Bank of England, with respect to investor lending.

One way to think about this tool is that it gives the Reserve Bank more degrees of freedom with the interest rate instrument. Normally the policy interest rate leans against excessive activity in the housing market, because inflationary pressure is correlated with house price increases. But in recent years the two have become disconnected. With the test interest rate approach the Bank has (at least) two interest rates that can be directed to two (or more ) distinct policy objectives.

If desired more than one test interest rate could be used. There could, for example, be a higher Auckland interest rate. If the Reserve Bank really thinks that investors are the problem, or are the least disruptive, or politically acceptable way to reduce housing demand, a higher rate could be applied to the assessment of investor loans.

If there is a concern that banks might be overstating the extent to which higher income borrowers can reduce their expenditure in a stress situation, then again there are simple fixes. For example, the Reserve Bank could require banks to supplement their expenditure estimates with a prescribed additional expenditure estimate that could be a simple function of income (say, 10 percent of gross income above \$60,000). A borrower with an income of \$300,000 would apply an additional \$24,000 to the assessment of irreducible income.

The advantages of the above approach are:

- It preserves the substance of the banks' risk assessment methodologies, which are basically sound.
- It avoids the perverse outcomes that the DTI can generate.
- It is simple, cheap and can be quickly implemented.
- It can be calibrated to deliver a short sharp shock to housing demand, or a more graduated approach can be applied.
- It is consistent with decades long practice of relying on the interest rate tool for macroeconomic stabilisation.

### **The Bank's response**

The Bank's response to this option appears to be covered under their option 'More detailed prudential oversight'.

*An alternative approach to LVR and DTI limits, used by some overseas regulators, is to create a more detailed standard for prudent lending practices. Like LVRs and DTI limits, a prudential practice guide provides an overlay on bank's self-discipline, but does so by providing guidance on all aspects of the origination decision (e.g. prudent assumptions about living expenses and potential future increases in interest rates). Regulators can then benchmark banks against the guide and provide feedback on aspects that they consider need to be strengthened (see Richards 2016).*

*A prudential practice guideline could, in theory, be calibrated to have similar implications for credit availability to a DTI limit. A key difference is that this approach requires a fairly detailed and regular collection of information on bank origination policies, with the regulator needing to have an ability to require specific changes where it feels particular banks are not originating loans sufficiently closely to the guidance provided. In contrast, a DTI policy provides a control on the overall results of bank origination policies, while leaving banks to make more of the decisions about how to implement that control. A DTI policy is therefore likely to require less detailed rules on origination standards and less supervisory resources to monitor compliance.*

The argument that the a minimum test rate requirement must also necessarily involve micro-management of the detail of bank's lending policies, simply does not follow. The APRA guidelines (which defacto already apply to a large part of the New Zealand market) are general in nature and do not impose particular detailed requirements (other than a 7 percent test rate minimum). The Reserve Bank could simply set its minimum test interest rate requirement and leave it at that, or has it has done already through its recent housing lending thematic review, enquire more deeply into lending practices.



