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Macroeconomic determinants of house prices and rents: Evidence from New Zealand

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Abstract:

Over the period 2005 to 2021, New Zealand house prices rose by 142% including several years of rapid house price inflation, especially during, and following, the COVID-19 pandemic. This paper explores how far these movements in property prices (house prices and rents) can be attributed to macroeconomic (monetary and fiscal) policy choices. Based on an extension of the property price model of Grimes and Hyland (2015), our empirical estimates indicate that, in addition to previously established macroeconomic influences on property prices, monetary and fiscal policy settings have a direct impact of New Zealand's property prices, with the largest effects observed in association with the COVID-19 pandemic.

Keywords: House prices, rents, monetary policy, fiscal policy, housing tenure

JEL codes: E63, E65, R21, R31

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1. Introduction

Over the past decade, significant increases in house prices have coincided with expansionary macroeconomic policy. For example, over the period 2005 to 2021, New Zealand house prices rose by 142%, with some of the most rapid house price inflation occurring during/after the COVID-19 pandemic which coincided with substantial monetary and fiscal expansion. Prior New Zealand evidence on house prices determinants indicates that the combined impacts of a global decline in interest rates, the tax system, and restrictions on urban land supply have led to large increases in house prices and to an increase in the ratio of house prices to rents (Housing Technical Working Group [HTWG], 2022). These findings are consistent with earlier results in Grimes and Aitken (2010) who found that real house prices in New Zealand are determined by the ratio of population to dwellings (the ‘dwelling ratio’), incomes and the user cost of capital.

Grimes and Hyland (2015) provided further evidence based on a utility-maximising, microeconomic model. Their theoretical approach, which also underpins the analysis in this paper, incorporates a representative agent model in which each individual derives utility from non-housing consumption and from housing services (which are proportional to the housing stock). The individual maximises lifetime utility subject to a budget constraint which incorporates the ability to invest in financial assets and housing. After aggregating across all individuals, the real price of housing is shown to be determined theoretically by three factors: aggregate per capita consumption (reflecting per capita incomes), the user cost of capital and the dwelling ratio.¹

In empirical modelling for New Zealand, Grimes and Hyland (2015) confirm that long-run real house prices and rents are determined positively by income and by the dwelling ratio,² and negatively by the user cost of capital. In addition, they find that credit market constraints (proxied by banks’ non-performing loan ratios) act to suppress house prices. While incorporating impacts of the user cost of capital and credit constraints, these prior studies did not account for any influence of exogenous asset market sentiment or for more recent ‘unconventional monetary policies’ involving central bank purchases of assets.

We incorporate each of these influences in our modelling below. Specifically, we adapt the Grimes and Hyland (2015) approach to include the US share price index as an exogenous representation of asset market sentiment³ and include the total assets of the Reserve Bank of New Zealand (RBNZ) reflecting the asset purchase activities of the central bank. We find strong evidence for New Zealand that, in addition to the influences of income and the dwelling

¹ They further show that the housing stock, and hence the dwelling ratio, is influenced by building costs and regulatory constraints.

² Nguyen et al. (2022) also find, for New Zealand, that an increase in the dwelling ratio associated with inward migration leads to short-to-medium term increases in both rents and house prices.

³ We include the US index rather than a NZ index to ensure that this sentiment variable is exogenous to the NZ economy; we include a share price index rather than a housing index to abstract from specific US housing market factors.

ratio, house prices respond to New Zealand banks' non-performing loans and international asset prices respectively. To capture the effects of domestic monetary policy we add the mortgage rate⁴ to regressions, together with the RBNZ's total assets (capturing the Bank's use of unconventional monetary instruments). As the charts discussed in section 3.2 show, this latter variable displays rapid increases from 2020 in association with the COVID-19 pandemic, as the Bank purchased large amounts of government debt issued to fund pandemic-related public spending. Especially during the pandemic years therefore, this variable captures the combined loosening effects of monetary and fiscal policy.

Our research is primarily concerned with the long-run determinants of property prices (rather than short-run dynamics). We examine whether macroeconomic influences, including the dwelling ratio, reveal a long run relationship with property prices by testing whether a cointegrating relationship exists between property prices and macroeconomic variables (each of which is non-stationary). In doing so, we evaluate whether there is a *prima facie* case that the estimated relationships reflect overarching impacts of macroeconomic influences on property prices. Following a brief review of recent literature, we outline the methods used in this paper, before applying these methods to examine the relationship between macroeconomic variables and property prices.

2. Prior Literature

There is a well-established body of literature confirming that monetary policy affects asset prices, particularly housing prices. For example, Bernanke and Gertler (2000) and Mishkin (2007) outline how lower interest rates and quantitative easing (QE) increase asset prices by reducing borrowing costs and boosting liquidity. Subsequently, Jordà et al. (2015) provide long-run cross-country evidence that housing markets are particularly responsive to monetary loosening, often leading to credit-driven housing booms. This effect is strongest in areas with constrained or price-inelastic housing supply, where monetary policy shocks trigger sharp increases in house prices. Using micro data across territories, Chadwick et al. (2022) confirm such an effect for New Zealand, showing that 'monetary policy stimulus triggers stronger house price movements in those New Zealand regions where the supply of housing is relatively less responsive' (p.1).

Recent studies of periods of sustained expansionary monetary policy, such as during the COVID-19 pandemic or post-Global Financial Crisis, have also drawn attention towards the role of central banks in influencing house prices. Diamond et al. (2023), for example, using a calibrated macro model for the United States, show that fiscal and monetary stimulus packages

⁴ We use a mortgage rate in preference to the RBNZ's own 'official cash rate' (OCR) since the former is more directly related to the housing market. RBNZ monthly data reveal that correlations between the OCR and several flexible and fixed (6-months, 1-year, 2-year) bank mortgage rates range from 0.94 to 0.99 over the 2005-25 period. With the inclusion of the mortgage rate in regressions, we omit the user cost of capital (UC) variable included by Grimes and Hyland (2015) in their regional house price model. The UC variable includes both an interest rate and lagged house prices in its definition, hence potentially co-linear with the mortgage rate in our regressions below.

designed to combat the negative COVID-19 shock, can generate large subsequent house price increases if post-shock taxation and interest rates are not increased to deal with pandemic-induced increases in public debt. Thus, while others have argued that loosening monetary and fiscal policy during a Covid-type recession can generate house price inflation early in the recessionary episode, Diamond et al. argue that if ‘the government inflates away its debt after the COVID-19 recession, a boom in house prices occurs too’ (Diamond et al., 2023, p.2).

More generally, recent macro modelling, especially post-Covid, has begun to address, and in some cases incorporate explicitly, a role for asset quantities and prices (property and/or stock market, government bonds) in models of monetary/fiscal policy interventions. In the context of new Keynesian models, it is shown that these development can yield substantive effects of monetary interventions on asset quantities as well as prices (see, Koln, 2009; Baker, 2020; Leeper 2023; Caballero and Simsek, 2024).

For New Zealand, during the COVID-19 pandemic the Reserve Bank (RBNZ) used both reductions in interest rates (the Official Cash Rate, OCR) and unconventional monetary instruments, such as the Large-Scale Asset Purchase (LSAP) programme and the Funding for Lending Programme (FLP), to combat the expected recession. Since the LSAP and FLP involved large purchases of government debt, this variable will also capture the effects of expansionary fiscal policy.⁵ As we show below, as in a number of countries, this expansionary policy in New Zealand occurred concurrently with sharp increases in house prices: by 22% during the COVID-19 years (2020-21). Our analysis tests whether this ‘concurrence’ can be shown to be causally related to the use of those monetary-fiscal policy tools. The suggestion that they may be causally related led the New Zealand Parliament (2021) to amend the Bank’s Monetary Policy Committee’s remit to require the Bank to consider “sustainable house prices ... to help improve affordability for first-home buyers”. Although the remit change was unusual, many central banks have similarly faced scrutiny over their role in house price inflation.

3. Empirical Approach

3.1 Methods

We test whether a cointegrating relationship exists between rents, house prices, and a set of macroeconomic variables using an Engle-Granger Augmented Dickey-Fuller (EG-ADF) test (Engle & Granger, 1987); we also check for Granger causality from the residual of the cointegrating relationship to either house prices or rents. Subsequently, we provide tests of coefficient significance using the dynamic ordinary least squares (DOLS) estimator (Stock & Watson, 1993).

⁵ Indeed Leeper (2023) notes that ‘the two policy regimes - monetary dominance (active money/passive fiscal) and fiscal dominance (passive money/active fiscal) ... can produce identical macroeconomic equilibria. That is, any economic outcomes that a monetary dominant regime produces can be replicated by a fiscal dominant regime’ generating ‘observational equivalence’ when analysing policy outcomes. See also Eusepi and Preston (2018), Cochrane (2022a, b).

To test whether a cointegrating relationship holds, we first test whether the relevant variables have a unit root (with and without trend). If so, we include them in an OLS regression:

$$Y_t = \alpha_0 + \alpha_1 Trend + \theta X_t + e_t \quad (1)$$

where Y_t is the non-stationary [I(1)] dependent variable (rents or house prices), $Trend$ is a time trend (which is omitted if not required for cointegration⁶), X_t is a vector of non-stationary variables chosen in accordance with the studies cited above, e_t is a stationary residual; α_0 , α_1 and the vector θ are coefficients to be estimated. We run a Dickey-Fuller test on the estimated residuals, $\hat{e}_t$, with the null hypothesis that $\gamma = 0$ in equation (2), using critical values given by MacKinnon (2010):

$$\Delta \hat{e}_t = \gamma \hat{e}_{t-1} + \varepsilon_t \quad (2)$$

If we reject the null hypothesis in (2), we conclude that the residuals of equation (1) display mean reversion, so the variables exhibit a long run (cointegrating) relationship.⁷ By itself, a cointegrating relationship does not necessarily imply that the dependent variable in equation (1) is (Granger)-caused by the independent variables. To test whether this is the case, we estimate an error correction equation (3), and test whether the error correction coefficient, β , is negative and significantly different from zero. If the null hypothesis is rejected, Y_t converges to the value predicted by the long-run relationship:

$$\Delta Y_t = \beta \hat{e}_{t-1} + \varepsilon_t \quad (3)$$

Even when equation (1) is a cointegrating relationship, we cannot directly use it for inference since the estimates have a non-normal distribution. Instead, we estimate a DOLS equation (using robust standard errors), which expands equation (1) by including lag and lead ΔX_t variables, as in (4):

$$Y_t = \alpha_0 + \alpha_1 Trend + \theta X_t + \sum_{j=-p}^p \delta_j \Delta X_{t-j} + u_t \quad (4)$$

The standard errors from equation (4) have a normal distribution in large samples, so standard inference can be applied to the θ vector. In our application, we use one lag and one lead value of ΔX_t .

To apply the regression specification in (4) to our property pricing model, we use DOLS regressions applied to our two Y_t variables, house prices and rents, recognising the potential endogeneity between them. For our X_t vector, we adapt the regional house price model of Grimes and Hyland (2015) to our macroeconomic context by including per capita income and the dwelling ratio. We further extend the model to capture the impact of international and domestic asset market sentiments on property prices by including a US share price index and an index of New Zealand banks' non-performing loans (NPL) respectively.

⁶ Our subsequent empirical tests show that *Trend* is not required for cointegration in any of our specifications.

⁷ This conclusion holds even in the presence of codetermination of the variables.

Finally, to capture directly the effects of monetary policy we add the (proxied) effective mortgage rate to regressions, together with the RBNZ’s total assets (capturing the Bank’s use of unconventional monetary instruments). This latter variable, as noted earlier, at least during the COVID-19 period, is likely to capture the combined effects of pandemic-related fiscal polices, via the RBNZ’s purchases of government bonds, issued to finance large pandemic-related increases in public spending. As the charts discussed in section 3.2 show, this asset variable displayed unprecedented increases (by historical standards) during, and in the immediate aftermath of, the pandemic.

3.2 Macroeconomic data

Table 1 provides definitions and sources for data on the macroeconomic, and policy-related, variables included in regressions below. We use two property price indices: a quality adjusted house price index from the Real Estate Institute of New Zealand (REINZ) and a (geometric mean) index of residential rents. Both prices are nominal and are at the national level. Variables included in the X_t vector include a Statistics New Zealand (StatsNZ) income series of average weekly earnings, and the population to dwellings ratio proposed by Grimes and Hyland (2015). Financial variables include the credit market condition proxies: the US share price and the NPL ratio, plus the two monetary/fiscal policy variables: the mortgage rate, and RBNZ total assets (see Table 1).⁸

Table 1: Macroeconomic variable definitions and sources

Variable	Definition	Source
Rents	Geometric mean of new rents lodged with tenancy bond services	MBIE
HPI	House Price Index (quality adjusted)	REINZ
Wages	Average weekly earnings (quarterly interpolated to monthly)	StatsNZ
Mortgage rate	6-month lagged 2-year mortgage rate	RBNZ
Dwelling ratio	Ratio of population to total dwellings (quarterly interpolated to monthly)	StatsNZ
RBNZ assets	Total assets of RBNZ	RBNZ
US shares	US Share price (reported by FRED from OECD database)	FRED
NPL ratio	Ratio of banks’ non-performing loans to total bank assets ⁹	RBNZ

The data are all available from June 2005 – December 2024, giving 235 monthly observations.¹⁰ Each variable is tested for a unit root using an ADF test with results reported in Table 2. The null hypothesis of a unit root cannot be rejected for any of the variables, so

⁸ RBNZ reported an effective mortgage rate through to January 2017 when the series was discontinued. We tested which of the (current and lagged) individual mortgage rates of different tenures (floating, 6-month, 1-year, 2-year, 3-year, 4-year, 5-year) had the highest correlation with the effective mortgage rate for the period 2004(12)-2017(1) over which these rates overlapped with the effective mortgage rate. The 6-month lagged 2-year rate had the highest correlation coefficient (0.967) of all alternatives, so is used henceforth to represent the effective house mortgage rate.

⁹ The source for 2008(12)-2024(12) is RBNZ series BSAQS.MAR2A4.P; source for 2004(12)-2008(12) is the quarterly series derived by Grimes and Hyland (2015) from prior RBNZ data, interpolated to monthly. The two series have identical data for the overlapping month, 2008(12).

¹⁰ Data for all variables other than the effective mortgage rate are available starting in January 2005, as shown in subsequent figures.

each variable is treated as being non-stationary. Given the time series properties of the data, we describe the variables through a series of time series figures (since standard descriptors such as mean, etc., are not meaningful for non-stationary data).

Table 2: ADF tests with and without trend: p-value for null of unit root

Variable	No trend	With trend
ln(Rents)	0.975	0.278
ln(HPI)	0.886	0.525
ln(Wages)	0.998	0.994
Mortgage rate	0.355	0.616
ln(Dwelling ratio)	0.589	0.916
ln(RBNZ assets)	0.803	0.812
ln(US shares)	0.844	0.220
ln(NPL ratio)	0.472	0.758

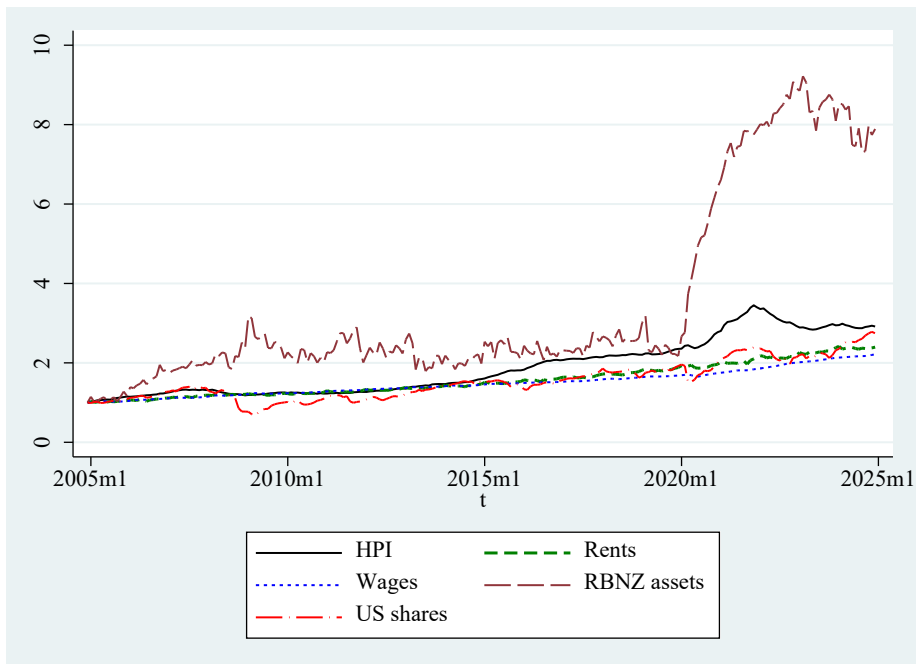
Notes: Each Augmented Dickey-Fuller (ADF) test includes 3 lags; varying the lag length does not alter non-rejection of the null hypothesis. Variables are as defined in Table 1.

Figure 1 graphs the four price variables (HPI, rents, wages, US share prices) together with RBNZ assets, with each variable indexed to 1.0 in December 2004. The massive spike in RBNZ assets from December 2019 to November 2022 is apparent as is the concurrent (but much smaller) increase in house prices. Given the distorting nature of the RBNZ asset series on the scale, Figure 2 repeats the graph with the omission of RBNZ assets. It is apparent that the rise in rents outpaced wages but was considerably smaller than the increase in house prices. The figure also shows that major fluctuations in the US share price appear to be correlated (at least on some occasions) with fluctuations in New Zealand's house prices.

Figures 3 to 5 graph the NPL ratio, mortgage rate, and dwelling ratio respectively. The large rise in non-performing loans associated with the global financial crisis, 2009-10, is evident as is its subsequent fall (Figure 3). Any NPL rise associated with COVID-19 in 2020 is however much smaller, soon to be followed by a fall. The mortgage rate declined fairly steadily from 2008 through to late 2021, after which a tightening in monetary policy led to a rise in the rate (Figure 4).¹¹ The dwelling ratio increased from 2013 to early 2020 reflecting high net inward migration not matched by similarly strong dwelling growth. Border closures during the COVID-19 pandemic, and subsequent tightening of immigration rules, have since led to a substantial fall in the dwelling ratio (Figure 5).

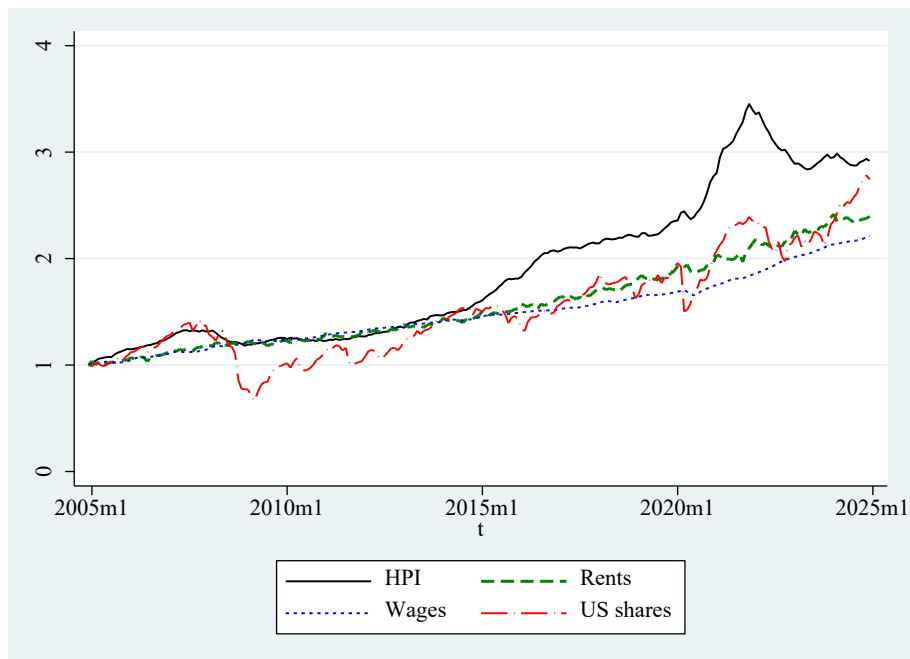
¹¹ Though mortgage rates remained above 3% at the height of the Covid pandemic, in monetary policy terms New Zealand could be considered to have reached the effective zero lower bound by March 2020 when the OCR reached its low of 0.25%, remaining there until September 2021. Thereafter the OCR rose steadily to reach 5.5% in May 2023.

Figure 1: Price variables and RBNZ assets



Note: Values have been indexed to 1.0 at December 2004.

Figure 2: Price variables



Note: Values have been indexed to 1.0 at December 2004.

Figure 3: NPL ratio (%)

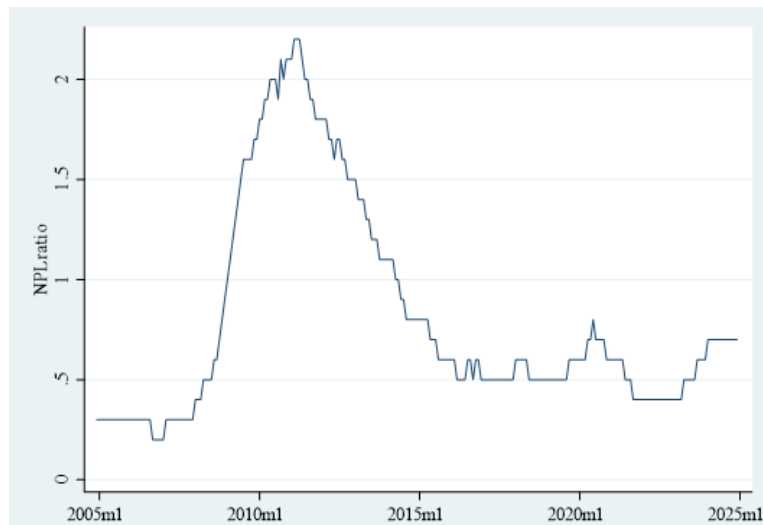


Figure 4: Mortgage rate (%)

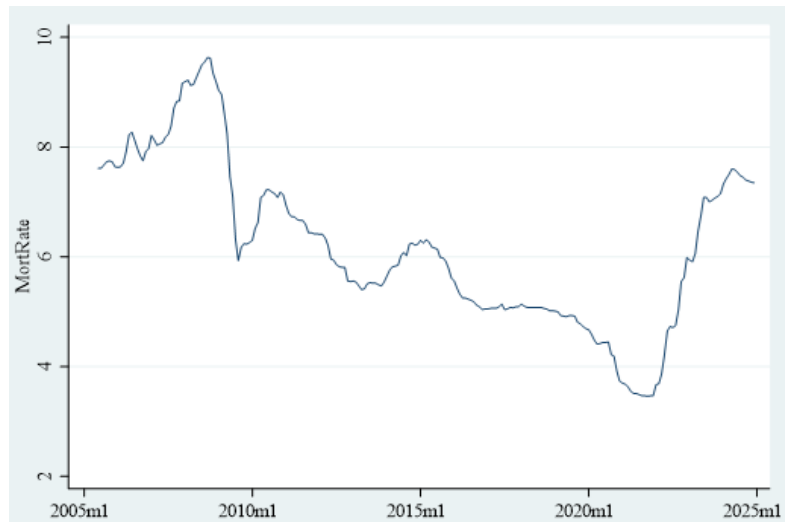


Figure 5: Dwelling ratio (population/dwellings)



4. Rent and House Price Regression Estimates

We begin by considering which macroeconomic variables predict New Zealand’s long-run rental prices. The HTWG report and Figure 2 suggest that rents may bear a closer long-run relationship with incomes than with house prices: the relationship of rents with incomes being expected from the model outlined earlier. However, supply factors which affect costs to landlords (e.g. house prices and interest rates) may also impact the real value of rents (Grimes and Hyland, 2015). Accordingly, we test for a cointegrating relationship between (ln) rents, (ln) wages, (ln) house prices, and mortgage interest rates.¹²

Results for the cointegrating equation are presented in Table 3, column (1), in which a unit root in the residuals is rejected (i.e. cointegration holds).¹³ The error correction term¹⁴ shows that rents respond significantly (and quickly) to lagged disequilibrium; almost 30% of any disequilibrium is corrected within one month. The DOLS estimates in column (2) indicate that rents are positively and significantly associated with both wages and house prices with elasticities of 0.82 and 0.24 respectively. Controlling for these influences, a one percentage point (pp) rise in the mortgage rate is associated with a 0.3% rise in rents.

House prices are modelled in two ways to test robustness. First, column (3) adopts the theoretical model derived by Grimes and Hyland (2015) in which house prices are a function of the dwelling ratio, incomes and the mortgage rate. These factors are supplemented by the three financial market/policy factors outlined in Section 3.1: the proportion of banks’ non-performing loans (reflecting credit constraints caused by a reluctance by banks to lend when their balance sheets are impaired), the US share price index (to reflect global asset market sentiment), and total RBNZ assets, i.e. the size of the RBNZ balance sheet (to reflect the influence of unconventional monetary policies implemented when interest rates approached the zero lower bound). In particular, through the COVID-19 pandemic, monetary authorities (including the RBNZ) engaged in quantitative easing designed to provide additional monetary stimulus over and above that channelled through interest rates. In New Zealand’s case, as in several other countries, this quantitative easing reflected a monetisation of concurrent fiscal easing, so this term, as noted earlier, reflects coordinated monetary and fiscal policy decisions. As shown in Figure 1, RBNZ assets rose by 318% between December 2019 and November 2022 during this quantitative easing phase and then fell by 13% through to December 2024 (the end of our sample).

¹² The use of logarithms means that estimated coefficients can be interpreted as elasticities. The mortgage interest rate is not logged since an interest rate is already approximately equal to the log of the gross interest rate. Results are similar if (ln) mortgage rate is used instead.

¹³ See the row “Gamma (γ)” in Table 3 and the associated “Cointegration test statistic”.

¹⁴ See the row “Error correction estimate (β)” in Table 3.

Table 3: Rent and house price estimates

	(1) ln(Rents)	(2) ln(Rents)	(3) ln(HPI)	(4) ln(HPI)	(5) ln(HPI)	(6) ln(HPI)	(7) ln(Rents)	(8) ln(Rents)
ln(HPI)	0.2341*** (0.0091)	0.2381*** (0.0102)						
ln(Wages)	0.8262*** (0.0142)	0.8207*** (0.0154)	0.8490*** (0.0423)	0.8631*** (0.0477)			0.9727*** (0.0199)	1.0237*** (0.0241)
Mortgage rate (%)	0.0035*** (0.0008)	0.0034*** (0.0008)	-0.0293*** (0.0025)	-0.0319*** (0.0028)	-0.0326*** (0.0025)	-0.0337*** (0.0024)	0.0040*** (0.0012)	0.0020 ⁺ (0.0013)
ln(Rents)					0.8506*** (0.0401)	0.8474*** (0.0460)		
ln(Dwelling ratio)			3.6528*** (0.2928)	3.5545*** (0.3371)	1.9868*** (0.3192)	1.9976*** (0.3453)	2.0257*** (0.1376)	1.8216*** (0.1395)
ln(RBNZ assets)			0.1773*** (0.0095)	0.1677*** (0.0128)	0.1350*** (0.0105)	0.1326*** (0.0137)	0.0537*** (0.0045)	0.0382*** (0.0055)
ln(US shares)			0.0984*** (0.0227)	0.0978*** (0.0227)	0.0713*** (0.0226)	0.0747*** (0.0228)	0.0421*** (0.0107)	0.0277** (0.0117)
ln(NPL ratio)			-0.1111*** (0.0063)	-0.1114*** (0.0067)	-0.0995*** (0.0058)	-0.0998*** (0.0057)	-0.0113*** (0.0030)	-0.0125*** (0.0029)
Lag & lead differences	No	Yes	No	Yes	No	Yes	No	Yes
R ²	0.995	0.995	0.991	0.993	0.992	0.993	0.996	0.997
N	235	233	235	233	235	233	235	233
Gamma (γ)	-0.3017***		-0.1696*		-0.2054**		-0.3907***	
Cointegration test statistic	-6.428		-4.654		-5.173		-7.514	
Error correction estimate (β)	-0.2853*** (0.0538)		-0.1036*** (0.0217)		-0.0894*** (0.0260)		-0.3151*** (0.0600)	

Notes: Constant included but not reported; gamma is the coefficient on the lagged residual, γ , from equation (2); cointegration test statistic is the 't-value' on γ in equation (2); error correction estimate (with robust standard error reported) is the coefficient on the lagged residual, β , in equation (3); coefficients in odd numbered columns correspond to estimates from equation (1), with no significance levels reported owing to the non-standard distribution; coefficients in even numbered columns (with significance levels reported) correspond to estimates from equation (4); robust standard errors reported in parentheses; significance levels: ***p<0.01, **p<0.05, *p<0.1, [+ p=0.12]. The full sample period, using monthly data, is June 2005 - December 2024; DOLS sample period is July 2005 – November 2024.

The estimates in column (3) show that this model rejects a unit root at $0.05 < p < 0.1$, i.e. a weak cointegrating relationship is apparent. The relationship remains cointegrated if either the US share price index or wages is omitted from the regression, though these variables are retained given their significance in the DOLS estimates (discussed below). Cointegration fails to hold if either of the ‘core’ theoretical variables, the dwelling ratio or the mortgage rate, is omitted confirming their key role in explaining long-run house prices. Cointegration also fails to hold if either the NPL ratio or RBNZ assets is omitted. Thus, these additional financial policy influences (the NPL ratio and RBNZ assets) are required in addition to the core theoretical determinants to provide a valid explanation for the long run path of house prices.

The error correction estimate in column (3) shows that house prices react to a disequilibrium with approximately 10% of any disequilibrium corrected within a month. The DOLS estimates in column (4) show an elasticity of house prices with respect to the dwelling ratio of 3.55, and with respect to wages of 0.86. A 1pp fall in the mortgage rate is associated with a 3.3% rise in house prices. Each of the financial variables is significant at $p < 0.01$. An increase in non-performing loans is associated with a reduction in house prices reflecting credit restrictions (with an elasticity of -0.11), an increase in US share prices is associated with an increase in New Zealand house prices (elasticity of 0.10), while the elasticity of house prices with respect to RBNZ assets is 0.17.

As Figure 1 makes clear, the time-series of RBNZ assets reflects a highly unusual and rapid balance sheet expansion (by historical standards) during COVID-19 as the RBNZ purchased large quantities of government bonds. To further explore how the pandemic-specific changes in monetary-fiscal policy affected house prices, Table 4 uses the parameters from Table 3, column (4) together with the observed changes in the X vector variables from December 2019 to November 2022 – the period of relatively rapid expansion of RBNZ assets – to examine the (long-run) marginal effects of each variable on house prices.

Table 4 shows that $\ln(\text{RBNZ assets})$ increased by 1.43 between December 2019 and November 2022 – or equivalently RBNZ assets more than quadrupled over the period. The marginal effect on $\ln(\text{HPI})$ shows that this channel is associated with an increase of 0.240 increase in $\ln(\text{HPI})$; that is, a 27% increase in New Zealand house prices over this three-year period. It can be seen that this predicted $\ln(\text{HPI})$ effect is almost identical to the actual increase in house prices observed over the same time (0.237). That is, the impacts of the other right-hand side variables largely cancel each other out during this period, leaving changes in RBNZ assets as the main source of the observed house price increases. It is also notable that over this period, net immigration – which is typically the major driver of short-term house price spikes in New Zealand – collapsed, causing the dwelling ratio to fall substantially. This influence therefore had a *downward* impact on house prices rather than contributing to the house price surge during the COVID-19 pandemic.

Table 4 Long-run (Marginal) Effects on HPI, Dec. 2019 to Nov. 2022¹⁵

	ln(HPI)	ln(Wages)	ln(RBNZ Assets)	ln(US Shares)	ln(NPL Ratio)	ln(Dwell Ratio)	Mortgage Rate
Observed change	0.237	0.172	1.430	0.100	-0.405	-0.035	0.93 ¹⁶
Predicted HPI effect (ln points)	0.288 ^a	0.149	0.240	0.010	0.045	-0.126	-0.030
Predicted HPI effect (% change)	33.4%	16.1%	27.1%	1.0%	4.6%	-11.8%	-3.0%

Note: ^a This is the total effect on ln(HPI) from the other 6 terms in this row, hence excluding any error correction, short-run, or unexplained (residual) effects.

The unusually large observed changes in RBNZ assets in association with the pandemic raises the question of whether our estimated effects for this variable over the whole period are essentially driven solely by the pandemic-related expansion. To test this further, we re-ran the DOLS regression in column (4) of Table 3 for the period July 2006 to December 2019. Results are shown in Appendix Table A1 alongside the full sample results (July 2006 to November 2024). Estimates for the elasticity of house prices with respect to wages are similar in each case (0.92 for the shorter sample versus 0.86 for the full sample) while the elasticity with respect to the dwelling ratio is higher in the shorter sample (5.73 versus 3.55). The effect size for each of the financial variables is reduced in the shorter sample, but in each case the direction of effect remains consistent with the full sample. Other than the mortgage rate estimate, which reduces considerably in absolute size and significance ($p=0.105$), the estimated effects for US shares, the NPL ratio and RBNZ assets remain significant at $p<0.01$. Notably, the elasticity with respect to RBNZ assets falls, but only moderately from 0.17 (full sample) to 0.13 (shorter sample); hence the shorter sample estimate which excludes the pandemic period provides support for the hypothesis that house prices are related to the RBNZ's balance sheet size.

The second approach to estimating house prices recognises that the house price should reflect the present discounted value of rents. In this specification, we replace the wage variable with rents (noting, from the estimates in columns (1) and (2) that wages and rents are highly correlated).

¹⁵ Using long-run parameters from column (4) in Table 3.

¹⁶ Note that while mortgage rates fell during the initial phase of the pandemic (from 4.69% in Dec 2019 to a minimum of 3.46% by October 2021, by November 2022, they had risen again to reach 5.62%, as anti-inflationary policy tightened).

Results are presented in columns (5) and (6) of Table 3. The cointegrating relationship is now significant at $p < 0.05$ and the error correction term remains significant at $p < 0.01$. The estimated elasticity for the dwelling ratio falls to 2.0 in this specification, possibly because that ratio also influences rents. The influence of the mortgage rate and of the other financial variables, including RBNZ assets, remains similar to the estimates in columns (3) and (4).

If rents are a function of house prices, as in column (1), and house prices are a function of rents, as in column (5), then it follows that rents should be a function of the factors that determine house prices. Accordingly, we model rents as a function of the variables included in the house price specifications, excluding house prices themselves. The results are presented in columns (7) and (8). Cointegration holds ($p < 0.01$) and the error correction coefficient is both large (in absolute value), at -0.32, and highly significant ($p < 0.01$). Other than the mortgage rate, each of the variables estimated to affect house prices also affects rents. The elasticity of rents with respect to wages is now almost exactly unity (1.02). An increase in the dwelling ratio, US share prices and RBNZ assets each has a positive effect on rents, while an increase in non-performing loans decreases rents. These results are consistent with the house price specification. The previous specifications indicate that the mortgage rate has offsetting effects on rents. A rise in the mortgage rate decreases house prices but, conditional on house prices, higher mortgage rates increase rents. The estimate in Column (8) implies that the net effect of interest rates on rents is either zero or slightly positive ($p = 0.12$); the point estimate implies that a 1pp rise in interest rates leads to a 0.2% rise in rents.

Taking these estimates together, there is strong evidence for New Zealand that house prices reflect the influence of incomes, the ratio of population to the dwelling stock, and exogenous financial market pressures (international asset prices and banks' non-performing loans). Furthermore, house prices are impacted by monetary policy via the mortgage rate and also via the rapid monetary-fiscal quantitative easing associated with the COVID-19 pandemic. As we show in Blamey et al. (2025) using New Zealand unit record data, property prices appear to have a direct impact on objective and subjective measures of the wellbeing of New Zealand households. Together with the results in this paper, it may be inferred that macroeconomic policies potentially act on wellbeing through the property price channel.

5. Conclusions

Recent analyses across a number of countries have noted that the fiscal and monetary policy responses to the COVID-19 pandemic appear to have been associated with especially rapid increases in asset prices – equities and/or property. This, in turn, has encouraged innovations in modelling of pandemic-type recessions that simultaneously account for asset price rises, not least because the previous global recession, the GFC of 2008-09, was characterised initially by dramatic *falls* in property prices. Partly as a result, post-GFC macro modelling of recessionary shocks, for

example by central banks, has tended to downplay concerns about the potential for shock-related property price *rises*. As we noted in section 2, post-COVID-19 this omission is being addressed both in conceptual/computational macro models and in empirical exercises.

Our paper adds to this empirical literature by examining the macro determinants of property prices in New Zealand, including the use of monetary and fiscal policy instruments and by incorporating the Covid-related period in particular.

Our results provide strong support for a causal impact on New Zealand property prices from monetary policy via changes in interest (mortgage) rates and RBNZ assets in addition to other determinants related to both foreign and domestic credit market conditions, and the housing supply-demand balance as captured by the ratio of New Zealand's population to its residential dwelling stock. For the Covid and initial post-Covid period in particular, the large estimated house price effects from RBNZ asset increases are intimately related to the government's fiscal decisions during the pandemic via bond financing of rapidly expanding public spending. In New Zealand's case this involved explicit coordination between the Treasury department and RBNZ as both government institutions quickly adopted policies in early 2020 to minimise the domestic recessionary impact of the global pandemic. The consequent rapid surge in house prices may have been both unintended and unforeseen (at least in its magnitude) but nevertheless resulted in substantive property market and wellbeing consequences for the country.

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Appendix Table A1: Column (4) of Table 3 with differing sample periods

Sample period	Jul 2006-Nov 2024	Jul 2006-Dec 2019
Dependent variable	ln(HPI)	ln(HPI)
ln(Wages)	0.8631*** (0.0477)	0.9187*** (0.0925)
Mortgage rate (%)	-0.0319*** (0.0028)	-0.0061 ⁺ (0.0038)
ln(Dwelling ratio)	3.5545*** (0.3371)	5.7330*** (0.3362)
ln(RBNZ assets)	0.1677*** (0.0128)	0.1261*** (0.0223)
ln(US shares)	0.0978*** (0.0227)	0.0685*** (0.0245)
ln(NPL ratio)	-0.1114*** (0.0067)	-0.0840*** (0.0073)
Lag & lead differences	Yes	Yes
R ²	0.993	0.991
N	233	174

Notes: Robust standard errors reported in parentheses; significance levels: ***p<0.01, ⁺p=0.105.

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