March 2021

Supply and Demand: A Quantitative History of BC Home Prices

- Growth in home prices is a function of many factors and those factors do not always impact prices to the same degree
- Shocks to housing demand and interest rates are the largest contributors to fluctuations in home prices, but provincial and municipal governments have limited to no ability to control these factors
- Policies to increase the overall housing stock and grow the supply of residential listings would be enormously beneficial to controlling future price growth

Discussions about the provincial housing market and appropriate housing policy are often distracted by arguments over which factors are causing elevated home prices, with some pointing to out-of-control demand and others to lack of supply. These arguments can be perplexing to economists as home prices are driven by various forces and not always to the same degree. This market intelligence will attempt to answer whether it's possible to say how much of the last decade's rise in home prices we can attribute to changes in supply, demand, interest rates and other factors, and what this analysis says about appropriate policy responses.

What factors have been the most important in driving home prices?

An increase in home prices often has several underlying factors and it can be difficult to distinguish which of those factors is the principal cause. That difficulty can lead to misdiagnosed policy decisions and media narratives. Disentangling the various drivers of home prices is not a simple task. For example, low interest rates are often the result of policies designed to stimulate economic growth, meaning we frequently see falling mortgage rates and employment growth at the same time. Moreover, these factors impact the housing market and economy with long and variables lags. Quantifying, or "identifying" in economic jargon, to what extent a rise in home prices is due to individual factors is therefore complex. However, with some intuitive assumptions and the right framework, we can make solid estimates that should provide insight into the history of BC home prices.

In this analysis, we use assumptions about the relationship between five important housing market and economic variables to isolate four specific "shocks," or forces that drive home prices. The five housing market and economic variables are:

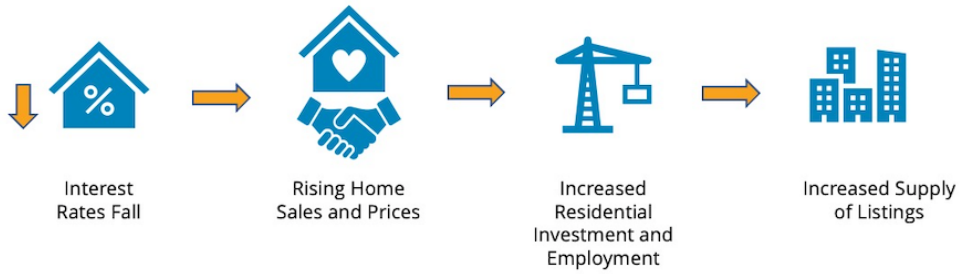
1. the growth in inflation-adjusted home prices,
2. the 5-year fixed mortgage rate less inflation expectations,
3. new residential listings,
4. the sales-to-new listings ratio, and
5. provincial employment growth.

Meanwhile, we characterize the four "shocks," or forces driving prices that arise from unexpected movements to these five variables, as:

- demand shock,
- supply shock,
- mortgage rate shock, and
- price growth expectations shock.

An illustration of how the **mortgage rate shock** is defined in our model is shown in Figure 1 below.

Figure 1: Simple Illustration of Mortgage Rate Shock



A decline in 5-year fixed mortgage rates leads to an increase in home sales and rising home prices. Rising prices lead to increased residential investment and employment, and eventually, a rise in new home listings.

Our **demand shock** focuses on provincial employment, to isolate the impact of a growing economy on demand for housing. The **supply shock** is measured by new listings, recognizing that the availability of homes for immediate purchase drives market prices. Finally, the **price growth expectations shock** can be considered similar to price growth produced by speculative demand.

Figure 2: Relative Importance of Each Shock In Explaining Price Fluctuations (1982-2020)

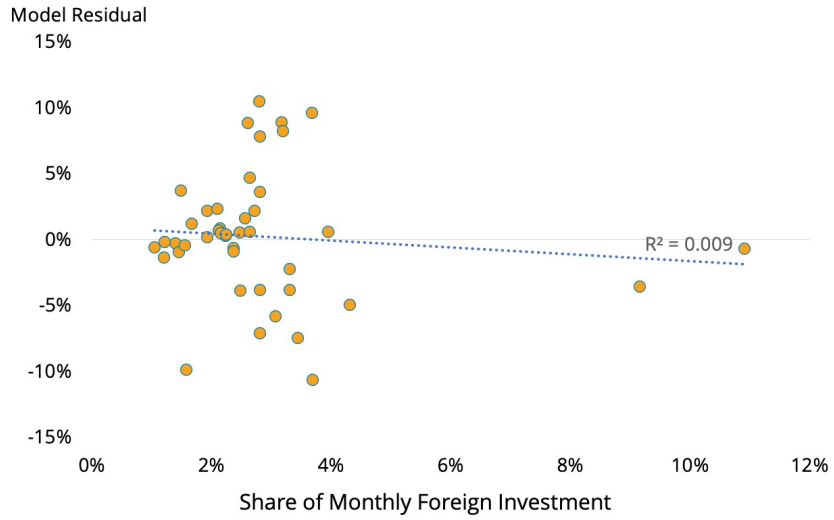
(Forecast Error Variance Decomposition)

Source: BCREA Economics

We used these four shocks to estimate which factors drove growth in home prices over the past four decades. The exact assumptions and methodology are detailed in Appendix 1.

From 1982 to 2020, the demand shock and mortgage rate shock are the most important factors in explaining fluctuations in BC home prices. These shocks accounted for 24 and 22 per cent of the total growth in home prices, respectively. The price growth expectations shock accounts for a further 18 per cent of growth, and supply shocks account for 16 per cent. Altogether, those four shocks explain about 80 per cent of fluctuations in home prices since 1982.

Figure 3: Unexplained Variation vs Foreign Investment



Source: BCREA, DataBC

As the model we used is based on five variables but we only identify four shocks, there is some residual fluctuation left unexplained, which is typical in the literature[1]. This unexplained portion is a function of the sales-to-new listings ratio, which helps capture short-run movements in prices but encompasses factors impacting both supply and demand, which makes it difficult to isolate or interpret as a stand-alone shock. That said, we did estimate several alternative model specifications, focusing on external demand not linked to growth in the provincial economy, using the exchange rate, immigration and net migration, but the results of the analysis did not materially change.

Another high-profile candidate for explaining price growth is foreign investment. We are constrained due to the limited set of official foreign investment data, however, based on the small amount of data that is available, we did not find any correlation with the unexplained residual variation – see Figure 3. This suggests that the impact of foreign investment is already being captured in one of the four shocks defined in our model.

Historical decomposition of price growth

On average, shocks to demand and mortgage rates are the dominant source of rising prices, but these contributions are not constant. The factors that push home prices above or below their long-run trend fluctuate over time, with some factors taking greater prominence over certain periods.

Figure 4 is a historical decomposition[2] of inflation-adjusted price growth. It shows the estimated individual contribution of each of our four shocks from 1982-2020. As noted earlier, our four shocks explain 80 per cent of fluctuations in home prices since 1982.

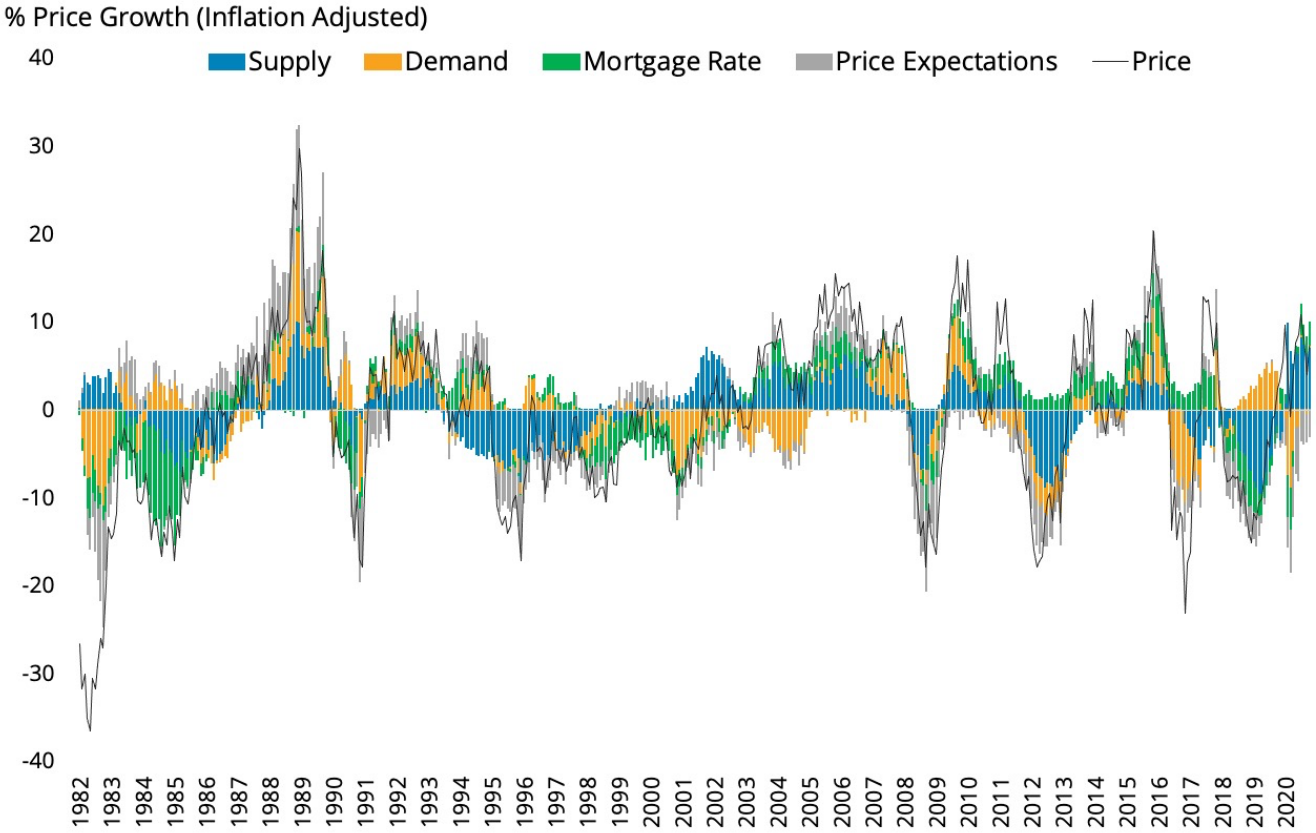
[1] See Towbin and Weber, "Price Expectation and the US Housing Boom," IMF Working Paper, July 2015.

[2] A historical decomposition expresses an endogenous variable in a vector autoregression model as the sum of its long-run trend and past structural shocks. For comparison, the black line in Figure 4 shows de-trended real price growth for BC average home prices.

Looking at Figure 4, we can see that the historical decomposition of our model follows quite closely with how prices moved during the period (black line in Figure 4[3]).

In Figure 4, the coloured bars that are below zero mean that those shocks were putting downward pressure on prices; when they are above zero, the identified shocks were putting upward pressure on prices. For example, a negative shock to supply will mean upward pressure on home prices.

Figure 4: Historical Decomposition of Real Price Growth



Source: BCREA Economics

The most prominent feature of Figure 4 is the volatility in BC home prices. Far from just a steady upward march, home prices have fluctuated from periods of rapid acceleration to periods of sharp declines. If we examine the narrative told by the historical decomposition, it lines up well with what we know about the history of the BC housing market and the provincial economy.

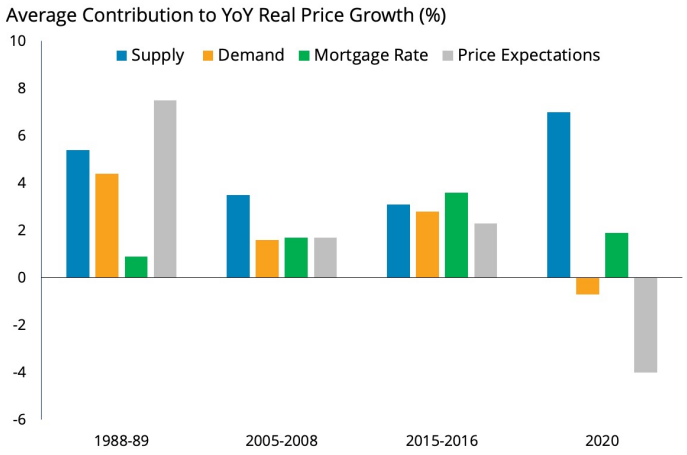
A bursting housing bubble in the early 1980s shows up here as a decline in price expectations along with a large shock to interest rates as mortgage rates hovered near 20 per cent for several years. The massive run-up in prices experienced in the late 1980s

[3] The price fluctuations shown in Figure 4 show deviations for inflation-adjusted price growth from its long-run trend or equilibrium value.

appears to have been largely driven by rapidly rising price expectations and a strong economy clashing with a very under-supplied market. Indeed, as shown in Figure 5, the model estimates that expectations of rapid price growth were more pronounced during that 1988-89 period than at any other time in the data

The 2005 to 2008 period, which saw consistently strong price growth, is estimated to have been primarily a function of low supply following a period in the early 2000s when both new home completions and new listings had trended to near-record lows. That said, other shocks also made consistently strong contributions. This was interrupted by the 2008/09 financial crisis, which shows up in the model as a large shock to demand, an overhang of supply, a credit-crisis-induced rise in mortgage rates and falling price expectations.

Figure 5: Comparing Drivers of Past Housing Booms

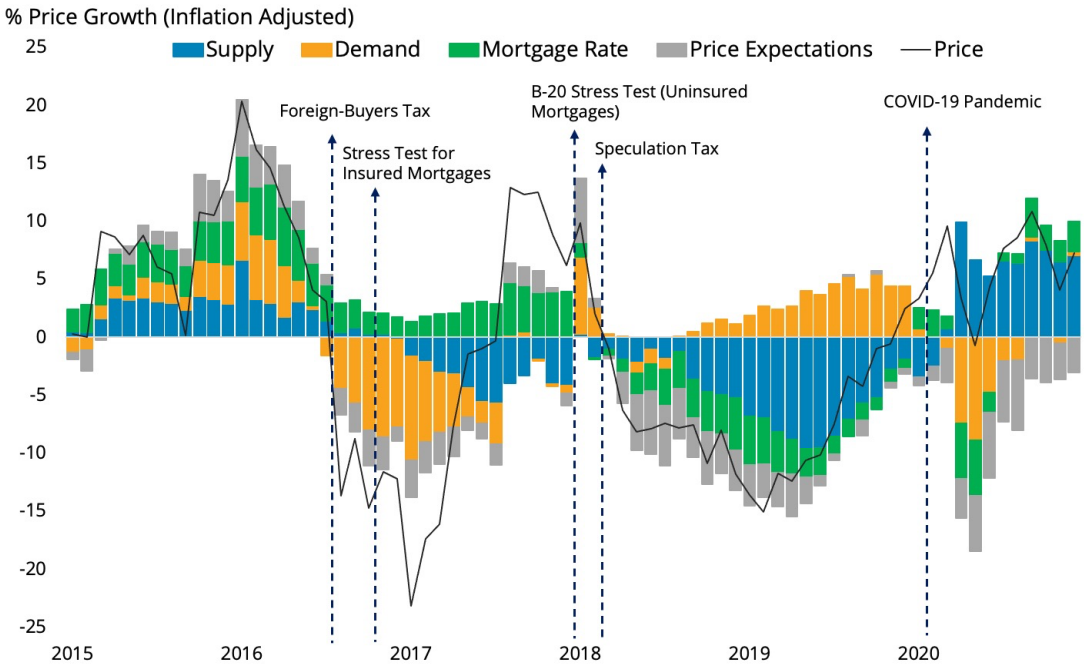


Source: BCREA Economics

A closer look at the recent past

Given the media and policy attention paid to the housing market in recent history, it is worth highlighting the key drivers of price fluctuations over the past five years. As Figure 6 shows, the period from 2015 to 2020 was particularly volatile, with swings in home prices driven by government policy, economic fluctuations, and most recently, a global pandemic.

Figure 6: Historical Decomposition of Real Price Growth 2015-2020

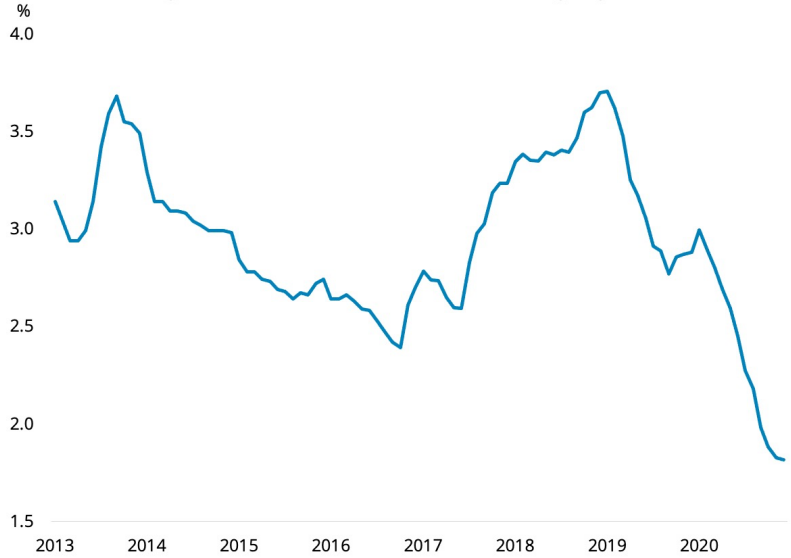


Source: BCREA Economics

The BC housing market experienced rapid price appreciation from early 2015 through to the summer of 2016. That acceleration is often attributed to an increase in foreign investment. However, as the historical decomposition shows, much of that period's price growth was driven by the usual fundamentals.

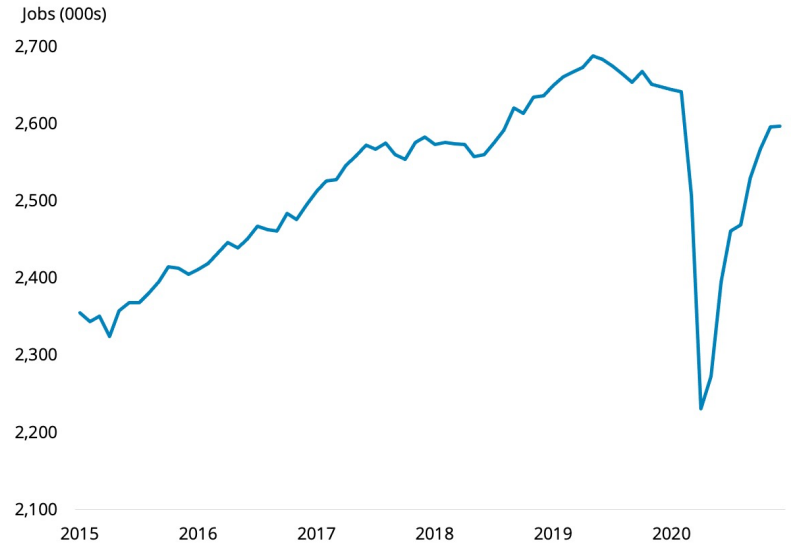
Mortgage rates had been steadily falling since 2013 and reached a then-record low of about 2.4 per cent in 2016. Meanwhile, employment in the province was rapidly expanding, growing by close to 10 per cent from 2015 to 2017. Those factors pushed prices higher, while new listings remained low, providing extra supply-side pressure. Where foreign investment may have been a significant factor is in forcing price expectations higher. However, the model weighs that impact as smaller in its relative contribution to price growth than pressures from supply, demand and mortgage rate shocks. The historical decomposition also shows that upward pressure from demand was waning even before the foreign-buyers tax was implemented in August 2016.

Figure 7: 5-Year Fixed Mortgage Rate



Source: RateSpy; BCREA Economics

Figure 8: BC Employment 2015-2020



Source: Statistics Canada

The model decomposes the impact of the 2016 foreign-buyers tax into a swift but relatively short-lived swing in price growth expectations accompanied by a large, negative demand shock. While employment had plateaued for a period in 2017, a resumption of strong job growth, combined with low mortgage rates, helped pull the market back into positive territory before mortgage rates began rising in late 2017, ultimately peaking nearly 1 full point higher by 2019. That rate increase was compounded by the B-20 mortgage stress test and provincial tax measures that created a temporary excess supply of listings in the market. However, once mortgage rates reversed course and began declining in mid-2019, and the impact of B-20 and changes to provincial tax policy began to fade, supply was quickly absorbed. This set the stage for what was expected to be a fairly average year in 2020.

Those expectations were upended with the outbreak of the COVID-19 pandemic, which shows up in our historical decomposition as a shock to employment and price expectations. Home prices have remained surprisingly strong throughout the pandemic, which the model attributes almost entirely due to much lower-than-expected supply. That makes intuitive sense since normally a negative economic shock of this size would lead to financial hardship and an increase in listings.

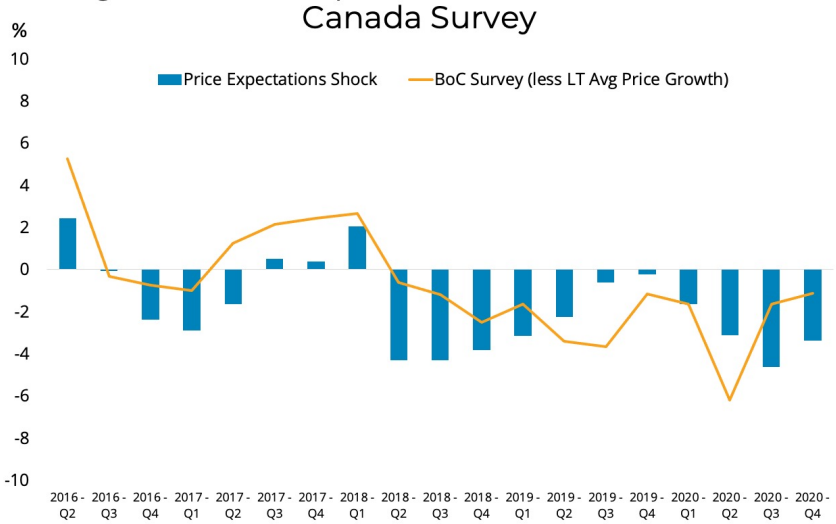
The initial rise in 5-year fixed mortgage rates at the start of the pandemic is shown to have contributed downward pressure on home prices, before a massive stimulus from the Bank of Canada forced mortgage rates to record lows. While mortgage rates are estimated to have made a significant contribution to price growth in 2020, that contribution is still slightly smaller than expected. Recall that the contributions of each variable are based on shocks, or the deviation of each variable from its model forecasted path. Since the model expects a large decline in mortgage rates due to the massive negative demand shock, the actual decline is not treated as a large shock as it's in line with the model forecast.

What does this analysis mean for government policy?

Clearly, demand shocks are a very important driver of prices. The most important factors driving demand include a strong labour market, income growth and healthy population growth. These are positives and should be encouraged, not limited, by policy choices.

Another key driver of price growth is the long-term downtrend in global interest rates. The forces behind this downtrend are numerous and well known, and importantly, are not under the control of those who make choices about local housing policy. Moreover, while rates are low, regulation around mortgage credit has never been tighter following several actions by the CMHC, most importantly the B-20 mortgage stress test.

Figure 9: Price Expectations Shock vs Bank of Canada Survey



Source: Canadian Survey of Consumer Expectations (Bank of Canada); BCREA Economics

There were certainly periods where expectations of rising prices played a fundamental role in rapid price growth. However, too many are quick to blame foreign investors or foreign capital as the primary source of those rising price expectations. Domestic investors and homebuyers are just as capable of inflated home price expectations as their non-resident counterparts.

Policymakers have already deployed various tools in hopes to dampen speculation with much of the province subject to a foreign-buyers tax and a speculation tax. However, the relatively low impact of foreign investment was further enforced in 2020 as borders closed due to the pandemic and foreign investment sank to under 1 per cent of sales volume. At the same time, home sales and prices recovered to a record-setting pace, fueled by domestic demand and a lack of supply.

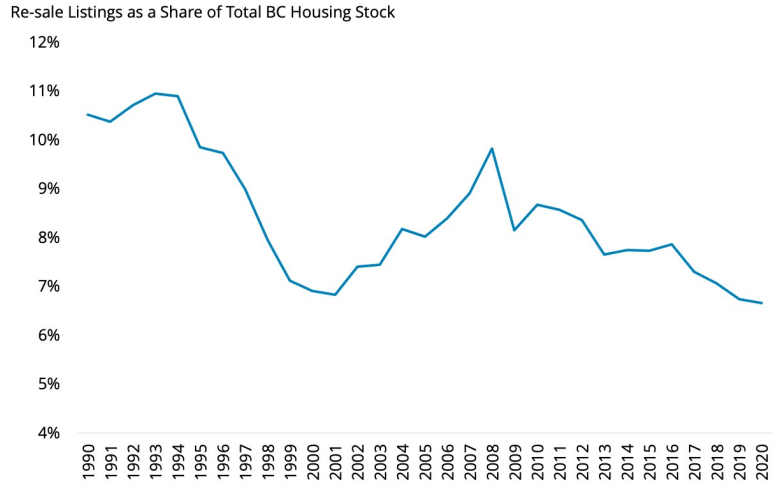
That leaves supply as the one factor over which municipal and provincial governments arguably have the most ability to influence. While a record number of units are under construction in the province, what matters to price growth is not simply future additions to the housing stock but rather how much of the housing stock is available now to meet rising demand.

If we look at the number of units available to buy in the market today, as measured by total listings, markets across BC are woefully undersupplied. Looking back in time at new listings, we see a concerning downtrend, both in absolute numbers and as a share of the BC housing stock. Some of that downtrend has to do with a low level of completions of new housing, which is also a function of how long projects are taking to complete.

If less and less of the housing stock is available to buy each year, prices are going to rise as the population grows at a faster rate. So, how do we counter that? By making housing more available through re-zoning and faster construction completion times. The latter is particularly important. The inability of supply to match rapidly changing demand in a timely fashion has intensified price pressures in the past and created conditions for periods of rapid price acceleration.

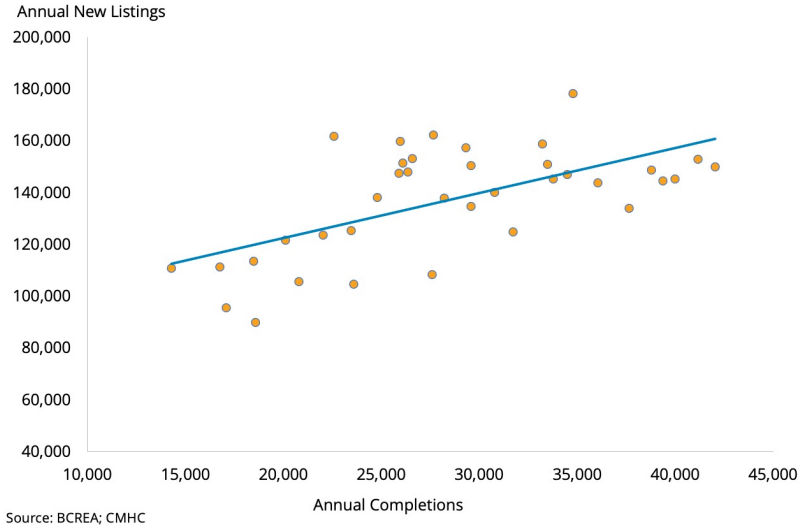
Policy steered toward better, faster matching of supply with rapidly changing demand would not solve affordability. Economic forces outside of our control are always going to have an impact on the housing market. However, thoughtful supply-side policies can at least act to temper rather than exacerbate these periods.

Figure 10: Downtrend in Share of Housing Stock for Sale



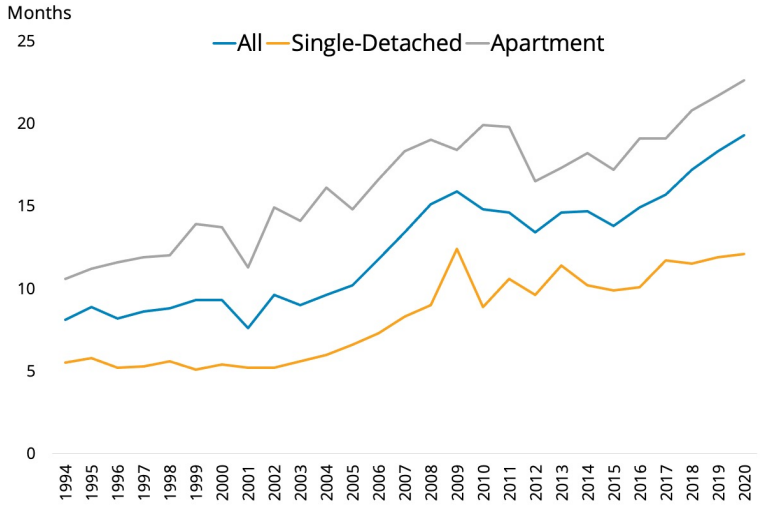
Source: BC Stats; BCREA

Figure 11: Higher Completions, Higher Listings



Source: BCREA; CMHC

Figure 12: Time to Complete Getting Longer



Source: CMHC

Conclusions

Given the results obtained from our analysis, what is the takeaway for policymakers?

The factors that drive demand to outpace supply are either out of the control of those who make provincial housing policy, are positives for the economy (like a strong labour market) or have already been addressed by policymakers. Indeed, in the past decade, the BC market has seen a litany of demand-side policy, most of which have had temporary impacts.

Supply is the only part of the equation that provincial and municipal policymakers have concrete control over. While we have tried a lot of different demand-side policies, there have been no major changes to the regulatory framework around supply. Perhaps it's time we try some?

Appendix 1: Methodology

We estimate a Vector Autoregression (VAR):

$$y_t = \sum_{i=1}^{P} A_i \, y_{t-1} + e_t$$

Where y_t is a vector of five variables: the per cent growth in inflation-adjusted home prices, new residential listings, the sales-to-new listings ratio, real 5-year mortgage rates and growth in BC employment.

Each of the model shocks is then identified using the sign restriction algorithm developed in Uhlig (2005). These sign restrictions are summarized in Table 1.

We identify four separate shocks through sign restrictions.[4] That is, we attempt to isolate model results that fit a standard set of assumptions about the behaviour of a demand shock, a supply shock, a mortgage rate shock and a price expectations shock. These shocks are defined as follows:

Demand Shock: a positive shock to housing demand from rising employment and income causes home prices to rise and increases supply as sellers opt to take advantage of higher prices. However, since supply is slower to react than demand, the sales-to-new listings ratio rises. The impact on mortgage rates assumes that the demand shock is being experienced nationwide, causing an increased demand for credit and therefore upward pressure on mortgage rates.

Supply Shock: an upward-sloping supply curve means that a decline in supply, measured by new listings in our model, will lead to rising prices. This supply shock could be the result of a slower pace of additions to the housing stock, changing demographics, zoning policy that leads to an under-supply of housing or other factors that lead to a lower-than-expected level of resale listings. Given no change in demand, this leads to a rising sales-to-new listings ratio until new listings are brought to the market. To aid in identification, we also impose the restriction that under-investment in residential housing leads to slower than expected employment growth.

Mortgage Rate Shock: a fall in interest rates, which makes borrowing cheaper, could result for several reasons such as a lowering of the overnight rate by the Bank of Canada or falling term-premiums, which leads to rising home prices. Rising prices lead to strong residential investment and an increase in employment. It is assumed that listings and residential investment rise in response to this higher demand. This results in the usual lag in matching supply with demand, which leads to an increase in the sales-to-new listings ratio.

[4] This framework is similar to Towbin and Weber, “Price Expectation and the US Housing Boom,” IMF Working Paper, July 2015.

Price Expectations Shock: we assume that home prices are forward-looking and depend on expected future prices and interest rates. Expectations of higher future prices will impact buying and selling behaviour today, perhaps through the so-called “fear of missing out” factor, leading to rising prices. Rising price expectations have two impacts on the supply side. First, we assume an increase in residential investment as developers begin projects now to take advantage of future prices. However, that supply is slow in coming to market. Potential sellers hold off on listing, anticipating higher future prices and creating a decline in listings and a rise in the sales-to-new listings ratio. Second, employment is assumed to rise as residential investment increases, which drives an increase in overall employment growth.

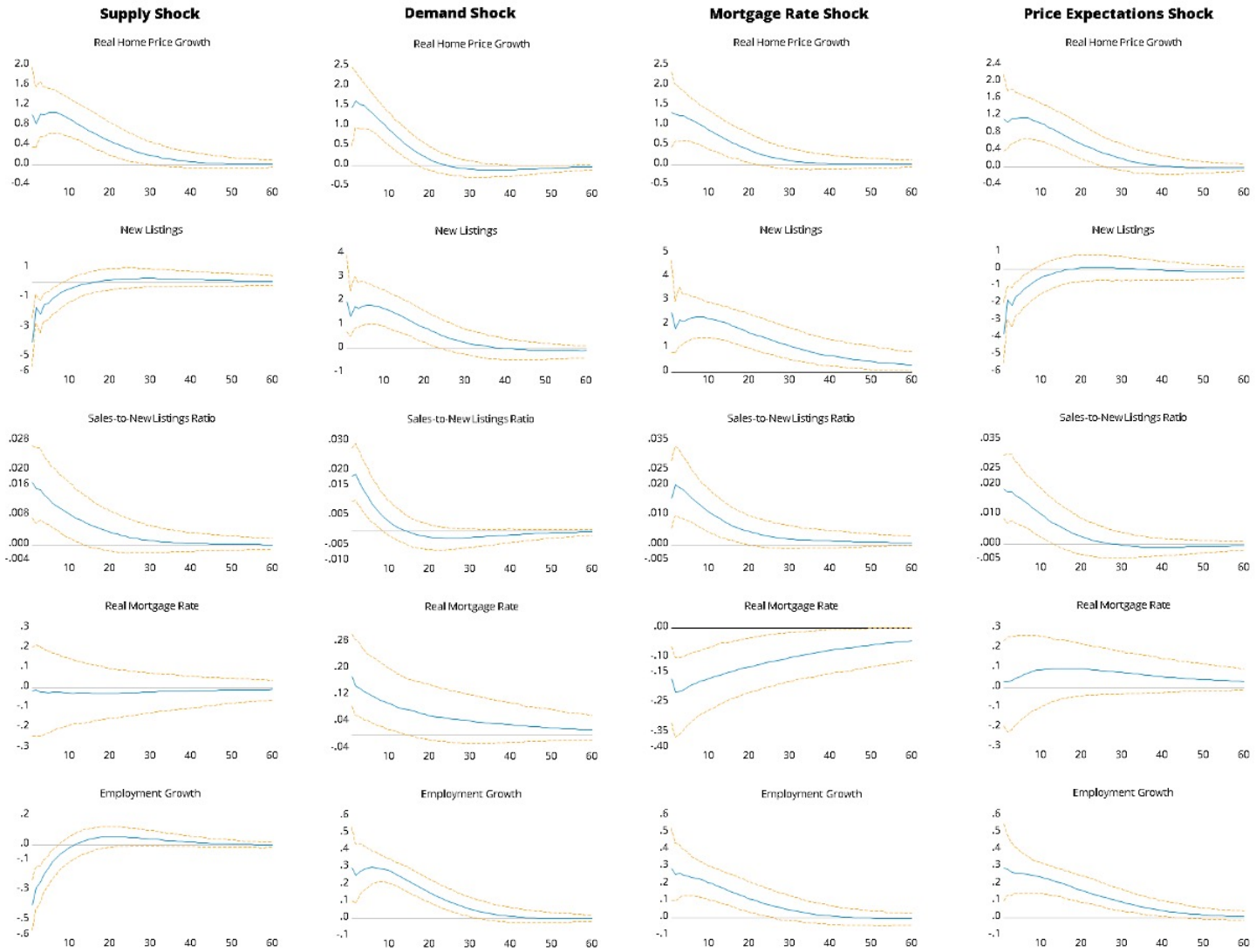
Table 1: Shock Identification

	Shock to:			
	Supply	Demand	Mortgage Rate	Price Expectations
Real Home Price	+	+	+	+
New Listings	-	+	+	-
Sales-to-New Listings	+	+	+	+
Real Mortgage Rate	Unrestricted	+	-	+
Employment	-	+	+	+

All shocks are based on a rise in home prices (+ means the variable is restricted to rise; - means the variable is restricted to fall for reach identified shock)

Visualizations of these four shocks, known as impulse response functions, are shown below. Each of the shocks is shown as an increase in home prices.

Figure 13: Estimated Impulse Response Functions



Source: BCREA Economics