

We conclude in this study that the shocks in demand and supply of housing explain only a very small part of the fluctuations in Swedish inflation and GDP. However, we do find that the fact that houses are used as collateral for loans reinforces the effects of monetary policy.

## House prices and the economy

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### We use a model to analyse the significance of the housing sector

House prices have risen rapidly in recent years. This raises some interesting questions:

1. How do house prices affect private consumption, housing construction, inflation and GDP growth?
2. How does monetary policy affect house prices?

The answers to these two questions may provide a clearer picture of how the interest rate affects inflation and growth. They are therefore important in enabling the Riksbank to set its interest rate at the right level.

We are also interested in measuring the effect of institutional changes that affect the housing market. One example is the requirement for a down-payment in cash, which has declined over the past two decades.

In an attempt to answer all of these questions we have used a model often quoted in academic literature (Iacoviello and Neri, 2007) to make calculations using Swedish quarterly data for the period 1986-2007.

### A model of a closed economy with two sectors

The model is a general equilibrium model that has some similarities to the Riksbank's model for the Swedish economy, Ramses.<sup>2</sup> A general equilibrium model provides an overall picture of the different components of the economy. It enables us to analyse how a shock will affect the economy in a unified framework, where one has hopefully taken into account the most important of all of the interdependencies existing between the different components of the economy.

The most important difference compared with Ramses is that this model includes the production of houses and households who borrow using their house as collateral. Moreover, it is a model of a closed economy, that is, the economy does not interact with other countries through foreign trade or capital flows.<sup>3</sup>

The model contains two sectors: one produces consumer goods (and services) and the other produces housing. Consumer goods are produced with the aid of labour and capital. To produce houses, land is also required.

There are two sorts of household: "patient" and "impatient". Impatient households are all those who are not allowed to borrow as much as they wish, for instance, young households or others who for some reason wish to spend their future income today. We call these households collateral-constrained.

All households can borrow or save at the given interest rate, but loans are only granted against collateral in the form of the borrower's house. It is not possible to borrow up to the entire value of the house. Some part must consist of a down-payment.

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<sup>2</sup> For a description of Ramses, see Adolfson, Laséen, Lindé and Villani (2007).

<sup>3</sup> The assumption of a closed economy is limiting. We are currently considering expanding the model into a model of an open economy. Our assessment is that the effects of housing prices on other consumption are further reinforced in an open economy, where loans can be taken out abroad. However, there may be counteracting forces for other macro variables.

The impatient households always choose to borrow the maximum amount for immediate consumption of goods and housing. Their capacity to consume will therefore vary in line with housing prices. If the value of the house increases, they can increase the size of their mortgage and thus consume more. This creates an extra channel for house prices to affect total demand in the economy.

The central bank sets the nominal interest rate in accordance with a simple policy rule (the same as in Ramses). The interest rate reacts mainly to deviations in the inflation rate from the target level and deviations in GDP from the long-term sustainable level.

## House prices have risen more rapidly than consumption on the whole

Figure 1 shows how much household consumption and real house prices (that is, house prices in relation to consumer prices) have increased since the first quarter of 1986 and up to the fourth quarter of 2007.<sup>4</sup> Please note that house prices have risen much more quickly than consumption. The fact that house prices have increased so quickly is partly explained in our model by productivity growth in the housing sector having been at a low level for a long period of time. The costs for producing housing have therefore risen more quickly than the costs for producing other goods. But according to the model, the upturn since the year 2000 is largely explained by an increase in demand for housing. We will provide an analysis of and a possible explanation for this development later on.

## The effects of demand for housing on the economy

We can illustrate how the model works by imagining that household demand for housing suddenly rises. In concrete terms, the change consists of households suddenly valuing housing higher than other consumption and choosing to spend a larger percentage of their incomes on their housing. This leads to house prices rising, which increases the scope for the impatient households to borrow. A quarter of all households are estimated to be collateral-constrained ("impatient"). They spend their recently borrowed money on both goods and housing. The patient households instead reduce their consumption in that they lend more money to the impatient households. But the net effect of the total private consumption is nevertheless positive.

When demand for housing increases, more housing is built and capital investment increases. GDP, which comprises the total sum of consumption, housing construction and investment, therefore increases. Inflation also accelerates as a result of costs rising when demand for both labour and capital increases. When inflation overshoots the target and GDP growth is no longer at a long-term sustainable level, the central bank has to raise the interest rate.

## Changes in the housing market have little effect on the economy

One might wonder how much of the variation in inflation and growth originates from sudden changes in the housing market. According to the model, the changes in demand for housing explain only just over 1 per cent of the variation in inflation and GDP. The variation in the consumption of goods is explained slightly more, around 5 per cent, by a change in the demand for housing. The fact that changes in the demand for housing have little effect is in line with what Iacoviello and Neri (2007) have found to apply for the United States. Also in more general terms our results are fairly similar to theirs. If the supply of housing changes, the macro variables are only negligibly affected.

We nevertheless find that some of the downswing in GDP and inflation during the period 1993-1994 depends on sudden changes in the demand for housing. This is hardly surprising given the overall changes in taxes and subsidies made in the housing market during this period.

<sup>4</sup> We use the prices of single-family dwellings, as stated in the Real estate price index from Statistics Sweden, throughout to measure house prices. To calculate real house prices we deflate the real estate price index with the CPIX. The CPIX is also used as a measure of inflation when comparing the model with data.

However, the overall conclusion is clear. According to this model, sudden changes in the housing sector will normally be of minor importance to the rest of the economy.

Inversely, one can consider how large an impact sudden changes in other parts of the economy have on the housing sector. The answer is that there is actually a larger effect in this direction. Just over one quarter of the variation in house prices over an economic cycle originates from macroeconomic changes, including monetary policy. But only around 5 per cent of the variation in house prices is due to sudden changes in the interest rate.

## Covariation between housing construction and GDP different in Sweden

In almost all of the OECD countries the cycle for building houses is ahead of the rest of the economy – first there is a peak in housing construction, then in GDP and economic activity in general. This has led some researchers, primarily Leamer (2007), to argue that the variation in housing construction is an important factor that not only precedes, but also causes, downswings and upswings in economic activity. But in Sweden things are different: our housing construction peaks more than a year later than the economic cycle. This fact has recently been documented by the IMF (in 2008). Leamer's hypothesis is therefore irrelevant for Sweden.

The direct effect of this special Swedish pattern is that GDP stabilises when we build housing in Sweden. However, movements in house prices are reinforced by the housing construction and become more cyclical than would otherwise have been the case.

Given that there are collateral-constrained households, we also have an indirect effect that has a destabilising effect on GDP. The fact that some households vary their consumption in relation to the value of their house means that private consumption varies more over the economic cycle.

The question remains as to why the relationship between general economic activity and construction is so different in Sweden than in most other countries (Italy and to some extent Germany and Norway are countries that show similar patterns). Two possible reasons are that the share of apartment blocks is high and that the processes for obtaining building permits are unusually long. Both of these aspects lead to a longer period of time between planning and construction start. It is also conceivable that interventions from the Swedish government have historically played a role in the Swedish construction pattern. Governments have sometimes tried to dampen fluctuations in construction activity, which may have led to the construction pattern we now have in Sweden. Temporary tax deductions for building work during recessions are one example of interventions by governments.

## Collateral constraints affect the impact of monetary policy

To fully understand the effects of monetary policy one should take into account the effects of sudden changes in interest rates on housing construction and house prices. Housing construction falls by around half a percentage point and house prices fall almost one percentage point if the interest rate is suddenly raised 1 per cent and then gradually falls back to follow its historical pattern. These effects are very slight compared with what the IMF (2008) calculates in a purely statistical model.<sup>5</sup>

The fall in house prices means that the opportunities for households to borrow decline and that consumption and inflation therefore react much more strongly to monetary policy when there are collateral-constrained households.<sup>6</sup> This is because the impatient households' consumption is affected much more than the patient households' consumption when the Riksbank changes the interest rate. We calculate that collateral constraints account for 10-15 per cent of the effect on inflation and 25 per cent of the effect on consumption of a sudden change in the interest rate.

<sup>5</sup> One disadvantage with the method used by the IMF in its study is that it results in almost permanent effects on GDP and house prices from temporary changes in monetary policy. This is not in line with economic theory.

<sup>6</sup> To analyse how collateral constraints affect the impact of monetary policy we also calculate the effects of interest rate changes in a hypothetical situation where the share of collateral-constrained households is small and declining. We can then compare the effects in our original model with this special case.

## Effects of a lower cash down-payment requirement

In the model we have assumed a fixed share of the housing value that is the maximum amount which the households can borrow. This maximum loan share was set at 85 per cent (that is, a requirement for a 15 per cent down-payment) for the period 1986-2007. But we know that the loan share has increased during this period and that, for instance, the SBAB mortgage institution has offered a share of 95 per cent in recent years. We therefore also make calculations in our model for a situation where the loan share is 95 per cent, but where everything else remains the same.<sup>7</sup>

A sudden change in the interest rate has a 50-per cent stronger effect on households' total consumption when the down-payment requirement falls from 15 to 5 per cent. The effect on GDP is also tangibly reinforced, while the effect on inflation is almost unchanged. The reason for the reinforced effect on consumption is that the impatient households are relatively more indebted and own housing of a higher value in a situation where the down-payment requirement is lower. They are therefore forced to significantly reduce their consumption as a response to the interest rate change.

One long-term effect of the reduction in the down-payment requirement is that the demand for housing increases. This is because the households which earlier experienced difficulty in obtaining loans to buy housing are now finding it easier. As it takes many years to build up the housing stock to the new, long-term equilibrium level, house prices will rise substantially during a transition period. It is possible that this type of mechanism to some extent explains the increase in house prices and housing construction in Sweden in recent years. However, according to this type of model, house prices are not affected in the long term by demand factors; they fall back to their normal levels when a sufficient number of new houses has been built.<sup>8</sup>

## Conclusions

**The three main conclusions from our analysis are:**

1. Changes in the demand for or supply of housing only explain a very small part of the fluctuations in GDP and inflation. On the other hand, house prices are affected by developments in the economy.
2. Housing used as collateral for loans reinforces the effects of monetary policy. This mechanism functions through the effects of the interest rate on house-prices and thereby households' possibilities to borrow. 10-15 per cent of the effect of a monetary policy change on inflation is due to collateral constraints. This component becomes stronger the lower the down-payment requirement is. A change in the down-payment requirement from 15 per cent to 5 per cent, all else being equal, will mean that the effect of monetary policy on consumption is reinforced by 50 per cent. The effect of monetary policy on GDP is also reinforced.
3. One theoretical insight is that real house prices may follow a different long-term trend than real GDP and consumption. It is also clear that this is the case, both in Sweden and in many other countries. From the assumptions usually made in this type of model, it is instead implied that the share of GDP (disposable income) that constitutes housing expenditure should remain fairly stable. This means that it is fully possible that real house prices will increase more quickly than GDP and that housing investment will grow more slowly than GDP, which has been the case since 1986. As house prices are in the long term primarily determined by production costs in the housing sector, this development can be explained by weak productivity growth in this sector.

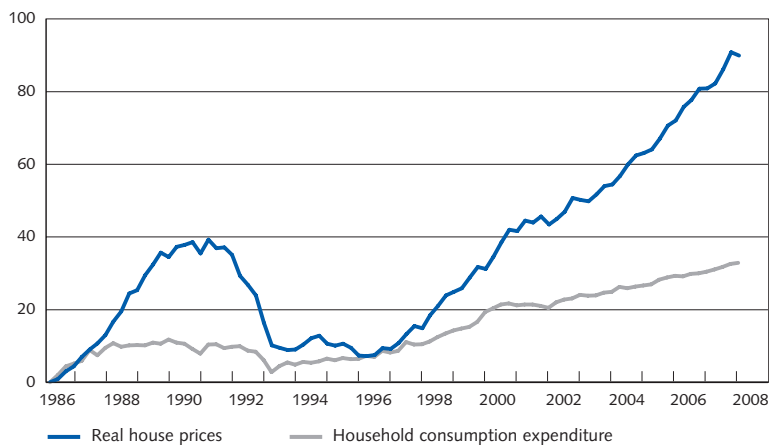
Furthermore, we believe that an economic model of this type, with an explicit role for the housing sector and its effects on households' borrowing ability, is useful in fully understanding the effects of monetary policy and the dynamics of the economy in general. This is particularly true when structural changes occur that affect the housing market, or housing financing, such as changes in the down-payment requirement or changes in property tax.

<sup>7</sup> However, this is a very strong assumption. For example, it is reasonable to imagine that the share of collateral-constrained ("impatient") households declines when they are allowed to borrow a larger share of the value of their housing.

<sup>8</sup> Please note, however, that the entire analysis is based on the assumption that land is not a limiting factor. Instead we assume that over time there is just as much suitable land to build on. This assumption can be regarded as inhibiting, even though Swedish is relatively sparsely-built up compared with most other countries.

Figure 1. House prices and consumption since 1986

Per cent



Source: Statistics Sweden.

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