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Price and transaction volume in the Dutch housing market

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ABSTRACT

Housing markets typically exhibit a strong positive correlation between the rate of price increase and the number of houses sold. We document this correlation on high-quality Dutch data for the period 1985–2007, and estimate a VEC-model that allows us to study the mechanism giving rise to the correlation. The data identify the flows of new houses offered for sale as well as the number of houses sold. According to the estimated model, shocks to market fundamentals (the mortgage rate) have an immediate and significant impact on the rate of sale, little impact on the rate of entry of new houses for sale, and a gradual impact on the house prices. This pattern is consistent with an economy where buyers and sellers gradually learn about changes in market conditions.

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1. Introduction. Price-volume correlations

Between the mid 1980s and today real house prices more or less doubled in most industrialized countries. Even before the recent crisis, this was not a smooth process of continuous growth. All countries experienced cycles where booms with price increases above trend were followed by busts with stagnating or falling prices. But price fluctuations alone do not fully characterize the ups and downs of the housing market. In price booms, the market is typically also more liquid with frequent transactions and houses selling quickly, whereas in busts there are fewer sales and many houses remain on the market for a long time. Since the housing stock is fixed in the short run and most transactions are driven by households moving from one home to another, i.e. being present more or less simultaneously on both sides of the market, this is something of a puzzle. Figs. 1 and 2 illustrate this pattern for the Dutch market for owner-occupied homes, based on the data being analyzed in this paper. Peaks and troughs of price changes and the number of sales coincide clearly in some periods (e.g. the trough in 1995 and the peak in 1999), but over other periods the correlation is weak. Once we relate sales to the number of houses for sale there is a much stronger correlation. Fig. 2 shows that the rate of sale (sales divided by houses on the market) and price changes follow each other very closely (the correlation coefficient is 0.71).

Market developments reflect the decisions of thousands of homeowners to offer their houses for sale and to set reservation prices that they are prepared to accept. At the same time, prospective homebuyers shop around for good deals. Given the search nature of the process, the market does not clear continuously and variations in the time on the market and the rate of sale may accommodate inertia in prices. Previous empirical studies have largely been confined to looking at data on transaction prices and the number of sales. In this paper we are able to give a richer picture of the process. We analyze detailed Dutch data that allow us to distinguish between the rate of entry of new houses offered for sale and the rate at which the houses on the market are being sold. We are also able to distinguish between the list price at which a house is offered for sale and the final transaction price. The data set contains observations on these variables for the entire Dutch housing market over a period of more than 20 years. For nearly two million dwellings sold between 1985 and 2007, we observe the original list price and the date when the dwelling was put on the market as well as the final sales price and the date of sale.

Beyond providing descriptive statistics on these variables, we estimate a dynamic model of the housing market where prices and quantities are driven by disturbances to two fundamental demand factors, unemployment and the interest rate. In our estimated vector error-correction model shocks to demand fundamentals have an immediate but temporary impact on the rate of sale, a gradual and permanent impact on prices (both list price and sales price) and little impact on the rate of entry. This dynamic pattern is in line with previous studies by Hort (2000) on Swedish data and Andrew and Meen (2003) on

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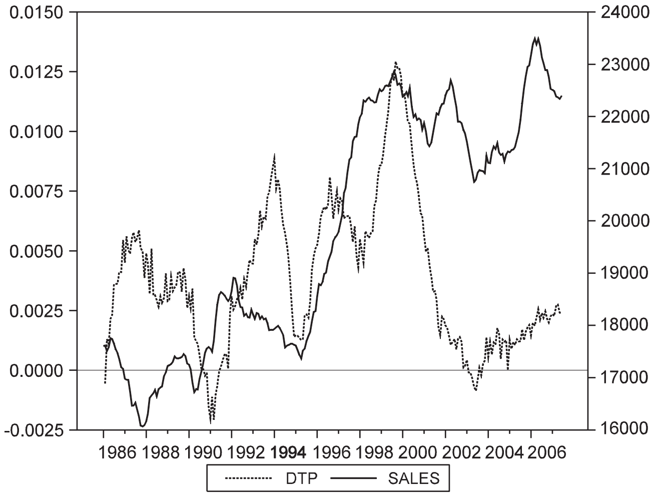

Fig. 1. Number of dwellings sold and the rate of real price change. DTP is the rate of price change expressed as the 12 month average of the monthly change in the transaction price index, estimated as described in Appendix A and deflated by the consumer price index. Sales is the 12 month average of the number of sold houses (where the numbers of sold houses are corrected for the NVM market share).

British data, although these studies look at total sales rather than the rate of sale. It stands in some contrast to a study on US data by Clayton et al. (2010), which finds that the effect on both price and sales peak already one quarter after the shock. We discuss the interpretation of our results against the background of different theories of the interaction between housing prices and sales. We conclude that it is consistent with a housing market where agents gradually learn about changed market conditions, e.g. because sellers have a good overview of the houses offered for sale whereas sellers do not have a corresponding overview of potential buyers searching for a new dwelling.

The next section of the paper reviews the empirical literature on the price-quantity correlation. Various theoretical explanations for this correlation have been advanced. In Section 3 we briefly discuss the main candidates: liquidity, asymmetric information, the interaction between credit constraints and demand and supply, and loss aversion. Next we present the data and some descriptive statistics in Section 4. The vector-error-correction model is specified in Section 5 and the estimation results, primarily in the form of impulse-response functions, are presented in Section 6. We conclude in Section 7 that the results are consistent with the asymmetric information view but not with the credit-constraint story.

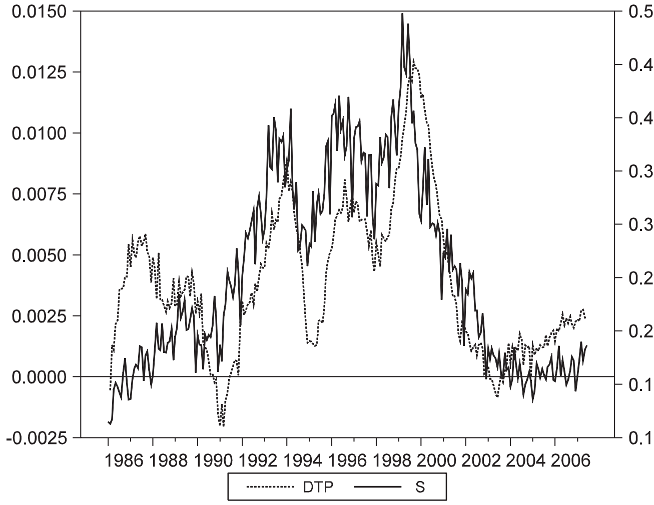

Fig. 2. Rate of real transaction price change and rate of sale. DTP is defined as in Fig. 1. S is the rate of sale expressed as the number of houses sold in the current month divided by the number of houses on the market at the start of the month.

2. The empirical evidence

The positive correlation between price changes and transaction volumes in owner-occupied housing markets is by now a relatively well established empirical regularity, primarily for US data but also for other countries like the UK and Sweden.[1] In fact, realtors and other market actors seem to take the fluctuations between hot and cold markets—differing both in price development and sales activity—as a basic fact of life. While this general pattern is confirmed by most studies, the empirical picture is not without ambiguity. Some authors have looked at the simple correlation between price changes and number of sales. An early paper by Miller and Sklarz (1986), based on condominium data from Hawaii, shows that the rate of sale in one quarter is positively related to the price change in the next quarter; sales predict price changes. Two influential theoretical papers include a look at aggregate US data. Stein (1995) reports a significant relation between current sales volume and last year's rate of price change, i.e. a temporal lag in the opposite direction to that found by Miller and Sklarz. Berkovec and Goodman (1996) regress the change in median sales price on the simultaneous *change* in turnover, again with a significantly positive coefficient. Counter to these results, Follain and Velz (1995) find the *levels* of price and sales volume to be negatively correlated when estimated in the context of a four-equation model of the housing market.

On an informationally efficient asset market without frictions a shock to fundamentals should have an immediate price effect. If supply adjusts only gradually as it certainly does in real estate, the initial price impact should overshoot the final price change once a new long-run equilibrium has been reached. In contrast, several empirical studies, including those discussed in the next section, have shown that house prices respond only gradually to shocks. This indicates that returns to investing in housing are predictable, but given the large transaction costs it is not clear that there are unexploited profit opportunities. More interesting, however, is to compare the time profile of the price response with that of the number of houses sold.

Two papers on European housing markets estimate the joint dynamics of sales and prices. Hort (2000) finds no consistent relation between price changes and turnover changes using panel data for local housing markets in Sweden. Fixed effects regression on sales against the house price level yields negative coefficients at all frequencies. Hort then goes on to investigate how shocks to fundamentals (represented by the after-tax mortgage rate) are transmitted into house prices and sales. Based on a VAR-model she concludes that an interest shock has an immediate negative impact on sales but depresses prices only gradually. More recently, a study on aggregate UK data by Andrew and Meen (2003) focuses on the adjustment to fundamentals within an error-correction framework. In a first stage, they estimate a long-run levels relation between price and fundamentals represented by income, the housing stock, the number of households and construction costs. In a second stage, a two-equation conditional VAR-model is estimated where price change and the number of sales (as a fraction of the stock) are driven by deviations from equilibrium (the residuals of the first-stage equation). The results indicate that a shock to fundamentals impacts on sales and prices in the same direction. The sales effect peaks after about a year and sales revert back to their original equilibrium level after a couple of years. Prices, on the other hand, continue to fall for more than two years before turning and oscillating back towards the new equilibrium level.

More recently, the price–volume-correlation has also been addressed for a large panel of US local housing markets by Clayton et al. (2010). They estimate a two variable VAR in price and turnover

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[1] We limit our interest to owner-occupied housing. Other studies, e.g. Leung and Feng (2005), look at commercial real estate markets.

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