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Seasonal cycles in a model of the housing market

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HIGHLIGHTS

- The US housing market goes through seasonal boom and bust cycles.
- In summers prices rise and trade speeds up, in winters prices fall yet it takes much longer to sell.
- Cycles are repetitive, hence difficult to explain with frictionless asset-pricing models.
- We present a search model based on the premise that the market is thick in summers and thin in winters.
- Unlike previous attempts in the literature, the model generates deterministic cycles.

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ABSTRACT

The US housing market exhibits seasonal boom and bust cycles where prices *and* the speed of trade (turnover rate) rise in summers and fall in winters. We present a search model that analytically generates the observed cycles. The proposed mechanism is based on swings in market thickness rather than market tightness, the leading explanation in the literature.

1. Introduction

The US housing market goes through seasonal boom and bust episodes:- in summers prices rise and trade speeds up whereas in winters prices fall, it takes much longer to sell and the number of sales slides to the annual lows. The cycles are highly predictable and repetitive, seemingly defying the no-arbitrage condition; hence difficult to explain with standard frictionless asset pricing models. Fig. 1, which depicts seasonal components in purchase-price and speed of trade, illustrates these cycles using monthly US data from January 1991 to December 2011.[1]

In an oft cited article Novy Marx (2009) constructs a search model of the housing market to provide rationale for the observed cycles. The idea is that if a season exogenously adds more buyers to the market then the buyer–seller ratio goes up and therefore houses sell more quickly. The housing supply is assumed to be

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[1] The panel illustrates seasonal components in sale prices (right axis) and the speed of trade (turnover rate). The patterns show that the market systematically alternates between boom and bust episodes where in summers prices rise and trade speeds up while in winters the trend reverses. The monthly purchase price index comes from the Federal Housing Financing Agency and it is constructed by a version of the weighted-repeat sales methodology proposed by Case and Shiller (1989). The method controls for differences in the quality of the houses comprising the sample. The speed of trade, on the other hand, is proxied by the ratio of the number of new-single family houses sold at the end of the month divided by the number of houses listed as being for sale that month. The higher the ratio, the higher the speed of trade in that month. The data are obtained from the US Census Bureau and are not seasonally adjusted. We used the X-12-ARIMA procedure, developed by the Census Bureau, to obtain the seasonal factors in each data set. The procedure conducts three formal tests to assess the presence of seasonality: a parametric *F*-test, a non-parametric Kruskal–Wallis test and a moving seasonality test based on two way ANOVA. All tests positively indicate that identifiable seasonality is present in both series.

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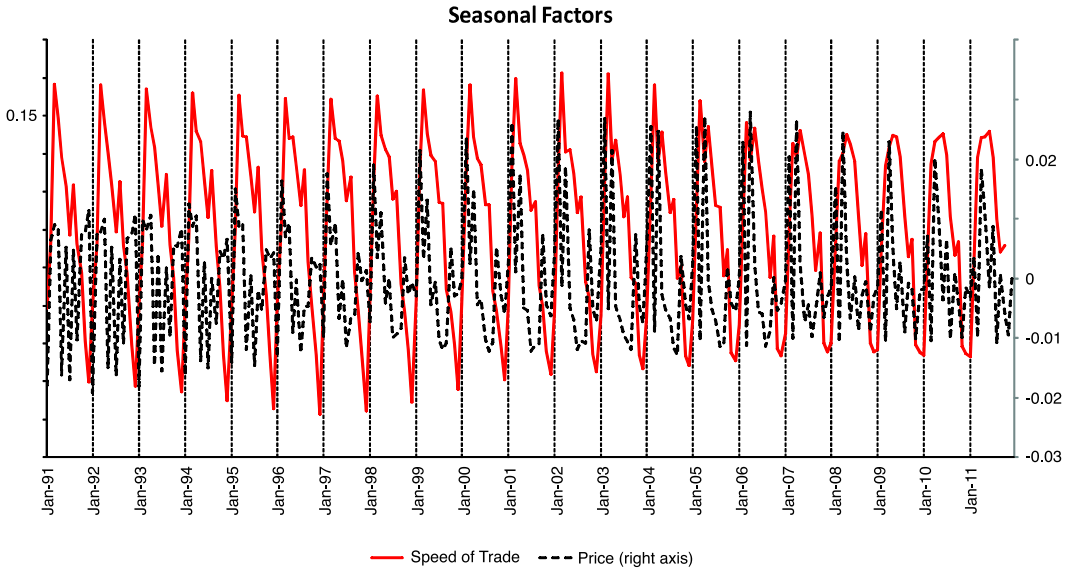

Fig. 1. Seasonal components in price and speed of trade (turnover rate).

fixed so it reduces rapidly and the buyer–seller ratio increases even further, which, in turn, leads to higher prices.[2] The mechanism operates through market tightness (buyer–seller ratio) and to obtain cycles as in Fig. 1 one needs to assume that the buyer–seller ratio rises every summer and falls every winter.

While it is true that there are more potential buyers in summers than in winters, the supply side is hardly fixed—in fact it exhibits the same pattern as the demand side, i.e. there are more houses on sale in summers than in winters.[3] Therefore it is not clear whether or not market tightness – the key parameter of interest in Novy Marx (2009) – indeed increases in summers.

In this letter, we propose an alternative mechanism that depends on market thickness (the number of market participants) instead of market tightness (ratio of participants) and is capable of producing deterministic boom and bust cycles. Market thickness refers to the fact that there are more houses on sale in the summer market than in the winter market, hence better quality matches are formed in summers. The thick summer market comes with the greatest possible choice of residence which means that buyers encounter better quality matches in such a market. People are willing to pay a premium for housing that closely matches their needs, tastes and preferences; hence prices go up in the summer. On the other hand, sellers have no means of transferring the extra value across seasons, so they have strong incentives to trade while the market is still thick. Therefore, they limit the price rise to a modest amount to ensure that the trade indeed speeds up. The rising prices coupled with the increased speed of trade means that the market booms in the summer. The trend reverses in the summer, so the market alternates between boom and bust episodes as seasons change.

2. Model

Time is discrete, infinite and deterministically alternates between two seasons, summer (s) and winter (w). The economy is populated by a continuum of houses and a continuum of buyers each of whom wishes to purchase a house. In summers there is a measure of h_s properties for sale and b_s buyers whereas in winters these measures are h_w and b_w. Each house is owned by a risk neutral seller, who derives no utility from the ownership. Buyers, too, are risk neutral and receive periodic housing services starting the period after the purchase and continuing forever. The measures of potential buyers and sellers are exogenous; however the number of transactions, the speed of trade and sale prices are, of course, endogenous.

The market is characterized by two types of frictions. The first is finding a counterpart, which depends on market tightness (buyer–seller ratio). Assuming an urn-ball matching function and letting $\lambda_x := b_x/h_x$ denote the buyer–seller ratio in season $x = s, w$, a seller meets a buyer with probability $1 - e^{-\lambda_x}$ whereas a buyer meets a seller with probability $\left(1 - e^{-\lambda_x}\right)/\lambda_x$.

Assumption 1. We have $\lambda_s = \lambda_w = \lambda$. Furthermore $h_s > h_w$.

The mechanism in Novy Marx (2009) operates through market tightness, λ_x; so, for exposition, we shut down this channel by assuming that λ_x remains constant throughout the year. The second part of the assumption is based on the aforementioned empirical findings by Rosen (1979) and Goodman (1993) and states that in summers there are more houses on the market than in winters.

The second friction deals with whether the house turns out to be a good match. After an initial inspection, the buyer realizes his valuation $v \in [0, 1]$, which is private information and a random draw via cdf $F(v, h_x) \equiv F_x(v)$. From the buyer's perspective the search process amounts to finding a high enough v. The cdf F

[2] Krainer (2001) presents an alternative model where the market fluctuates between hot and cold episodes, however the model fails to produce deterministic cycles. Indeed if the persistence parameter in Krainer (2001) is set $\lambda = 0$ so that seasons alternate deterministically then, interestingly, one obtains the wrong cycle; the market is cold in the summer and hot in the winter. Ngai and Tenreyro (2013) present a setup generating deterministic cycles, but their results are based on quantitative simulations. See also Kaplanski and Levy (2012), Muellbauer and Murphy (1997), and Stein (1995).

[3] Rosen (1979), one of the most comprehensive studies on seasonality in the American housing market, presents substantial evidence documenting seasonal ups and downs in demand and supply in the residential property market and concludes that demand and supply are both high in summers and low in winters. In other words, the seasonality in housing demand coincides with the seasonality in housing supply (housing authorizations, construction of new houses and listings of existing properties). Goodman (1993), using the data from separate sources confirms Rosen's findings.