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<u>*Determinants of Time on the Market in a Thin Real Estate Market*</u>

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Abstract

We develop a two-stage model of the determinants of time on the market and a duration model that sheds light on factors that affect the time needed to sell a property in the post-transitional and developing real estate market in Slovenia. The results of the TOM model show that property characteristics, market conditions and macroeconomic determinants all turned out to be statistically significant determinants of time on the market. Time on the market decreases with the age of a property and increases with its size, although the latter effect seems to diminish and disappear for very large properties. The degree of overpricing also turned out to be a statistically significant determinant of time on the market. However, this effect does not seem to be statistically significantly non-linear (U-shaped). The macroeconomic determinants are highly statistically significant; higher house prices (at the national level) and the average interest rate for housing loans both extend a property's time on the market as they indicate greater costs for potential buyers. Better availability of housing loans, on the other hand shortens the TOM. We additionally estimated a proportional hazard model of the TOM that yielded consistent results.

Keywords: time on the market, overpricing, Central and Eastern Europe, Slovenia

Introduction

With the development of the real estate markets in Central and Eastern Europe, real estate prices and market trends in the region came to the forefront of many professional and academic discussions. Gaining a deeper understanding of real estate markets in the region has become increasingly important in the aftermath of the negative implications the slowdown in the real estate market has had on the overall economy.

Numerous papers have analysed real estate market development, real estate prices and market trends in Central and Eastern European countries (e.g. Palacin & Shelburne (2005), Egert & Mihaljek (2007) for the region; Matalik et al. (2005) for the Czech Republic; Drobne et al. (2010) and Golob et al. (2012) for Slovenia). Market prices, however, only give us partial information about the real estate market. The real estate market is characterised by many imperfections, such as the high heterogeneity of traded assets, there is a sequential bid process instead of a simultaneous transaction process and real estate is thinly traded over relatively long holding periods (Anglin & Wiebe, 2009; Cheng, Lin &Liu, 2008; Lin & Liu, 2008). As a result, unlike a centralised market with perfect information, the real estate market is characterised by a certain degree of illiquidity that is typically measured by the time it takes to sell a property, the so-called time on the market (TOM).

Time on the market is affected by many factors and is not under the full control of the seller who sets the selling price (Lin & Liu, 2008). In 'hot' markets, the prices are generally high and sellers typically sell their houses after short marketing times and the volume of sales is higher than average. In 'cold' markets, the prices tend to decrease, longer times are needed to sell a property and the volume of sales is relatively low (Krainer, 2001). Short-term market dynamics are affected by factors on the demand and supply sides of the market, as well as idiosyncratic, national (or local) factors that can lead to significant differences in market dynamics across countries or even within a country (Tsatsaronis & Zhu, 2004). These idiosyncratic factors, such as tenure structure, transaction cost framework, provision of financing or uncertainty about future prospects, also contribute to the fact that the turnover rate on some markets is considerably higher than on others, including over a longer period of time (Krainer, 2001; Smith et al., 2010). For example, the average turnover rate in Estonia in the 2007 to 2010 period was 5.5 percent in comparison with 1.2 percent in Germany and a mere 1 percent in Slovenia.[1]

The research problem of our paper is to investigate the factors that affect a property's time on the market in the residential real estate market in the capital city of Slovenia, Ljubljana. We provide a relevant literature review of theoretical and empirical findings related to time on the market. While most empirical evidence deals with the highly developed US residential market, the novelty of our paper is that we focus our

[1] Calculated from the data in EMF Hypostat (2010).

analysis on the relatively thin Slovenian housing market. With our two-stage model of the determinants of time on the market we aim to identify the factors that affect the time needed to sell a property in the post-transitional and developing real estate market in Slovenia. We additionally develop a duration model that captures the probability of a residential unit being sold.

Literature review

A seller in the real estate market faces a trade-off between the time needed to sell their property and the price eventually received (Anglin et al., 2003). In this process, the seller's choice of listing price clearly plays a critical role and acts as a signal to potential buyers. The listing price provides a prospective buyer with information that helps them narrow their choice of properties within their specific price range, and to make a selection of properties they will inspect and potentially engage in a bargaining process with a view to making a purchase. One or more potential buyers, who may have entered the market at any time, eventually make a bid.

A substantial body of literature has established there is a strong relationship between real estate prices and TOM. Early TOM studies estimated the relationship between selling price and the selling time (e.g. Cubbin, 1974; Miller, 1978), while later studies also took other determinants of TOM into account.

Several studies (e.g. Yavaş & Yang, 1995; Ong & Koh, 2000; Anglin et al., 2003) have validated the importance of the choice of listing price and related degree of overpricing, showing that above-market pricing leads to a longer TOM. In the theoretical model developed by Leung et al. (2002), the relationship between TOM and the sale price is determined by a demand-side factor (the buyers' arrival rate), a supply-side factor (the percentage of bidders who remain in the bidding process), and property-specific factors. The latter implies that atypical houses are more difficult to market and take a longer time to sell. This relationship is supported by the empirical findings of Haurin (1988) and Glower et al. (1998).

The length of time a property is on the market is also affected by market conditions as they influence the demand and supply factors indicated by Leung et al. (2002). Although demand and supply factors define a market's liquidity in general and therefore have an impact on the TOM, the housing market is also segmented. More homogeneous housing segments are expected to have greater liquidity (Anglin et al., 2003; Turnbull & Dombrow, 2006) and empirical evidence confirms the presence of location-specific variations in the models of listing duration (Smith, 2010).

Other elements influencing a property's marketing time refer to the seller's motivation and the impact of the brokerage (or estate agent) firm. Glower et al. (1998) show that home sellers who are motivated to sell quickly will set a lower list price, have a lower reservation price and accept earlier, lower offers. Cheng et al. (2008) emphasise the importance of the associated costs and benefits of waiting for another buyer and Lin & Liu (2008) empirically confirm the impact of a seller's financial distress on the marketing time. Since sellers often rely on the services of brokerage firms, their characteristics may also influence the TOM, as shown by Yavaş & Yang (1995) and Gardiner et al. (2007).

Model and methodology

The price-TOM locus shows a set of potential expected selling price and expected TOM combinations (Anglin et al., 2003). It represents the effects of a seller's choices and, by also taking the seller's motivation that is embodied in his objective function into account, one can solve for the optimal list price. According to Anglin et al. (2003), at the optimum, if an increase in list price, p^L, raises the expected selling price, then the cost of selling, $E(TOM)$, must also go up. Even though one can choose directly the "optimal selling price" and "optimal TOM", these concepts are imprecise as each of them ignores half of the trade-off that makes a particular list price optimal (Anglin et al., 2003, p. 98).

Each house is described by a vector of characteristics **X**. Both the selling price and TOM depend on these characteristics and changes in **X** may shift the price-TOM locus and change the optimal price since houses with differing characteristics attract different numbers and types of buyers. As buyers have an incomplete prior description of a property, the latter may be listed higher than its "peer group" due to features only revealed through inspection (Anglin et al., 2003, pp. 98-99). However, a high list price may also indicate an attempt by the seller to exert bargaining power that adversely affects the potential buyer. Based on the signalling function of the listing price, Anglin et al. (2003) further hypothesise that the types of houses with bigger variance in list prices have "greater" noise and a given change in the list price can be expected to have a smaller effect on the behaviour of a group of potential buyers.

First, we estimate the typical list price for a property described by characteristics **X** in market conditions described by a vector **M**. The list price model is thus (cf. Yavaş & Yang, 1995; Anglin et al., 2003; Cheng et al., 2008):

$$E\left[\ln\left(p^L\right)\middle|\mathbf{X},\mathbf{M}\right] = \mathbf{X}\boldsymbol{\alpha} + \mathbf{M}\boldsymbol{\beta}\,. \tag{1}$$

Since specification testing indicates the presence of heteroscedasticity, the list price model is estimated by applying a robust variance estimator. The residual of the list price model is then used to estimate the degree of overpricing, *DOP*, the percentage of deviation from a 'typical' list price for a house described by **X** and **M**. The *DOP* is calculated as:

$$\ln\left(p^L\right) - E\left[\ln\left(p^L\right)\middle|\mathbf{X},\mathbf{M}\right],$$

and is expected to affect the eventual selling price and the TOM.

Next, we specify the TOM model with time on the market, *t*, being a function of property characteristics **X**, market conditions **M**, macroeconomic determinants **C**, and the "list price" (cf. Leung et al., 2002; Anglin et al., 2003; Smith, 2009):

$$E\left[\ln(t)\middle|\mathbf{X},\mathbf{M},\mathbf{C},DOP\right] = \mathbf{X}\boldsymbol{\alpha} + \mathbf{M}\boldsymbol{\beta} + \mathbf{C}\boldsymbol{\gamma} + \delta DOP. \quad (2)$$

Often, the least squares estimator is used to estimate a TOM model, which produces unbiased but generally inefficient estimates. Lancaster (1990), for example, reports for a "single risk" model that the use of a semi-log OLS model to estimate the determinants of TOM is equivalent to throwing away 39 percent of the data if the true model is exponentially distributed, and 43 percent of the data if a Weibull distribution is more appropriate. Thus, in addition to the standard linear regression model, we use a hazard model to evaluate the listing duration or TOM, conditional on the unit being listed up to a point in time.

Measuring residential liquidity and TOM with survival models has become widely accepted (cf. Kluger & Miller, 1990; Anglin, 1997), and the proportional hazard model originally introduced by Cox (1972) provides a particularly useful survival approach given the uncertainty of the baseline hazard distribution. The inherent flexibility of the Cox model in establishing a specific probability distribution is a significant advantage in many real estate applications due to the absence of *a priori* information indicating what distribution should be used (Smith, 2010, pp. 154-156).

In this article, it is assumed that the underlying hazard rate (rather than survival time) is a function of the explanatory variables and is obtained by applying the maximum likelihood estimator. The hazard rate, which assesses the instantaneous risk of failure, is for the proportional hazard model equal to (cf. Anglin et al., 2003; Smith, 2010):

$$h\left(t\middle|\mathbf{X},\mathbf{M},\mathbf{C},DOP\right) = h_0(t)\exp\left[\mathbf{X}\boldsymbol{\alpha} + \mathbf{M}\boldsymbol{\beta} + \mathbf{C}\boldsymbol{\gamma} + \delta DOP\right] \quad (3)$$

or equivalently:

$$\ln\left[h(t)\right] = \ln\left[h_0(t)\right] + \mathbf{X}\boldsymbol{\alpha} + \mathbf{M}\boldsymbol{\beta} + \mathbf{C}\boldsymbol{\gamma} + \delta DOP, \quad (4)$$

where $h_0(t)$ is a baseline hazard function. When analysing the TOM, the proportional hazard represents the probability of selling at time t, conditional on the seller listing the property to that point in time, and subject to the explanatory variables.

Among the explanatory variables, property characteristics **X** comprise in our case the age and size of a property, the size of parking lots, the presence of an elevator, the and particular floor in the building; market conditions **M** consist of location dummy variables; while macroeconomic determinants **C** include the house price index, the effective interest rate for housing loans, and the total value of housing loans.

Description of data

The data in this paper were drawn from three sources. The micro-level data, comprising a sample of completed transactions for housing real estate properties in the city region of Ljubljana, were obtained from the largest real estate brokerage agency in the capital city that is also the largest residential real estate market in Slovenia. The original time series comprised transactions from 2000 to 2010, totalling 371 transactions. Based on the available statistics on the number of transactions, the sample represents approximately 2.5 percent of all transactions in that period.

The basic descriptive statistics for the micro-level variables are presented in Table 1. The average size of a property in the sample was just below 60 square metres and it sold for just over EUR 2,000 per square metre; both numbers are close to the official statistics, making the sample representative. On average, such a property was almost 30 years old and was on the market for three months.

We included some variables that are known to influence the list price, selling price and time on the market from previous research, also taking the specifics of the Slovenian real estate market into account. The variables include parking space, elevator, top or ground floor, indication of recent renovation, and the city area (quarter) in which the property is located.

Table 1. Descriptive statistics for the sample (*n* = 371)

Variable	Mean	Std. dev.	Min	Max
List price (in EUR)	128,187	71,269	25,038	397,000
List price per square metre (in EUR)	2.168	723	766	4,416
Selling price (in EUR)	118,533	65,619	4,227	390,000
Selling price per square metre (in EUR)	2,015	649	708	3,832
Time on the market (in days)	92.41	120.06	1	909
Age (in years)	29.21	21.71	0	133
Size (in square metres)	59.60	26.28	16.99	223.93
Size of parking lots (in square metres)	19.95	35.67	0	89.92
Floor in the building	3.39	3.03	0	18
Ground floor apartment (percentage)	9.7	29.6		
Penthouse (percentage)	17.7	38.3		
Renovated (percentage)	34.0	47.4		
Balcony (percentage)	73.4	44.3		
Elevator (percentage)	58.1	49.4		
Bežigrad Area (percentage)	15.3	36.1		
Centre Area (percentage)	30.4	46.1		
Fužine Area (percentage)	2.4	15.4		
Moste Area (percentage)	7.8	26.8		
Šiška Area (percentage)	31.5	46.5		
Vič Area (percentage)	12.6	33.3		

Source: Authors' calculations

The macro-level data came from two sources. Due to the unavailability of macro-level data on housing loans and interest rates, we used a shorter series from 2003 to 2010. Consequently, in the regressions involving macro-level variables only 261 observations are used.

The house price index was calculated from the hedonic pricing model data available from the Statistical Office of the Republic of Slovenia on transactions and is based on price per square metre of an average unit. Since detailed regional data were only available from 2007 onwards, the average for Slovenia was used. Data were available on the quarterly level and matched to transactions with the date of entry to the market. The source of the data on loans and the effective interest rate was the Bank of Slovenia database. Due to data series availability, long-term loans to households (in million EUR) and the average interest rate for housing loans (in percent) were used. The data are available on the monthly level and again matched to transactions with the date of entry to the market.

Results

The results of the list price model (Table 2), defined by expression (1), established property characteristics and market conditions as statistically significant determinants. As a property's age increases its (list) price decreases, although this effect seems to diminish and disappear for very old properties, as indicated by the age-squared regressor. Size of a property has the opposite dynamic; an additional square metre of a property increases its (list) price, while this effect weakens and vanishes for very large properties, as indicated by the size-squared regressor. The presence and size of parking lots also has a positive effect on the (list) price because this is a very important feature of a property located in an urban area, especially in a city like Ljubljana with a high inflow of car traffic into the very centre.

Table 2. Determinants of list price

Explanatory variable	Regression coefficient	Standard error
Age	–0.00543***	0.00102
Age squared	0.00002*	0.00001
Size	0.01865***	0.00091
Size squared	–0.00004***	0.00001
Size of parking lots	0.00062**	0.00030
Floor in the building	–0.00281	0.00276
Bežigrad Area	–0.06157**	0.02773
Fužine Area	–0.22499***	0.05945
Moste Area	–0.14730***	0.03713
Šiška Area	–0.07782***	0.02702
Vič Area	0.00558	0.03300
Observations	371	
Standard error of regression	0.1497	
R^2 adjusted	0.9102	
F–test and p–value	179.55	0.0000

Notes: List price in logarithms is the endogenous variable of the model. An intercept and dummy explanatory variables for the year of transaction are included in the regression. A heteroscedasticity correction is applied in the calculation of standard errors. Asterisks *, ** and *** denote statistical significance at the 10 percent, 5 percent and 1 percent levels, respectively.

Source: Authors' calculations

Location dummy variables were employed to show how various quarters of the city compare to the proverbially most expensive Centre Area. As Table 1 shows, the average list price is (6.2 to 22.5 percent) lower in all quarters, with the exception of the Vič Area where the difference is not statistically significant. The model as a whole explained 91.0 percent of the variation in logarithms of the list price.

The main purpose of the list price model was to create a variable measuring the degree of overpricing, *DOP*, which was then used as an additional regressor in the TOM model. For transactions where the property was sold below its expected value, defined by property characteristics and market conditions, the degree of overpricing amounted to 9.53 percent (with a standard deviation of 7.97 percent). This is substantially higher than the degree of overpricing reported e.g. by Anglin et al. (2003) for a sample of houses in the USA, where it amounted to 1.45–1.83 percent. This difference might be due to the relatively thin housing market in Slovenia compared to the housing market in the USA. With fewer transactions and also lower market transparency, there is also less information available to sellers when they are setting the listing prices for their properties.

The results of the TOM model, defined by expression (2) and estimated by the least squares estimator, are reported in Table 3. As can be observed, property characteristics, market conditions and macroeconomic determinants all turned out to be statistically significant determinants of time on the market. Time on the market decreases with the age of a property and increases with its size, although the latter effect seems to diminish and disappear for very large properties, as indicated by the size-squared regressor. Properties with an elevator remain on the market for a shorter period of time compared with properties without an elevator. The degree of overpricing also turned out to be a statistically significant determinant of time on the market; a 1 percent increase in *DOP* results on average, *ceteris paribus*, in a 1.10 percent increase in the TOM. However, this effect does not seem to be statistically significantly non-linear (U-shaped).

Table 3. Determinants of time on the market

Explanatory variable	Regression coefficient	Standard error
Age in logarithms	–0.11400*	0.06075
Size	0.01793***	0.00622
Size squared	–0.00007**	0.00003
Elevator	–0.21790*	0.12957
Degree of overpricing	1.09602**	0.48201
Degree of overpricing squared	–3.45897	2.18314
House price index in logarithms	2.00906***	0.59532
Average interest rate for housing loans	0.21595***	0.07954
Total value of housing loans	–0.00184***	0.00033
Centre Area	0.37565**	0.18069
Fužine Area	–0.34649	0.70439
Moste Area	0.67024***	0.24631
Šiška Area	0.05745	0.14324
Vič Area	0.44292**	0.22327
Observations	261	
Standard error of regression	0.8915	
R^2 adjusted	0.4552	
F–test and p–value	11.35	0.0000

Notes: Time on the market in logarithms is the endogenous variable of the model. An intercept and dummy explanatory variables for the year of transaction are included in the regression. A heteroscedasticity correction is applied in the calculation of standard errors. Asterisks *, ** and *** denote statistical significance at the 10 percent, 5 percent and 1 percent levels, respectively.

Source: Authors' calculations

The macroeconomic determinants are highly statistically significant; higher house prices (at the national level) and a higher average interest rate for housing loans both extend a property's time on the market as they indicate a rise in costs for potential buyers. Better availability of housing loans, on the other hand, increases access to debt financing and thus shortens the TOM. The housing loan variable also has the highest standardised regression coefficient, indicating that the availability of housing finance has the largest effect on time on the market among all variables included in the model.

Location dummy variables were employed to show how various quarters of the city compare to the proverbially liquid Bežigrad Area. As Table 3 shows, the average TOM is statistically significantly higher in the Centre Area (by 37.6 percent), the Vič Area (by 44.3 percent) and the Moste Area (by 67.0 percent). The model as a whole explained 45.5 percent of the variation in logarithms of the TOM, which is substantially higher than in other empirical TOM models (Yavaş & Yang, 1995; Forgey et al., 1996; Anglin et al., 2003).

In addition, a proportional hazard model of the TOM, defined by expression (3), was estimated by the maximum likelihood estimator. The results are presented in Table 4 where we report the hazard ratios rather than the regression coefficients (the latter are not substantially different from those in Table 3). The hazard ratio is a measure of the sensitivity of listing termination to changes in an explanatory variable (cf. Smith, 2010). A hazard ratio below one means that a one-unit increase in the explanatory variable is associated with a decline in the hazard, i.e. the probability of the unit being sold. Conversely, a hazard ratio above one implies that a one-unit increase in the explanatory variable is associated with an increase in the conditional probability of sale.

Table 4. Duration model of time on the market

Explanatory variable	Hazard ratio	Standard error
Age in logarithms	1.17305**	0.08568
Size	0.98048***	0.00717
Size squared	1.00009**	0.00004
Elevator	1.24564	0.18424
Degree of overpricing	0.31310***	0.14434
Degree of overpricing squared	3.55968	7.57788
House price index in logarithms	0.17140***	0.10676
Average interest rate for housing loans	0.83009**	0.07545
Total value of housing loans	1.00272***	0.00040
Centre Area	0.52541***	0.11374
Fužine Area	1.02392	0.80023
Moste Area	0.43510***	0.12796
Šiška Area	0.85177	0.13843
Vič Area	0.49621***	0.13319
Observations	261	
Log-likelihood value	–315.20	
LR–test and *p*–value	211.11	0.0000
Weibull shape parameter	1.43784	0.06973

Notes: A Weibull distribution is utilised as the survival distribution of the model. An intercept and dummy explanatory variables for the year of transaction are included in the regression. The Delta method is applied in the calculation of standard errors. Asterisks *, ** and *** denote statistical significance at the 10 percent, 5 percent and 1 percent levels, respectively.

Source: Authors' calculations

The results shown in Table 4 are consistent with those in Table 3. The probability that a property is sold increases on average with the age of a property and decreases with its size (with the corresponding characteristic non-linear effect). The degree of overpricing also has a statistically significant and substantial effect on the hazard; a 1 percent increase in *DOP* results on average, *ceteris paribus*, in a 0.69 percent decrease in the probability that a property is sold. From the macroeconomic perspective, higher house prices and interest rates for housing loans both decrease the probability that a property is sold, while a bigger volume of housing loans increases the hazard on average, all other things being equal. The effects of a property's location are qualitatively the same and quantitatively very similar to those shown in Table 3.

Our results, based on the dataset of market transactions in Ljubljana in the 2000 to 2010 period, also support findings for Slovenia by Golob et al. (2012) who used subjective indicators attained by a structured survey of stakeholders in the housing market. According to their results, the respondents believe that the level of interest rates, type of housing unit and its location influence the time and speed of sales.

Conclusion

In contrast to liquid markets, the time it takes to sell a property on the housing market can vary from a few days to a few months. Our analysis shows that the marketability of a residential property in Slovenia depends highly on the price dynamics of the market, housing characteristics and degree of overpricing. Time on the market for a certain property also varies between various micromarket segments and is highly affected by the availability and cost of housing loans. Yet the relative importance of each group of variables varies. The most important determinants of the marketing time are the cost and availability of housing finance as well as the housing price index and all three can be directly related to the affordability of housing. Better access to debt financing, lower cost of debt and lower housing prices increase the number of properties that are within the range of a given prospective purchaser and, therefore, the time it takes the seller to divest the property is shorter. This is also supported by the size variable since bigger housing units are less affordable as they are usually more expensive in absolute terms. They thus face a thinner market and longer marketing periods.

Before the financial crisis the availability of housing loans in post-transitional economies had considerably increased due to these countries' better access to international financial markets. Deregulation and competition in the banking sector had reduced the cost of housing debt. In Slovenia, both of these effects positively affected the housing market's liquidity. On the other hand, the rigidity of the supply side of the market often contributed to substantial rises in housing prices. After 2007, the adverse effects of the financial and economic crisis have negatively affected the marketing times of residential real estate.

Another important determinant of marketing time is the degree of overpricing that in our case is relatively large. A transparent housing market and quality information on housing transactions may both influence the degree of overpricing and thus contribute to better liquidity in the market.

These insights into the determinants of marketing time in a relatively thin post-transitional housing market in Slovenia can provide important insights for practical purposes (such as pricing strategy for market participants) as well as another perspective to help understand the dynamics of the developing housing market. Although only the local residential market is used in our paper, the findings may also be of interest to other market segments.

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