

Estonian Housing Market: Searching for Origins of the Boom

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Abstract

This paper studies the Estonian housing market, which, being the market with fastest growing prices in CEE, has undergone a rapid growth that has been often explained solely by an active convergence process to more advanced European countries. The study seeks to discuss the effects of changes in the economic environment on the Estonian housing market; outline the dynamics of the housing market development and assess this using ratio analysis and the Poterba model. Considering the specific features of the Estonian housing market, the paper further develops the Poterba model. The main question addressed in the study is whether the large price increases in the Estonian housing market can be interpreted as a housing boom. The research results confirm the presence of a price bubble in the housing market, which burst in 2007. The practical and methodological problems identified in the paper might be interesting for people studying similar issues on other emerging markets.

JEL classification codes: L85, R22; R31

Keywords: housing market, Estonia

1. Introduction

Research of real estate market, including housing market, has been topical for a long time. The studies have covered the impact of economic environment on demand and supply and on real estate value in old, developed real estate markets (e.g. Gallin, 2003) and in recent years also in new CEE markets (Kucharska-Stasiak and Matysiak, 2004; Balázs and Dubravko, 2007; etc). Tobin's q concept has often been used to analyse supply and long-term changes in housing markets (Barot and Yang, 2002; Malpezzi, 1999; Mayes, 1979; Meen, 2001; etc.) as well as in real estate related studies (Schulz and Werwatz, 2005).

In a dynamic analysis of housing prices in the long term, many analysts (Garratt, 2001; Case and Shiller, 2003; Gallin, 2006; etc.) attribute the greatest significance to real household incomes (household incomes adjusted for inflation) and claim that in the long term a stable relationship is formed between real household incomes and housing prices.

The problems of housing boom and burst of the bubble have been analysed by Angell and Williams (2005), Helbing (2005), Hilbers et al. (2001) among many others. One can find many ways to define a "housing boom" in literature. Angell and Williams (2005) define a housing boom as a 30% or greater increase in inflation adjusted (real) home prices during any three-year period. Helbing (2005) concluded in his research of real estate cycles in 14 countries during 1970-2002 that the market is booming when the price rise in two years is at least 32% corrected with inflation. In his opinion the boom does not always mean overheating of the market or formation of a so-called bubble. He defined the bubble as a situation where the property prices are considerably higher than their justified value.

Key economic factors believed to show the possibility of a boom are fast economic growth and loan volume growth, liberalised loan conditions, taking larger credit risks, low interest rates, overpriced properties and positive expectations for the future (Hilbers et al., 2001). It has been identified that asset price bubbles are difficult to identify in real time and are thus often only identified *ex post*. However, there appear to be a number of tools that can help to identify the emergence of bubbles (ECB, 2005). Housing price busts occur on average approximately once every 20 years, last about 4 years, and involve price declines of about 30 percent. While only about one fourth of the equity price booms have been followed by busts, about 40 percent of housing price booms have ended in a bust (IMF, 2003). Housing price busts have been associated with more severe macroeconomic and financial developments than equity price busts (*ibid.*).

The Estonian real estate market, being the smallest among Central and Eastern European (CEE) real estate markets, started to grow rapidly in 2000. The biggest (60% of the value of transactions) and most active (70% of the number of transactions) part of the real estate market is the housing market. The price rise in the housing market was the biggest across all real estate market sectors, not only in Estonia but among all CEE countries in 2002-2006. The Estonian housing market studies so far have been focused mainly on identifying the market trends and comparing them to changes in the economic background system (Kolbre and Kallakmaa-Kapsta, 2006). Also, the real estate market has been modelled by several authors (Randveer and Rell, 2000; Matsik, 2006). However, there are no studies conducted to assess the development of the Estonian housing market from both supply and demand side, using simultaneously different ratios and models, on the basis of which to identify the roots of overpricing of real estate.

The purpose of the current study is to assess from various aspects the Estonian housing market development. The housing market developments have been investigated in this study from three main aspects. First, the development of and changes in Estonian economic environment are evaluated and links to the general development of the whole real estate market and especially of housing market are provided. Secondly, in greater detail the demand and factors influencing demand in the housing market are analysed. Thirdly, the supply of the housing market and the factors that facilitate and inhibit its development are investigated. In order to find an answer to the main question of the study, whether large price increases in the housing market can be defined as a housing boom, the market condition is assessed additionally with the help of such indicators as price-to-income ratio, price-to-earnings ratio, Tobin's q and Poterba model. The aim of this paper is also to identify whether and to what extent the ratios and models used for real estate market analyses in developed countries can be used in transition economies and, if necessary, adjust them according to the Estonian housing market conditions.

Such a research would provide new information for market actors, first of all developers and investors active in the Estonian real estate market as well as market analysts and market participators in other CEE countries who evaluate the market situation in new, rapidly growing real estate markets.

The outline of the paper is as follows. The next section provides an economic background to housing market development in Estonia. The third section provides an overview of the theoretical and empirical literature on the determinants of demand, supply and prices of living space and the methods used in this research. The fourth section assesses the market condition using different ratios and Poterba model. The last section presents the estimation results and concluding remarks.

2. Economic Background and Housing Market Development in Estonia

2.1 Economic Factors Influencing the Housing Market

The annual economic growth in Estonia was very fast in 2000–2006. The growth was encouraged by favourable investment legislation and loan conditions, and low interest rates. However, the growth rate has been declining since the end of 2007.

The annual growth of private consumption peaked in 2006 at 12.8% (with remarkable growth in the fourth quarter of 2005). The largest contributors to the growth of private consumption were the rapid growth rates of employment and salaries, the decrease in the income tax rate and the increasing debt burden of households. Domestic demand also continued its rapid growth in the first months of 2007. Although income growth was still quick in 2007, private consumption started to decline at the end of the year. This was revealed in a less moderate growth of retail sales and the slowing down of income growth. Instability has been increased by inflation, which has lowered the consumers' purchasing power. Inflation gathered momentum at the end of 2007 and early 2008, amounting to 11 percent in January 2008. The main reason for that was the larger than expected rise in the prices of foodstuffs and fuel in the world market. The employment rate was high and unemployment continued to fall until the second half of 2007. The growth of employment was remarkable in construction and in the related sectors. In 2008, however, the unemployment rate started to rise and is projected to be approximately 14% in 2010.

Average monthly gross wages and salaries increased from 393 euros in 2002 to 784 euros in 2007. Disposable income was rising fast, not only because of the rapid rise in wages but also because of the drop in income tax rates. In 2006-2007, the real wage growth exceeded 11%, in 2008 the wage growth slowed down considerably and in 2009 started to fall.

Table 1. Economic Indicators 2004-2008 and Forecast 2009-2011

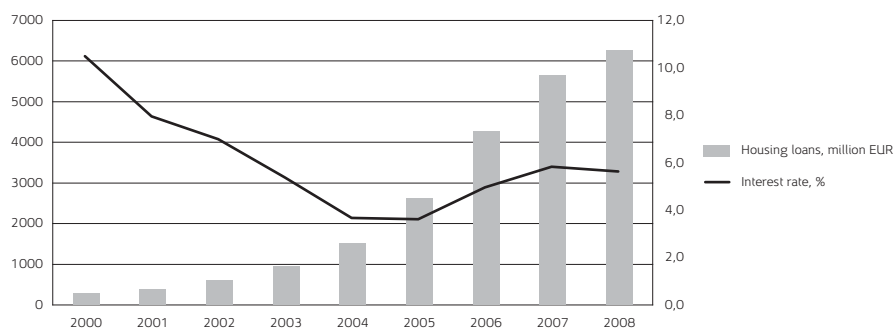
	2004	2005	2006	2007	2008	2009	2010	2011
Real GDP growth (%)	7.2	9.4	10.4	6.3	-3.6	-12.3	0.2	4.7
Real private consumption growth (%)	6.7	10.6	12.8	7.8	-4.0	-9.5	-1.7	4.7
Unemployment rate (%)	9.7	7.9	5.9	4.7	5.5	12.8	13.7	12.5
Real wage growth (%)	5.2	6.1	11.6	11.6	3.3	-4.7	-3.2	3.7
Nominal credit growth (%)	33.8	35.6	51.6	30.2	7.3	-7.5	-0.5	4.9

Source: Bank of Estonia

In 2005 and 2006, the growth rate of expenditure per household member was also induced by increase in incomes, as well as by larger loans taken by people – in 2005, loan amounts were about 60% higher compared to 2004 and in 2006 63% higher than in 2005. The impeding factors were the growth of investments in real estate (by more than two thirds) and increase in repayment of loans compared to the previous year (Statistics Estonia).

The total volume of housing loans increased as a result of low interest rates and sharp competition in the banking sector. The annual growth of housing loans was more than 40% in 2005–2006. More than half of the Estonian banks' loan portfolios have been given to real estate companies or to households for housing purposes and 70% of these are secured by a mortgage.

Figure 1. The Total Volume of Housing Loans and Interest Rates in Estonia



Source: Bank of Estonia

In 2005, the interest rates that had been decreasing, reverted to increase due to the rise in Euribor (*Euro Interbank Offered Rate*), the base interest rate on euro denominated loans, which constitute the majority of long-term loans in Estonia. First the insignificant rise in interest rates did not have any deep effect on Estonian household borrowing as the disposable income was rising. At the same time, Estonian banks started recommending households to fix their

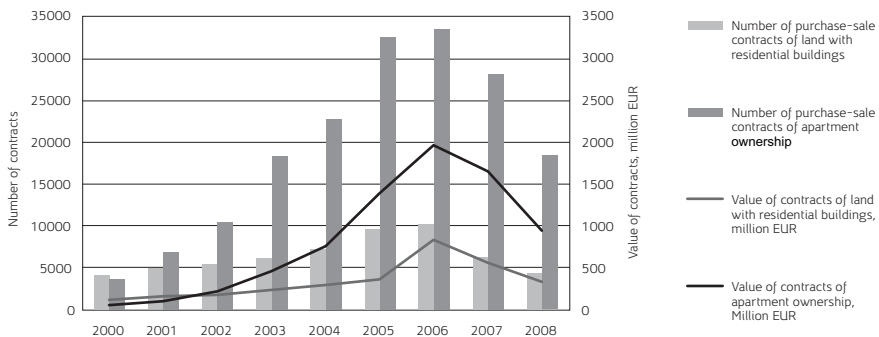
loan interest rate to avoid possible interest risks. In order to respond to the explosive increase in the volume of housing loans the Bank of Estonia made two changes in their existing system. First the risk weight on housing loans was raised from 50% to 100%, i.e. they toughened the rules of calculating capital adequacy. The change has been effective since 2006. As an additional measure the legal reserve requirement was increased from 13% to 15% in July 2006; the new requirement became effective on 1 September 2006 (Bank of Estonia, 2006).

The increase in the volume of housing loans has slowed down within the last years and a similar trend is being forecasted for the near future; interest rates have risen and the number of potential borrowers has significantly decreased. In brief it means that the recent primary resources for housing market growth have been exhausted.

2.2 Housing Market Development

The housing market is the most rapidly developing part of the real estate market in Estonia. The notarised purchase-sale contracts of immovables with residential buildings and ownership of dwellings accounted for 75% of the total number of transactions in 2007. Upswing in the housing market started in the year 2000 due to increased borrowing and the related higher purchasing power. Figure 2 illustrates the number of notarised purchase-sale contracts of registered immovables with residential buildings and apartment ownership and value of contracts.

Figure 2. Notarised Purchase-Sale Contracts of Registered Immovables with Residential Buildings and Apartment Ownership



Source: Statistics Estonia

The year 2005 was characterised by significant price increases, which started after the first quarter and the growing number of transactions in the standard apartment market in Tallinn and Harju County. The price increases were driven by a general rise in the standard of living of the residents of Tallinn. The average gross salary in Tallinn increased by 8% and the average interest rates of mortgage loans remained between 3.6 and 4.0%. At the same time, supply could not keep up with the general demand, which raised the average price levels. A comparison of the average price levels of the Soviet time standard apartments shows that the prices went up by 25-30% during the year. The prices were also continuously adjusted upwards in the market of new apartments where demand significantly exceeded supply. At the beginning of 2006, the price rise slowed down and the sales periods of apartments

increased in Tallinn. In other cities the growth continued until the first two months of that same year. The number of transactions, which had increased very rapidly at the end of 2005, started to fall early in 2006. The number of transactions in the second quarter of 2006 was approximately 12% lower than in the same period in 2005. The number of apartment transactions increased slightly in the third quarter, but was smaller than the number of transactions in the same quarter in the previous year. Compared to the fourth quarter of 2005, there were approximately 10% less transactions with apartments in the last quarter of 2006, but the value of the transactions increased by approximately 15%, implying that average prices of apartments rose (Uus Maa, 2007).

During 2006, the total value of apartment transactions and average transaction prices, at the same time, showed a general rising trend. Despite the declining number of buyers in the market, most of the sellers were not willing to lower prices; due to that the sales periods became longer and the number of apartment sale offers increased. The fast rise in the price of standard apartments was followed by a recovery and a sharp rise in the prices of one-family houses and residential land, as the prices of standard apartments had achieved the level where buying a private house was an alternative. The price of residential land in the more desirable locations increased even 100% or more in 2006 (Baltic Property Expert, 2007).

Early in 2007, the situation in the housing market stabilised, characterised by a low growth rate of prices and differentiation of prices across regions and objects, lengthening of the sales periods and an active rental market. In the second half of 2007, transactions in the housing market diminished further as buyers were waiting for prices to fall and sellers were not willing to lower prices. Dwelling prices started to fall at the end of 2007 and continued to fall at 2008. At the end of 2008, the prices of apartments had fallen 40-45% from the peak prices of 2007, those of one-family houses and residential land 35-40%. Housing market prices continued falling in 2009, and a stabilisation of the market is expected in the first half of 2010.

Table 2 outlines nominal growth rate of Estonian house prices to those in other CEE countries. A particularly fast growth rate of Estonian house prices can be noted.

Table 2. Nominal Growth of House Prices in National Currency Units
(Average of Quarterly Percentage Changes)

	1990s–2001	2002–2006
Poland (2000)	9.1	2.3
Croatia (1997)	2.7	8.7
Czech Republic (2000)	16.7	9.8
Slovenia (1996)	6.1	9.9
Hungary (1998)	8.0	11.9
Bulgaria (2001)	...	23.5
Lithuania (2000)	4.9	23.8
Estonia (1995)	13.8	36.4

Note: Initial years for country data samples are shown in parentheses.

Source: Balázs and Dubravko, 2007

3. Methods

The first step in analysing the Estonian housing market is analysis of the economic environment, as changes in the economic environment affect both demand and supply. The factors that influence the level of demand in the housing market on the basis of previous studies (Gallin, 2006) are as follows: age composition of households, household income, credit conditions, demographic factors; price of substitute units, ownership costs and expectations for the future. The analysis is based on a simple demand model of housing, Q_d , that is expressed as follows:

$$Q_d = D(Y, N, W, UC, \Theta_d),$$

where Y – income; N – population; W – wealth; UC – user cost; Θ_d – other demand shifters. The user cost of capital, in turn, depends on the price of housing, P ; mortgage rates, m ; income and property taxes, τ_y and τ_p ; respectively, maintenance and depreciation costs, δ ; and expected capital gains, c_g :

$$UC = P[(1 - \tau_y)(m + \tau_p) + \delta - c_g]$$

Since the number of population in Estonia has not changed during the period of our analysis, property tax is imposed on land only and is therefore very small, and income tax rates were diminishing, then in the current study the following indicators have been used to study the economic impact on housing market: real GDP, real private consumption, real wage and nominal credit growth, total volume of housing loans, interest rates and unemployment rate. Real estate market development is described with the notarised purchase-sale contracts of registered immovables with residential buildings and apartment ownership, and value of contracts.

Many analysts claim that in the long term a stable relationship is formed between the real household incomes and housing prices (e.g. Malpezzi, 1999; Ortalo-Magné and Rady, 2006). This relationship is measured with the aid of the price-to-income ratio (P/I) – the share of the average (median) price of an apartment/house in the average (median) total annual net household income, measured in real values and adjusted for inflation (CPI). According to Meen (2003), the most frequently used method for estimating long-term price developments is the empirical rule combined with the P/I ratio, but, particularly after 1990, the estimates of price developments in the United Kingdom, especially in the short term and based only on the value of the P/I ratio, were unreliable.

The most common way to analyse a bubble in the housing market is to look at changes in the price-to-earnings (P/E) ratio, which is the price of the house divided by the current yearly rent that the house could earn, after adjusting for maintenance costs (Stephansen and Koster, 2005; Eschker and Messner-Zidell, 2005).

In his analysis of real estate prices Poterba (1991) further developed the measurement of the P/E ratio. In equilibrium the expenditures on renting and buying a dwelling have to be equal. Poterba defined such balance of the user cost of owner occupied housing as follows:

$$R = (i + \tau_p + m + \delta - \pi) \times P_H,$$

where R – rental price, i – interest rate, τ_p – property tax rate, m – maintenance cost rate, δ – depreciation rate, π – inflation rate and P_H – the housing price. Poterba's main aim in compiling this model was to estimate the effect of tax allowances on the market. This model can also be used to estimate the effects of changes in interest rates. When interest rates rise the housing prices should fall to keep the equilibrium. Housing prices in market equilibrium would be:

$$P_H = \frac{R}{(i + \tau_p + m + \delta + \pi)}$$

As the market of rental housing is underdeveloped in Estonia and cannot be adequately assessed (a large portion of rental agreements are not reflected in the public data) and comparison with rental costs does not provide a trustworthy result, we will modify the Poterba model for further implementation in the Estonian housing market.

Considering the peculiarities of the housing and borrowing markets in Estonia we shall proceed from the following in using the model:

- The real estate tax levied in Estonia, which is only land tax, has so far been very low. As we are dealing only with the housing market, the expenditures on taxes are close to zero in cost analysis and therefore we will leave the factor of real estate tax out of the model.
- For the level of maintenance costs and depreciation rate we shall use the fixed level suggested by Poterba – both 2%. In this case the value of housing will be depreciated in 50 years, which is probably quite close to the average maximum use of the same dwelling by a private person. Considering the average expenditures on housing according to the data of the Statistics Estonia and adding to these estimated renovation costs, 2% is also adequate under Estonian conditions.
- The inflation rate in 2002-2007 is used as the value of π . The expected changes in the real estate prices are not taken into consideration here because we are interested primarily in the owner's expenditures as compared to average incomes and not in the economic profitability of investments in real estate. In this case it is reasonable to consider the inflation rate as a rate of adjusting current expenditures.
- According to the data published by commercial banks, in Estonia in half of the cases two private persons (the persons living together as a married or an unmarried couple) take a real estate loan together. Therefore we multiply the average net wages by 1.5 to get a correct ratio of the owner's expenditures to wages.
- Deductions are made from interest payments in the amount of an income tax incentive, since persons who have a housing loan get an income tax incentive.

Proceeding from the Poterba model let us consider the ratio of owner costs to average net incomes (c) in the Estonian housing market and follow its dynamics, primarily as the interest rates change. This ratio, c , can be expressed as follows:

$$c = \frac{P[i(1-\tau) + m + \delta - \pi]}{W_n}$$

where τ – income tax rate, i – interest rate on housing loans and W_n – annual net wages. The economic variables that affect the supply side of the new construction market are (The Appraisal of Real Estate, 2001): the prices of the factors of production used in the construction process; productivity of the factors of production and technology; number of builders in the market and builders' expectations for sales in the near future. In the resale market, supply is not a function of production-oriented variables such as input prices, number of builders etc.

It is a function of non-production-related, economic and demographic variables (Carn et al., 1998). Gallin (2006) presents the supply model as:

$$Q_s = S(P, C, \Theta_s),$$

where P – price of housing, C – cost of new construction, Θ_s – other supply shifters. To analyse the supply, the dynamics of the volume of construction, the number of granted building permits and completed dwellings have been presented and Tobin's q for the Estonian and Tallinn apartment market has been calculated. Please refer to the Results section.

Tobin (1969) formulated a theory of investment that relies on the ratio of marginal asset values to replacement costs – Tobin's q . This means that Tobin's q is a ratio of firm value to replacement cost of the assets owned by the firm:

$$Q = \frac{\text{Market Value of the Firm}}{\text{Replacement Value of Assets}}$$

The following relationship has been used to find Tobin's q for the analysis of housing market (Schulz and Werwatz, 2005):

$$q = V / C,$$

where V – market value of housing and C – housing replacement costs. In steady state real estate prices should be equal to replacement costs, or q should be equal to 1. Real estate developers are not interested in offering new housing if $q < 1$, since the selling price will not cover the construction costs and the price of land. At the same time, reduced demand for land, building materials and labour might involve a decrease in construction costs and the price of land. If $q > 1$, then the real estate developers can get additional profit by offering new housing. However, developers' growing demand for vacant land, building materials and labour may increase construction costs. Both developments conduct the market toward equilibrium (Poterba, 1991).

Primary research data are from the database of Statistics Estonia, Estonian Land Board transactions register, publications of the Bank of Estonia and real estate firms.

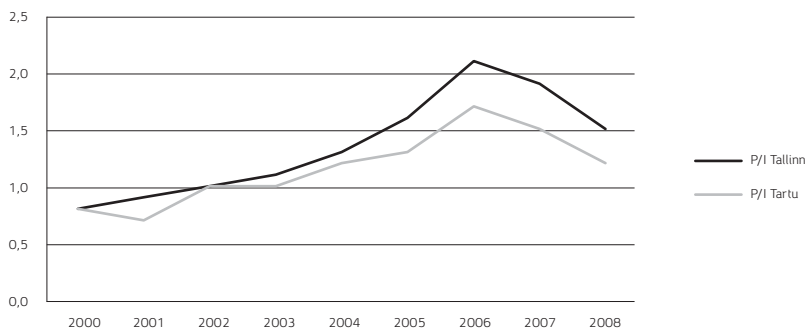
4. Results

4.1 Price Developments in the Housing Market

The indicator to evaluate price developments over a longer period of time is the ratio of price per square metre to personal income (P/I ratio). In Estonia, because of data available and significance of the housing market, this indicator has been calculated for major towns where most of the transactions take place, i.e. Tallinn and Tartu. The weakness of using P/I ratio is that the calculations have been made with average property prices and average incomes. At the same time it is known that different target groups have different interests and housing affordability. It was very easy for low income people to get a loan to finance the purchase of housing in Estonia but the average includes both different incomes and different types of housing.

Figure 3 illustrates the P/I ratio for the housing market in Tallinn and Tartu in the period from 2000 to 2008. The ratio reached a maximum in 2006 and it has always been higher in Tallinn, which the authors consider to be an expected result as in the world in general the housing prices in major cities (where a country's business life has been concentrated to) are higher compared to average income. A rise in the P/I ratio to more than 1, in 2004, indicates a price bubble followed by continued increases in 2005-2006. In 2007, the P/I ratio started to fall and the fall continued into 2008, which, from the aspect of market equilibrium, could be considered a positive development.

Figure 3. P/I Ratio of the Tallinn and Tartu Housing Market
(Based on the Price of 2- and 3-Room Apartments)

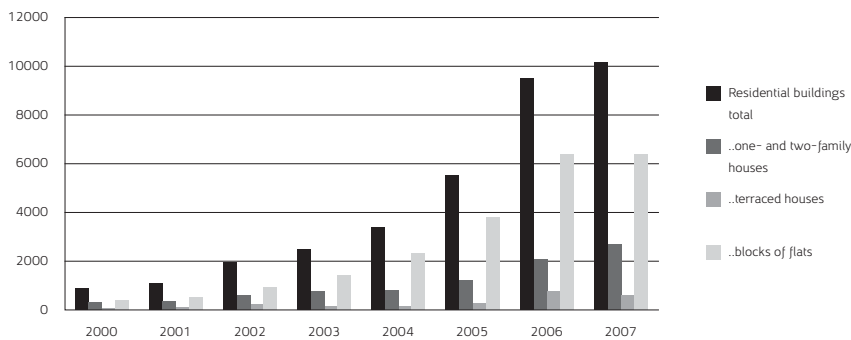


Source: Statistics Estonia and author's calculations

4.2 Supply Development in the Housing Market

The real estate market supply had increased at a growing rate during 2004-2006, especially residential construction (Figure 4). During the period 2000-2006, the total volume of residential construction increased 10.7 fold. The share of apartment buildings in total construction increased at a fast rate: in 2000 it was 46%; in 2007 it was 63%. The construction of apartment dwellings increased 15.7 fold in the same period.

Figure 4. Construction of Residential Buildings in Estonia at Current Prices, Kroons in Millions

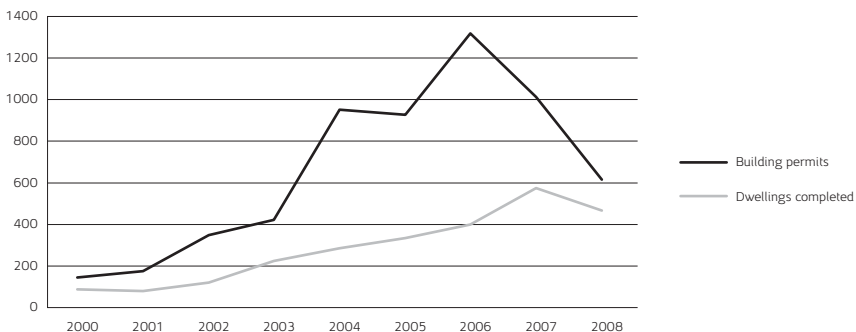


Source: Statistics Estonia

The amount of unfinished buildings increased significantly over 2005-2006. The number of granted building permits exceeded the number of completed dwellings in 2005 about 2.5 fold and in 2006 about 3.3 fold, which means that a large amount of new living space will be added in the short term. However, the number of building permits has dropped since the beginning of 2007, caused by an increasingly conservative attitude of city governments and municipalities toward new projects; additionally, fewer applications were handed in for building permits under the changed economic and market situation. Issuing permits for use is expected to stay active for some time, but issuing building permits will probably continue to decline further still.

Although it might seem that the construction growth has been enormous, the floor area of dwellings for which building permits had been granted in 2007 accounted for 2.6% of the total dwelling stock, i.e. stayed within the limit of 2-3%, which is considered a natural depreciation rate for immovable property. The new dwelling completions accounted for only 1.5% of the dwelling stock in 2006. Additionally, while the European Union average square metres per capita is 32.8 sqm, in Estonia it was 28.9 sqm (slightly higher than in Latvia and Lithuania). The same indicator in more advanced European countries is 36.6 sqm. In addition to the square metres we should also take into account the quality of the dwellings (year of construction or renovation, provision with modern utility systems etc.). In this respect Estonia also lags behind the developed European countries. Estonia's dwelling stock has lower quality compared to the advanced European Union member states – dwellings in Estonia are smaller, in some cases with less modern utilities, and the share of apartments is higher. At the same time, it should be mentioned that construction activity in Estonia, like real estate transactions, has concentrated into Tallinn and its vicinity where the granted building permits evidently account for a high share of the dwelling stock.

Figure 5. Number of Granted Building Permits and Completed Dwellings (New Construction),
Floor Area of Dwellings in 1000 sqm



Source: Statistics Estonia

To analyse the supply on the basis of Tobin's q , we calculated the average selling prices and replacement costs of apartments per 1 sqm for the whole Estonia and for Tallinn, which include the construction cost and the price of land on the basis of the Estonian Land Board's transactions database (see Table 3).

Until the year 2003, investment into apartment development projects was not profitable in Estonia as a whole. However, it was expedient in a few regions, first of all in Tallinn and

other major towns where incomes were large enough to create demand for new apartments. This is also revealed in the faster growth of q of the apartment market in Tallinn. The period 2003-2006 was extremely favourable for the development of apartment houses: the value of q was between 1.03 and 1.76 in Estonia as a whole, and 1.26-2.20 in Tallinn.

Table 3. Tobin's q of the Estonian and Tallinn Apartment Market

Year	Estonian apartment market			Tallinn apartment market		
	Replacement cost of 1 sqm, EEK	Selling price of 1sqm, EEK	Tobin's q	Replacement cost of 1 sqm, EEK	Selling price of 1sqm, EEK	Tobin's q
2000	7,543	3,775	0.50	8,243	5,600	0.68
2001	7,987	4,842	0.61	8,751	7,100	0.81
2002	8,267	7,820	0.95	9,073	11,400	1.26
2003	8,603	8,840	1.03	9,457	11,400	1.21
2004	9,233	11,360	1.23	10,134	16,200	1.60
2005	10,854	14,640	1.35	10,891	21,600	1.98
2006	11,241	19,780	1.76	12,565	27,700	2.20
2007	12,277	21,960	1.79	12,565	27,000	1.98
2008	12,533	20,100	1.60	16,078	25,200	1.57

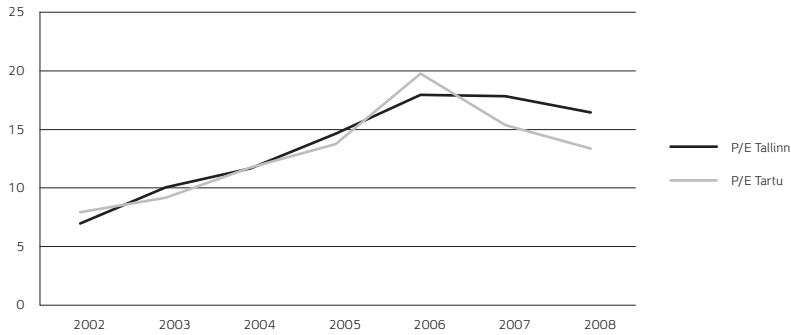
Sources: Land Board, Statistics Estonia and author's calculations

Favourable conditions for real estate development in Tallinn ended in 2007 when the loan conditions became more and more strict, interests on loans increased and quite many unfinished housing development projects were accumulated in Tallinn. In other Estonian regions where the supply of new dwellings and price rises were also lower, the year 2007 was still favourable for the developers. The real estate market statistics, for the year 2008, indicated a continuous waning of market activity and a price fall, which is quickly nearing a Tobin's q value of 1.

4.3 Housing Market Equilibrium

To identify a real estate boom and bubble the P/E ratio is used, where the ratio is the quotient of price and potential earnings (from rent). The P/E ratio depicted in Figure 6 has been calculated on the basis of selling prices and rents for two-room apartments in two major cities (Tallinn and Tartu) in Estonia, as these towns have a sizable rental market for which long-term statistics are available.

The P/E ratio was growing fast until 2006 when it achieved its maximum. The difference between Tallinn and Tartu was quite small throughout the period 2002-2006. At the time of the high price rise until 2007, the rental earnings accounted for a relatively small share of the lessor's total earnings (rental income plus real estate price rise). Owing to the slowing price rise, the significance of rental earnings for the owner has increased and the growth has been greater in Tartu.

Figure 6. P/E Ratio of the Tallinn and Tartu Housing Market (2-room Apartments)

Source: Statistics Estonia and author's calculations

Taking the share market as an alternative investment opportunity for a lessor, for example, most probably a P/E ratio higher than 15 (additional earnings from rising real estate prices are not included) is not an attractive level for a real estate owner in the long term. Hence, the potential scenarios for the future are a significant rise in rental prices, which cannot be regarded very realistic considering the income level, and a possibility that current tenants buy a dwelling, which is a more likely scenario considering the declining trend of housing prices.

Table 4 presents prices per 1 sqm of housing on the Tallinn and Tartu housing markets calculated using the Poterba model. Real estate tax was not taken into consideration in the calculations as in Estonia the tax is levied only on the land and the tax rate is very low. For interest and inflation rates the average levels of the years 2002-2007 were used (to level out the high volatility) and for both maintenance costs and depreciation rate 2% a year was applied.

Table 4. Equilibrium Price According to the Poterba Model, EEK/sqm

Year	Actual price in Tallinn (EEK/m ²)	Price according to model (EEK/m ²)	Actual price in Tartu (EEK/m ²)	Price according to model (EEK/m ²)
2002	8,300	11,112	4,700	7,481
2003	12,300	14,857	6,700	8,857
2004	15,000	18,116	9,500	11,302
2005	18,500	21,781	11,300	14,178
2006	25,800	26,304	19,300	17,826
2007	28,500	34,213	19,300	27,064

Source: Statistics Estonia and author's calculations.

The results show that equilibrium prices on the basis of the Poterba model should be significantly higher (with the exception of Tartu in 2006). Unfortunately the results cannot be regarded as realistic for several reasons. An important factor in the Poterba model is the rental rate, which cannot be adequately assessed in the Estonian housing market. Fast growth in the housing market in 2002-2006 occurred, due to the favourable borrowing

conditions, only in the sales sector and the rental market was almost underdeveloped. The residential rental market was extremely small; very few transactions compared to the sales market were made. Also the official statistics on rental rates was inadequate, as only the transactions by real estate firms were covered. The Poterba model also does not work in the conditions where the inflation rate is higher than the total of interest rate, property tax rate, maintenance cost rate and depreciation rate, as the result would be a negative rental price.

Table 5 presents the results of the calculations where the Poterba model, which was adopted by the authors to be implemented in the Estonian housing market, was used. Instead of the equilibrium price, the share of owner's costs in net wages has been calculated based on the justification given in section 3. The results show that the costs of owning a dwelling have varied greatly by years both in Tallinn and Tartu. The analysis of the dynamics of both cities shows that 2006 was the peak year when probably the price bubble also reached its peak. Thanks to the rapid increase of incomes, inflation, lowering of income tax level and halting of price increase an important correction occurred in 2007 – revealed as dropping owner's costs. Another important conclusion is that the housing price in Tartu has been clearly more favourable than in Tallinn from the standpoint of owner's costs.

Table 5. The Percentage of Owner's Costs to Net Wages on the Tallinn and Tartu Housing Markets

Year	The percentage of owner's costs to net wages on the Tallinn housing market, %	The percentage of owner's costs to net wages on the Tartu housing market, %
2002	31.3	18.5
2003	32.5	23.4
2004	31.0	24.1
2005	29.1	21.9
2006	32.3	27.9
2007	22.5	19.6

Source: Statistics Estonia and author's calculations.

The fact that the costs of owning a dwelling decreased in 2007 could be expected due to the falling selling prices of housing, since there was less interest in buying an apartment because of the toughened investment and borrowing conditions, and so the number of purchase-sales aimed at the owners actually living in the dwelling fell. Simultaneously, in 2007, the renting market developed notably. The weakness of the model is that an average housing loan taker need not earn the average wages of an Estonian inhabitant. The average wage was used as banks could not disclose data about their clients so there was some possibility of error as the average wages of owners might actually have been somewhat higher than the Estonian net average wage. Another problem with this model appeared in 2008; when the rate of inflation was exceptionally high (10.4%) and higher than the sum of interest rates on housing loans, depreciation and maintenance cost rates (9.8%). In these conditions the share of owner's costs is negative, which is not realistic.

5. Discussion and Conclusions

The presence of a boom and the probability of a crisis on the Estonian housing market were forecasted by the following indicators: rapid growth in loan volumes, liberalised terms for loans, taking high risk loans, low interest rates, fast economic growth, overvalued properties, positive expectations for future and large foreign capital inflow. The expectation of interest growth and the lack of possibility to control the interest rates at the local level are an obvious threat to Estonian economy as a whole. Actually, the Bank of Estonia lacks appropriate instruments and majority of the housing loan portfolio comprises loans with floating interest rates, the level of which, in turn, depends on the economic situation in Europe.

The dynamics of the housing market prices and turnover showed that high deal activity increased the prices and, on the contrary, a decrease in the number of deals lowered the prices. Such relation would be very illogical in a customary market situation. Buying interest should be lower at a higher price level and contrariwise at a low price level. The logic which is prevailing in Estonian housing market proves that it was a market where due to favourable loan terms demand constantly exceeded supply, and changes in prices had, first and foremost, an impact on the suppliers' behaviour. Two more specific circumstances which caused the long time pressure of demand in the Estonian housing market can be considered as local peculiarities – obsolescent housing stock and less floor space per capita in square metres than the average in the EU countries.

The results of price-to-income ratio (P/I) and price-to-earnings ratio (P/E) analysis allow to state that the fast price rise caused a bubble in housing market, which peaked at the end of 2006 and at the beginning of 2007. It is difficult to tell when exactly the bubble developed, as the analysis of possible overvaluation of real estate prices in Estonia is complicated due to the status of transition economy where a nominal and real convergence should be accompanied by a growth of real estate prices, the more so that the initial price level of residential property was very low.

For analysing equilibrium prices using the Poterba model, housing prices should be even higher in order to create economically reasonable option in favour of renting, which, however, is unrealistic. The findings allow only drawing a conclusion that during the period under review (2002-2007) owning a dwelling was economically more beneficial than renting it both in Tallinn and in Tartu (excluding Tartu in 2006). The reasons why the Poterba model cannot be used for calculating the equilibrium price in the Estonian housing market are as follows: an undeveloped rental market and inadequate statistics on rental rates. Additionally, the model does not work with a very high rate of inflation, as was the case in Estonia in 2008. When the rate of inflation is higher than the sum of interest rate, property tax rate, maintenance cost rate and depreciation rate, the result would be a negative rental rate.

Taking into consideration the specific features of the Estonian housing market (the underdeveloped rental market, inadequate statistics on rental earnings and mostly functioning purchases and sales market, which is greatly affected by loan conditions) the Poterba model was correspondingly developed and the share of owner's costs in net wages was found. The results showed that both in Tallinn and in Tartu the costs of owning a home had been different year-over-year, but 2006 was the peak year of the bubble in both cities. Thanks to the rapid growth in incomes, inflation, tax rate decrease and stopped increase in prices, actually a significant correction occurred in 2007, which was revealed in decreased owner's expenditure. The second important conclusion is that in recent years the housing

price in Tartu had been clearly more favourable in the light of owner's expenditure. However, problems may also arise in using the owner's expenditure model in high inflation conditions, as in the case of the Poterba model. Namely, when the rate of inflation is higher than the sum of interest rate, property tax rate, maintenance cost rate and depreciation rate the result would be a negative share of owner's expenditure in net wages.

If the Estonian housing rental market statistics are more adequate in the future, it will be possible to develop the model similarly to the method provided by Poterba, i.e. to compare the ratio of the rental expenses and owner's expenditure to the housing price. Furthermore, it will be very easy to include the real estate tax rate in the model if it should significantly increase compared to the present level and have impact on the result. At present a tax is levied only on land in Estonia and the tax rate is very low.

Tobin's q calculations for the Estonian housing market showed that the most challenging period for property developers on the supply side was in 2003–2007, when Tobin's q ranged from 1.02 to 1.76.

To sum up, it can be said that the fast price rise and bubble in the Estonian housing market were caused by:

- fast economic growth, resulting in increased household income;
- relatively low level of households' tax burden in the environment of significantly falling interest rates and increasingly more favourable loan conditions for the borrower and the banks' extremely aggressive financing policies;
- foreign investors' great interest in housing for investment purposes;
- relatively small housing floor space per capita (28.9 sqm in 2006) compared to developed European countries (36.6 sqm) coupled with the obsolescent housing stock;
- supply not keeping up with demand due to the limited capacity of the construction sector and problems with planning.

Due to the last year's developments (price rise stopped and was replaced by decline) a part of this bubble has disappeared by now but prices will continue to fall. One reason for that is still too large supply (development projects that were started earlier are finished), which under small demand compels to correct prices downwards. Other reasons are stricter loan conditions and rise of interest rates.

As economic forecast for the following years are pessimistic, there is no clear understanding at the moment of how long the market depression would last. A new market recovery definitely cannot occur in the conditions of economic decline. It is difficult to estimate how deep the decline might ultimately be but the Estonian housing market is far from the "equilibrium point".

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