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Drivers of Estonian Housing Market Cycles

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Abstract

The aim of this study is firstly to define the housing market cycles of the Estonian market through the analysis of price and transaction volume dynamics and secondly, to postulate factors that have the most substantial influence on real estate prices in the new market growth phase. The authors have applied a Honeycomb cycle, theory-based method to analyse the cyclical nature of price and volume interactivity and present regression analysis as a basis of a dedicated econometric model.

The study concludes that changes in the housing market are firstly reflected in the activity of transactions and then in prices — which is confirmed by the data that has been collected. On the Estonian housing market, the main factors influencing apartment prices have substantially changed in the process of convergence, when comparing the current growth levels to those of the growth phase witnessed before the economic boom, and are now much more akin to the primary factors found in more developed markets.

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1. Introduction

The Estonian real estate market has recovered after the significant drawbacks that occurred between 2007-2009, and has returned to growth, achieving record heights in 2014. In comparison to the lowest points at the time of crisis, both land and apartment transactions have increased by around 40%. The general Estonian real estate market has grown by 8% in volume and the total number of transactions in 2014 shows an increase of 12%. This real estate bubble index growth is being led by the apartment factor, with the transaction prices of residential land that includes buildings and agricultural land, gaining ground alongside. Likewise, the offered prices for apartments, houses, commercial spaces and land are also on the increase.

Similarly to Estonia, various changes have taken place in the housing markets of European countries, both before and after the recent crisis. Most of the studies published on this topic deal with markets of developed countries. For example, Corradin and Fontana have examined the house price dynamics of thirteen advanced European countries, by means of a Markov-switching model, characterising the changes in the parameters of the error correction model (Corradin & Fontana, 2013). Corradin, Fillat, and Vergara-Alert (2012) have analysed a wide variety of high and low-growth phases in housing markets across US States and provided evidence that switching from a low to a persistent high growth phase affects the probability of buying a new house and conditional moving increases the housing investment. Moreover, a high-growth phase decreases participation in stock market investment. Pomogajko and Voigtländer (2012) have explored the extent to which the synchronisation of business cycles affected the co-movement of house prices in OECD countries between 1990-2010. Additionally, Hilbers et al. (2008) have compared house price developments in Europe.

Less attention has been turned to housing markets in East and Central Europe (CEE). Selected studies have covered the impact of the economic environment on demand and supply (Kucharska-Stasiak & Matysiak, 2004). A paper by Balazs and Dubravk (2007) observes the determinants of house prices in eight transition economies of CEE and 19 OECD countries. The main question addressed was whether the conventional fundamental determinants of house prices, such as GDP per capita, real interest rates, housing credit and demographic factors, have actually driven observed house prices in the area. Widłak and Tomczyk (2010) have presented estimated results of a hedonic price model, as well as housing price indices for the Warsaw secondary market. The Estonian housing market has previously been analysed with the aim of evaluating the affordability of housing and to assess regulatory framework decisions' impact on the local housing market (Kallakmaa-Kapsta & Kolbre, 2013). A problem previously untouched is how the cycles are transforming and evolving, what price changes are resulting from those changes, and how can developments in Estonia, in that regard, be related to the experiences of other countries.

The aim of this research is to define and explore housing market cycles in the context of the relatively young real estate market of Estonia (since 1990s), from the viewpoint of price and transaction activity dynamics, in order to evaluate the current situation on the market and compare it to neighbouring Latvia, who shares notable historical similarities with Estonia, and then to the markets of the more highly developed Nordic countries. An additional goal is to identify factors that have primary influence on housing prices in Estonia, to allow for more precise future forecasting of prices.

The analytical model applied in this paper consists of two phases: the first phase analyses changes in market cycles based on Honeycomb cycle theory; the second phase focuses on

identifying and evaluating the primary price-influencing factors on the local housing market, based on a regression analysis.

This paper delivers three main contributions to the literature on housing markets. Firstly, the Honeycomb cycle is applied to studying transactions and price dynamics on the market in an emerging economy, which is in the process of convergence — an original approach and analysis of current data. Secondly, the similarities and differences between regional developing economies and more highly developed economies are observed. Thirdly, the paper identifies the factors that influence housing prices in a period of new growth, as well as the differences in comparison to the primary factors in the previous phase of rapid growth, shedding light on the changes that have taken place during the market development cycle.

The outline of the paper is as follows. The first section provides a brief overview of the existing theoretical and empirical literature on housing cycles and on the determinants of house prices. The second section discusses the interactivity of a number of transactions and housing prices, presents our empirical model and describes the estimation techniques. The next section presents the estimation results. Finally, the last section outlines our concluding remarks.

2. Theoretical framework

Even though real estate investors often refer to a single real estate cycle, there are various interrelated cycles that have been observed to exist in the real estate market, influencing prices and transaction volumes. Pyhrr et al. (1989) have identified 14 distinct cycles that impact real estate investors. One of the few specific definitions offered for a real estate cycle is the following, by Pyhrr et al. (1989): property cycles are repeating but irregular fluctuations in the return rate of real estate.

In 1994, Mueller and Laposa adapted the sinus wave theory to suit real estate market specifics. The authors defined 4 phases: hyper supply, recovery, expansion and recession. According to them, the market balance point is positioned between expansion and the returning point. In the context of a growing economy, the long-term trend is that both supply and demand are going upward, so that every new cycle peak is higher than the previous.

In general, it appears to hold true that the changes in supply have a higher amplitude than demand variations. This is due to the enthusiasm of the supply side reaching over demand in the phase of demand peak and, similarly, due to pessimism in the lowest point that falls below demand (Pritchett, 1984). Real estate cycles have been characterised by price acceleration — in a growth phase, the prices increase faster than they are expected to increase. In decline, the same happens in the opposite direction, resulting in over-priced and under-priced real estate, respectively (Born et al., 1999).

Supply usually follows the demand pattern with a certain time-lag. This has mostly been seen as a result of slow financing and construction processes. This means that it is difficult for supply to follow demand after market indications and it is not possible to flexibly reduce available supply in times of significantly fallen demand. The real estate cycles of the past have proven to be volatile, complex and continuous phenomena (Phyrr et al., 1989).

There are competing theories about the causes of a "real estate bubble". One branch is demand-driven, claiming that the bubble is the result of the growth in consumer demand that initiates a price climb (Hendershott, 2000; Wheaton et al., 2001). Alternatively, supply-driven theories claim that the bubble is primarily caused by easier credit availability, therefore

allowing consumers to undertake purchases for more expensive housing. However, according to Levitin and Wacther, monetary policy, irrational consumer behaviour, non-elastic housing supply and regulatory changes fall short of explaining the formation of the bubble. (Levitin & Wachter, 2012)

The authors of the theory of psychology of masses and irrational exuberance (Case & Shiller, 1988; 1989) propose that correlation on the time scale on the real estate market is mostly a result of hindsight expectations by market participants. Case and Shiller have carried out a survey among recent real estate buyers, which demonstrated that the buyers have greater expectations to real estate prices on a growing market than buyers on a non-growing market. The buyers on a growing market would view their purchase more as an investment and are more thoughtful about market dynamics. In the opposite market, the buyers are much more focused on evaluating the details of personal consumption. This theory also assumes quick access to credit (Levitin & Wachter, 2012).

The common ways to evaluate long-term price developments on the housing market are P/E ratio (price to rent in housing context) and P/I ratio (price to income). P/E relates price to available dividend. The ratio is meant to show if properties are over-priced, assuming that rent values should more accurately reflect the actual fair situation of the market. Similar rules apply to the P/I ratio, which assists in evaluating the fair value of housing (Levitin & Wachter, 2012). However, according to Meen (2003), 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, have been noted to be unreliable.

The impact that the number of transactions has on prices has also been explored in various studies. Capozza et al (2002) have approached prices from two different aspects: analysing the housing market of the US from the viewpoints of a supply-based theory and a transaction volume based explanation. Specifically, he suggests that the housing market is very heterogeneous, which makes it difficult to determine a fair price at any given moment. In general, fair price is a balance between the past and present prices of similar assets, where the spread of information on transaction activities is vital in providing indications of actual prices (Levitin & Wachter, 2012).

Wheaton (1999) has treated transaction volume as a significant indicator of market trends. Whenever economic or demographic factors influence transaction volumes, it usually results in some districts reacting faster, or with higher amplitude to the underlying shock, firstly through a correction in transaction volume. In its model, Wheaton (1999) has emphasised that the positive shock of net wage increases initiates both activities of moving and renovating. This simultaneously increases transaction volumes, lowers the cost of searching for information on available offers and allows for higher prices. When the adaption has taken place, the transaction costs return to their long-term levels (Wheaton, 1999).

Multiple studies have demonstrated that the real estate market does not adapt to changes in fundamentals without inertia — the correlation exists with a time delay. This suggests a lack of market efficiency. Real estate prices fail to account for all available market information and future corrections are delayed. Moreover, Abraham and Henderscott (1996) have claimed that the inefficiencies between fundamental indicators and prices result in prices reacting to macro-economic indicators with substantially larger amplitudes. This means that information on market fundamentals, as well as fair value, reaches consumers with a delay, suggesting that the number of transactions is a more reliable factor in identifying the current market cycle phase than current price. (Festa et al., 2013)

In the primary and secondary segment, the housing market is commonly viewed based on the age of the building. Therefore, both primary and secondary demand, as well as primary and secondary supply, can be viewed separately. Many authors have suggested that primary and secondary markets are influenced by different factors and in different ways. Primary demand consists of mostly first purchases, or households searching for a new home, whereas secondary demand consists of more investment purposes, alongside the wish to improve the current quality of life by moving (Balazs & Dubravk, 2007).

Jansenn et al. (1994) have described the housing market in the Netherlands, where yearly transaction numbers fluctuated more than average price. In their view, this meant that explaining the dynamics of transaction activity is equally important as explaining the changes in prices. The authors developed a cyclic theory based on combined price and transaction interactivity on the housing market. They claim that a change in market conditions triggers a cyclical response in the housing market, in both prices and the number of transactions. This is caused by construction delays, but also by the reaction of buyers and sellers. The fact that many buyers are also sellers, and vice-versa, impacts the cycle. The volume changes appear more closely statistically related to changes in market condition than price changes. "The approach linking price and volume changes in the housing market is based on the microeconomic theory of market behaviour of economic subjects, a version of which is stimulated by observations of the course of realised average price and realised number of transactions" (Jansenn et al., 1994).

Econometric models that aim to identify the primary influencing factors of prices on housing markets are a common method to describe and explain market dynamics. There is a plethora of models and opinions as various models only work well for some environments and do not translate well to different countries and cities. Secondly, models might not have the ability to predict the future over longer periods of time. Many studies have dealt with attempting to include the factors of supply and demand into various econometric models. Among the more recent studies are Himmelberg, Mayer and Sinai, 2005; Ceron and Suarez, 2006; Song and Shon, 2007; Gao and Asami, 2007; Wilhelmsson, 2008; Özsoy, Taltavull and McGreal, 2009; Pashardesa and Savvab, 2009; Hadavandi et al., 2011; Glindro et al., 2011; Arestis, González, 2013, Ong, 2013, etc.

One recent study, also relevant in an Estonian context, is by Balazs and Dubravki (2007), which evaluates the fundamental factors for explaining the impact of housing prices in Central and Eastern European (CEE) countries. The main factors under focus were demonstrated to be GDP, nominal interest rates, credit volume and demographic indicators. Additionally, housing financing developments, housing quality developments and growing demand by non-CEE residents were taken into account. The authors suggested that housing market institutions in most CEE countries are rather weak and housing financing is low. Developments in regulations and institutional framework were seen as being mostly down to the process of European integration. The reforms in legal framework, which facilitated easier transfer of ownership of real estate assets as credit warranties, simplified financing with credit institutions. Following such reforms, long-term housing loans grew notably and interest rates fell (Balazs & Dubravk, 2007).

Additionally, researchers such as Attanasio and Weber (1994) have proposed that the institutional developments of the housing market and the lowering of credit limits correlates positively with real estate prices. The prices tend to rise to a balance point when markets are under regulated. For example in the UK, a housing bubble at the end of 1980s was supported by earlier liberalisation in the finance sector.

The study of the Estonian housing market by Kolbre et al. (2007) demonstrated that in the apartment market, only two indicators were of primary influence: credit volumes and interest rates.

The following study is guided by the following three hypotheses:

- Combining transaction volume and prices, the honeycomb cycle phases are evidently observable only given the appropriate environment of respective macroeconomic indicators.
- Due to a lack of information, the transaction volume reacts to changes in the housing market environment before the prices and the volume should, therefore, be viewed alongside market prices.
- The price per m^2 of an apartment in an adequate condition depends on the conditions of private loans, average gross monthly wage, GDP, consumer price index, the unemployment rate, the number of transactions on the market, the amount of building and usage permits and expectations on economic outlook over the following 12 months, both from a consumer and construction industry point of view.

3. Research methodology

In the context of evaluating the changes on the evolving housing market, viewing price dynamics separately from cycle phases can be mostly insufficient. A relatively better overview can be achieved with a combination of methods — firstly, treating market dynamics through cyclical phases and secondly, identifying the macro-level indicators primarily behind the price level on the housing market, keeping in mind that the primary influencial factors can change in the transformation of cycle phases. The first step applies Honeycomb cycle theory and is aimed at testing the first two hypotheses. The Honeycomb cycle allows for the simultaneous evaluation of different markets, their cycle phases and furthermore in the current case, to compare the data from developed countries to converging countries. The second step applies regression analysis as an established tool of determining causal factors of primary influence on the given variable in question and therefore tests hypothesis number three.

The honeycomb cycle explains the interactivity of changes in prices and in the number of transactions in real estate. As a combined outcome of criteria, the change is reflected on a plot of actual price and actual number of transactions in a period — as a hexagon, similar to a honeycomb, hence the name (Janssen et al., 1994). Even when the data from a specific market does not form a hexagon shape, the core idea remains — changes in prices and in transaction volumes are related and they should be viewed together. (Festa et al., 2013)

The combined forces of the external and internal cycles can influnce the local housing market through various balance points. This balance is only temporary and is impacted by the local business cycle. The following table presents the division of phases in a cycle according to changes in prices and in the number of transactions (Janssen et al., 1994).

Table 1. Honeycomb cycle turning points in relation to supply and demand

Phase	Market	Supply	Demand	Supply	Demand	Price	Volume
		secondary		primary		realised (actual)	
E1 -> E2	Active	0/+	0/+	0/+	+	+	+
E2 -> E3	Stagnating	-/0	-/0	0/+	+	+	-
E3 -> E4	Recession	-/0	-/0	-/0	-/0	0	-
E4 -> E5	Inactive	-/0	-/0	-/0	-	-	-
E5 -> E6	Turning	0/+	0/+	+	0/+	-	+
E6 -> E1	Recovering	+	+	+	+	0	+

+ increase - decrease 0/+ stable or increase -/0 decrease or stable

Source: Janssen et al. (1994)

Jansen et al. (1994) interpret the six phases of the following sequence:

Phase E1 → E2 – The situation in the economy is strong, economic outlooks are favourable and consumers have a high level of trust regarding present and future security. Secondary demand is rising, which results in equal growth in secondary supply. The number of transactions are therefore growing, but without having a full effect on price. Primary demand is also increasing. The prices are then starting to increase, which induces a wish to react with supply, but primary supply is price elastic in the short term, due to the length of the process of provision. Therefore, prices continue to climb.

Phase E2 → E3 – A turning point is met when external factors turn general, short-term future expectations towards negative. Primary supply is met with unfavourable conditions which results in a significant drop in construction volumes. Still, primary demand remains strong as people wish to enter the market before the prices climb higher. The influences of secondary supply and demand postpone the plans due to a negative outlook. This influences transaction volumes, but not prices, directly. Therefore demand is growing more than supply, which then results in an increase in prices.

Phase E3 → E4 – The outlooks appear negative, the transaction numbers are in decline but prices can still be growing. Primary demand goes into decline. From a primary supply point of view, there are no reasons to enter the market, however, a part of new housing is still in the process of development. In this phase, primary demand and primary supply are equal. At the same time, secondary demand continues to decrease, as does secondary supply, constraining the number of transactions without influencing the prices.

Phase E4 → E5 – In this phase, most households agree that the economy is shrinking. Primary demand is falling, especially when price cuts are witnessed and further cuts are expected. The representatives of primary demand have no reason to initiate new developments and, therefore, less new housing is built, compared to previous phases. Secondary demand is also dependent on economic situation, which results in even lower total demand. As secondary supply falls, the number of transactions continue to drop further. The market is not active.

Phase E5 → E6 – This phase starts after the next turning point in the economic environment towards positive expectations. Primary supply expects growth from the economy, assuming that it has passed the lowest point. New housing developments are initiated.

Phase E6 → E1 – The prices are stabilising due to primary demand increasing and with primary supply able to meet the demand, which has not yet grown to its peak. In terms of secondary demand, people who have postponed their transactions become active and this also induces growth in secondary supply. The transformation from phase six to phase one takes place when postponed transactions have been realised. As a result, prices and the amount of transactions are stable. Still, with higher economic growth, a number of households may be tempted to become homeowners and therefore primary demand increases. Because of the inertia in construction, primary supply is not able to meet all of the demand and prices start increasing again.

Festa et al. have added that phase two can entail additional difficulties with access to credit (due to rising interest rates and the high price of capital, especially in larger cities, which causes the demand to decrease, which does not satisfy sellers' expectations). Furthermore, phase three is characterised by both demand and supply preferring to postpone actions. On one hand, economic downturn can lower income; on the other hand, there's a wish to remove offers from the market, as there is no demand for the offerings at the expected price level. The fourth phase is "waiting", which by theory is a slow process and entails future market forecasting. In this situation, the economy is in difficulties. On one side, instability on the market can propagate real estate investments. This might lead to a longer stagnation period, where both prices and transaction numbers change relatively little (Festa et al., 2013).

The data in the first phase of analysis covered the period between 2002-2013. The data sources on transactions and prices originated from Statistics Estonia; the Central Statistical Bureau of Latvia; Statistics Norway, Statistics Sweden and Baltic Property Market report, 2014. In the second phase of analysis, the following multiple regression is applied (Tamm, 1996):

$$y_{xj} = a_0 + a_1x_1 + a_2x_2 + ... + a_nx_n \quad (1)$$

where

y_{xj} – *outcome, target, dependent variable;*
xj – *explanatory variables* (j = 1,2, ... , n).

The parameters (a_j) are identified via the method of least squares, which assumes the minimisation of the sum of squared differences between resulting empirical values and theoretical values (Tamm, 1996)

$$\sum (y - \bar{y}_x)^2 = \sum (y - a_0 + a_1x_1 + a_2x_2 + ... + a_nx_n) = min \quad (2)$$

The specific values for parameters () can be found from the following equations. According to the number of variables, there exists methods for calculating parameters for the cases of 1, 2, x ... n independent variables in regression (Tamm, 1996)

$$\begin{aligned} &a_0n + a_1\sum x_1 + a_2\sum x_2 + ... + a_n\sum x_n = \sum y \quad (3)\\ &a_0\sum x_1 + a_1\sum x_1^2 + a_2\sum x_1x_2 + ... + a_n\sum x_1x_n = \sum x_1y\\ &a_0\sum x_2 + a_1\sum x_1x_2 + a_2\sum x_2^2 + ... + a_n\sum x_2x_n = \sum x_2y\\ &a_0\sum x_n + a_1\sum x_1x_n + a_2\sum x_2x_n + ... + a_n\sum x_n^2 = \sum x_ny \end{aligned}$$

The following variables were chosen combinig selected theoretical findings with practical insight.

Dependent variable:

KH – The average transaction price (in euros) of a reasonably conditioned, two-room apartment, located in Tallinn, in the period between the first quarter of 2000, to the last quarter of 2013.

Independent variables:

Intr – the private interest rate of housing loans for individuals;
LK – total turnover of private loans (in mln €);
SKP – nominal gross domestic product;
THI – Consumer Price Index;
Palk – average gross montly income;
Tootus – the unemployment rate in the age group of 15-74 years-old in Estonia;
TA – the number of appartments sold;
EL – the amount of new building permits for housing;
KL – the number of new housing usage permits;
Oot – consumer barometer index – the expectation of the household economic situation for the following 12 months;
Eb – construction barometer index – the expecation of the construction sector for the following year.

The preliminary econometric model was the following:

$$KH = a_0 + a_1 \times LK - a_2 \times Intr + a_3 \times Palk + a_4 \times Tootlus + a_5 \times TA + a_6 \times EL + a_7 \times KL + a_8 \times Eb + a_9 \times Oot + a_{10} \times THI \quad (4)$$

where:

KH – dependent variable;
a_i – parameters (i=0…11);
LK, Intr, Palk, Tootlus, TA, EL, KL, Eb, Oot, SKP, THI – independent variables (i=1...11).

The analysed data from the period 2000-2013 originated from official statistics according to various local authorities: the nominal gross domestic product, the Consumer Price Index, the average gross montly income, the unemployment rate in the 15-74 age group, the number of new building permits for housing and housing usage permits, from Statistics Estonia; the number of appartments sold, from the Land Board; the consumer barometer index and the construction barometer index, from the Estonian Institute of Economic Research; and the private interest rate of housing loans for individuals and total turnover of private loans, from the Bank of Estonia. The data is sequenced quarterly. Multiple regression analysis was carried out with a statistics application Gretlis (Gnu Regression, Econometrics and Time-series Library).

4. Results

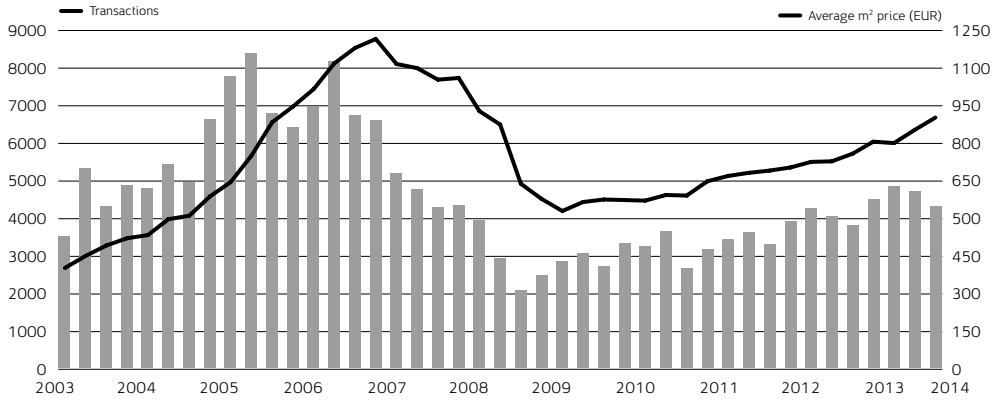
4.1 The cyclical nature of the Estonian housing market

Estonia has faced recent economic crisis with a balanced state budget that leans towards free trade. The GDP growth in 2011 peaked at 12.9%, slowing down afterwards, reaching 3.9% in

2012 and 1.5% in 2013. Such cooling-down is mostly seen as a result of a low external demand. Unemployment levels peaked at 17% in 2010 and then dropped to 9% in 2013. It is estimated that unemployment will not drop below 7.5%. The average local wages have been increasing since 2011. The export volumes are in slight decline, equalling around -2% in 2013 (Statistics Estonia).

The main characteristics of the Estonian housing market are depicted in figure 1, which presents similar trends in the number of transactions and average price per m^2, but with evident time lag and varying amplitudes.

Figure 1. Average m^2 price of apartments (in EUR) and the number of transactions between 2003 III q – 2014 I q.



Source: Statistics Estonia

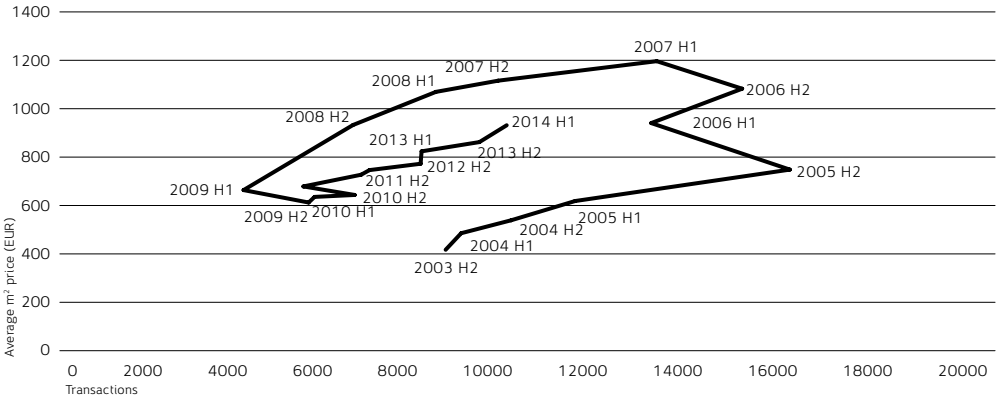
The Estonian housing market is, by and large, driven by Tallinn, the capital — about 2/3 of all transactions take place in Tallinn and its nearby surroundings. The market activity peaked in 2005-2006, reaching 1100 transactions in a month. Following the 2007 crash, growth was restored by 2010. This was followed by a slight decline in 2011, due to Estonia switching over to the euro. In 2012, the activity grew by almost 20%. In 2013, transactions grew a further 14.7%, reaching the same levels as 2003-2004. Continuous growth is expected in 2014. The prices have currently reached 2006 level, which is still 20% below the peak of 2007.

The market is in a situation where demand for apartments is rather large, despite the tightening conditions in terms of loans, whereas supply is quite modest. In 2007, new constructions met record activity, with a total of 9800 new apartments being sold. Since 2008, the construction of new apartment buildings has shrunk. Only in 2013 did the numbers of new apartments sold return to growth (both ready and in-construction) – the first nine months of 2013 saw a 16% increase, when compared to a similar period in 2012. In new constructions, larger projects are avoided due to higher risks – new buildings have only 30 apartments on average, with random bigger projects found in cheaper areas outside the city centre (Newsec, 2014).

Figure 2 analyses the applicability of the Honeycomb theory in the Estonian apartment market. To eliminate seasonality, half-year averages are used both for the number of transactions and price per m^2. Until the end of 2005, both price and activity was growing, reaching the turning point from where onwards only prices increase, with activity remaining stable. Starting from the first half of 2007, the activity was notably shrinking until 2010. In

2007, the price was stable, followed by a substantial decrease in 2008 and 2009. In 2007 and 2008, the market activity dropped by 50% and only then did the prices begin to notably drop as well.

Figure 2. Average m² price and transaction numbers in the Estonian apartment market between 2003 and 2014, in half-year periods (in EUR).



Source: Authors' representation of data presented in appendix 1.

Until the first half of 2010, the first five phases of the Honeycomb theory are evident. The fifth phase only lasted for half a year, followed by new growth due to an improved economic outlook. This optimism has changed both prices and market activity. The graphs reveal an optimistic turning point in the economy, where prices are quickly following the market activity increase and the first phase of growth starts again. Comparing market dynamics with Honeycomb theory it appears that housing market, 70% of which is covered by apartments, has been in rapid growth recently and is expected to reach a point of decrease in activity, which will then start to put pressure on prices in the following phase.

4.2 The cyclical analysis of nearby housing markets

For a better comparison with neighbouring markets, the authors are primarily using the Latvian market, which is economically and historically similar to Estonia. The Nordic countries — Norway, Sweden and Finland — are geographically close, but economically and historically more distant. For these cases, there has been speculation and warnings on the formation of a real estate bubble, which means that the prices on the housing market are systemically overpriced, compared to fundamental economic indicators.

4.2.1 Latvia

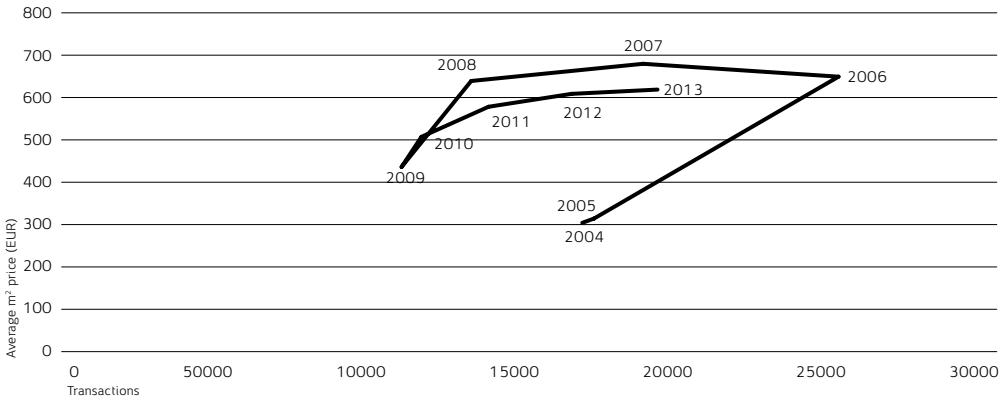
After a substantial downturn in 2008-2010, Latvia has demonstrated strong recovery. The driving force has been the growth in domestic trade and commercial services. Strong growth has been witnessed in the real estate sector, public service sector (healthcare, education etc.), as well as in construction and in horeca sector. The unemployment rate has dropped from a 2010 peak of 21.3% to 11.4% in 2013 and average incomes are increasing (Statistics Latvia).

The housing market has witnessed quick growth. In 2012, the number of transactions increased by 32% and a further 16% in 2013. Of the total of 9400 transactions per year, 15% were situated in the centre of Riga, the capital city. New projects are slightly increasing in price — 6% in 2013. Still, new apartments form only 18% of total transactions, remaining sensitive to the supply.

The demand for housing in Latvia is continuously high. The growth in new constructions has been mostly due to favourable loaning conditions and supported by an improving economic climate. Compared to a few years ago, supply is increasing as numerous new projects are entering the market. It can be projected that supply will soon outgrow demand in Riga. In relation to that, forecasts assume a price drop of 5-6% in 2014, with more in the more expensive regions (Baltic Review).

In relation to price and transaction numbers in Latvia, four of six Honeycomb phases are depicted in Figure 3, of which two have been only one year long. It is also of interest that the third phase, where prices are stable and lag behind the drop in activity, did not exist in the case of Latvia in 2007 — the crisis of 2007, in a more synchronised fashion, impacted the prices and market activity from 2007 to 2009. In the period 2003-2009, four phases of Honeycomb are apparent due to macroeconomic conditions.

Figure 3. Average price and transaction numbers in the Latvian apartment market in 2003-2014 (in EUR).



Source: Authors' representation of data presented in appendix 2

It has been observed that, since 2010, both prices and market activity has picked up again, which means that for Latvia, the distinct Honeycomb phases of five and six were skipped and the market has, by now, entered phase two.

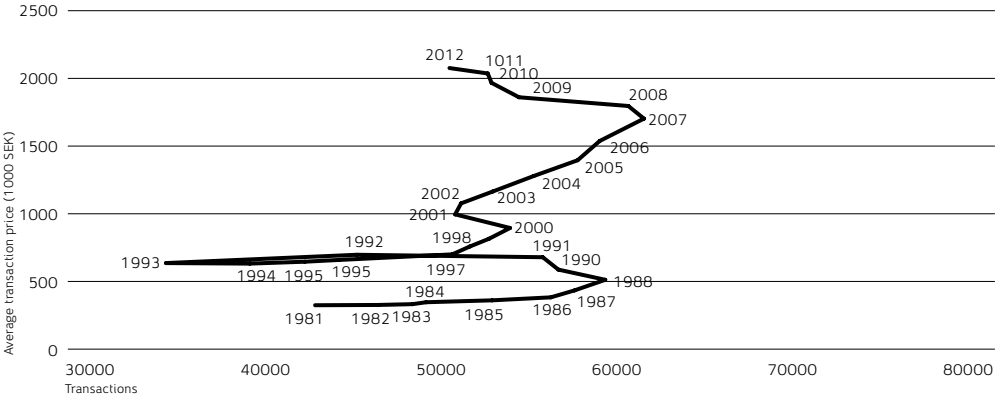
4.2.2 Sweden

Similar to other real estate markets of Northern Europe, the price of housing in Sweden has almost tripled compared to 1990s levels. Growth was either slowed or halted altogether during the recession, but the prices are currently headed for record heights once more. Housing in Sweden is notably overpriced, at around 120% of historical income-to-price ratio and 140% in terms of rent-to-price. Additionally, interest rates have fallen from 6% in 2008 to 3% in 2012 (the Global Property Guide). Usable data on housing prices and market activity exists from

1981. The existing trends are better demonstrated using the 2-year moving averages found in Figure 4. It appears that in terms of Honeycomb theory, the market has devolved through rather long half-cycles. In the period of 1982-1993, the prices had gone half a circle, but then a new growth cycle was quickly initiated. Between 1993 and 1997, the activity increased substantially without a price increase. The prices have been growing ever since, whereas the activity peaked in 2007 and is currently back on the levels of the mid-1990s, with approximately three times higher prices.

In figure 4, the period 2000-2012 forms the first two steps of the Honeycomb. In 2000-2007, prices were constantly increasing. The transaction numbers were also growing, but at a relatively modest pace. Since 2008, the prices have continued to climb, but the growth rate has somewhat slowed down.

Figure 4. Transactions and two-year moving average price in Sweden in 1981-2012 (in SEK).



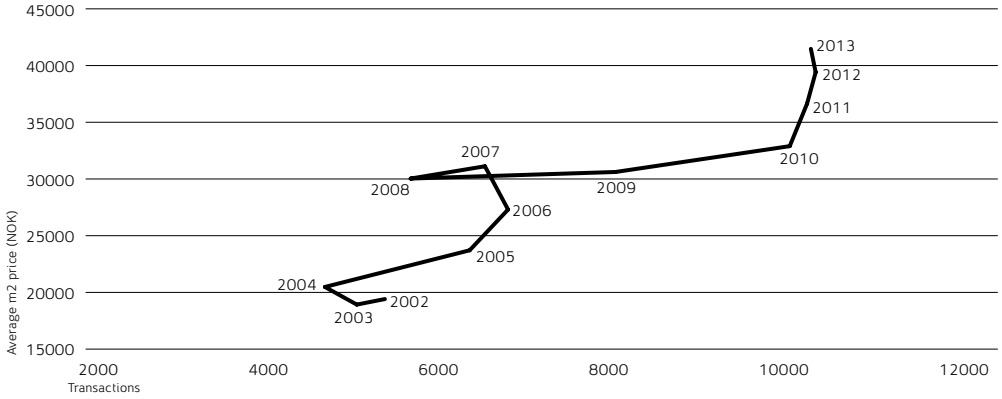
Source: Authors' representation of data presented in appendix 2

4.2.3 Norway

In Norway, housing prices have quadrupled in the last two decades and are around 30% higher than after the recent crisis, due to a steady inflow of new capital. Prices are on the level of 125% to historic P/I and 170% to historic P/E. Both Robert Shiller and the former prime minister of Norway, Jens Stoltenberg, have expressed concern over the potential looming burst of the real estate bubble. The Eurozone crisis has affected the currency exchange rates towards increased value of the local currency and created the situation where the central bank sees it as necessary to lower interest rates to reduce capital inflow (Milne, 2013).

Figure 5 depicts the dynamics of transactions and prices in Norway for over a decade, which is notable for partially failing to reflect the logic of the Honeycomb theory. In 2002-2004, price level was stable and market activity was in decline. This was followed by a growth period, both in price and activity, from 2006 onwards. The following crisis had only a modest impact on transaction activity and entailed only minimal price adjustments. The prices declined less in 2007-2008 than they had grown a year before and prices have been climbing on the market ever since. The transaction activity of 2008 was comparable to 2005 level, so it was more notable than the price adjustment. In 2009-2010, the market activity almost doubled and has now been stable for three years straight, whereas prices reached record heights, reaching almost double the level of 2004.

Figure 5. Transactions and average m² price in Norway in 2003-2013 (in NOK).



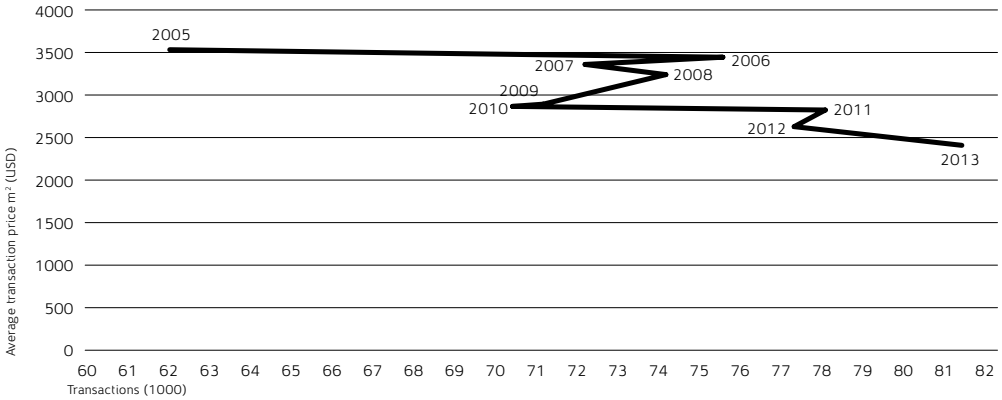
Source: Authors' representation of data presented in appendix 2

In summary, both transaction activity and average price has doubled in a decade. Such long-term growth in prices and stability in activity would indicate phase two of the Honeycomb theory. The logic of the next phase would indicate that the activity can be forecasted to slow and the price climb will ground to a halt and then go into decline.

4.2.4 Finland

Housing prices in Finland grew by 84% between 1993-2013 (adjusted for inflation). The price climb has been the result of continuous growth in credit volumes. In 2013, The European Commission noted that should the price increase reverse, it can be seen as a risk for financial stability and generally a noteworthy issue for the local economy. It was also suggested that the price growth has rather been a reaction to structural changes in supply and demand factors. The long-term P/E rate has been high and has grown even higher recently, as rent levels have remained stable, while prices have declined due to lower credit costs (European Commission, 2013). In the case of Finland, the statistical housing market price index is used for analysis, which allows for the demonstration of price and transaction dynamics.

Figure 6. The housing market transaction activity and average transaction price in Finland, 2005-2013 (in USD).



Source: Authors' representation of data presented in appendix 2

Figure 6 shows the main dynamics of the Finnish market between 2000-2012. The period 2002-2005 saw steady growth in both prices and transactions. From then onwards activity was in decline until 2008, whereas prices have continued to grow at a remarkable pace. After the crisis, the transaction activity fluctuated.

In the case of Finland, the crisis did not have a notable impact on real estate prices, nor did the aftermath. Only transaction activity has been impacted. Similarly to Sweden and Norway, it is reasonable to suggest that the price increase is not sustainable and a correction can be expected. According to the Honeycomb theory, four phases can be seen with some tolerance in the given case. It appears that the transaction activity is open to influences from the background economic environment.

4.3 Factors influencing apartment prices

In this study, the dependent variable was chosen as the purchase price of a two-room apartment in Tallinn, Estonia — to allow for a maximum possible time period and increase the validity of the regression analysis. This is the biggest single slice of the housing market in Estonia and the findings can be assumed to explain the entire housing market in Estonia.

The preliminary model, as presented in the methodology, was iteratively tested. As a result, the following variables were left out from the final analysis:

- Building permits – firstly, the delay of issuing permits can be notable. To balance it out, a 9-month delay time was then assumed. Also, substantial fluctuations were attempted to control with logarithmic smoothing. As a result, the relevance of this particular variable did not improve and it was removed from the model. As the time between issuing a building permit and selling actual apartments can last years, it was not feasible to use this as a parameter in regression.
- Construction barometer index: it appeared from the plot that this supply-side variable is not correlated to price and should be excluded.
- GDP and gross monthly wage: Even though the plot indicated some similarities between these variables and price, they were not statistically valid for the regression model. The correction with squaring did not help.

Adjusted variables in the regression model:

- Unemployment: it appeared that the unemployment rate follows with a stable delay to apartment price. The variable was introduced with a three month delay and the statistical relevance improved.
- Consumer price index, housing loan volumes and interest rate: similarly, the plot indicated a relation with a delay. The model then used a 3-month delay for these variables and their statistical relevance improved.

The final regression equation is the following:

$$KH = -454{,}27 + 2343{,}59 \times Intr - 3{,}4059 \times Tootus + 8{,}86179 \times THI + 2{,}52908 \times LK + 5{,}74704 \times Oot$$

In this equation, the variables interest rate (Intr), turnover of housing loans (LK), consumer price index, (THI), unemployment rate (Tootus) and finally consumer barometer (Oot), are statistically valid.

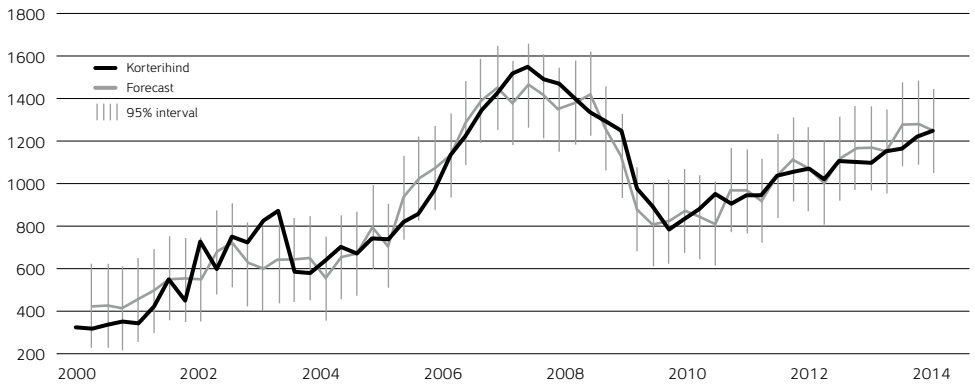
The model can be considered as statistically relevant. Testing for heteroscedasticity with the Breusch-Pagan test outputted a p-value of 0.283, which means that there was no heteroscedasticity. This was confirmed by a White test, which had a p-value of 0.188. To control the normal distribution of residuals, the Gretl model chi-squared test gave the p-value of 0.0358, which means that the residual elements are normally distributed. This was additionally confirmed by a Jarque-Bera test — normal distribution with a p-value of 0.319.

Furthermore it was shown that there is no auto-correlation (p-value 0.145). For multi-collinearity testing, the collinearity function indicated that multi-collinearity does not exist in this model. The collinearity test for independent variables gave the following results: intr = 2.397; LK_1 = 3.709; Oot = 2.246; sd_THI = 1.622.

For evaluating the model shape, the RESET test outputted a p-value of 0.54, confirming its suitability. The Harvey-Collier statistic in the Cusum test demonstrated the absence of structural changes in the model (with respective p-value 0.105).

To evaluate the impact that the prices of apartments in Tallinn would have across the entire Estonian housing market, the authors have calculated a Spearman correlation coefficient between the variables in question, in the period from Q4 2003, to Q1 2014. The correlation coefficient is 0.99, which means that the Estonian housing market would certainly react to the changing conditions in a similar way. The model simulated in the regression, in figure 7, is capable of forecasting the apartment prices to a 95% confidence interval. When this data is viewed from the perspective of cycle theory, it suggests no more than one cycle per every 9-10 year period.

Figure 7. Forecasting the dependent variable in hindsight of independent variables. The dependent variable is apartment price (korterihind).



Source: Authors' calculations.

Since 2004, the prices have increased and the market entered a phase of expansion, which was caused by optimism in the economy in general, as well as on the housing market. Since 2008, the market has been shrinking, which is characterised by a decline in prices. This phase ended for Estonia in 2009 and the market has been in a new growth phase ever since.

The long-term trend of increasing prices is notable — the price at the beginning of a new cycle is nowhere near the price at the start of the previous cycle. The phases of the housing price cycle are greatly varying in length, where rapid expansion and shrinking phases have been rather short.

5. Conclusions

Without looking at the differences between more and relatively less developed countries' housing markets, the Honeycomb cycle analysis on the analysed markets demonstrated that the economic crisis had, in general, primarily impacted transaction numbers, but also had an impact on prices. It appeared that while some Honeycomb phases were not readily apparent from the data, then phases 1-3 – optimism, crisis and recovery – reflected in transaction and price dynamics and were mostly in accordance with the theory. This has been made possible by the wide extent of the crisis, which impacted even the strongest of economies, such as Sweden and Norway, even though the impact was not nearly as severe.

Housing market dynamics in all the studied countries reveal that it is possible to differentiate between three phases in the last decade. Strong market growth with increasing activity and prices lasted until 2006/2007, showing small differences between countries. In this phase, the market trust satisfied both demand and supply. The following phase was rather short and was characterised by the cooling of prices and a decline in activity, guided by a changed economical context. In terms of Latvia, it should be noted that the third phase, where price remains stable but transactions already react to the decline in the economy, did not exist — both transactions and prices started to decline at a notable rate. The main differences between countries after the crisis is mostly determined by the length of time that its impact was felt. In terms of Estonia, the analysis showed that housing prices were over-priced beforehand and that the economic crisis was simply 'the last straw'.

Honeycomb theory claims that changes in the economy, as well as on the housing market, are at first reflected in transaction activity and only after then in price. This was clearly observed to hold true for all countries analysed in this paper. This can be explained as a combined result of two factors. The first is the timely availability of price information of secondary demand and secondary supply, which is essentially a delay in information, which is finally obtained from the market's transaction dynamics. Secondly, changes in the economic background and fundamental indicators take time to apply to the housing market and a price reaction cannot be simultaneous. This aspect is relevant in explaining the formation and bursts of housing bubbles.

The analysis also showed that for countries like Norway, Sweden and Finland, price decline was not substantial, or did not exist, which hints at over-priced transactions and the risk of 'the bubble'. The Estonian market has passed through the predicted phases after the recession without such significant over-price risk and has reached the phase of recovery.

In conclusion, it can be claimed that even though countries and their housing markets differ, the main indicators act in a similar fashion. The Honeycomb approach reinforced the fact that the recent recession affected all the countries due to the impacting, important macro-economic factors. The results suggest that the Honeycomb theory is most valid in two ways. Firstly, that the shape of the cycle in its initial phases is in harmony with the business cycle phases in the background, where decline is experienced. Secondly, even though not all the predicted phases are actualised, due to certain economic conditions, the transaction volume is a functioning indicator of changes on the housing market.

The results confirmed the offered hypothesis. The first hypothesis proposed that the combined observations of housing market activity and prices form the respective Honeycomb phases that are given when the macroeconomic indicators fit with the phase in question. This hypothesis holds true, as all observed economies reacted strongly to the global crisis and, since

2006, another phase formed in which the price increase was notably slower, but the transaction amounts began to decline. The second hypothesis proposed that due to lack of information, the transaction volumes react to the changes on the housing market before the price. Based on the data, this relationship is confirmed.

The Honeycomb analysis revealed that it is important to create models emphasising the dynamics of the market and various cyclic phases. This is a step forward in developing tools which would allow for a better understanding of the situation and dynamics within the housing market, especially focusing on external and internal demand and supply.

In a cyclic environment, it is both necessary to understand the logic of the current phase, as well as the fundamental indicators that are foremost in determining the emergence of the real estate cycle. For this purpose, regression is often applied to explain the valid indicators that have the most notable impact on market price.

Based on the factors identified in the regression analysis, the following conclusions can be drawn:

- An increase in the seasonally corrected Consumer Price Index in Tallinn of 1€ can be expected to increase the price of an apartment (in reasonable condition) in Tallinn by 8.86 € / m^2.
- An increase in the total credit turnover by Estonian banks by 1 million € would, after a three-month delay, increase the price of a similar apartment by 2.53 € / m^2.
- An increase in the seasonally corrected housing loan interest rate decrease by the coefficient of 0.1 would, after a three month delay, increase the price of a similar apartment by 23 € / m^2.
- A decrease in unemployment rate would, with a three-month delay, increase the price of a similar apartment by 3.4 € / m^2.
- An increase in the consumer expectations barometer by one point on the scale would increase the price of a similar apartment by 5.75 € / m^2.

The third hypothesis proposed that the price of m^2 of an apartment in an adequate condition depends on the conditions of private loans, the average gross monthly wage, GDP levels, the Consumer Price Index, the unemployment rate, the number of transactions on the market, the amount of building and usage permits and expectations on economic outlook over the following 12 months, both from a consumer and construction industry point of view. Based on the analysis, this hypothesis is partially confirmed: the average gross monthly wage, GDP levels, the number of transactions, and the amount of building and usage permits — does not considerably influence the per m^2 price of an apartment.

In the current revival phase of housing markets, it appears that the convergence process has significantly altered the causal factors of real estate prices, compared to previous pre-boom growth, appearing to be more similar to the factors that primarily influence developed markets.

By coupling Honeycomb predictions with an indicator-based cycle, the models agree that the housing market in Estonia is in a phase of recovery. This phase is expected to be followed with more rapid growth until the market reaches an adjustment phase. The housing prices might also decline somewhat, on a seasonal-basis, but the general trend of price growth appears inevitable. It must be added that the housing prices used in the empirical study have certain limitations: in some countries, statistics are collected and published per apartment area in m^2, in others by acts of transactions. Furthermore, data from national sources can refer to different types of residential property; prices are usually shown in the national currency and historic data series are mostly shorter than optimal, which can impact the results in undesired ways.

This paper provides a contribution to real estate market research literature. In contrast to developed housing markets, the cyclical nature and influences of converging markets have seen relatively little academic attention. Our study, combining Honeycomb and regression analysis, fills a void in this area, which has not been specifically studied before in the context of a relatively small, developing market. The Honeycomb method served as a novel tool for studying an emerging economy in the process of convergence. The methodological contribution of our approach was a two-phased model, initially determining the current cycle phase with Honeycomb and then determining influences on price via regression, outputting market insights to planning decisions. The paper identifies the factors that influence housing prices in a period of new growth, as well as differences in comparison to the primary factors in the previous phase of rapid growth, shedding light on the changes that have taken place during the market development cycle. Another novel aspect of this paper was that similarities and differences were observed between regional developing economies and more highly developed economies.

The findings and interpretations from this study are relevant for decision-makers in political, socio-economical, those at financial institution level and also for real estate developers and other housing market participants. Combining market cycle and regression analysis allows for more precise price forecasting on the housing market. More specifically, information is now provided to 1) financing institutions, allowing them to alter loan conditions and apply more strict policies on demand; 2) to real estate developers relying on future forecasts to either start or postpone new projects; 3) to local authorities to determine the changes in need for affordable social housing; and 4) to all housing market participants, allowing for better analysis of the rationality of their planned transactions.

Finally, as financing conditions have a substantial effect on housing markets, it is suggested that the negative equity impact on market developments should be seen as a relevant future research area. The relatively easy accessibility of loans, low interest rates and the risk of value over-estimations are preparing the ground for a new real estate bubble on the Estonian housing market, perhaps similar to the one experienced a decade ago. Therefore problems concerning overestimations of property value are a continually valid research area.

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Appendix 1.

Average m² price and transaction numbers in Estonian apartment market between 2003 and 2014 by quarter periods

Year	Quarter	Number of transactions	Average m² price, euro	Year	Quarter	Number of transactions	Average m² price, euro
2003	III	3 518	393	2009	I	2 068	693
2003	IV	5 329	436	2009	II	2 467	639
2004	I	4 307	473	2009	III	2 855	596
2004	II	4 872	499	2009	IV	3 069	628
2004	III	4 809	510	2010	I	2 711	637
2004	IV	5 435	567	2010	II	3 340	635
2005	I	4 953	579	2010	III	3 256	633
2005	II	6 655	648	2010	IV	3 651	653
2005	III	7 779	699	2011	I	2 653	651
2005	IV	8 413	793	2011	II	3 159	702
2006	I	6 800	912	2011	III	3 435	721
2006	II	6 433	968	2011	IV	3 609	732
2006	III	6 994	1 030	2012	I	3 311	740
2006	IV	8 181	1 122	2012	II	3 911	751
2007	I	6 737	1 177	2012	III	4 266	771
2007	II	6 615	1 209	2012	IV	4 047	773
2007	III	5 192	1 120	2013	I	3 822	800
2007	IV	4 776	1 105	2013	II	4 512	843
2008	I	4 300	1 064	2013	III	4 845	838
2008	II	4 339	1 069,87	2013	IV	4 723	885
2008	III	3 940	951,8	2014	I	4 327	929
2008	IV	2 930	903,59	2014	II	5 823	931

Source: Real estate transactions. Estonian Statistics.

Appendix 2.

Average m² price and transaction numbers in Swedish, Norwegian, Latvian and Finnish apatrment market

	Sweden[1]		Norway[2]		Latvia[3;5]		Finland[4; 5]	
Year	Number of trans-actions	Average m² price in SEK (two year moving average)	Number of trans-actions	Average m² price, NOK	Number of trans-actions	Average m² price, EUR	Number of trans-actions	Average transaction price, USD
1995	42 308	652 000						
1996	44 250	665 000						
1997	50 647	706 000						
1998	51 625	763 000						
1999	52 730	821 000						
2000	53 914	900 000						
2001	50 810	1 000 000						
2002	51 145	1 081 000	5 302	19 413				
2003	52 934	1 168 000	4 980	18 925				
2004	55 251	1 282 000	4 615	20 481	17335	310		
2005	57 736	1 398 000	6 272	23 714	17707	320	81 208	2 417
2006	58 988	1 540 000	6 712	27 310	25465	650	77 121	2 634
2007	61 486	1 704 000	6 447	31 127	19265	680	77 884	2 827
2008	60 602	1 797 000	5 596	30 044	13809	640	70 245	2 869
2009	54 424	1 861 000	7 942	30 624	11599	440	71 001	2 895
2010	52 867	1 967 000	9 937	32 903	12229	510	73 991	3 238
2011	52 653	2 036 000	10 135	36 641	14359	580	72 024	3 356
2012	50 486	2 076 000	10 234	39 425	16989	610	75 380	3 440
2013			10 179	41 486	19721	620	61 887	3 527

[1] Average price and transaction numbers in Swedish housing market. Statistics Sweden. http://www.scb.se/en_/Finding-statistics/Statistics-by-subject-area/Housing-construction-and-building/ (10.03.2014)

[2] Average price and transaction numbers in Norwegian housing market Statistics Norway. http://www.ssb.no/en/bygg-bolig-og-eiendom (10.03.2014)

[3] Average price of transactions in Latvian housing market . Central Statistical Bureau of Latvia. http://data.csb.gov.lv/Menu.aspx?selection=rupnbuvn_Ikgad%C4%93jie%20statistikas%20dati_ M%C4%81jok%C4%BCi&tablelist=true&px_language=en&px_db=rupnbuvn&rxid=cdcb978c-22b0-416a-aacc-aa650d3e2ce0 (20.03.2014)

[4] Average price of transactions in Finnish housing market. Statistics Finland. http://www.stat.fi/til/aiheet_en.html#asu (20.03.2014)

[5] Number of transactions at the housing market of Finaland, Latvia. Helgi Analytics. http://www.helgilibrary.com/sectors/index/economics. (10.04.2014)