Narodowy Bank Polski

Report on the situation in the Polish residential and commercial real estate market in 2012

The Report has been prepared at the Economic Institute in collaboration with sixteen Regional Branches for the purposes of NBP authorities and presents the opinions of the authors. The document should not be understood as an advisory material or a basis for investment decisions.

Authors:

Part I i II

Augustyniak Hanna	Economic Institute
Gajewski Krzysztof	Economic Institute
Łaszek Jacek	Economic Institute
Olszewski Krzysztof	Economic Institute
Waszczuk Joanna	Economic Institute

Part III (people that are underlined are also authors of the analytical articles)

<u>Baldowska Grażyna</u>	Regional Branch in Warsaw
Barska Ewa	Regional Branch in Bydgoszcz
Białach Ewa	Regional Branch in Lublin
Borzym Henryk	Regional Branch in Olsztyn
Broniecki Waldemar	Regional Branch in Olsztyn
Czapka Izabela	Regional Branch in Katowice
Gałaszewska Krystyna	Regional Branch in Gdańsk
Hulboj Izabela	Regional Branch in Zielona Góra
Kiernicki Jarosław	Regional Branch in Bydgoszcz
Książczyk Jolanta	Regional Branch in Łódź
Lekka Marta	Regional Branch in Szczecin
<u>Leszczyński Robert</u>	Regional Branch in Białystok
Leśniewicz Artur	Regional Branch in Poznań
Mach Barbara	Regional Branch in Rzeszów
Mach Łukasz	Regional Branch in Opole
Markowska Janina	Regional Branch in Wrocław
Masiak Małgorzata	Regional Branch in Wrocław
Mikołajczyk Łukasz	Regional Branch in Opole
Misztalski Maciej	Regional Branch in Wrocław
<u>Myszkowska Barbara</u>	Regional Branch in Warsaw
Opioła Zbigniew	Regional Branch in Katowice
Orliński Sławomir	Regional Branch in Kielce
Osikowicz Grażyna	Regional Branch in Kraków
Perczak Jacek	Regional Branch in Kielce
Piwnicka Małgorzata	Regional Branch in Poznań
Przewoźniak Kinga	Regional Branch in Kraków
Tomska-Iwanow Anna	Regional Branch in Szczecin
Tyszkiewicz Robert	Regional Branch in Łódź
Warzocha Jolanta	Regional Branch in Rzeszów
Zadrożna Iwona	Regional Branch in Gdańsk
Żywiecka Hanna	Regional Branch in Poznań

Summary

The results of the studies presented in this Report lead to the following conclusions:

- In 2012, there was a slight decrease in (offer and transaction) prices in the primary and secondary markets of 16 voivodeship cities. High demand for homes and their sales in the primary market at the end of the year under analysis were due to the winding up of the government programme "Family's on its own" (Rodzina na Swoim). Despite formal winding up of the programme at the end of 2012, processing of the vast number of loan applications filed just before the programme ended, further continued. In 2013 Q1, loans disbursed amounted to approx. 70% of disbursements from the record-high 2012 Q4. The loans were predominantly used in the primary market.
- In 2012, rents in the home rental market displayed slight quarterly fluctuations in particular cities. Average rental rates stabilised in Warsaw, increased slightly in Gdańsk, Cracow and Poznań, and decreased in Łódź and Wrocław.
- The annual change in the value of mortgage debt of households was the lowest since 2005, yet gross loan disbursements fell slightly as compared to 2011. From the beginning of 2012, housing loans denominated in foreign currencies continued on a decline, in FX adjusted terms. As a result of exchange rate fluctuations and possible further declines in home prices, some of the existing mortgage loans in foreign currencies fail to provide sufficient collaterals. Due to falling interest rates on PLN loans and a slight decline in home prices, banks were more cautious in extending loans in the analysed period.
- In 2012, housing policy continued to be focused on supporting home ownership. At present, works are underway in the Parliament on adopting a new programme "Home for the Young" (Mieszkanie dla Młodych). The planned introduction of the new programme may result in a certain decline in demand for homes in 2013. The Act on real estate development came into force in 2012, which resulted in a slight construction boom (effect of evasion of rigorous regulations) and higher surplus of unsold homes.
- The commercial real estate market saw a slight increase in the volume of transactions and stabilisation of the level of rents. Capitalisation rates remained at the 2011 level in the case of office and commercial real estate.
- The value of commercial real estate loans for enterprises amounted to approx. PLN 46 billion at the end of 2013 Q1. The percentage of real estate non-performing loans extended to enterprises is high. In the case of real estate development companies, it was 30% at the end of 2012.
- The real estate development sector, operating in the conditions of housing surplus in the market and falling demand, faces higher operational risk. At present, operating and profitability indicators of developer companies are not alarming, but it may change in the future.

- The Polish housing market cannot brag a fully developed private home rental sector (less than 10% of the housing stock). The barriers to its development include frequent absence of formal contracts between the landlord and the tenant and the existing legal solutions on tenant protection.
- In 2012 as compared to 2011, the housing situation of 16 voivodeship cities in Poland improved slightly due to deterioration of the majority of fundamental factors, especially demographic ones. Buyers' activity was low in all real estate market segments in the analysed cities. Despite different price and development levels in particular cities, price growth did not differ significantly across those cities.
- Panel analysis of average home prices in the analysed markets in 2002-2012 shows that home transaction prices in the primary market of 7 large cities depended on fundamental variables such as wages, loan availability and unemployment decline. Some data show that in 2007-2008 prices were excessively high, which is indicative of demand boom.
- Analytical studies on particular housing units and their attributes in the local markets show that replacement of simple home price indicators (median and mean) with the hedonic index helps to improve the reliability of price measurement and thus increases market transparency. Yet, such analysis requires longer series of very detailed data that had been gathered under BaRN from 2006 Q3 only.
- Last year was rather favourable for all real estate market participants and tended to equilibrium. Home buyers were able to choose from a wide range of completed homes at prices slightly lower than last year. Developers gradually sold out completed housing and embarked on new investment projects that were better tailored to current needs of home. The banking sector did not grant any risky foreign currency loans and was more cautious in extending PLN loans.
- Studies on the influence of the housing sector on the economy should take into account the diversity of housing and complexity of decision-making. The key aspect of the analyses is to take into account potential choices of consumers between different types of consumption (including housing consumption), housing investment demand and housing consumption demand and different forms of home ownership.
- The real estate markets continually tends to equilibrium, yet it is subject to frequent shocks which shift it. Accumulation of sectoral tensions combined with other economic problems may result in real estate crises affecting the entire economy. Literature on the subject discusses susceptibility of the housing market to manipulation and speculation and its low transparency resulting from data access difficulties. Moreover, the market is prone to political influence that frequently affects the financial system. The housing market requires comprehensive regulation, yet it is frequently subject to inadequate and procyclical intervention.

Introduction

The Report aims to provide the stakeholders, including real estate market participants, with fairly complete, reliable and objective information on the situation in the residential and commercial real estate market in Poland in 2012. The Report focuses mainly on the 2012 phenomena which directly impact current situation. Yet, whenever justified, backward-looking insight was also provided.

Due to the local nature of housing markets, similarly as in the previous editions of the Report, sixteen markets of voivodeship cities are the object of an in-depth analysis, yet, in various aspects. The analysis of offer, transaction and hedonic[1] home prices in the primary and secondary market is based on data obtained by analysts from the Regional Branches of Narodowy Bank Polski under the survey of the housing market Real Estate Market Database (BaRN).[2] As the survey covered a variety of agents operating in the market (agents, developers, housing co-operatives, municipal offices), it allowed its authors to obtain extensive information.[3]

The study also relied on the database by PONT Info Nieruchomości (PONT) containing data on offer home prices, the SARFIN database of the Polish Bank Association containing data on housing market financing and AMRON database containing data on housing appraisal and transaction prices of mortgage-financed housing. The authors have also drawn on the reports issued by the Polish Financial Supervision Authority (KNF) as well as aggregate credit data released the Credit Information Bureau (BIK). The statistical data published by the Central Statistical Office (GUS) and analyses including sectorial data have been used in the structural analysis.[4] The authors have also made use of the findings of the "Social Diagnosis" survey. The information about the commercial real estate market is based on data provided on a voluntary basis by commercial real estate brokers, as well as

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[1] See: Glossary of terms and abbreviations, hereinafter marked with #.

[2] Cf. "Programme of statistical studies for public statistics for 2012. Appendix to the Ordinance of the Council of Ministers of 22 July 2011 on the programme of statistical studies for public statistics for 2012 (Dz. U. [Journal of laws] No 173, item 1030)." *Study of residential real estate prices in selected Polish cities, ref. 1.26.09(074), conducted by the President of Narodowy Bank Polski.*

[3] Databases collected by NBP Regional Branches from 2006 Q3 during 29 quarterly surveys,; at present there are about 900,000 records in the databases. Detailed information on the BaRN database is provided in Annex A1 *Convergence and differentiation processes in local markets and structural changes (comparison of markets).*

[4] This concerns, in particular, Sekocenbud studies on the structure and costs of construction, research conducted by the company Real Estate Advisory Service (REAS) on home prices and the real estate development sector, of the Polish Construction Research Agency (Polish: Polska Agencja Badawcza Budownictwa (PAB)) concerning the construction sector and many other entities and associations operating in this market. The most important ones included the Polish Association of Polish Banks (Polish: Związek Banków Polskich), Polish Association of Home Builders (Polish: Polskie Stowarzyszenie Budowniczych Domów), Associations of Employers – Producers of Construction Materials (Polish: Związek Pracodawców-Producentów Materiałów dla Budownictwa) and many others.

real estate management and consulting companies. The analysis has been supported with knowledge of experts of particular agencies.[5]

Although many sources of information have been explored, missing data or insufficient quality of data have proved a significant barrier. In such situations, the authors have relied on estimates verified on the basis of expert and specialist opinions. In drawing up the Report, the authors have assumed that even estimates, verified in several sources, provide better information than general opinions.

Technical terms, defined in the glossary of terms and abbreviations following the first part of the Report, have been marked with'#'.

The main focus of the Report is sectorial equilibrium. We define it as a state where there are conditions that allow markets to generate goods and services in a stable way, which means that economic effects can be achieved without excessive risk accumulation. Housing policy strongly influences both the standard of satisfied needs and the breakdown of the housing stock. As the real estate market is correlated with other sectors of the economy (especially the banking, real estate development and construction sectors), while analysing the housing sector we should take into account different market agents and internal correlations. In effect, new significant influences emerge that affect the real estate sector and its environment, i.e. the national economy. The purpose of this Report and its previous editions is to explain the developments and interdependencies observed in real estate markets and to present the results of NBP studies.

The Report consists of three parts. Part I presents certain common processes in the real estate market in Poland in 2012, Part II consists of analytical studies, providing more insight to selected issues discussed in Part I. Part III is more detailed and presents information on each of the sixteen markets of voivodeship cities.

Part I describes the situation in residential and commercial real estate markets in 2012. There was a slight decrease in (offer and transaction) prices of housing in the primary and secondary markets of 16 voivodeship cities. Rents in the home rental market displayed slight quarterly fluctuations in particular cities. The commercial real estate market observed a slight increase in the volume of transactions and stabilisation of the level of rents. Capitalisation rates remained at the 2011 level in the case of office and commercial real estate.

It should be noted that residential and commercial real estate use similar means of production whose prices are the same for both real estate types, yet cycles in both markets are only slightly correlated. Both the residential and commercial real estate sector use bank loans. The quality and volume of real estate loans should, therefore, be monitored on an ongoing basis so that they do not affect the stability of the banking sector. The annual

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[5] The authors relied on the data and information provided by the following agencies: CBRE, Colliers International, Cushman & Wakefield, DTZ, Jones Lang LaSalle, Ober Haus and the following associations: Retail Research Forum of Polish Board of Shopping Centres, Warsaw Research Forum and the database: comparables.pl.

change in the value of mortgage debt of households was the lowest since 2005, yet gross loan disbursements fell slightly as compared to 2011. From the beginning of 2012, housing loans denominated in foreign currencies were on a decline, in FX adjusted terms. Due to falling interest rates on PLN loans and a slight decline in home prices, banks were more cautious while extending loans in the period under analysis. A description of the loan segment can be found in Chapter 1.3 *Real estate loans to households* and 1.4 *Real estate loans to enterprises.*

We should remember that home price growth, which affects the entire economy, is of constant interest for central banks and regulators. Home price increases evidence tensions between supply and demand, which translates into tensions in the construction and banking market. Therefore, Chapter 2 presents development factors of the real estate sector in 2012. In the period under analysis, the real estate market experienced strong disturbances of market processes due to new regulations, i.e. the winding up the "Family on its own" programme and the entry into force of the Act on real estate development and Recommendations S and T. Changes in fundamental factors, which affect the development of the real estate market, are also of considerable importance. We have analysed home price growth in the primary market as it translates into changes in developer production very fast, contributes to the emergence of strong cycles and generates risk for the banking sector. Therefore, a panel analysis of 17 voivodeship capital cities was performed taking into account the factors suggested by the findings of the analysis of convergence and differentiation processes and structural changes, presented in Article 1 *Convergence and differentiation processes in local markets and structural changes (comparison of 16 markets in Poland).*

Chapter 3 provides a description of the conditions of sectorial equilibrium and actual economic processes affecting them. Sectorial equilibrium is a state where economic benefits may be achieved without exposure to excessive risk and without excessive tensions. The residential real estate sector is considered a system of different economic segments. Its main components include housing stock, financial sector, home construction sector and the environment of the residential real estate sector, i.e. the remaining part of the national economy with which there are many sectoral interactions. Then, the Chapter presents entities operating in these markets and discusses the measures of smooth operation of these markets, tensions and equilibrium between market agents, which are largely determined by bank prudential regulations and long-term experience of the sector. Analysis shows that contrary to the 1990s, the Polish real estate market is mature enough to function in the long run in a stable and rational way, i.e. generate adequate rates of return for economic agents and satisfy housing needs of households. Yet, it concerns only up to 30-40% of the wealthiest households. Yet, the ranges of admissible fluctuations of inflation, income, interest rates and prices of factors of production, which allow stable functioning of the market (developers, banks, borrowers), are relatively narrow. Considering large investment portfolios of mortgage loans and the cyclical nature of the sector, it poses great challenges to monetary, fiscal and prudential policy to avoid excessive price fluctuations or a real estate crisis.

Real estate markets, especially housing markets, are local as real estates are permanently attached to land. Factors on the demand side are both local (income, demographic situation, etc.) and national (interest rates, migrations, capital inflow, etc.). In order to identify convergences and similar trends in local voivodeship markets, a cluster analysis was performed and cities were clustered on the basis of selected criteria (i.e. indicators presenting the housing situation, scale of construction, home prices, fundamental factors, indicators of demographic burden in particular centres). The results were presented in Article 1 *Convergence and differentiation processes in local markets and structural changes (comparison of 16 markets)*, where similarities and dissimilarities of voivodeship capital markets were sought by clustering them, based on different criteria.

Analysis of the real estate market is multidimensional. One of the dimensions is the previously discussed local nature of markets and the other is heterogeneity of housing as a good. Housing is both consumer and investment good, and for both these functions its value is the sum of valuations of its attributes (location, standard, etc.). Analysis of particular homes and their attributes in the local markets, presented in Article 2 *Results of studies of factors differentiating home prices and the possibility of their use by NBP*, show that replacement of simple home price indicators (median and mean) with the hedonic index helps to improve the reliability of price measurement and thus increases market transparency. The article presents significant aspects of heterogeneity. It allowed identification and verification of basic price factors in secondary markets. The article says that the Polish real estate market has started to be governed by market mechanisms and it values home attributes in a stable way. It should be noted that hedonic models can be used to identify attributes that have significant influence on home values and to attempt at objective real estate valuation on the basis of consumer choices. Taking into consideration the heterogeneity factor in microeconomic analysis offers important practical advantages. The first advantage is that it is possible to construct more precise price indices (hedonic index) that take into account changing sample of homes on the market, which is used by NBP in the published analyses. Another advantage is the opportunity to value real estate more adequately, which is of considerable importance to the economy in general, especially to the banking system. Another practical aspect is the possibility to foresee changes in (residential and commercial) real estate prices resulting from the conducted economic policy or private sector investments. On that basis, for example future real estate taxes can be projected.

Article 3 *Housing in consumer theory* presents complexity of a home purchase decision and the problem of valuation by the consumer. It is emphasised that there are many optimisation conditions which individual consumers take into account when making decisions to buy and sell. Making simplifications as to the absence of housing heterogeneity and complexity of housing decisions, concerning both consumption and investment housing, frequently leads to erroneous conclusions. Also valuation of housing by the consumer has significant impact on the decisions. The key aspect of analyses is to take account of consumers' choice between different types of consumption (including housing consumption), investment housing demand and consumption housing demand and different forms of home ownership. We have presented a model where the consumer's

objective is to maximise utility throughout his/her life by choosing appropriate proportion between the level of housing consumption and consumption of other goods in different periods. It was assumed that the consumer owns a home and in subsequent periods he/she can expand or reduce it by buying more goods into the basket or selling subsequent units. Optimal solutions show relationships between the number of housing and quantity of consumption within and between periods.

Article 4 *Buy or rent? Analysis of decisions made by housing market players determined by housing policy* continues to discuss the decisions made by consumers by limiting them to the choice between owning and renting a home. It emphasises the high share of owner-occupied housing in the entire housing stock in selected European countries with relatively low per capita income, in contrast to the situation observed in the developed housing markets, and describes the underlying causes of this phenomenon. The way in which the development of the home rental market can affect the situation in the property market is presented on the basis of a simple model. The share of owner-occupied and rented housing in the housing stock is a matter of importance to price stability in the housing market. The increasing share of owner-occupied housing and underdeveloped rental market can generate significant sectoral tensions and exert pressure on prices. A

As coordination of monetary, fiscal and prudential policy is usually the basic problem, since they may have opposite influence, increasing the sector's risk, a detailed analysis of sectoral relations and agents is necessary.

Yet, it should be noted that the real estate market is cyclical. Another factor adding to the cyclical nature is speculation and related behaviour of agents, strongly linked with the financial system, usually delayed and inadequate intervention of public authorities carried out to maintain financial sector stability, for social reasons or as part of the general economic policy. Fluctuations are often local and vary from one market segment to another. Thus, the real estate market permanently tends to equilibrium, never reaching it. Therefore, if we assume equilibrium when creating a supply and demand i for the housing market may yield erroneous results and misleading guidelines for economic agents. Article 5 *Housing cycles – disequilibrium model and its calibration to the Warsaw property market* presents a simple demand model where the consumer maximises utility similarly as in Article 3 *Housing in consumer theory*, allocating funds between consumption of housing services and consumption of other goods in an optimum way, but considering each period individually. Next, it presents a supply and demand disequilibrium model in the housing market, calibrated to the Warsaw market, used to discuss the last cycle and show how a combination of slight demand shocks with short-term rigid supply leads to strong fluctuations.

Part III provides detailed information on particular real estate markets of 16 voivodeship cities and the factors affecting them.

Part I The real estate market in Poland in 2012

1. The situation in the real estate markets

In 2012 the situation in the residential and commercial real estate markets was stable. The prices in the residential market continued to follow a downward trend, yet remained relatively rigid due to regulatory changes.[6] The commercial real estate market saw stabilisation in the volume of transactions and the level of rents.

1. The situation and prices in the residential real estate market

The data on offer and transaction prices, along with the description of real estate, from the BaRN database allowed to perform an in-depth analysis of the residential real estate market. In 2012, home prices continued to decline slowly, both in the primary and in the secondary market. The decline had been recorded since 2009 in the largest residential markets in Poland where nominal prices fell slightly (see Figure 1 - Figure 4) and, due to increasing inflation, real prices dropped at a slightly faster rate (see Figure 7 and Figure 8).

The overall difficult economic situation, reduced supply of mortgage loans, including, a virtual halt in foreign currency lending, as well as conservative price limits in the RNS scheme in 2012 contributed to further decrease in average prices. The analysis of prices in real terms shows that prices in the primary and the secondary market approached the prices recorded before the boom (see Figure 7 and Figure 8). A significant surplus of unsold housing in the primary market in large cities, resulting from business operations of real estate developers, contributed to price decline in that market.

In 10 cities, the rise in home prices during the boom was lower than in large markets of 6 cities, since their lending recovery was limited. Moreover, in smaller cities single-family houses constitute an alternative for apartments in the blocks of flats which could have halted the boom supply for flats, partly shifting it towards houses. In those cities, the difference between transaction and offer prices in the primary and the secondary market was relatively stable in 2012 (see Figure 3 and Figure 4). Despite the decline in transaction prices in the primary market in Warsaw and 7 cities, real estate developers maintained relatively high offer prices. While in 2010 and 2011, as well as in the first three quarters of 2012, real estate developers tried to adjust the prices to the market reality, in 2012 Q4 they reverted to probing the possibility of selling the flats for a higher price. Since the offers better adjusted to market expectations are finalised quickly, other offers in the market often reflect exorbitant price expectations of sellers. Some developers want to wait until the time of lower prices is over due to the existing loan contracts and previously incurred costs. Sellers in the secondary market also expected higher prices than they could get.

From the beginning of 2012, and most pronouncedly at the turn of 2012 and 2013, an increase of the relation of home prices in the primary market and in the secondary market

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[6] More on regulatory changes in Chapter 2.1 *Assessment of changes in the regulatory environment and its impact on the real situation.*

was observed. The change is particularly marked in Warsaw where historically prices in the secondary market considerably exceeded the prices in the primary market.[7] In 2012, home prices in the secondary market continued to fall. In 2013 Q1, prices in the primary market in all the analysed cities remained stable or even increased. The number of contracts placed on the market for the first time dropped, but their quality and location were better adjusted to the current needs of potential buyers, thus contributing to an increase in their prices.

Since the composition of the sample of analysed housing units in the BaRN database undergoes qualitative and quantitative changes, the price adjusted with the hedonic index was also analysed.[8] The analysis shows that prices in the markets remain stable in the long-term. The observed short-term fluctuations result from the change in the structure of the analysed sample (i.e. size of the sample and changes of the market offer, as well as a bigger or smaller number of more expensive dwellings) (see Figure 9 and Figure 10).

As a result of the fall in prices, in particular in real terms, the ratio of the price of one square meter of a housing to income (P/I), which may constitute a measure of tensions in the market, nearly returned to its level from before the price boom in the years 2006-2008 (see Figure 15).

Rental payments resulting from sublease were subject to considerable fluctuations in particular quarters, similarly as in the previous years. However, their trend levelled off in Warsaw, went upwards in Gdańsk, Kraków and Poznań and declined in Łódź and Wrocław (see Figure 16). The virtually complete abandonment of foreign currency denominated mortgage loans (with a considerably lower interest) by banks in 2012 resulted in higher costs of financing for buyers. Therefore, in all big cities, except for Warsaw[9], the loan servicing cost significantly exceeded rental costs (see Figure 13). This should motivate households to rent rather than to buy, but due to various factors which we discuss in the analytical part of Article 4 *Buy or rent? Analysis of decisions made by housing market players determined by housing policy*, there is a strong tendency to own housing in Poland. This explains persisting relatively high prices of housing compared to rents.[10] Although rental

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[7] This was due to very good location and quality of housing units in the secondary market. The majority of housing units in the primary market are relatively less attractive in terms of location as compared to those in the secondary market. New housing units are usually built far from city centres and main transport routes, with their local infrastructure being insufficient (shops, schools, kindergartens, etc.).

[8] The price adjusted with the hedonic index is a "pure" price, i.e. resulting from other factors than differences in housing quality (size, location, technical condition, age, etc.). The price of a standardised housing unit, based on the econometric model, is always analysed. It adjusts the average price from the sample with a change in quality of housing in the sample in each quarter. This distinguishes it from the average price or median growth in the sample which would strongly react to a change in the sample composition, e.g. by a higher number of small housing units with a higher price of a square metre. More information in the article by M. Widłak (2010), *Metody wyznaczania hedonicznych indeksów cen jako sposób kontroli zmian jakości dóbr* [Methods of determining hedonic price indices as a way to control quality changes of goods], „Wiadomości Statystyczne" [Statistical News] No 9.

[9] In Warsaw, the rental market is insufficient to satisfy the needs of tenants -commuters from other cities/towns and students. As a result, rents are very high.

[10] These values are calculated as rents discounted with interest rate on housing loans.

offers higher rates of return than investments in bonds or bank deposits, they are lower than in the case of commercial real estate (see Figure 14). However, it should be noted that relatively high cost of maintenance of rental stock and the risk related to dishonest tenants have not been taken into account.[11]
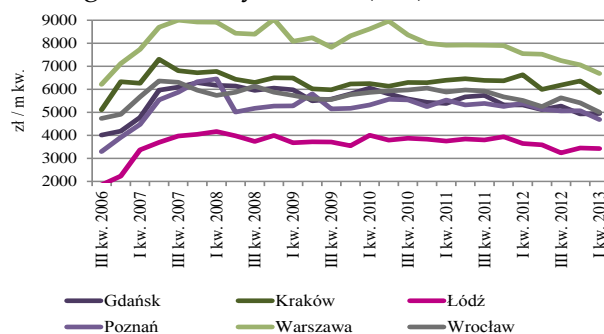
Figure 1 Transaction prices of 1 square meter of housing - primary market (PM)
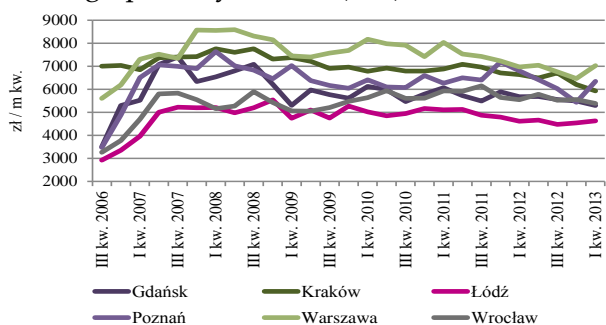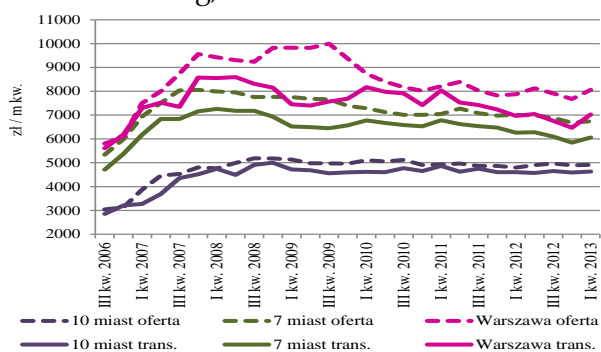

zł / m kw.	PLN/m²

Source: NBP.

Figure 2 Transaction prices of 1 square meter of housing - secondary market (SM)

zł / m kw.	PLN/m²

Source: NBP.

Figure 3 Weighted average price of 1 square meter of housing, offers and transactions - PM

zł / m kw.	PLN/m²
kw.	quarter
miast oferta	cities - offer
miast trans.	cities - transaction
Warszawa oferta	Warsaw - offer
Warszawa trans.	Warsaw - transaction

Figure 4 Weighted average price of 1 square meter of housing, offers and transactions - SM

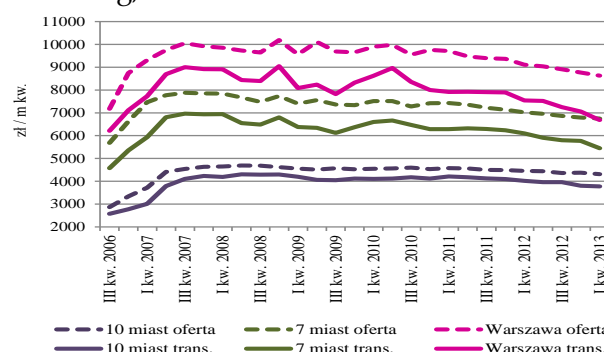| zł / m kw.	PLN/m²
kw.	quarter
miast oferta	cities - offer
miast trans.	cities - transaction
Warszawa oferta	Warsaw - offer
Warszawa trans.	Warsaw - transaction

Notes to Figures 3-9: Price weighted with the share of housing in the housing stock, Warsaw: average price.
6 cities: Warsaw, Kraków, Poznań, Wrocław, Łódź, Gdańsk, 7 cities: as above plus Gdynia;
10 cities: Białystok, Bydgoszcz, Kielce, Katowice, Lublin, Olsztyn, Opole, Rzeszów, Szczecin, Zielona Góra.
Source: NBP.   *Source: NBP.*

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[11] More information about the risk of rental: Chapter *Real estate loans for households* and in Article 3 *Housing and consumer theory.*
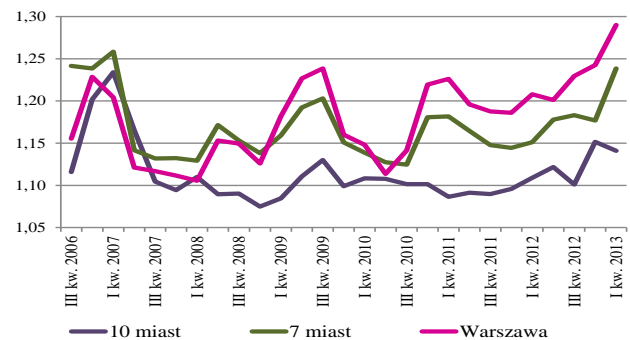
Figure 5 Relation of weighted average
transactional price of 1 square meter of housing -
PM to SM (result >1 means that the price in PM
exceeded the price in SM)
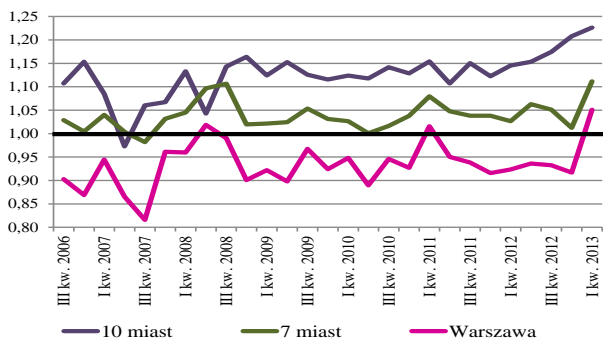
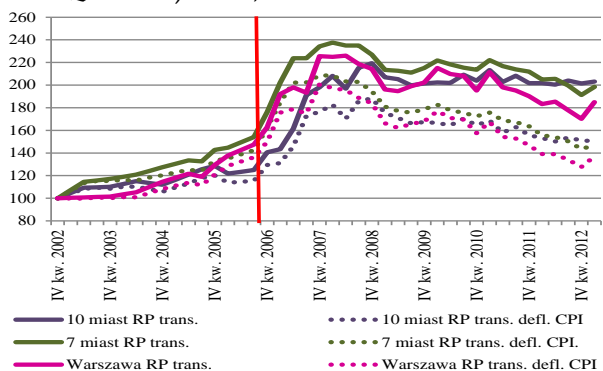| kw.	quarter
10 miast	10 cities
7 miast	7 cities
Warszawa	Warsaw

Source: NBP.

Figure 6 Relation of weighted average price of 1
square meter of housing, offer to transactional -
SM

kw.	quarter
10 miast	10 cities
7 miast	7 cities
Warszawa	Warsaw

Source: NBP.

Figure 7 Index of average weighted price of 1
square meter of housing and real price to CPI
(2002 Q4 = 100) - PM, transactions

kw.	quarter
10 miast RP trans.	10 cities, primary market, transactions
10 miast RP trans. defl. CPI	10 cities, primary market, transactions deflated by CPI
7 miast RP trans.	7 cities, primary market, transactions
7miast RP trans. defl. CPI	7 cities, primary market, transactions deflated by CPI
Warszawa RP trans.	Warsaw, primary market, transactions
Warszawa RP trans. defl. CPI	Warsaw, primary market, transactions deflated by CPI

Figure 8 Index of average weighted price of 1
square meter of housing and real price to CPI
(2002 Q4 = 100) - SM, transactions
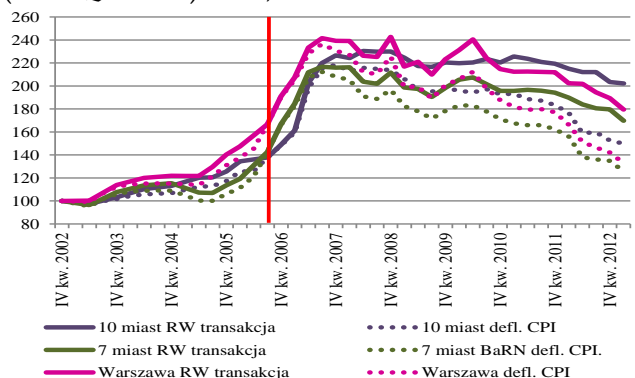
kw.	quarter
10 miast RW transakcja	10 cities, secondary market, transaction
10 miast defl. CPI	10 cities, deflated by CPI
7 miast RW transakcja	7 cities, secondary market, transaction
7miast BaRN defl. CPI	7 cities, BaRN deflated by CPI
Warszawa RW transakcja	Warsaw, secondary market, transaction
Warszawa defl. CPI	Warsaw, deflated by CPI

Note: The NBP database of housing prices (BaRN) has been in place since 2006 Q3, the red line separates the
BaRN data from estimated transactions prices based on the growth rate of offer prices PONT Info.
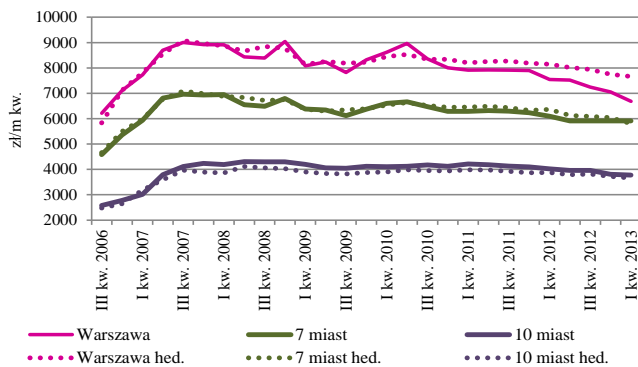*Source: NBP, PONT Info, GUS.*   *Source: NBP, PONT Info, GUS.*

Figure 9 Weighted average price of 1 square meter of housing and hedonic-adjusted price - PM, transactions

zł / m kw.	PLN/m²
kw.	quarter
Warszawa	Warsaw
Warszawa hed.	Warsaw, hedonic
7 miast	7 cities
7 miast hed.	7 cities, hedonic
10 miast	10 cities
10 miast hed.	10 cities, hedonic

Figure 10 Hedonic-adjusted transactional price of 1 square meter of housing, SM, in 6 cities

zł / m kw.	PLN/m²
kw.	quarter
Warszawa	Warsaw

Note: The price of 1 square meter from the reference period adjusted with the index of price dynamics, taking into account qualitative changes of housing in subsequent quarters.
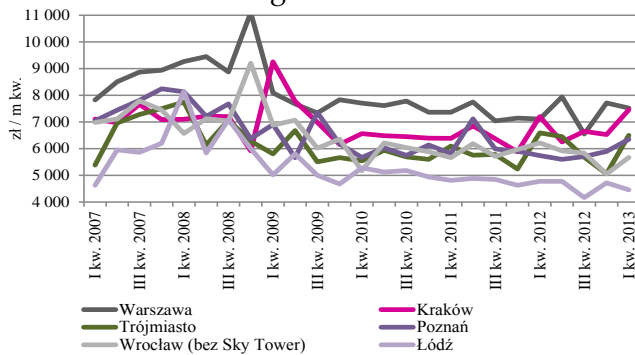*Source: NBP.*
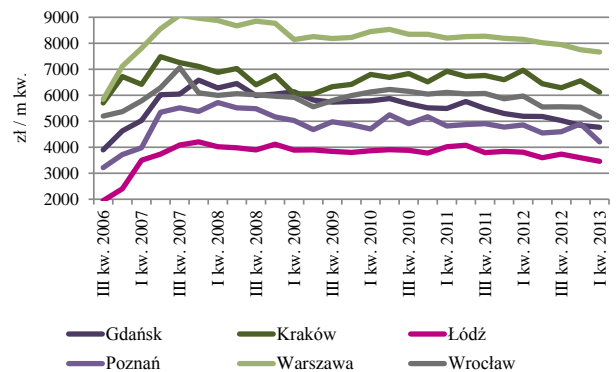
Source: NBP.

Figure 11 Average offer prices for 1 square meter of new housing contracts - PM

zł / m kw.	PLN/m²
kw.	quarter
Warszawa	Warsaw
Trójmiasto	Tricity
Wrocław (bez Sky Tower)	Wrocław (without Sky Tower)

Figure 12 Average offer prices for 1 square meter of housing - PM

zł / m kw.	PLN/m²
kw.	quarter
Warszawa	Warsaw

Note: The prices concern only new contracts, placed on the market for the first time.
Source: REAS.
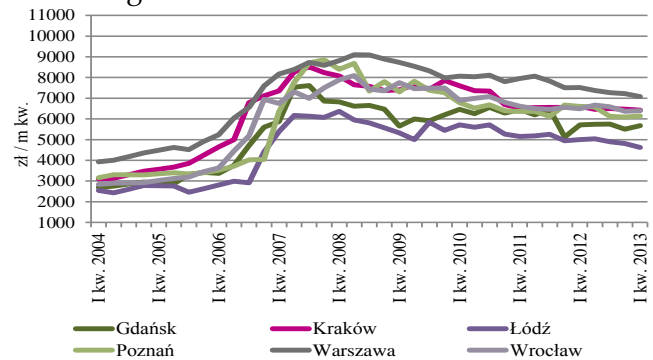
Note: The prices are collected from all available sources.
Source: PONT Info Nieruchomości.

Figure 13 Relation of interest costs on a housing loan to rent, per 1 square meter (excl. cost of maintenance); weighted loan in 6 cities
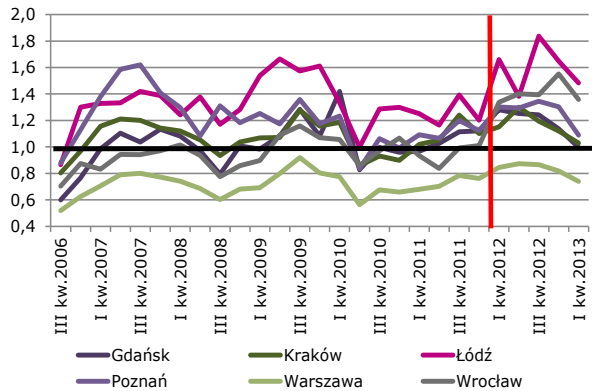
kw.	quarter
Warszawa	Warsaw

Figure 14 Profitability of housing rental (average in 6 cities) compared to deposits and housing loans of households, 5Y Treasury bonds and capitalisation rate of commercial real estate (offices and commercial space)
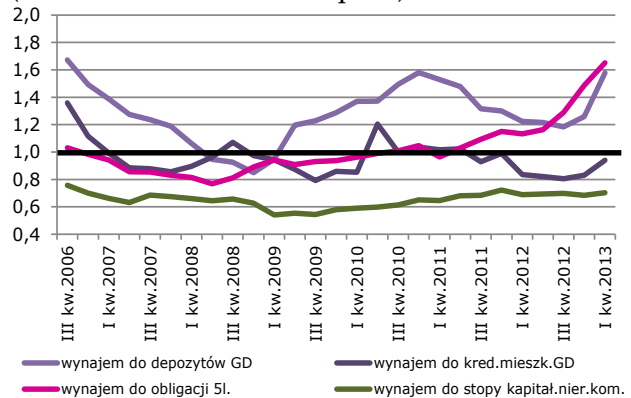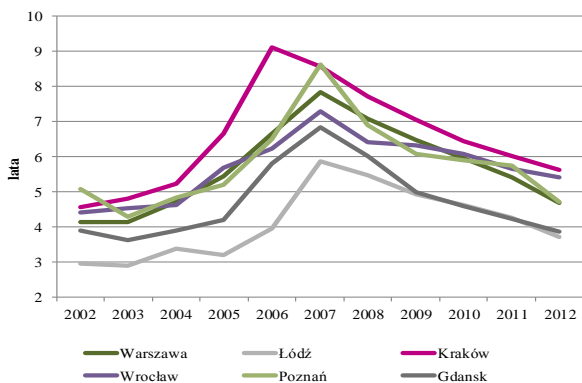

kw.	quarter
wynajem do depozytów GD	Rental to deposits of housholds
wynajem do obligacji 5l	Rental to 5-year bonds
wynajem do kred. mieszk. GD	Rental to housing loans of households
wynajem do stopy kapitał. nier. kom.	Rental to capitalisation rate of commercial real estate

Note: In Figures 13 and 14, the values exceeding 1 mean that housing rental is more profitable. The red line separates the values weighted with a currency structure of the quarterly change of the housing loan from solely PLN values occurring since 2012.

Source: NBP, GUS.   *Source: NBP, GUS.*

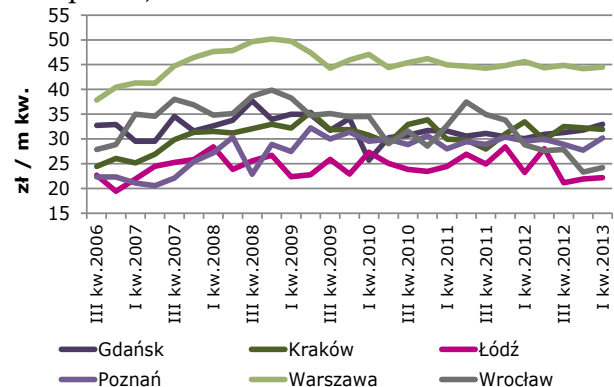Figure 15 Ratio of price of 1 square meter of housing to income (P/I) (in years)
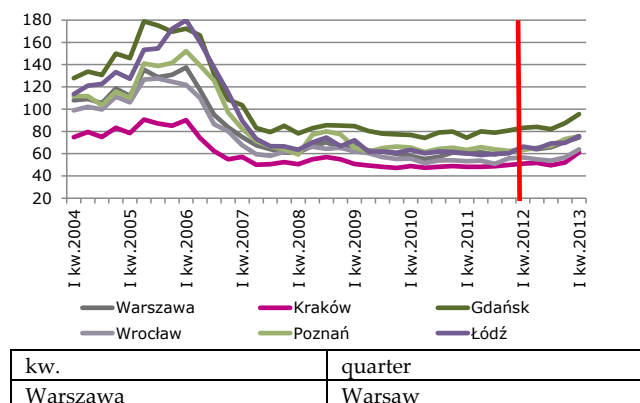

lata	years
Warszawa	Warsaw

Figure 16 Average price of 1 square meter of rented housing (average of lease transaction and offer prices)

zł / m kw.	PLN/m²
kw.	quarter
Warszawa	Warsaw

Source: GUS, NBP.   *Source: NBP.*

17

Figure 17 Availability of mortgage-financed housing in square meters (weighted loan, from 2012, PLN only)

kw.	quarter
Warszawa	Warsaw

Note: Quarterly increase in housing loans for households weighted with the currency structure.
Source: NBP, GUS, PONT Info.

Although from the beginning of 2012 only PLN loans were granted (with higher interest than foreign currency denominated loans), loan availability of average housing[12] purchased by an average households improved (see Figure 17). This was mainly due to declining interest rates on PLN housing loans and a slow decrease in housing prices. The indicator did not translate into higher lending, since banks were more cautious when extending loans.

Relationship between the cycles in the housing market and in the commercial market

Taking into account the fact that housing and commercial real estate use similar factors of production (land, construction materials, labour), with prices being similar for both types of real estate, it seems that the cycles in both markets should be similar (see Gyuorko, 2009). However, the current global crisis and data for Poland show that there is little correlation between the cycles. This is mainly due to the fact that commercial real estate is more closely linked to the business cycle than residential real estate. Residential real estate is often financed from household savings or, wholly or in part, from loans taken in local banks, whereas commercial real estate are predominantly financed by foreign capital.[13] Furthermore, housing is mainly intended for owners, while commercial real estate is leased by various economic operators for a rent. Rent is the main source of loan repayment or payment of profits to shareholders of investment funds. It should be noted that commercial real estate is, to a large extent, leased by international operators that are sensitive to the global business cycle. Therefore, the commercial real estate market is largely determined by global events, while the housing market is usually of local nature (see Gyuorko, 2009).

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[12] Availability of average housing for a given city is a measure of potential demand.

[13] E.g. by loans from foreign banks, bonds, shares or interests in investment funds.

2. The situation   in the commercial real estate market [14]

The volume of investment transactions and the rent level levelled off in the commercial real estate market in Poland in 2012.

Investment transactions

In 2012 the commercial real estate market[15] was in its upswing phase of the investment cycle[16]. The annual volume of investment transactions amounted to EUR 2.8 billion, mainly as a result of growth in investment transactions in the last quarter of the analysed year (by EUR 1.6 billion, cf. Cushman & Wakefield data). The figure is similar to the volume of transactions recorded in 2007, i.e. before the global crisis. Furthermore, the value of transactions had followed an upward trend since 2010. The value of transactions in the office and retail space market was similar to the 2011 figures, while investments in warehouse space almost trebled (however, secondary market transactions prevailed, as shown by the data from Comparables.pl). Warsaw continued to be the main office space market, accounting for 90% of all investment volume. International investors dominating investment in commercial real estate still consider Poland to be a safe and developed market. In 2012, approximately 75% of their investments in commercial real estate in Central and Eastern Europe were located in Poland (see Cushman & Wakefield, 2013). Capitalisation rates on investments in office and retail real estate amounted to approx. 6%, i.e. remained at the 2011 level (see data of DTZ, Figure 19).In view of relatively stable rents in most markets, the prices of such real estate may also be considered stable.

Space and rents

In 2012, office space in Poland increased by 500 thousand square metres. During the economic slowdown, it partially contributed boosted vacancy rates (see Figure 20 and Figure 21). However, asking rents remained stable (see Figure 22). The overwhelming majority of new office space is located in Warsaw (270 thousand square meters, see Figure 24 and Figure 25).

According to the estimates by Jones Lang LaSalle (2013), another 336 000 square metres of office space will be available in Warsaw in 2013. If the economic slowdown

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[14] The study focuses on modern commercial real estate. The analysis was supported with the knowledge of experts from individual agencies involved in commercial real estate consulting, intermediation or management. It should be emphasized that individual agencies, whose data were used, may apply various definitions and indicators concerning commercial real estate.

[15] Theintroduction to the commercial real estate market can be found in the *Report on the situation in the Polish residential and commercial real estate market in 2010*, NBP.

[16] The investment cycle, , and in particular its dynamics in the commercial real estate market in Poland, may be broken down into four phases: (1) a gradually growing value of transactions in the pre-accession years; (2) acceleration in the years close to the EU accession, with the highest level in 2006; (3) a gradual drop in the years 2007–2008 (amidst intensifying global crisis) to the lowest level of transactions recorded in 2009; (4) rebound of the upward trend in the years 2010-2012, with approx. EUR 2 billion, EUR 2.5 billion and EUR 2.8 billion worth transactions (see Cushman & Wakefield data and Figure 20).

continues, this office space growth, the highest since 2000, may add to further growth in vacancy rates (to approx. 10% in 2013 from 8.8% in 2012 and 6.7% in 2011, see Figure 25, data of WRF and CBRE (2013a)).This can result in downward pressure on rents in older buildings. In Łódź, demand for office space increased in 2012, thereby reducing significantly the vacancy rate, which was usually high, to the level recorded in other cities.

Retail space in Poland increased by almost 500 thousand square meters in 2012 (see data of the Polish Council of Shopping Centres). As in the previous years, shopping centres were completed mainly in smaller cities, with the population below 100 000 (see Figure 26 and Figure 27). In 2013, the trend is expected to reverse towards an increase in the share of new centres in large agglomeration (see CBRE (2013b)). In the majority of agglomerations, asking rents in prime locations remained stable, while in Warsaw they followed an upward trend. This may suggest an increased demand with a relatively limited supply of new retail space (see Figure 28). Asking rents vary considerably in cities of different size which can be attributed to the diversified purchasing power of their inhabitants. Rents in main shopping streets in some cities followed a slight downward trend since the turn of 2009 and 2010 (see Figure 31).

In 2012 warehouse space in Poland expanded by 430 thousand square meters which marks a growth of 10% as compared to 2011. The higher demand for warehouse space is evidenced by the fact that, despite higher supply, the vacancy rate declined from 11.4% in 2011 to stand at 9.2% at the end of 2012. In the analysed period, rents for warehouse space remained stable in the majority of locations (see Colliers International (2013)).
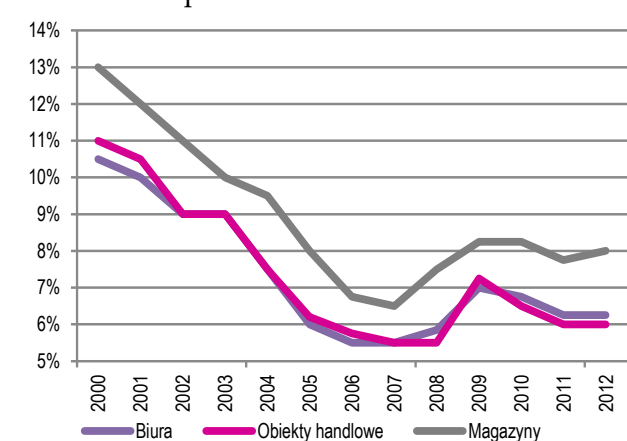
Figure 18 Value of investment transactions (EUR million)
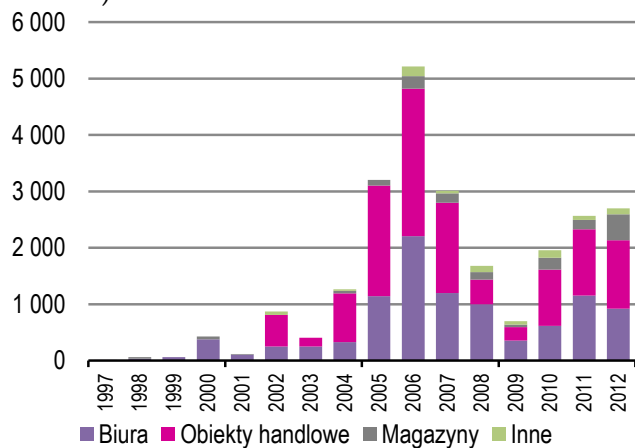
Biura	Offices
Obiekty handlowe	Retail
Magazyny	Warehouses
Inne	Other

Source: Cushman & Wakefield.

Figure 19 Capitalisation rate on investments in real estate in prime locations

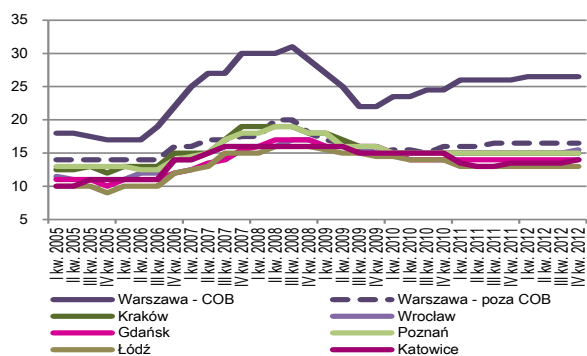| Biura	Offices
Obiekty handlowe	Retail
Magazyny	Warehouses

Source: DTZ.

Figure 20 Aggregate supply of modern office space (sq. m.)
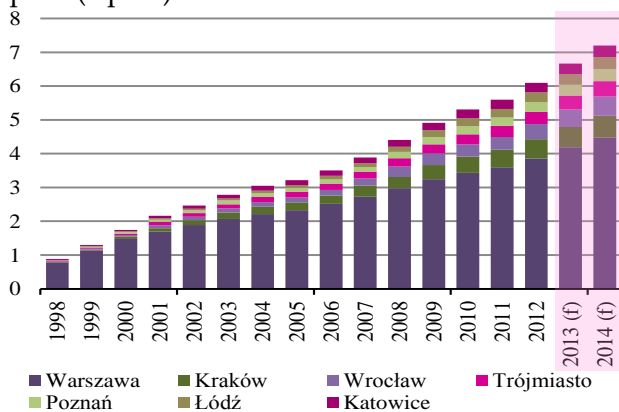
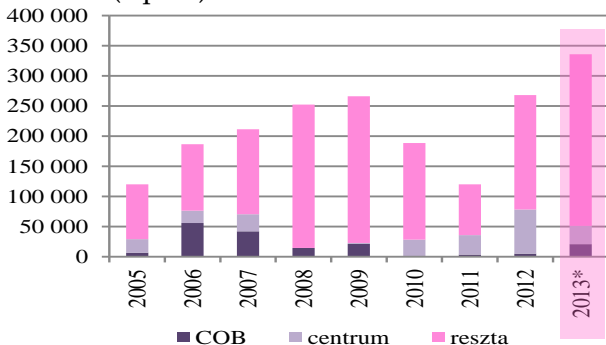| Warszawa	Warsaw
Trójmiasto	Tricity

Note: Data for 2013 and 2014 are estimates.
Source: DTZ.

Figure 22 Rents (EUR/square meter/month) for office space in prime locations

kw.	Q
Warszawa - COB	Warsaw - CBD
Warszawa - poza COB	Warsaw - non-CBD

Source: Cushman & Wakefield.

Figure 24 Annual supply of new office space in Warsaw (sq. m.)

COB	CBD
centrum	City Centre
reszta	Non Central

Note: Estimated data for 2013 provided by Jones Lang LaSalle. *Source: Jones Lang LaSalle, WRF.*

Figure 21 Office space vacancy rate in half-year periods
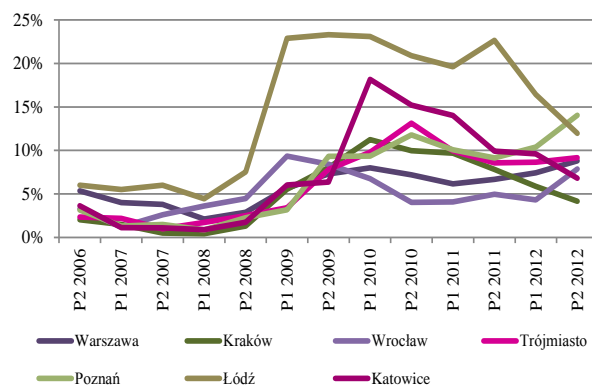
P	H
Warszawa	Warsaw
Trójmiasto	Tricity

Source: DTZ.

Figure 23 Capitalisation rate on investments in modern office space in prime locations
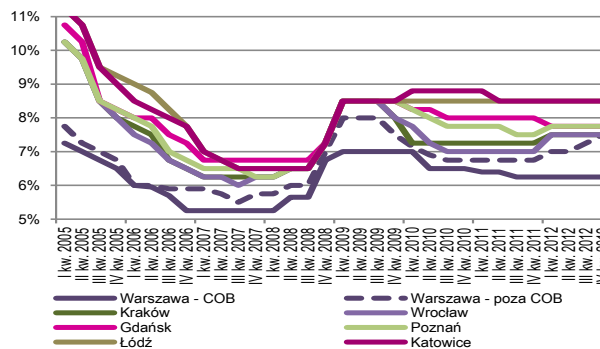
kw.	Q
Warszawa - COB	Warsaw - CBD
Warszawa - poza COB	Warsaw - non-CBD

Source: Cushman & Wakefield.

Figure 25 Office space vacancy rate in individual parts of Warsaw
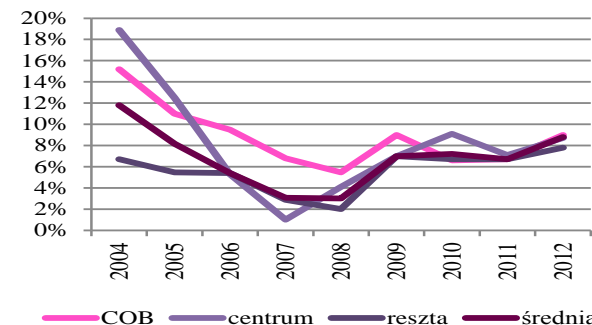
COB	CBD
centrum	City Centre
reszta	Non Central
średnia	Average

Source: Jones Lang LaSalle, WRF.

Figure 26 Aggregate supply of modern retail space (in million square meters) in large agglomerations and the rest of Poland

Source: Polish Council of Shopping Centres.

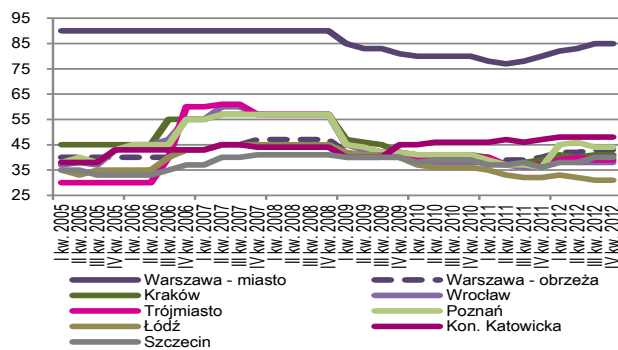Figure 27 Aggregate supply of modern retail space in large agglomerations (in square meters per 1000 inhabitants)
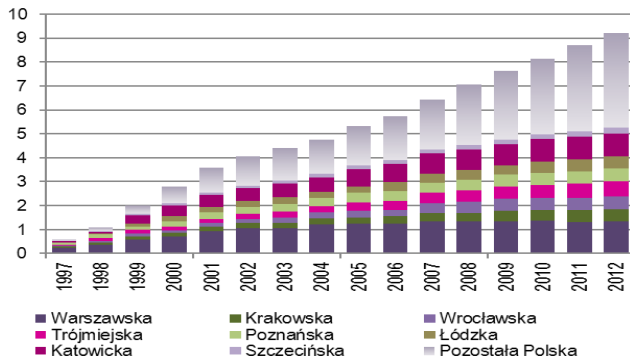
Source: Polish Council of Shopping Centres.

Figure 28 Rents (EUR/ square meter/month) in shopping centres in prime locations

kw.	Q
Warszawa- miasto	Warsaw (in-town)
Warszawa - obrzeża	Warsaw(out-of-town)

Source: Cushman & Wakefield.
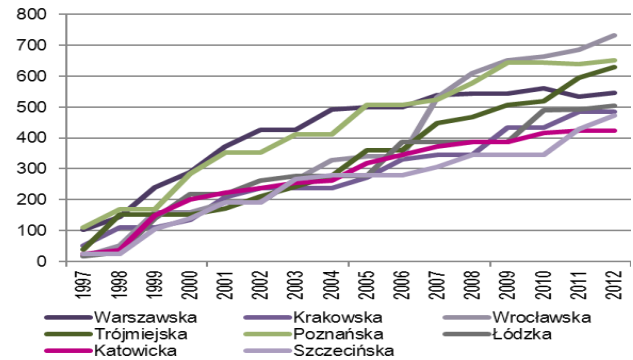
Figure 29 Capitalisation rates on investments in retail space in prime locations

kw.	Q
Warszawa- miasto	Warsaw (in-town)
Warszawa - obrzeża	Warsaw(out-of-town)

Note: Capitalization rates for all the markets except for Warsaw were almost identical since the end of 2008. *Source: Cushman & Wakefield.*

Figure 30 Rents for prime retail space in main shopping centres (EUR/square meter/month) in 2012 Q4

Miasta 75-100 tys.	Cities 75-100 thousand
Miasta 100-300 tys.	Cities 100-300 thousand
Miasta > 300 tys.	Cities > 300 thousand
Warszawa	Warsaw

Note: Rents for fashion and accessories retail space of approx. 100 square meters in the main shopping centre. *Source: Jones Lang LaSalle.*

Figure 31 The highest rents (EUR/square meter/month) in main shopping streets
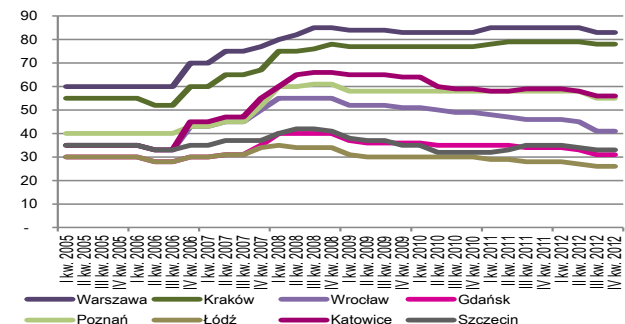
Source: Cushman & Wakefield.

Figure 32 Warehouse space stock in Poland's
regions (millions of square meters)

Warszawski	Krakowski	Wrocławski
Trójmiejski	Poznański	Polski Centralnej
Górnośląski		

| Polski Centralnej | Central Poland |
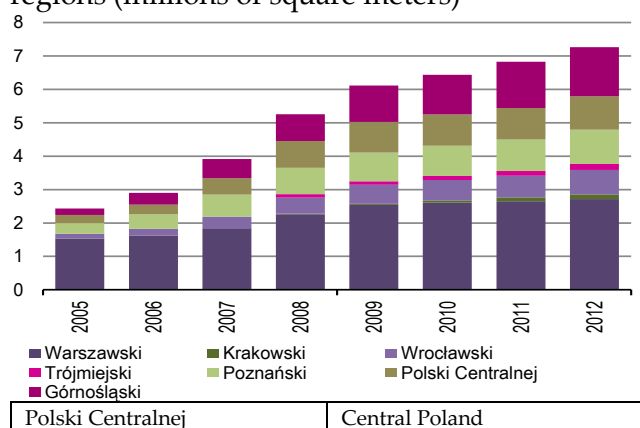
Source: Cushman & Wakefield.

3. *Real estate loans to households*

Home purchases were fuelled by cuts in NBP interest rates, which led to lower interest rates on deposits with banks and other financial instruments used as a method of saving. The annual change in the value of housing loan debt of households was the lowest since 2005, but the estimated gross disbursement of loans fell slightly as compared to 2011[17] (see Figure 33 and Table 1). From the beginning of 2012, housing loans denominated in foreign currencies were on the decline, in adjusted terms. As banks ceased to extend foreign currency denominated housing loans with lower interest rates, the cost of home financing has increased. Exchange rate fluctuations and possible further declines in home prices result in insufficient collaterals for some of existing housing loans in foreign currencies. Within the analysed period, banks extended only PLN loans and were significantly more cautious. As a result of falling interest on PLN loans and slightly lower home prices, coupled with almost stable market rents, yields on housing investments were higher than yields on saving with banks or even yields on State Treasury bonds. However, we must remember that the risks related to investment in housing in Poland are quite high. They involve both lease risk (the risk of vacancies, terminated contracts) and also the risk related to defaulting tenants which is still a problem in Poland. Furthermore, the cost of entry and exit from housing investments (including uncertainty regarding future changes in real estate prices) and own costs related to real estate management and administration are higher than in the case of investments in financial instruments.

Regulatory changes, global crisis and the related volatility of zloty exchange rate affected not only banks' lending, but also, with a certain delay, the average maturity of housing loans (see Figure 34). The maturity of PLN loans extended from approx. 11 years in the second half of 2007 to approx. 13 years in 2013 Q1. This was due to the fact that new

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[17] Differences between loan disbursements and growth in the loan volume result mainly from loan depreciation and flows from the foreign currency portfolio to the zloty portfolio.

loan contracts were signed for longer period, offering lower fixed instalments, which increased creditworthiness of borrowers and consequently availability of such loans. The process was strengthened by forced currency translation. Since interest on foreign currency denominated loans was by almost two times lower than on PLN loans, the repayment period had to be extended to enable borrowers to repay the loan after conversion. The fact that virtually no foreign currency denominated loans had been disbursed from the beginning of 2012, coupled with the repayment of the existing loans, resulted in the maturity of the foreign loans portfolio getting constantly shorter.
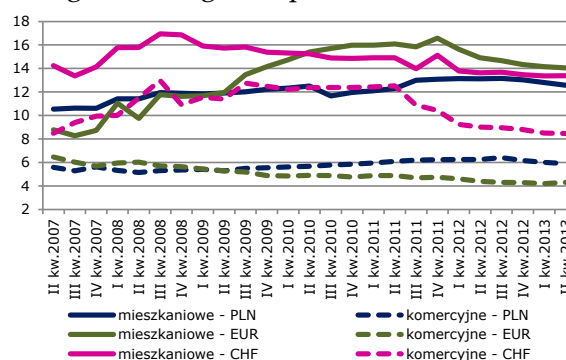
Figure 33 Changes in the value of housing loan debt of households in Poland
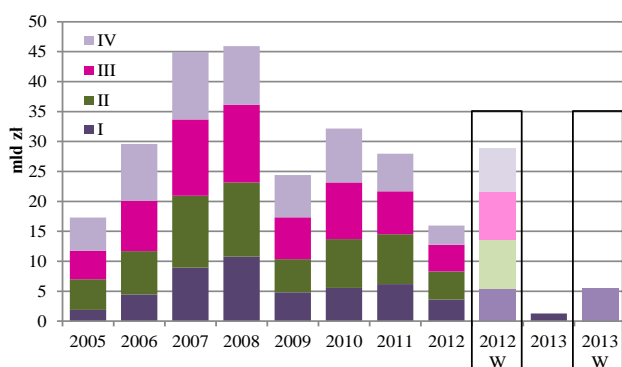
| mld zł | PLN billion |

Note: The data in frames are estimates of gross disbursement of housing loans for households (see Table 1). *Source: NBP.*

Figure 34 Average maturity of housing and commercial real estate loans, weighted with the figure for a given quarter

kw.	Q
mieszkaniowe	housing
komercyjne	commercial

Source: NBP.

Table 1 Estimated gross disbursement of housing loans for households in Poland and estimated cash and loan financed purchases of developer housing in 6 largest markets (in PLN million)

Date	Estimated disbursements of housing loans in Poland	Estimated value of housing transactions in the primary market in 6 cities	Estimated disbursements of loans along with own contribution for the purchase of housing in the primary market in 6 cities	Estimated cash purchases of housing in the primary market in 6 cities	Estimated share of cash purchases of housing in the primary market in 6 cities
2011 Q4		2 770			
2012 Q1	5 409	2 726	879	1 847	0.68
2012 Q2	7 346	2 783	1 194	1 589	0.57
2012 Q3	7 177	2 510	1 166	1 343	0.54
2012 Q4	7 274	2 839	1 182	1 657	0.58
2013 Q1	5 491	2 610	892	1 717	0.66

Note: The following assumptions were made: newly extended loans in Poland in individual quarters were estimated based on the NBP reporting data on the increase in loans for households, adjusted with loan depreciation and flows between the foreign currency loan portfolio and the zloty loans portfolio. The estimated value of housing transactions in the primary market of 6 cities was calculated by multiplying the average transaction price of housing and its average size in square meters and the number of housing units
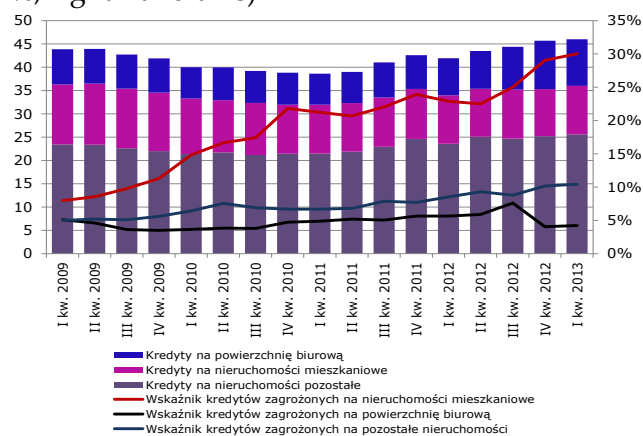
sold based on the data from REAS. Based on the data from the Polish Bank Association (ZBP) it was assumed that the primary market accounts for 50% of the volume of loans for housing in 6 cities. The estimated cash transactions were calculated as the difference between the transactions in 6 cities and the disbursement of loans with own equity contribution.
Source: NBP.

Real estate loans to enterprises

Investments in commercial real estate[18] are largely financed by international investors with foreign funds. A part of real estate of enterprises is financed by banks operating in Poland. The value of real estate loans granted to enterprises amounted to approx. PLN 46 billion at the end of 2013 Q1 (see Figure 35). Compared to housing loans to households, the total value of real estate loans granted to enterprises is low, but marked by a higher percentage of impaired loans. Real estate loans to enterprises are broken down into loans for office space, housing loans (mainly loans to real estate developers) and other, which amounted to PLN 10.0 billion, PLN 10.4 billion and PLN 25.6 billion, respectively, at the end of 2013 Q1. The ratio of impaired loans to real estate developers had been on the rise from the onset of the current crisis[19] and stood at approximately 30% at the end of 2012. However, it does not pose a risk to the stability of the banking system, since the share of such loans in the assets of bank extending the largest number of real estate loans did not exceed 4%. No significant changes in the value or quality was recorded as regards loans granted to enterprises for offices and other real estate.

Figure 35 Real estate loans for enterprises (in PLN billion, left-hand axis) and impaired loan ratio (in %, right-hand axis)

Kredyty na powierzchnię biurową
Kredyty na nieruchomości mieszkaniowe
Kredyty na nieruchomości pozostałe
Wskaźnik kredytów zagrożonych na nieruchomości mieszkaniowe
Wskaźnik kredytów zagrożonych na powierzchnię biurową
Wskaźnik kredytów zagrożonych na pozostałe nieruchomości

kw.	quarter
Kredyty na powierzchnię biurową	Commercial loans (office space)
Kredyty na nieruchomości mieszkaniowe	Housing loans
Kredyty na nieruchomości pozostałe	Other real estate loans
Wskaźnik kredytów zagrożonych na nieruchomości mieszkaniowe	Impaired housing loan ratio
Wskaźnik kredytów zagrożonych na powierzchnię biurową	Impaired office space loan ratio
Wskaźnik kredytów zagrożonych na pozostałe nieruchomości	Impaired other real estate loan ratio

Note: Exclusive of BGK. *Source: NBP.*

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[18] Commercial real estate is real estate purchased in order to generate profit for the owner. Commercial real estate includes offices, retail space, warehouses and, to an insignificant extent, also housing for rental.

[19] As a result of lower demand for housing, there is a large surplus of unsold developer-built housing in the markets. Therefore, real estate developers face certain problems with loan repayment.

Summing up, we can see that the situation in the residential and commercial real estate markets in 2012 slowly stabilized. Home prices adjusted to less dynamic economic growth resulting in reduced activity of home buyers. The annual change in the value of mortgage debt of households was low, in fact the lowest since 2005. The fact that banks ceased to extend foreign currency denominated loans with lower interest rates resulted in higher cost of home financing and often the lack of satisfactory mortgage collateral acceptable for banks. However, due to falling interest rates on PLN loans and a decline in home prices, banks were more cautious while extending loans which is a positive development from the point of view of the stability of the financial sector.

References:

Gyuorko J. (2009), "*Understanding Commercial Real Estate: How Different from Housing Is It?*" NBER Working Paper 14708.

Cushman & Wakefield (2013), "*Market Beat – Spring 2013*".

Jones Lang LaSalle (2013), "*Warszawski Rynek Biurowy IV kw. 2012*" [Warsaw Office Market 2012 Q4].

CBRE (2013a), "*MarketView - Warsaw Office Q4 2012*".

CBRE (2013b), "*MarketView - Warsaw Retail Q4 2012*".

Colliers International (2013), "*Poland Research & Forecast Report 2013*".

2. Determinants of the real estate sector development in 2012

The Chapter presents determinants of processes observed in the housing markets of 16 cities discussed in Chapter 1. It discusses the impact of regulatory changes and housing policy. It also presents a panel analysis carried out to identify factors driving up home prices in large cities.

Figure 36 Housing units placed on the market, sold and on offer in 6 cities
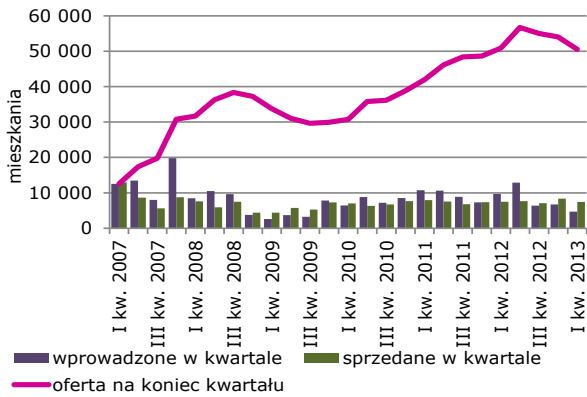
kw.	Q
mieszkania	housing
wprowadzone w kwartale	placed on the market in the quarter
sprzedane w kwartale	sold in the quarter
oferta na koniec kwartału	on offer at the end of the quarter

Source: REAS.

Figure 37 Housing price limit in the primary market of 6 cities under the RNS scheme

Source: BGK

Figure 38 Gap between the RNS limit and the median of transactional prices in the primary market (according to BaRN)

The gap is calculated as the difference between the maximum price (limit) under the RNS scheme and the median of the transactional price in the primary market in relation to the median of the transactional price. If the difference is positive, the scheme finances homes with prices higher than the median, and otherwise, if the difference is negative.
Source: NBP, BGK.

Figure 39 Disbursement of RNS loans in 6 cities

Source: BGK

27

In 2012, the excessive level of prices of homes covered by the RNS scheme was reduced, leading to market stabilization. Completion of this home subsidy scheme was officially announced at the end of 2012. Furthermore, the long-awaited Act on the protection of rights of real estate developers' customers entered into force (the so-called Act on real estate development activity[20]). The adoption of the Act brought about a small construction boom, since real estate developers accumulated a portfolio of projects not covered by the Act[21]. In consequence, in 2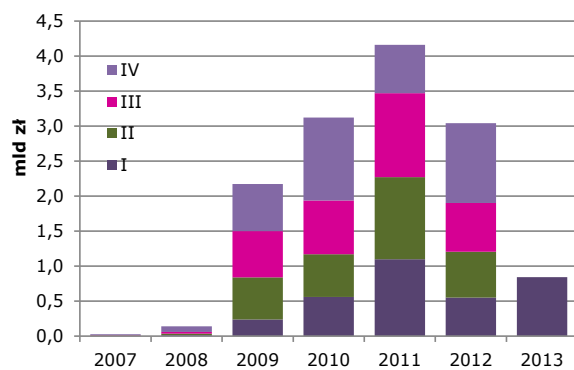012 disequilibrium in housing markets of the largest cities deepened and some real estate development companies faced liquidity problems. Despite continued profitability of home production[22], real estate developers experienced increasing difficulties with selling homes placed on the market. In 2012 bank started to perceive the real estate sector as risky and reduced mortgage lending. Meanwhile, growth in the RNS loans acted to the contrary[23]. Despite a substantial surplus of unsold housing in some markets, increase in RNS loans resulted in a slight price increase.

Figure 40 Liquidity ratios of large real estate development companies
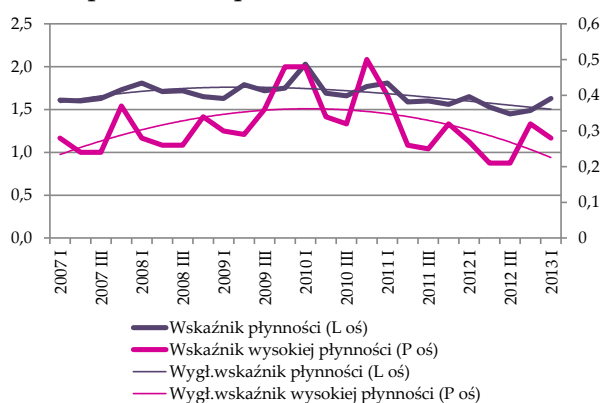
Source: NBP based on GUS.

Figure 41 ROE and ROA of large real estate development companies
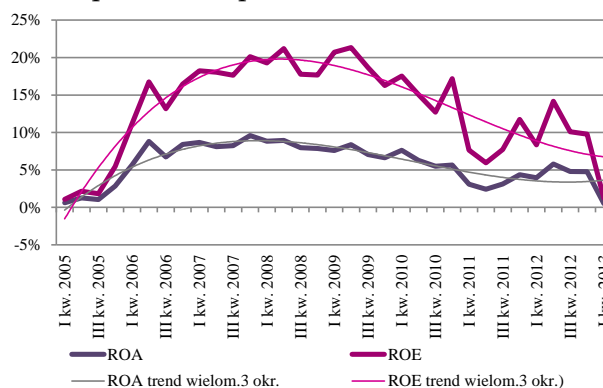
Source: NBP based on GUS.

Due to a clear disequilibrium in the real estate market[24], real estate developers' loans recorded increasing high impairment rates. Banks reduced the financing of real estate

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[20] The Act of 16 September 2011 (Dz. U. No 232, item 1377) on the protection of home buyers' rights defines the real estate development contract and obliges the real estate developer to provide the buyer with appropriate protection measures.

[21] The housing projects commenced by 29 April 2012 were not subject to the said Act.

[22] Profitability of real estate development production was calculated assuming that all completed housing units were sold, based on the model of Augustyniak et al. (2012).

[23] In 2012 Q4, the number of home buyers wishing to receive the last payments under the RNS scheme increased substantially. Due to the multitude of applications, disbursement of funds continued in 2013 Q1.

[24] Apart from unsold contracts, another problem of the real estate development sector is its internal diversification. Since 2008, the share of large companies posting negative financial results (approx. 20%) and negative equity (approx. 5%) had been on the rise. As a result, the percentage of real estate developers experiencing loan repayment problems was continually growing.

developers' investments, but the value of loans granted to real estate developers, despite a surge in their production, remained stable in 2012 (see Figure 35). Since real estate developers were seeking for alternative sources of financing, their debt in bonds increased from approx. PLN 1 billion at the beginning of 2012 to approx. PLN 1.9 billion at the end of the year (see Figure 42). The share of debt securities in the financing structure of large real estate developers also grew (see Figure 43).

Figure 42 The value of corporate debt securities (PLN billion, left-hand axis) and the value of debt securities of real estate developers quoted on GPW Catalyst (PLN billion, right-hand axis)
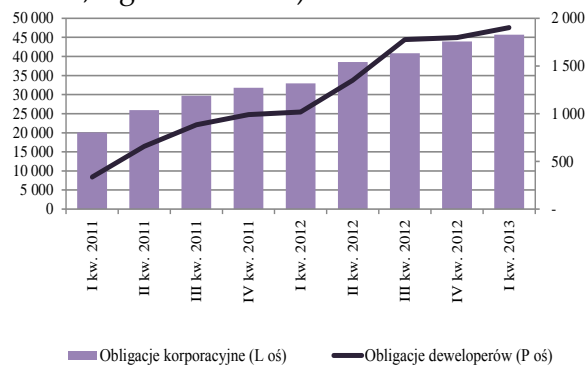
| Obligacje korporacyjne (L oś) | Corporate bonds (left-hand axis) |
| Obligacje deweloperów (P oś) | Real estate developer bonds (right-hand axis) |

Source: GPW Catalyst.

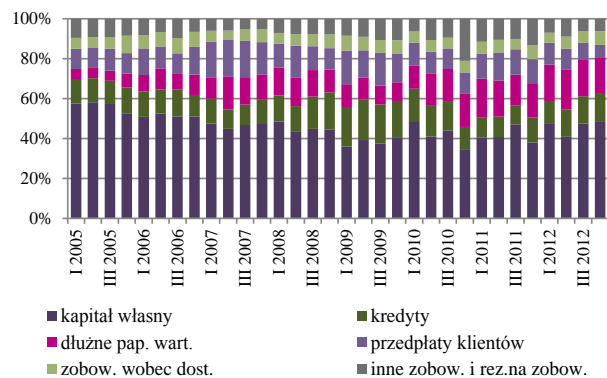Figure 43 Financing structure of large real estate developers

Source: NBP based on GUS (F01).

Termination of the RNS scheme was announced along with the launch of a new scheme of subsidies to loans on housing bought in the primary market at the end of 2013, called *Mieszkanie dla Młodych* (MDM) (Housing for the Young). The subsidies under the MDM scheme are poorly targeted, though at a lesser scale than under its predecessor – the RNS scheme. Therefore, the scheme may also have an adverse impact on the market equilibrium and price decrease Since a significant volume of subsidized RNS loans[25] was transferred to 2013 (delayed processing of loan applications submitted at the end of 2012), the next two years may be assumed to bring demand shocks and accumulation of expectations. This will make it difficult for the sector to reach equilibrium. Consumers may expect further price drops and decline in government subsidies and thus they will put off their purchase decisions. Real estate developers may expect demand-supporting schemes and therefore they may accelerate housing production and start new projects.

Summing up, the terminated RNS scheme must be assessed negatively, in particular its second stage, i.e. after numerous changes of price limits. The original aim of the scheme

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[25] According to the data of BGK, PLN 6 billion were paid in 2013 under the RNS scheme.

was to increase the share of modest standard owner-occupied housing, supporting lower income households and improving their housing situations (available OOH means increased political stability, modest standard under the scheme guarantees that subsidies are distributed to lower income households). Yet, after its subsequent amendments the scheme was transformed into a programme offering wide range of untargeted subsidies, failing to solve social problems and distorting the functioning of the housing sector. Its successor is only slightly better in this respect, since it provides grants instead of subsidies to interest payments (without the postponement effect and accumulation of budget burdens, reduced possibilities to redistribute the subsidies for the bank system). It is supposed to have a smaller scale (less intervention means less distortions in the free market) and its target group is reduced to young people[26]. However, neither the income criterion nor more stringent reduction of acceptable standard were introduced which means that subsidies will mainly be granted to those households that would purchase housing even without the aid from the state budget. As a result, the sectoral demand will increase less than it could, if the support was provided only to persons unable to take loans due to low income level. Social effects of the current scheme are doubtful (it is difficult to find reasonable justification for such a wide-scale financing of home ownership). Increases in prices may be expected, as well as re-emergence of the surplus of housing in the market, due to the related expectations and the impact of additional real demand.

The key problem of the Polish housing policy is its focus on owner-occupied housing and mortgage loans. Such loans are available to approx. 40% of households in Poland that meet income requirements. Experience (e.g. during the recent crisis in the USA or Spain) in excessive provision of owner-occupied housing to low income households shows that such schemes usually result in social problems and difficulties in the banking sector.

Figure 44 Distribution of PLN availability of owner-occupied housing for household sin Poland
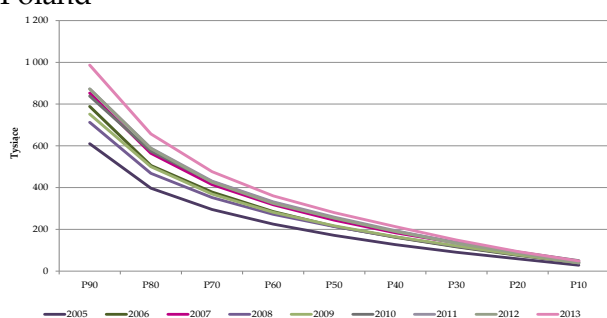
Source: NBP, GUS.

Figure 45 Estimated global availability of loan-financed housing for households in Poland
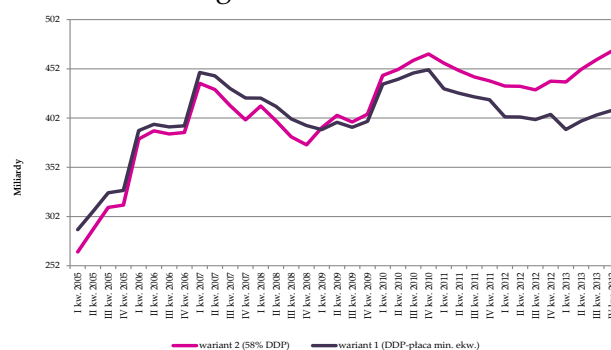
Source: NBP, GUS.

During the 23 years from the beginning of its transformation, the Polish housing policy has failed to successfully implement a project improving the level of satisfied housing needs (structuring of public housing stock, social housing, commercial and social

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[26] According to the draft Act, subsidized homes may be purchased by persons aged up to 35 years.

housing for rent). Exceptions include the already operating housing loan development programme and the currently implemented housing subsidies scheme. The natural trend to continue along the well-established path is reinforced by the lobbying of the real estate development sector and the banking sector.

Experience, including the most recent one, shows that the housing market generates considerable problems for the entire economy (long-term accumulation of tensions, including inappropriate political decisions, followed by sudden price plunges, massive loan defaults and social tensions). Excessive share, i.e. exceeding 30% of assets, of mortgage loans in the banks' assets is a risk to their stability. It should be remembered that under reasonable prudential regulations potential creditworthiness of households is limited (see Figure 45).

In 2011, Recommendation T entered into force and introduced limits on maximum share of loan repayments in the household budgets and reduced foreign currency denominated lending. The limits introduced by the Recommendation (50/65% TDR[#]) may be considered moderate in the context of the international experience, yet they coincided with deteriorating economic situation in the country and in the real estate and banking sectors. Therefore, the Recommendation was criticized. Disbursements of housing loans showed that Recommendation T had hardly any impact on the quantity of loans, but it may have contributed to an improvement in their quality. In December 2012, the draft amendment of Recommendation S[27] was submitted for consultation and the Recommendation was eventually adopted in June 2013. Its assessment is similar to the earlier Recommendation T, but since it enters into force in 2014, it did not have any impact on the 2012developments.

1.1 Assessment of changes in the regulatory environment and its impact on the real economy

In 2012, substantial disturbances of market processes were recorded in the real estate market due to introduced regulations, i.e. completion of the RNS scheme, entry into force of the Act on real estate development activity[28], Recommendations S and T. The regulations had an adverse impact on stabilization in the housing sector [29] after the credit shock in the

[27] Best practices for managing mortgage-backed credit exposures.

[28] The Act of 16 September 2011 (Dz. U. No 232, item 1377) on the protection of home buyers' rights defines the real estate development contract and obliges the real estate developer to provide the buyer with appropriate protection measures.

[29] The cycles in real estate markets, including housing markets, are usually longer and deeper than in other sectors (see André, 2010).This is due to rigid supply which, coupled with the growing fundamental and speculative demand financed by the banking system, causes price surges and then delayed supply. This delayed supply is observed in the market when the situation is already deteriorating, prices are falling and banks reduce lending. Such a scenario in the markets of the largest Polish cities was interrupted by the collapse of the US market which resulted in reduced lending, change in the market sentiment and a decline in demand to which real estate developers responded by curbing and freezing their investments. As a result, the

years 2005-2008. A subsequent increase in the unsold housing stock in the market, starting from 2009, and a very slow decline in prices resulted from a change of parameters[30] of the government scheme of subsidies to interest on housing loans (RNS). With relatively stable demand and loan disbursement, this resulted in a fast accumulation of the unsold housing stock. The price boom and response of real estate developers were presented in the analytical chapter on the example of the Warsaw market.

Figure 46 Housing units placed on the market, sold and on offer in 6 cities
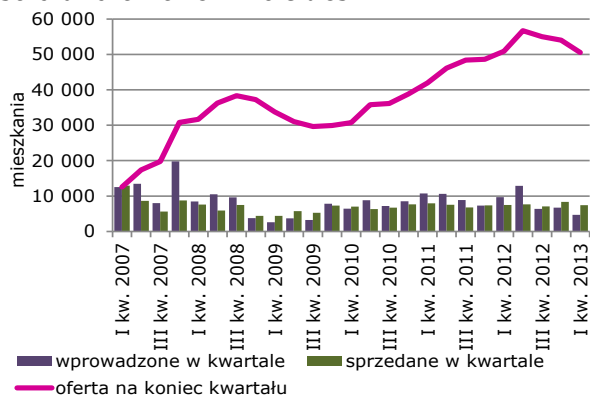
kw.	Q
mieszkania	housing
wprowadzone w kwartale	placed on the market in the quarter
sprzedane w kwartale	sold in the quarter
oferta na koniec kwartału	on offer at the end of the quarter

Source: REAS.

Figure 47 Housing price limit in the primary market of 6 cities under the RNS scheme
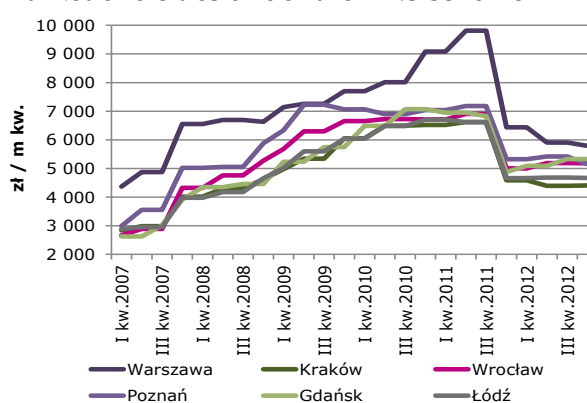
Source: BGK

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market started to stabilize faster, thus avoiding the outburst of the price growth bubble and the related adverse consequences which usually involve falling real estate prices and deteriorating loan quality.

[30] The years 2010 and 2011, saw a substantial increase in the prices of housing admitted to the scheme as compared to market prices. This contributed to accelerated disbursement of subsidies, stabilisation of prices at a high level and expansion of construction.

Figure 48 Gap between the RNS limit and the median of transactional prices in the primary market (according to BaRN)
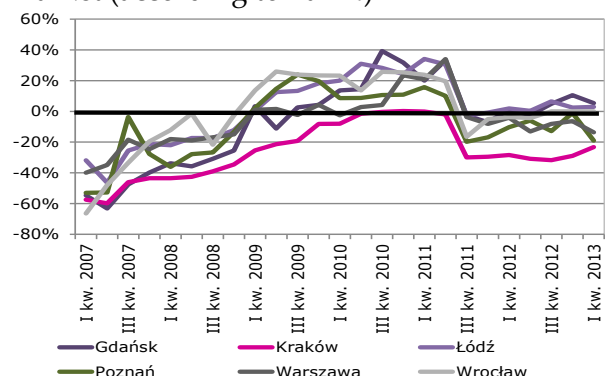
kw.	Q
Warszawa	Warsaw

The gap is calculated as the difference between the maximum price (limit) under the RNS scheme and the median of the transactional price in the primary market in relation to the median of the transactional price. If the difference is positive, the scheme finances homes with prices higher than the median, and otherwise, if the difference is negative.
Source: NBP, BGK.

Figure 49 Disbursement of RNS loans in 6 cities

mld zł	PLN billion

Source: BGK

In 2012, the excessive level of prices of homes covered by the RNS scheme was reduced, leading to market stabilization. Completion of this home subsidy scheme was officially announced at the end of 2012. Furthermore, the long-awaited Act on the protection of rights of real estate developers' customers entered into force (the so-called Act on real estate development activity[31]). The adoption of the Act brought about a small construction boom, since real estate developers accumulated a portfolio of projects not covered by the Act[32]. In consequence, in 2012 disequilibrium in housing markets of the largest cities deepened and some real estate development companies faced liquidity problems. Despite continued profitability of home production[33], real estate developers experienced increasing difficulties with selling homes placed on the market. In 2012 bank started to perceive the real estate sector as risky and reduced mortgage lending. Meanwhile, growth in the RNS loans acted to the contrary[34]. Despite a substantial surplus of unsold housing in some markets, increase in RNS loans resulted in a slight price increase.

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[31] The Act of 16 September 2011 (Dz. U. No 232, item 1377) on the protection of home buyers' rights defines the real estate development contract and obliges the real estate developer to provide the buyer with appropriate protection measures.

[32] The housing projects commenced by 29 April 2012 were not subject to the said Act.

[33] Profitability of real estate development production was calculated assuming that all completed housing units were sold, based on the model of Augustyniak et al. (2012).

[34] In 2012 Q4, the number of home buyers wishing to receive the last payments under the RNS scheme increased substantially. Due to the multitude of applications, disbursement of funds continued in 2013 Q1.
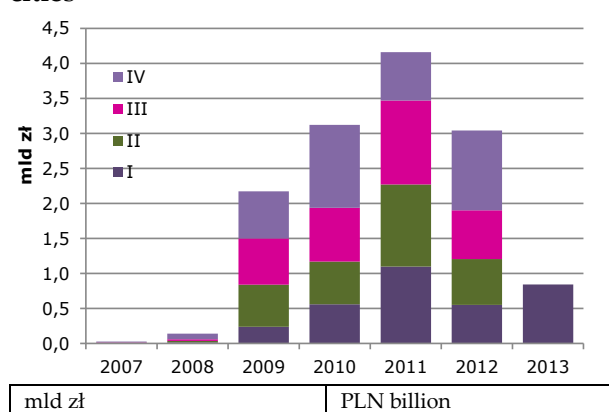
Figure 50 Liquidity ratios of large real estate development companies
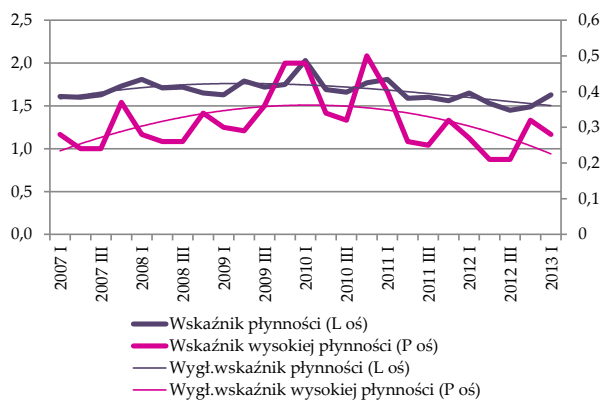
Wskaźnik płynności (L oś)	Liquidity ratio (Left-hand axis)
Wskaźnik wysokiej płynności (P oś)	Quick ratio (Right-hand axis)
Wygł. wskaźnik płynności (L oś)	Smoothed liquidity ratio (Left-hand axis)
Wygł. wskaźnik wysokiej płynności (P oś)	Smoothed quick ratio (Right-hand axis)

Source: NBP based on GUS.

Figure 51 ROE and ROA of large real estate development companies
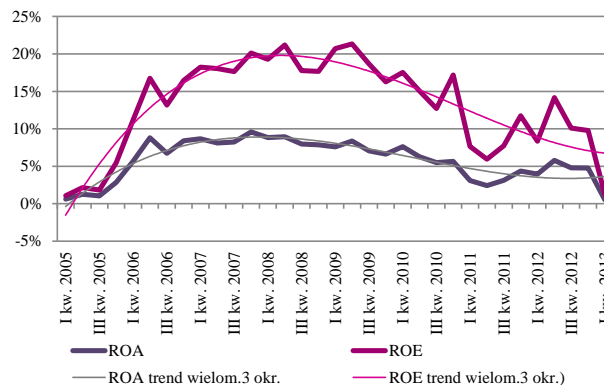
kw.	Q
ROA trend wielom. 3 okr.	ROA multi-month trend 3 period
ROE trend wielom. 3 okr.	ROE multi-month trend 3 period

Source: NBP based on GUS.

Due to a clear disequilibrium in the real estate market[35], real estate developers' loans recorded increasing high impairment rates. Banks reduced the financing of real estate developers' investments, but the value of loans granted to real estate developers, despite a surge in their production, remained stable in 2012 (see Figure 35). Since real estate developers were seeking for alternative sources of financing, their debt in bonds increased from approx. PLN 1 billion at the beginning of 2012 to approx. PLN 1.9 billion at the end of the year (see Figure 42). The share of debt securities in the financing structure of large real estate developers also grew (see Figure 43).

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[35] Apart from unsold contracts, another problem of the real estate development sector is its internal diversification. Since 2008, the share of large companies posting negative financial results (approx. 20%) and negative equity (approx. 5%) had been on the rise. As a result, the percentage of real estate developers experiencing loan repayment problems was continually growing.

Figure 52 The value of corporate debt securities (PLN billion, left-hand axis) and the value of debt securities of real estate developers quoted on GPW Catalyst (PLN billion, right-hand axis)

Figure 53 Financing structure of large real estate developers
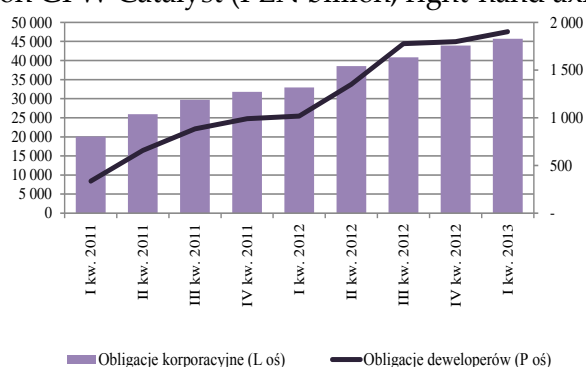
kw.	Q
Obligacje korporacyjne (L oś)	Corporate bonds (left-hand axis)
Obligacje developerów (P oś)	Real estate developer bonds (right-hand axis)
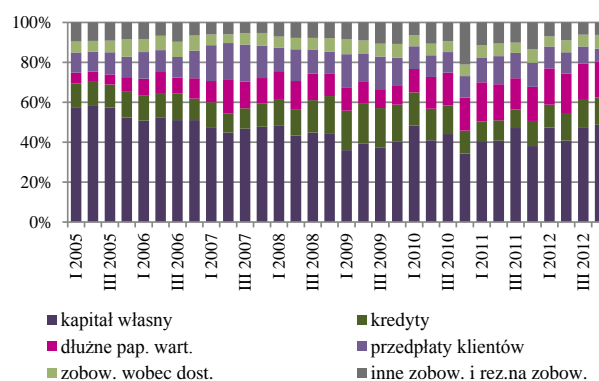
kapitał własny	equity
dłużne pap. wart.	debt securities
zobow. wobec dost.	trade liabilities
kredyty	loans
przedpłaty klientów	client prepayments
inne zobow. i rez. na zobow.	other liabilities

Source: GPW Catalyst.

Source: NBP based on GUS (F01).

Termination of the RNS scheme was announced along with the launch of a new scheme of subsidies to loans on housing bought in the primary market at the end of 2013, called *Mieszkanie dla Młodych* (MDM) (Housing for the Young). The subsidies under the MDM scheme are poorly targeted, though at a lesser scale than under its predecessor – the RNS scheme. Therefore, the scheme may also have an adverse impact on the market equilibrium and price decrease Since a significant volume of subsidized RNS loans[36] was transferred to 2013 (delayed processing of loan applications submitted at the end of 2012), the next two years may be assumed to bring demand shocks and accumulation of expectations. This will make it difficult for the sector to reach equilibrium. Consumers may expect further price drops and decline in government subsidies and thus they will put off their purchase decisions. Real estate developers may expect demand-supporting schemes and therefore they may accelerate housing production and start new projects.

Summing up, the terminated RNS scheme must be assessed negatively, in particular its second stage, i.e. after numerous changes of price limits. The original aim of the scheme was to increase the share of modest standard owner-occupied housing, supporting lower income households and improving their housing situations (available OOH means increased political stability, modest standard under the scheme guarantees that subsidies are distributed to lower income households). Yet, after its subsequent amendments the scheme was transformed into a programme offering wide range of untargeted subsidies, failing to solve social problems and distorting the functioning of the housing sector. Its successor is only slightly better in this respect, since it provides grants instead of subsidies

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[36] According to the data of BGK, PLN 6 billion were paid in 2013 under the RNS scheme.

to interest payments (without the postponement effect and accumulation of budget burdens, reduced possibilities to redistribute the subsidies for the bank system). It is supposed to have a smaller scale (less intervention means less distortions in the free market) and its target group is reduced to young people[37]. However, neither the income criterion nor more stringent reduction of acceptable standard were introduced which means that subsidies will mainly be granted to those households that would purchase housing even without the aid from the state budget. As a result, the sectoral demand will increase less than it could, if the support was provided only to persons unable to take loans due to low income level. Social effects of the current scheme are doubtful (it is difficult to find reasonable justification for such a wide-scale financing of home ownership). Increases in prices may be expected, as well as re-emergence of the surplus of housing in the market, due to the related expectations and the impact of additional real demand.

The key problem of the Polish housing policy is its focus on owner-occupied housing and mortgage loans. Such loans are available to approx. 40% of households in Poland that meet income requirements. Experience (e.g. during the recent crisis in the USA or Spain) in excessive provision of owner-occupied housing to low income households shows that such schemes usually result in social problems and difficulties in the banking sector.

Figure 54 Distribution of PLN availability of owner-occupied housing for household sin Poland
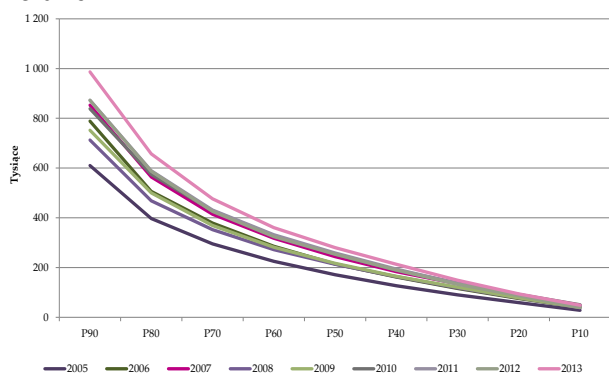
Tysiące	Thousand

Source: NBP, GUS.

Figure 55 Estimated global availability of loan-financed housing for households in Poland
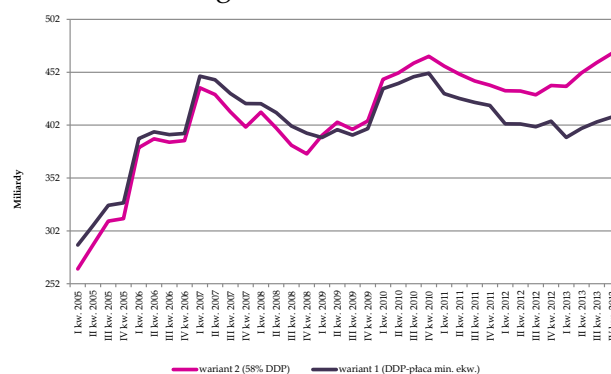
Miliardy	Billion
kw.	quarter
wariant 2 (58% DDP)	variant 2 (58% DDP)
wariant 1 (DDP - płaca min ekw)	variant 1 (DDP - min. salary equivalent)

Source: NBP, GUS.

During the 23 years from the beginning of its transformation, the Polish housing policy has failed to successfully implement a project improving the level of satisfied housing needs (structuring of public housing stock, social housing, commercial and social housing for rent). Exceptions include the already operating housing loan development programme and the currently implemented housing subsidies scheme. The natural trend to

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[37] According to the draft Act, subsidized homes may be purchased by persons aged up to 35 years.

continue along the well-established path is reinforced by the lobbying of the real estate development sector and the banking sector.

Experience, including the most recent one, shows that the housing market generates considerable problems for the entire economy (long-term accumulation of tensions, including inappropriate political decisions, followed by sudden price plunges, massive loan defaults and social tensions). Excessive share, i.e. exceeding 30% of assets, of mortgage loans in the banks' assets is a risk to their stability. It should be remembered that under reasonable prudential regulations potential creditworthiness of households is limited (see Figure 45).

In 2011, Recommendation T entered into force and introduced limits on maximum share of loan repayments in the household budgets and reduced foreign currency denominated lending. The limits introduced by the Recommendation (50/65% TDR[#]) may be considered moderate in the context of the international experience, yet they coincided with deteriorating economic situation in the country and in the real estate and banking sectors. Therefore, the Recommendation was criticized. Disbursements of housing loans showed that Recommendation T had hardly any impact on the quantity of loans, but it may have contributed to an improvement in their quality. In December 2012, the draft amendment of Recommendation S[38] was submitted for consultation and the Recommendation was eventually adopted in June 2013. Its assessment is similar to the earlier Recommendation T, but since it enters into force in 2014, it did not have any impact on the 2012 developments.

1.2 Panel analysis of home prices in the primary market for 17 cities[39]

Growth in home prices in the primary market is the subject of continous interest of central banks and regulators, as it rapidly translates into changes in real estate development production, drives housing cycles (see Augustyniak et al., 2013) and generates risk for the banking sector. The study focuses on determinants of the average price of square meters of housing in Poland's 17 largest urban markets. It can be assumed that housing built by real estate developers (thus from the primary market), due to a similar building technology and a similar housing quality, putting aside, of course, their different locations, can be relatively easily compared in each market. On the macro level, it can be also assumed that some fundamental variables observed in all markets can explain changes in average prices. However, dwellings in the secondary market display substantial differences in terms of building technology, quality of finishing, age and type of ownership. Due to such a diversity of housing, it is difficult to find common determinants of secondary market

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[38] Best practices for managing mortgage-backed credit exposures.

[39] The analysis includes Gdynia, which is a large real estate market, forming almost a common market with Gdansk.

prices[40]. The analysis, which takes into account the relatively stable period in the housing market (2002-2005), the housing boom period (2006-2008) and the market's slow return to the equilibrium point afterwards gives a good picture of the determinants of price changes in the primary residential market.

The aim of the analysis is to determine to what extent growth in home prices in the primary market was driven by fundamental variables. We analysed factors that affect demand for new housing in the local markets, using the results of the analysis of convergence and differentiation of local markets and structural changes presented in Appendix 1 (see also Andrews (2010) and Igan and Loungani (2012)). Prices of new housing should be affected by structural factors (i.e. the number of new marriages per 1 000 inhabitants, migration, the productive-age population to post-productive age population ratio, etc.) as well as economic factors (income growth, falling unemployment, increasing loan availability). Yet, a considerable part of variables follow an upward trend only, rather than to display fluctuations likely to explain the ups and downs in prices. If accounted for, they would lead to spurious regressions. Moreover, many data show a strong collinearity. After running numerous tests and regression models, we decided to include the following explanatory variables: the number of marriages per 1,000 inhabitants, average wages in the enterprise sector, the unemployment rate and loan availability[41]. For each market, we use local explanatory variables.

The analysis of transaction prices of housing in the primary market of 17 cities in Poland is based on annual data for the years 2002-2012[42]. In all the regressions logarithms of the above-mentioned variables were used, which helped us to better capture certain non-linear relationships between price changes and the explanatory variables. Also dummy variables for each year were used. Additionally, the cities were divided into seven large and ten smaller ones[43]. The estimation used the fixed effects regression method[44] with

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[40] Simple home price indices (median and mean) if replaced with the hedonic index can enhance the reliability of price measurement, thus increasing the transparency of the market (see Widłak (2013)). Such an analysis requires very detailed data that have been collected in the BaRN data base since 2006 Q3 only. If we limited the analysis to the period commencing practically in 2007 we would not be able to capture the behaviour of prices during the period of price stability, that is, in the years 2002 - 2005.

[41] Loan availability was calculated under the assumption that loans denominated in zloty and in foreign currency were granted during the period 2005-2011, whereas in the remaining years only zloty denominated loans were granted. A detailed description can be found in the glossary of terms and abbreviations.

[42] Transaction prices of housing for the years 2006-2012 are from the BaRN database (primary market), and previous prices were extrapolated on the basis of price growth based on PONT Info from the period 2002 to 2006 (primary market).

[43] The division was based on the number of inhabitants in a particular city. "Large" cities, i.e. with population exceeding 400 thousand inhabitants include: Gdańsk, Kraków, Łódź, Poznań, Szczecin, Warsaw and Wrocław. The group of "small" cities, i.e. with population of less than 400 thousand inhabitants include: Białystok, Bydgoszcz, Gdynia, Katowice, Kielce, Lublin, Olsztyn, Opole, Rzeszów and Zielona Góra.

[44] First, the choice of the fixed effects regression model has theoretical foundations. This method is used when the selected sample is not a random sample, but represents the entire population. Moreover, the economic analysis of individual markets, presented in Annex 1, shows that each market has a unique character, which practically does not change with the time. The fixed effects method makes it possible to

rebust standard errors. Home prices like most explanatory variables are non-stationary, yet, the Pesaran test (2004) showed that the regression errors are not correlated, therefore, it can be concluded that the models are correctly specified. The errors are also stationary. The regression results are shown below.

In all the specifications, the model explains price changes in large cities well. However, it cannot explain price changes in small towns as no fundamental explanatory variable is significant. Prices in smaller property markets tend to hover around a slightly upward trend. Thus, further studies are needed and the current results can be explained as follows. Most likely, due to of a much larger number of transactions, we have better data[45] in large cities. However, in smaller towns, there may be a large number of single or multi-family low-cost self-build houses which are excluded from the statistics, and thus not included in the study. There is also a large substitution between houses and housing units, and growing prices of housing urge households to build single-family houses. An important factor leading to low quality models in "small" markets may also be an effect of price spillover effects[46]. Markets in small towns follow suit of large cities, yet, the price impulse comes with a delay, which impedes regression results for these markets .

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exclude this fixed element which is impossible to detect with any variable, and would be erroneously attributed to the error term of the model. We also ran the Hausman test. It showed that the random effects model can be used, however, the results of this test can be considered reliable only after a much bigger number of observations (20-30 minimum time observations in a series).

[45] The bigger the sample of the analysed housing the larger the market and the closer the average observed price to the actual average price and the more determined by fundamental variables.

[46] De Bandt et al. (2010) argued that local shocks in the real estate market, which had their origins in the United States may spread to other markets.

Tabel 1. Results of particular regressions

	(1)	(2)	(3)	(4)
L_Mal1000	.5080	.1243	.5568	.1421
	[.6343]	[.5244]	[.6224]	[.5102]
L_Wages	1.3216**	.5452		
	[.5221]	[.4689]		
L_Unemployment		-.5439***		-.5448***
		[.1196]		[.1231]
L_DostKredytuWAGA			.8396**	.3715
			[.3410]	[.2994]
yd2003	-.0222	.02456	-.0755	.0002
	[.0447]	[.0363]	[.0547]	[.0427]
yd2004	-.0280	.0148	.1137***	.0748**
	[.0559]	[.0427]	[.0352]	[.0378]
yd2005	-.0250	.0107	-.0835	-.0195
	[.1119]	[.0913]	[.1254]	[.1043]
yd2006	.1648	.1256	.1295	.1036
	[.1799]	[.1618]	[.1802]	[.1696]
yd2007	.4982**	.2806	.5825***	.3076
	[.2246]	[.2107]	[.1917]	[.1971]
yd2008	.3744	.0683	.5354**	.1251
	[.2832]	[.2723]	[.2253]	[.2486]
yd2009	.2250	.2286	.5193***	.3433*
	[.2843]	[.2541]	[.1898]	[.2035]
yd2010	.2363	.2859	.5208***	.3947**
	[.2537]	[.2258]	[.1458]	[.1546]
yd2011	.2589	.3177	.5999***	.4491***
	[.2499]	[.2250]	[.1185]	[.1274]
yd2012	.1780	.3231	.6325***	.50351***
	[.2601]	[.2390]	[.0964]	[.1021]
_cons	-3.2684	4.6400	-3.5598	4.2117
	[4.3338]	[3.7840]	[4.4592]	[3.9292]
R-sq	0.8401	0.8683	0.8415	0.8658
Within	0.9599	0.9727	0.9597	0.9728
between	0.2659	0.5908	0.2560	0.5855

*Level of significance: 10 % - *; 5 % - **; 1 % - ***; bootstrap robust standard errors.*

In the first regression, the transaction price of one square meter of housing in the primary market was explained by the number of marriages and the average wage in the enterprise sector. Only the variable specifying the change in the wage level significantly explains price changes. Moreover, the dummy variable for 2007 was found to be statistically significant, suggesting that the price observed at that time was higher than implied by the included fundamental variables. Buyers' expectations of further price increases (discussed in the article in Appendix 5) might have sped up the decision to purchase housing and pushed prices higher than would result from fundamental variables.

In the second model we used the number of new marriages, wages and the unemployment rate as explanatory variables. The unemployment rate proved to be a very important factor with a strong impact on prices. It seems that the unemployment rate reflects the business cycle, which directly affects prices. The decrease in the unemployment

rate indicates economic recovery, which may encourage households to purchase housing. The rising unemployment rate, on the other hand, can be considered to point to a job loss risk, which will curb housing demand. This fundamental variable provides a significant explanation of price changes, while the number of new marriages, wages and dummy variables proved irrelevant.

In the third regression we included the number of marriages and the loan availability as independent variables. In this case, with the significance level of 0.05, loan availability and dummy variables for the years 2004 and 2007 to 2012 are statistically significant. Dummies for the years 2007-2008 may suggest the already discussed demand boom. It is worth noting that in this model, the dummy variables for the years of economic downturn (2009-2012) are relatively large and statistically significant, which means that the price was higher than it would result from the included fundamental variables. The persistence of relatively high prices might have also resulted from the generally good economic situation in Poland, including the society's optimism. Real estate developers who were rather reluctant to make home prices more realistic by putting them down, and if, only with a considerable delay, might have also contributed to this situation.

Next, we ran the fourth regression model in which the price of one square meter of housing is explained by the number of marriages per 1,000 inhabitants, the unemployment rate and loan availability. In this specification, only the unemployment rate and dummy variables for the years 2004 and 2009 to 2012 were found to be significant. This confirms the impact of a decline or rise in the unemployment rate on housing demand, while the dummy variables reflect the price boom and the already discussed delayed downward revision of prices by real estate developers.

The analysis confirmed that transaction prices in the primary market of large cities were dependent on fundamental variables such as wages, loan availability and falling unemployment. As demonstrated by part of the specifications, in the years 2007-2008, prices were excessively high, which may indicate a demand boom.

To sum up the chapter: in 2012, the real estate market saw disturbances driven by new regulations, namely the termination of the government-subsidized housing scheme Family on their own (RNS) and the entry into force of the Real Estate Development Act and S and T Recommendations. These regulations had a negative impact on balancing processes in the housing sector after the 2005 – 2008 credit shock. The rise in the unsold housing stock was the result of business actions of real estate developers wishing to evade the restrictive provisions of the Real Estate Development Act. However, a very slow decline in prices was due to higher limits of home prices in gradually terminated the government-subsidized housing scheme Family on their own (RNS). Panel analysis of average home prices in the analysed cities in the period 2002-2012 confirmed that the transaction prices of housing in the primary market of seven large cities were dependent on fundamental variables such as wages, loan availability or unemployment rate . Part of the specification shows that in 2007-2008, the prices were too high , indicating demand boom .

Literature:

André, C. (2010), "*A Bird's Eye View of OECD Housing Markets*", OECD Economics Department Working Papers, No. 746, OECD Publishing.

Andrews, D. (2010), "*Real House Prices in OECD Countries: The Role of Demand Shocks and Structural and Policy Factors*", OECD Economics Department Working Papers, No. 831, OECD Publishing.

Augustyniak, H., K. Gajewski, J. Łaszek and G. Żochowski (2012), "*Real estate development enterprises in the Polish market and issues related to its analysis*", MPRA Paper 43347.

Augustyniak, H., J. Łaszek, K. Olszewski and J. Waszczuk (2013), „*Cykle mieszkaniowe – model nierównowagi i jego kalibracja dla warszawskiego rynku nieruchomości*".

De Bandt, O., K. Barhoumi and C. Bruneau (2010), *The international transmission of house price shocks, In: Housing Markets in Europe*, Springer Berlin Heidelberg, 129-158.

Igan, D. and P. Loungani (2012), "*Global housing cycles*", IMF Working Paper No. 12/217.

Pesaran, M. (2004), *General Diagnostic Tests for Cross Section Dependence in Panels*, Cambridge Working Papers in Economics No. 0435, Faculty of Economics, University of Cambridge.

Widłak M. (2013), *Wyniki badań nad czynnikami różnicującymi ceny mieszkań i możliwość ich wykorzystania w NBP*. Artykuł zawarty w aneksie 2 niniejszego raportu.

2. Sectorial equilibrium of the housing market

The sectorial equilibrium is a state where the existing conditions enable uninterrupted and stable generation of goods and services by the entities operating in the market. Economic profits may then be achieved without exposure to excessive risk and without excessive tensions. The chapter presents the conditions of sectorial equilibrium and the actual economic processes determining those conditions.

2.1 Key areas, entities and parameters of the macrostability analysis of the residential real estate sector

This subchapter describes the breakdown of the real estate sector in terms of various aspects of the market functioning, entities and macrostability parameters.

Key areas of the real estate sector

In terms of a model, the real estate market or, more broadly, the real estate sector may be analysed as capital markets of housing space and housing units (cf. Augustyniak et al., 2013).

- The housing space market is the valuation (rent rates) and the consumption of the stream of services generated by real estate capital.
- The construction market (primary market) where financial capital is transformed into a new real estate capital by means of construction and assembly works.
- The housing market (secondary market) or fixed capital market, i.e. the place where spatial reallocation of fixed capital (real estate stock), the change of its characteristics and functions, as well as depreciation and replacement, take place.
- The financial market, or rather its specialist parts, is a place where the appraisal of real estate capital, based on generated income and its risk assessment, as well as the valuation of financial instruments based on the capital (debt instruments, shares, etc.), take place. As a result, the financial sector regulates the transfer of capital to the sector via financial instruments. The transfer concerns both the existing fixed capital stock (ownership changes, change of intended use, modernisation, etc.) and the creation of new real estate capital from the financial capital in the construction market. The transfer of capital includes also transfers of capital indirectly involved in the housing space services (market service companies, financial intermediaries, etc.). Institutions in this segment of the capital market are universal and specialist financial intermediaries, investment funds and individual investors, shareholders of real estate developers and specialist banks. A large impact of the financial sector on basic real estate markets and the market service system translates into a strong impact of the interest rate on primary and secondary real estate markets and the entire sector by means of financial instruments.

The real estate sector in Poland comprises all its segments (owner-occupied housing, social housing, rental housing - though there are no professional landlords) and market service entities. The financial sector relying on universal banks is relatively less

developed. At present, it is enough to analyse the primary and secondary residential real estate markets in Poland and the mortgage loan market, as well as the analysis of such entities as banks, real estate developers, consumers and investors in the OOH[47] market (housing as an object of consumption and speculation, as well as lending) and investors in the financial market (deposits). The subject of the analysis must be appropriately chosen to reflect the market development level and changes both in time and space, in particular in international cross-comparisons.

Entities affecting the housing sector

In textbook fashion (macroeconomic analysis), we may assume that the analysis will cover key entities operating in the housing market. In the majority of the countries, they will include banks, real estate developers, consumers (customers of banks and real estate developers - cf. article 3 *Housing in the consumer theory*) and investors/depositors.

The analysis of real estate developers may be extended to include construction companies, but such classification is often rather conventional, in particular, from the perspective of available statistical data. Average and minimum rates of return are difficult to determine for the real estate developer sector, as it is marked by a considerable lack of transparency and since rates depend on a number of additional factors (e.g. easiness to change the sector, alternative investment opportunities). The available data from the Central Statistical Office (GUS) are only an approximation.

The investor/depositor analysis in the majority of the countries where universal banks prevail will focus on those depositing their savings in the banking sector. In the case of countries with a well-developed, specialist system of real estate financing (mortgage securities or securitisation model), the analysis should also cover institutional investors (banks, investment and pension funds, insurance companies). The definition of an investor in the sector producing investment goods (housing or commercial real estate) is significantly wider than the definition of a depositor or purchaser of mortgage securities. An investor buys real estate for rental or further sale for a profit (speculation) or indirectly in the case of shares. In the case of OOH, investor and consumer are one.

In the Polish banking sector, which is of key importance for residential real estate financing, household savings are the main instrument on the liabilities side. Interest earned on savings is subject to capital income tax. The long-term equilibrium requires positive real interest rates on savings, after deduction of the capital income tax. In the case of mortgage banks, which constitute only a minor part of the lending market, the Polish Treasury bonds with 5-year maturity are the benchmark for mortgage bonds. The yield on mortgage instruments should be sufficiently high to compensate the risk of mortgage bonds.

Aspects of macrostability analysis of the sector

Real estate markets are cyclical due to rigid short-term supply and volatile demand (cf. articles in the analytical part and literature therein). Demand fluctuations result in price

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[47] Owner Occupied Housing.

changes thus translating into decisions of producers and generating supply effects with a considerable time lag. Speculation and the related behaviour of entities, as well as strong links to the financial system, reinforce the cyclical nature of markets. Another factor adding to the cyclical nature is usually delayed and inadequate intervention of public authorities, carried out to maintain financial sector stability, both for social reasons or as part of general economic policy. However, in practice the majority of such markets, despite their cyclical nature, tend to self-regulate. Not only such basic indicators as prices, stocks or output, but also a number of other variables, often related to the phenomena specific for a given cycle (e.g. profitability of foreign currency denominated loans, cf. Figure 51 and Figure 52), are cyclical. Fluctuations are often local and vary from one market segment to another (cycles in office real estate market, residential real estate market, etc.). They are also correlated with business cycles, though this is not a general rule.

Excessive accumulation of tensions in the sector[48], in particular, when combined with general economic problems, may lead to real estate crises with consequences for the entire economy spread via the financial sector. Such crises, which happened in the past, involved rapid, several dozen percent plunges in the real estate values, combined with massive defaults on mortgage loans, and usually lead to a breakdown of the financial sector. Although direct intervention into the cycle in the real estate market seems to be rather pointless due to its dubious effectiveness, the prevention of real estate crises reduces actual GDP losses. As regards relative pointlessness of reaction to cycles, it must be noted, however, that with a certain scale of tensions in the sector and the economy, there exist correlations and accumulations of seemingly poorly correlated phenomena. This requires a holistic and individual approach to each crisis.

Stability of the housing sector creates conditions necessary to stimulate capital flows and generation of capital goods and housing space services, as well as other necessary goods. It mitigates excessive tensions both within and between various components of the sector, i.e. financial sector, construction sector, housing units market (housing and commercial real estate) and the housing space market (lease markets, rent markets; in the case of OOH we have to do with the housing units market only). Production conditions in the segment of capital services (rents), financial services (financial instruments, institutions) and in the construction market may be defined as its sufficient profitability, taking into account the expected risk. Taking into account the risk inherent in the sector (cyclical nature), which is higher than the risk of the banking sector in Poland, average rates of return on housing projects according to the GUS data (F01) oscillated around several percent during the downturn (2000-2002), at 25-40% between 2006 and 2010, now standing at 18-20% (cf. Figure 41). Evaluation of the market prospects, demand and unsold product stocks seems to be equally important for real estate developers' decisions which is partly reflected in actual performance of the companies. The project profitability of 25-30% results

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[48] Measuring of tensions is a much more complex problem. Tensions in the sector may be defined as significant deviations of relevant economic indicators from the level characteristic for equilibrium (prices, stocks, income, time of sale, etc.).

in the inflow of new capital to the sector, while the ROE of 10-15% on projects, combined with growing stocks, is a signal for a cut down on output. Therefore, oscillation between 15% and 25% should be considered natural[49].

In the countries where the massive development of the OOH market has been observed for several decades[50], the long-term correlations between income, housing stock and housing prices vary significantly. In the markets with higher liquidity, flexible supply and higher income, the average price of a housing unit in the market and in the housing stock should not exceed 3.5 times the annual income of an average household [51] In the markets with a well-developed banking sector, the figure was usually determined by lending requirements and loan availability with interest rates running at 6-7% and maturity of 25-30 years. In Poland, the significant impact of the financial sector on the housing sector has been observed since 2004 (the lending boom began in 2005) and the ratio stood at 4-4.5 at that time, depending on the city/town analysed. The figure seems to correspond to the real situation of the Polish economy (disposable income for purchase of a housing unit is not average income, but 6-7 deciles).

As regards tensions and risks in the sector, the key problem of the market is a relatively small and rigid short-term supply, subject to very strong shocks of volatile demand. Therefore, the main natural factor boosting the stability of those markets is expansion of increase in elasticity of supply. The point is to ensure that a sudden surge in demand concerns not only the relatively small primary market, but also spreads to the secondary market. In the case of a rapid increase of interest in OOH, the possible flow of a part of housing stock from housing for rental may also be a factor contributing to the stability. Other significant factors include supply elasticity over time, i.e. the time needed to fill the existing demand gap by housing construction. This indicator may be broken down into at least three components: time needed to fulfil construction-related formalities, duration of the construction process itself and flexibility of launching orders. The last parameter is the possibility to sell home construction contracts. This adds to the customer risk, requires more complex regulations, but makes the market more flexible.

Demand elasticity in reaction to shocks is only one aspect of the problem. The appropriately functioning housing sector is a sector where, as a result of arbitrage, prices in the primary market and the secondary market even out in line with the rule of a similar price for similar products, adjusted for their technical condition (age, wear and tear) and possible risk (legal defects, real estate developer risk, neighbourhood, etc.). Excessive price differences resulting from regulations (e.g. state support for new homes only) may translate into differences in prices and then transform into problems with their rapid plunge (the banking sector) when regulations are withdrawn.

Similar risks are generated by inflexible, regulatory distribution of OOH and the same housing units for rental. Instead of alleviating tensions (more homes for sale) during

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[49] Figures are own estimations, consulted with market participants.

[50] Adjustments in the OOH market are counted in decades, cycles usually last 8-15 years.

[51] Own estimates based on historical data for the USA.

demand shocks, this leads to further disproportions (high prices, on the one hand, and low rents and vacancies, on the other hand). This may also lead to excessively high rents (risk premium) where the owner's position is weaker than the tenant's.

The relations of prices in the primary and secondary markets and the costs of ownership and rental determine the smooth functioning of those markets and tensions. Excessive differences between them signal growing disproportions which may, at some point, accumulate with others and lead to shocks. Security of the banking sector is determined by numerous factors, including regulatory and political ones, which are difficult to measure and forecast. They include eviction procedures, efficiency of the debt recovery process, politicians' interventions, households' ability to service debt and renounce and their expectations of state aid, disparity between the actual portfolio quality and the quality reported by banks, and many other. There may be factors specific for a given country which generate risks that materialize in specific circumstances (e.g. wrongly privatised, large sector of public housing may lead to a rapid price fall, foreign currency denominated loans). Between 2008 and 2012, the Polish banking sector generated a nominal rate of return along with the risk premium at the average level of 13.4% (cf. analysis of sectorial equilibrium in the next subchapter) which means that the real rate exceeded 10%. According to observations, the rate was all the time satisfactory for bank owners.

The consumer-borrower equilibrium is largely determined by prudential banking regulations and long-term experience of the sector. They include well-established indicators: DTI[52] (formerly DSC or DCCR) and LTV[53]. For the purpose of risk analysis, the indicators may be disaggregated and further specified, but in the developed countries[54] the compromise between risk and safety is achieved with DTI=40% and LTV=80%. DTI indicators are often analysed in a more detail based on the income buffer concept (surplus after debt should not fall below the social minimum). LTV in the case of debt recovery in Poland does not exceed 50% of the loan value[55], but in standard conditions the scale of debt recovery is small, since the process is primarily aimed at settlement with the debtor.

2.2 Sectorial equilibrium determinants and actual economic processes

The subchapter relies on an in-depth analysis of data from the BaRN database, information from construction prices bulletins[56] (used in the model of real estate developer building on the investment process) and the model of bank's functioning which takes into account various indicators (inflation, interest on deposits, interest on loans, margins, etc.), as well as business models of banking sector functioning.

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[52] Debt to Income.

[53] Loan to Value.

[54] This results from historical experience e.g. in Germany or the United States.

[55] The figure determined based on consultation with housing loan portfolio debt collectors.

[56] *Biuletyn cen obiektów budowlanych BCO cz.I obiekty kubaturowe* [Construction Prices Bulletin BCO Part I Enclosed structures], Sekocenbud working papers.

The key problem of the Polish OOH market is the insignificant extent of simultaneously occurring partial equilibriums of entities and the housing market itself. Slight changes in key parameters, both macroeconomic ones (i.e. interest rates, inflation) and those related to local markets (income), create tensions. Due to economic growth observed in the last decade and the related income growth, development of construction and competition in the sector[57], fall of inflation and interest rates, we are closer to sectorial equilibrium taking into account housing prices, cost of credit and real interest rates on deposits. Examples of proportions for Warsaw, based on data for the period between July 2012 and June 2013, are presented in Table 1 below.

Table 2 Key economic parameters of real estate market participants, average between July 2012 and June 2013, with inflation (y/y) of 2.1%

Deweloper		Bank		Nabywca/Kredytobiorca			Kapitałodawca	
cena w zł za m kw.	6822	nomialne oprocentowanie kredytu	6,39%	dochód do dyspozycji	6749		nominalne oprocentowanie depozytu	3,96%
udział zysku w cenie bez VAT	22%	marża	2,43%	DTI	**32%**		realne oprocentowanie depozytu po podatku	**1,03%**
ROE (przed opodatk)	**17%**	nominalne oprocentowanie depozytu	3,96%	LTV	80%		inflacja	2,14%
		ROE	**13,53%**	amortyzacja w latach	25			
		kredyt	327 436	liczba m kw.	**60,00**	**50,00**		
				P/I (cena do dochodu)	**5,1**	**4,2**		

Dictionary to the tables 3 and 4	
Deweloper	Real estate developer
Bank	Bank
Nabywca/Kredytobiorca	Buyer/Borrower
Kapitałodawca	Investor
Cena w zł za m kw.	Price in PLN per sq. m
udział zysku w cenie bez VAT	Share of profit in the price excl. VAT
ROE (przed opodatk)	ROE (before tax)
nominalne oprocentowanie kredytu	Nominal interest on loan
marża	Margin
nominalne oprocentowanie depozytu	Nominal interest on deposit
kredyt	Loan
dochód do dyspozycji	Disposable income
amortyzacja w latach	Depreciation in years
liczba m.kw.	Number of sq. m.
cena do dochodu	Price to income
realne oprocentowanie depozytu po podatku	Real interest on deposit after tax
inflacja	Inflation

The results of the analysis show that the last year was rather favourable for all market participants, since they could pursue their objective economic interests without excessive tensions and the related adjustments. The main driving force behind this situation was low inflation and related low nominal interest rates. As a result, profitability of real

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[57] In the sector which is able to satisfy housing needs of 30-40% of the largest cities' population.

estate developer investments stood at approximately 17% in nominal terms. The value in real terms was slightly lower (below the expectations of real estate developers), but achieved the level ensuring profitable housing production. Loan portfolios, if reasonably built and well managed, should ensure rates of return of around 17%[58] for the banks, thus covering the cost of equity and constituting an incentive to increase the mortgage loan portfolio. The average buyer of a standard apartment of approximately 60 sq. m. must bear the burden of loan repayment amounting to 32% of income which is a significant, though still acceptable, amount.[59] According to the GUS data, the average cost of home maintenance in Poland amounts to approximately 18% of income which means that all housing expenses, including the resulting DTI, account for 50% of household budgets. Therefore, the loss of employment by one of two household members will lead to default on loan repayment (mortgage eviction) or outstanding payments (housing cooperative or housing community auction) When analysing the situation of a bank's client, one must bear in mind that with floating interest rates the buyer always can choose the value of the housing unit and the amount of loan. On the other hand, after the purchase all changes in interest rates directly affect the buyer's budget.

High inflation is a threat to the housing sector. Without specially indexed loans, it quickly increases the burden for borrowers and magnifies problems for banks. Another threat in the countries which allowed for large portfolios of foreign currency denominated mortgage loans is foreign exchange risk. The consequences of a slight inflation shock may be observed on the actual data from the period between June 2011 and June 2012 (cf. Table 2). When inflation is high, rates of return on bank loans are also high. This results from a change in margins and different interest capitalisation on deposits and loans. A significant increase in the burden on households resulting from nominal interest repayment leads to an increase in DTI to 36% which, in turn, increases total housing costs to approximately 54% of household budgets. In the long-term perspective, this will cause deterioration of the portfolio quality, the need to create higher provisions for non-performing loans and a decline in the banks' ROE. Almost zero interest on deposits in real terms may lead to the outflow of deposits from the banking sector in favour of other forms of savings. This, in turn, may induce pressure to increase the interest rates and thus cause a fall of the banks' rates of return and a cut down on lending. A decrease in inflation in such conditions will improve the profitability of savings, but loan repayment conditions will remain difficult.

[58] Own estimate based on consultation with bank experts.

[59] American standards from before the crisis taking into account high housing maintenance costs and other liabilities allowed for DTI of 32%.

Table 3 Key parameters of market participants, average between July 2011 and June 2012, with inflation (y/y) of 4.2%

Deweloper		Bank		Nabywca/Kredytobiorca			Kapitałodawca	
cena w zł za m kw.	7165	nominalne oprocentowanie kredytu	6,91%	dochód do dyspozycji	6749		nominalne oprocentowanie depozytu	4,58%
udział zysku w cenie bez VAT	22%	marża	2,33%	DTI	36%		realne oprocentowanie depozytu po podatku	-0,54%
ROE (przed opodatk)	17%	nominalne oprocentowanie depozytu	4,58%	LTV	80%		inflacja	4,20%
		ROE	11,65%	amortyzacja w latach	25			
		kredyt	343 942	liczba m kw.	60,00	50,00		
				P/I (cena do dochodu)	5,3	4,4		

The radar chart (cf. Figure 46) presents changes in sectoral indicators for the past three years. Figures 47-50 show the paths of consumer, bank, developer and investor, based on discussed assumptions and building on quarterly data for Warsaw.

Figure1 Changes of sector indicators for Warsaw within the last three years
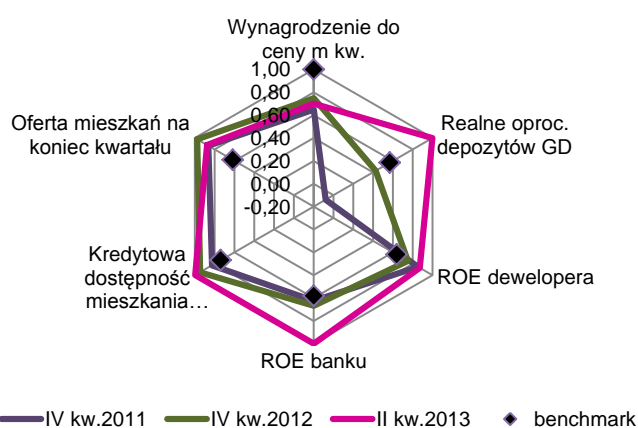
Wynagrodzenie do ceny m kw.	Salary to price of sq.m.
Realne oproc. depozytów GD	Real interest on household deposits
ROE dewelopera	ROE - developer
ROE banku	ROE - bank
Kredytowa dostępność mieszkania	Availability of loan-financed housing
Oferta mieszkań na koniec kwartału	Housing offer as of the end of quarter
kw.	quarter

Notes: The figure presents changes of indicators depicting the main areas related to real estate market. All variables are showed in relation to the maximum of the given indicator between 2011 Q1 and 2013 Q2. The period was selected due to data availability. The closer to the middle the observation, the closer it is to the minimum. An increase in the salary to price ratio and an increase in the (weighted) availability of loan-financed housing improves housing availability for buyers. An increase in the ZKPK index points to the easing of the banks' lending policy. A growth of real interest on household deposits increases the profitability of savings and thus may reduce the purchases of housing. An increase in the banks' ROE means that their activity is more profitable. An increase in real estate developers' ROE demonstrates higher profitability of their production. A smaller housing offer in the market indicates that the market proceeds towards equilibrium. The benchmark comprises figures allowing for stable functioning of the sector (salaries to prices >1, real interest >1%, ROE of the real estate developer >15%, ROE of the bank >10%, availability of

loan-financed housing = 55 sq. m., housing units on offer < 13000).
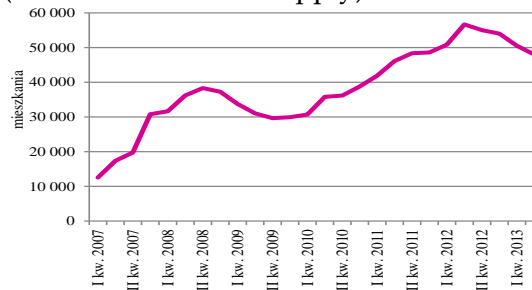*Source: NBP, GUS, Sekocenbud, REAS.*

Figure2 Real interest rates on savings, ROE of the bank, ROE of the real estate developer
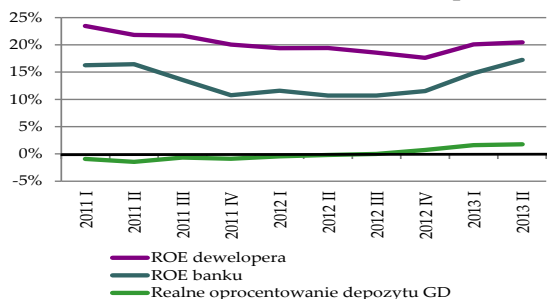
ROE dewelopera	ROE - real estate developer
ROE banku	ROE - bank
Realne oprocentowanie depozytu GD	Real interest on household deposits

Source: NBP, Sekocenbud.

Figure3 Housing units in the market (benchmark-annual supply)

mieszkania	housing units

Source: REAS.

Figure4 Indicators of importance for consumers
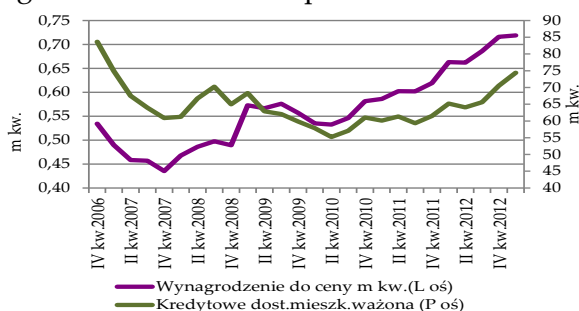
Wynagrodzenie do ceny m kw (L. oś)	Salary to price of one sq. m (Left-hand axis)
Kredytowe dost. mieszk. ważona (P. oś)	Availability of loan-financed housing (Right-hand axis)

Source: NBP, GUS.

Figure5 ROE of the real estate developer
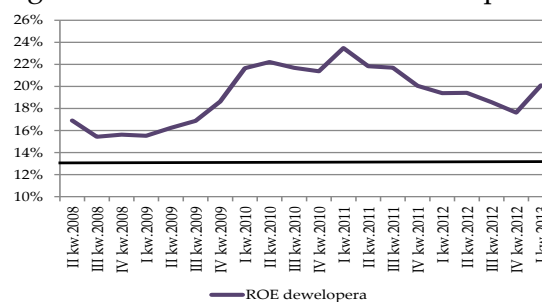
| ROE dewelopera	ROE- real estate developer

Source: NBP, Sekocenbud.

After the demand shock in the years 2005-2008, the sector started to see mechanisms restoring the equilibrium. However, restoration of the equilibrium in the real estate sector is not a simple and fast process due to the sector's specific nature. In 2012 rates of return favoured housing production and lending, while housing availability was rather low (P/I (price to income) ratio of 5.1 means that the price of housing equals 5-fold annual income). This may be attributed to persistently high prices and partly to excessive housing ambitions (with the housing unit size of 50 sq. m. the ratio falls to a more acceptable level of 4.2). The conditions for long-term bank savings have not always been favourable for saving persons, but there has always been surplus liquidity in the financial sector.

However, rates of return are only one determinant of economic decisions. Others include high general economic risk and sector risk. The latter was measured using the simplest, commonly used measures. For real estate developers, the main risk measured in

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the sector is the market risk. It is best determined by the number of unsold housing units or home construction contracts. Excessive stocks of unsold housing units[60] may result in liquidity problems of real estate developers, which, in turn, may cause solvency problems or a price drop and direct insolvency. More advanced method of measuring the risk in the sector include the analysis of long-term market foundations (the existing housing stock, demographics, income, and migration). Another risk factor is speculative demand. It leads to the excessive number of housing units being built and then problems with selling.

For banks, the risk related to the housing sector materializes in the credit risk. In developed banking systems, such as in the Western countries, a large portion of risk related to housing loans is in the form of the financial risk and results from extended market of financial instruments and institutions. In Poland, apart from the financial risk of foreign currency portfolios, the credit risk of the borrower and security are the most significant. Numerous factors affect the risk (loss of employment by the borrower, overall fall in prices), but experience shows that, due to cyclical nature, it grows in a non-linear way when the thresholds of LTV=80% and DTI=30% are exceeded. The market risk of the bank, in particular related to DTI, means also the risk of debt recovery from the household. The majority of investors pursue the strategy of backward looking which augments the demand boom. As shown by historical data from the boom period and the following slowdown in the market, there is a significant risk of loss of value of the real estate being mortgage collateral. It was particularly evident in the case of foreign currency denominated loans where the decline in the housing unit value overlapped with an increase in the loan value due to drastic depreciation of the zloty.
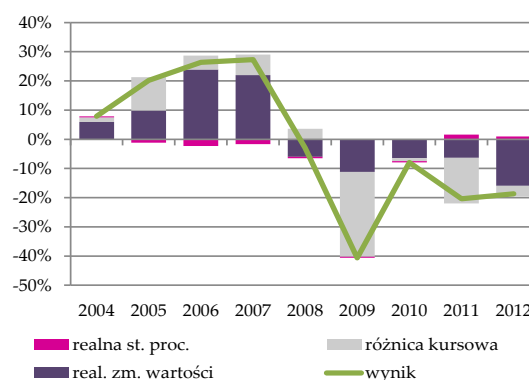
Figure6 Costs and capital and interest profits on investment in zloty denominated loan-financed housing
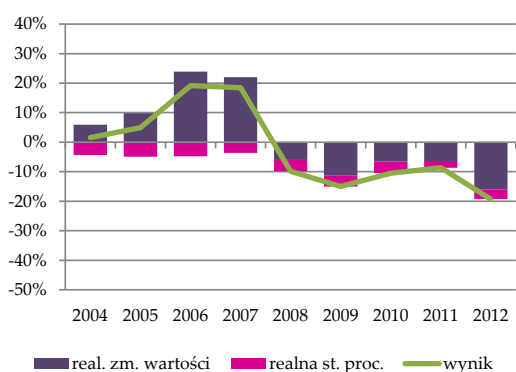
real. zm. wartości	Real change in value
real. st. proc.	Real interest rate
wynik	Result

Source: NBP, GUS.

Figure7 Costs and capital and interest profits on investment in CHP denominated loan-financed housing
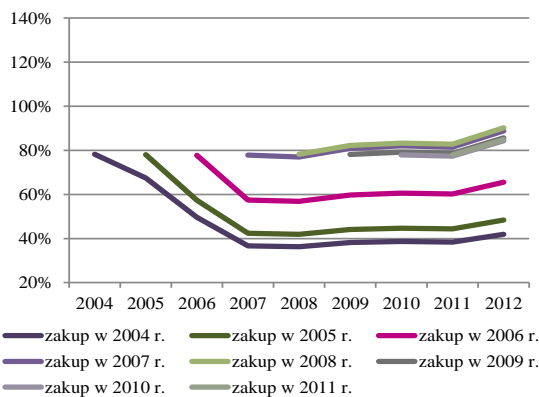

realna st. proc.	Real interest rate
real. zm. wartości	Real change in value
różnica kursowa	Exchange rate difference
wynik	Result

Source: NBP, GUS.

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[60] In Poland, excessive stock mean homes which have been on sale but not sold for over 1 year.
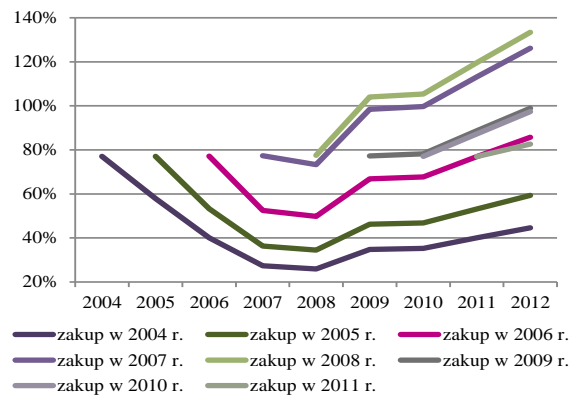
Figure8 LTV# of PLN-denominated loans cohorts

Figure9 LTV of CHF-denominated loan cohorts converted into PLN

Note: An own share of borrowers amounting to 20% was assumed for calculations.

zakup w	purchase in

Source: NBP, GUS.

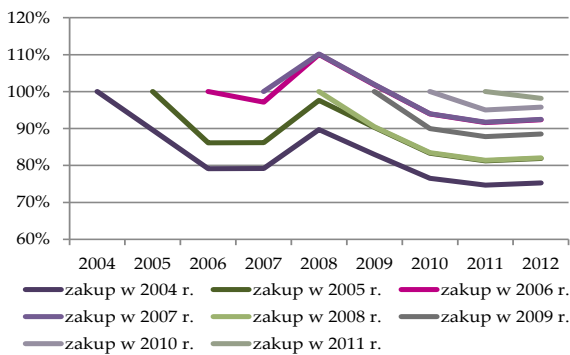| zakup w	purchase in

Source: NBP, GUS.

Figure10 TDR# of PLN-denominated loan cohorts

Figure11 TDR of CHF-denominated loan cohorts converted into PLN

zakup w	purchase in
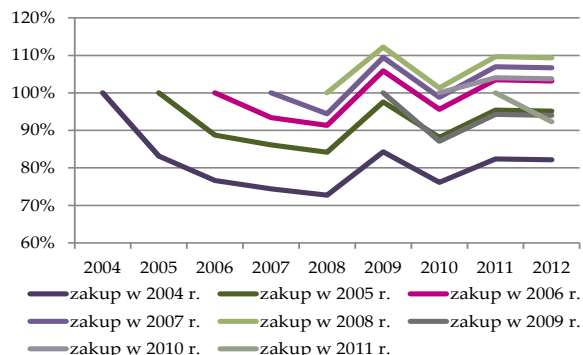
*Source: NBP, GUS.*

zakup w	purchase in

Source: NBP, GUS.

In the short term, home prices change cyclically. Price fluctuations are also the consequence of long-term structural changes (excessive, long-term increase in housing stock, a decline in the economic activity in the region, etc.). Quantification of the related risk factors, which can be captured by synthetic measures, requires further studies. Since the purchase of OOH is always an investment to a certain extent, the fast decline in its price brings also risk for the buyer. An increase in LTV may stem from a growth in the loan value, depending on the loan instruments used (in Poland they include foreign currency denominated loans, but also indexed loans or deferred payment loans).

The analysis of arbitrage# in the sector shows that differences between the prices of housing in the analysed primary and the secondary markets were insignificant and fully accountable. In towns, the primary market offered better quality housing than the existing one (thus the higher prices) and the overall prices were low (due to low local income). In cities, the relations reflected the standard of housing in the existing housing stock, the situation in the real estate developer market and the real estate developer risk assessments. The situation had not changed significantly after the RNS (*Rodzina na swoim*) scheme had

been limited to the primary market. It should be remembered that the so-called large housing deduction scheme in the 1990s resulted in its almost full capitalisation in the price of housing.

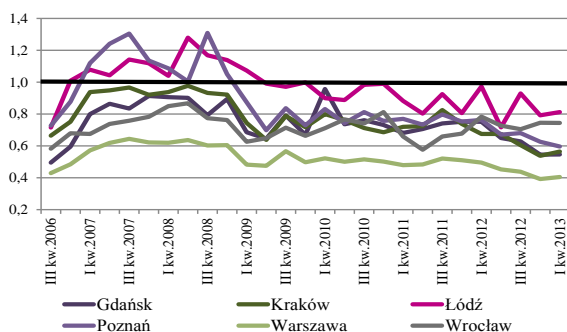Figure12 RNS limits for RP for Warsaw, 6 and 10 cities
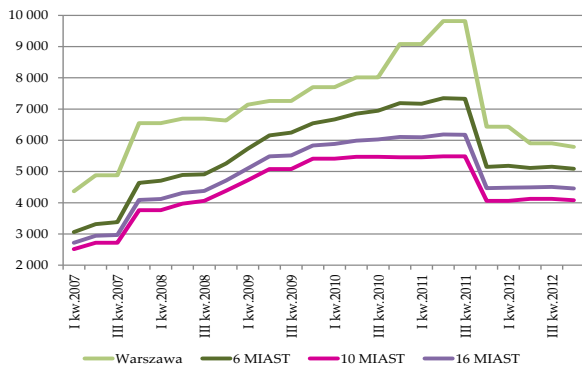
Figure13 Ownership cost and cost of rent weighted with a currency structure of the quarterly change of the housing loan

Source: BGK
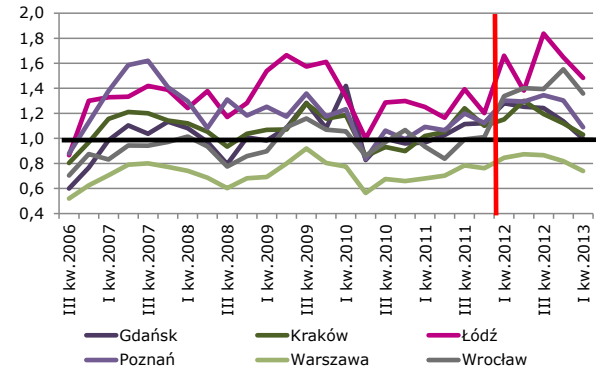
Note: The red line separates the values weighted with a currency structure of the quarterly change of the housing loan from solely PLN values occurring since 2012 *Source: NBP, GUS.*

The trends towards market equilibrium can also be observed when analysing the arbitrage between home rental and purchase. Despite the risk related to the Act on tenants' protection, the rents run below home ownership cost which usually results in an additional increase in demand and is temporary (otherwise everyone would build homes).

However, where foreign currency denominated loans prevail, the relation was reversed, accelerating the bubble in the housing market.

Figure14 Ownership cost vs. rent for CHF-denominated loans

Figure15 Rates of return and housing and commercial rents, and 5-year Treasury bills

Source: NBP, GUS.
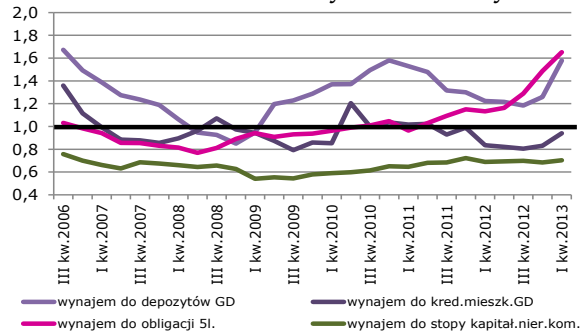
wynajem do depozytów GD	Rent to household deposits
wynajem do obligacji 5l.	Rent to 5Y bonds
wynajem do kred.mieszk.GD	Rent to households' housing loans
wynajem do stopy kapitał.nier.kom.	Rent to rate of commercial real estate capital

Source: NBP, GUS.

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Due to the risk generated by the Act on tenants' protection, the rental market is shallow, volatile and difficult to quantify (it is often the grey economy). Arbitrage between the OOH market and the rental market functions by means of comparing the rents and interest costs of loans (the simplest calculation), as well as the profitability of home rental compared to other alternative investments. The ratio of the posted rates of return to the yield on Treasury bills, deposits and commercial real estate reveals high volatility of parameters. The rates of return on rental are usually higher than rates of return on deposits, but only since 2011 they have been higher than the yield on Treasury bills which should be a general rule. In 2011, the rates of return on rental equalled with the costs of loans which, in the situation where there is no act on the protection of the customers of real estate developers, signalled a small-scale boom and, if continued, could lead to a risk of bubble in the sector. However, in the short-term it is a tool for stimulating demand in the sector.

Bibliography:

Augustyniak, H., J., Łaszek K. Olszewski i J. Waszczuk (2013), *Modeling of cycles in the residential real estate markets – interactions between the primary and the secondary market and multiplier effects*, National Bank of Poland Working Paper 143.

Glossary of terms and acronyms

AMRON – System for the Analysis and Monitoring of Real Estate Market Transactions.

Arbitrage – A situation where trading with assets leads to profits without any risk.

BaRN – Real Estate Market Database. The database that includes offer and transaction prices of housing in the markets of 16 voivodeship capitals of Poland. It also holds data on market rents. The data come from real estate brokers, housing cooperatives and real estate developers who volunteered for the study and partially also from the Registers of Prices and Values of Real Estate kept by particular counties. The data are gathered and verified by the Regional Branches of the NBP.

BIK – Credit Information Bureau.

Shopping centre – retail real estate that has been planned, constructed and managed as a single retail entity, consisting of common parts, with a minimum gross leasable area (GLA) of 5,000 sq. m, and a minimum of 10 shops (definition developed by the Polish Council of Shopping Centres).

D/I – households' gross disposable income

DTI – Debt to Income

Loan availability – measure of potential loan available at a specific interest rate, depreciation, lending requirements (social minimum) and average monthly wage in the enterprise sector. It indicates the amount of loan that the borrower is able to obtain for the average monthly wage in the enterprise sector in a particular market (GUS), in view of bank's lending requirements and loan parameters (interest rate, depreciation period, social minimum understood as the minimum income after the payment of loan instalments). Important information is provided by the rate of changes and regional differentiation rather than the indicator value alone.

Housing availability – measure of potential ability to purchase housing at the offer price for the average monthly wage in the enterprise sector. It indicates the number of square metres of housing with an average offer price in a particular market (PONT Info) that can be purchased for the average wage in the enterprise sector in a particular city (GUS).

Ten cities – Szczecin, Katowice, Bydgoszcz, Opole, Olsztyn, Rzeszów, Kielce, Zielona Góra, Białystok, Lublin.

Financial leverage –ratio of liabilities and provisions for liabilities to equity.

PONT Info Nieruchomości (PONT Info) – database holding data on real estate offer prices. The data are gathered by the company of PONT Info.

Global creditworthiness – measure indicating overall creditworthiness (mortgage loans) of all households in Poland's cities. It is calculated based on individual household disposable income (household budgets according to GUS) as well as bank lending requirements and loan parameters.

Hedonic housing price index – measure reflecting the 'pure' price change, i.e. a change resulting from factors other than home quality differences. The price of a standardized, average housing unit, common on a given market, estimated with econometric tools, is analysed. The index accounts for changes in housing quality in the study samples in each quarter, which distinguishes it from the growth rate of an average price median[61]. This way it is robust against composition changes, contrary to the simple mean or median price, that would react if more for example more smaller but more expensive housing units were sold in a given period.

Weighted average index – measure reflecting price growth adjusted for one of the most important home quality variables – location. Home price growth is calculated independently for selected locations (districts) and then aggregated in the weighted average formula.

Quality of mortgage loan portfolio – measure of percentage share of mortgage loans overdue for 91-180 days in the total of mortgage loans in a particular city.

Availability of loan-financed housing –measure specifying how many square metres of housing at an average offer price in a particular market (PONT Info) may be purchased for a mortgage loan obtained based on the average monthly wage in the enterprises sector in a particular market (GUS), in view of bank's lending requirements and loan parameters (interest rate, depreciation period, social minimum understood as the minimum income after payment of loan instalments). Also index growth rate and spreads between particular markets provide important information

LTV (Loan to Value) – ratio of the value of the loan granted to the value of the loan collateral.

Small and large real estate developers – analysed real estate development companies selected on the basis of economic activity classification number PKD2007. They were divided into large and small ones taking into account both the headcount and the value of earnings. Companies employing less than 50 people are considered as small, others are large.

MDR (Mortgage Debt Ratio) – percentage share of mortgage loans repayment in the borrower's budget.

Mieszkanie dla Młodych (MDM – housing for young) – a new government-subsidized programme intended to support housing construction through subsidies for housing loan. According to the assumptions program should enter into force at the beginning of 2014.

OOH – Owner Occupied Housing.
Cities 200+ – means all cities in Poland with a population of at least 200 thousand.

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[61] More information in the article entitled *Hedonic price indexes determination as the method of goods quality change control*, M. Widłak (2010), Wiadomości Statystyczne (Statistical News) No 9.

Building type 1121 – a residential multi-family five-storey building, which since 2004 has served as the basis for monitoring the average price of construction of one square metre of an average housing unit (see: the Construction Prices Bulletins by Sekocenbud).

P/I (Price to Income) – ratio determining the relationship of the price of an average housing unit in a particular year to the average disposable income.

Sub-rental (or occasional rental) –temporary rental by home owner of the whole or part of his real estate against a specific fee.

PSBD – Polish Association of Home Builders.

Credit rationing – restricted lending resulting from banks' own assessment of growing risk. In specific situations this may lead to declines in the value of newly granted loans, despite the absence of major changes in the current creditworthiness of the borrower, which may lead to self-fulfilling forecast.

Recommendation S – collection of good practices regarding mortgage-secured credit exposures. It was introduced in 2006 by the Commission for Banking Supervision, based on Article 137 clause 5 of the Banking Law Act (Journal of Laws No. 72/2002, item 665, as amended).

Recommendation T – collection of good practices in managing the risk of retail loan exposures. It was introduced in 2010 by the Polish Financial Supervision Authority, based on Article 137 clause 5 of the Banking Law Act (Journal of Laws No. 72/2002, item 665, as amended).

Sales profitability – ratio of net result to sales revenues.

Rodzina na Swoim (RnS) (*Family's own housing***)** – government-subsidized programme intended to support housing construction. The program was closed at the end of 2012.

SARFIN – Analytical System for the Real Estate Financing Market.

Sekocenbud –publishing house gathering data on costs in the construction sector; the team makes use of the quarterly Construction Prices Bulletins (BCO) – building.

Office real estate standard – office space is classified according to the standard offered. Classification depends on the age of the building, its location, possibility to customize the space, technical specification (e.g. raised floors or suspended ceilings), underground and over ground parking lots and other factors important from the tenant's point of view.

Capitalisation rate – quotient of net operating income that may be gained on the market and the market price of real estate (in accordance with the General Domestic Valuation Principles).

Six cities – Warsaw, Cracow, Wrocław, Poznań, Gdańsk, Łódź (whenever **seven cities** are mentioned, Gdynia is included in the group).

TBS (*Social Building Society*) – company operating under the Act of 26 October 1995 on certain forms of subsidizing housing construction (consolidated text in Journal of Laws No. 98/2000, item 1070, as amended). The object of the company's operation is housing construction and its rental, provision of management and administration services and conduct of business related to housing construction and accompanying infrastructure. It was planned that TBS offer would be addressed to non-affluent families eligible for loan subsidy from the National Housing Fund (KFM). The tenants pay rent, which is usually higher than in municipal housing (as loan is repaid from the rent) but lower than the market rent.

TDR (Total Debt Ratio) – percentage share of loan repayment in the borrower's budget.

Vacancy rate – relation of non-rented space to the accumulated (total) supply of commercial space in a particular location, e.g. town or district.

Profitability ratios – ROA (return on assets) – relation of net income to assets at the end of the period, ROE (return on equity) – relation of net income to equity at the end of the period, profitability of net sales – net profit in relation to sales income.

ZBP – Polish Bank Association.

Part II. Analytical papers

A1 Convergence and differentiation processes in local markets and structural changes (comparison of 16 markets in Poland)

Grażyna Baldowska[62], Robert Leszczyński[63], Barbara Myszkowska[54]

Although the residential real estate sector in Poland is often analysed as a whole, it is a heterogeneous market characterised by significant diversification across 16 voivodeship cities. A cluster analysis was performed in order to identify convergence and identical tendencies in local voivodeship markets. Clustering of cities based on the adopted criteria (i.e. indicators presenting the housing situation, scale of construction, housing prices, fundamental factors, indicators of demographic burden in individual centres) proved to be a difficult task, as in the previous years (see Figure 61 - Figure 66). While clusters of cities with similar trends or similar structure were differentiated using variables categorizing the markets, obtaining a homogenous division proved to be impossible (with each segregation generating different results). Another factor adding to the difficulty of the analysis and clustering of cities included structural changes in individual markets. The changes in the market taken together resulted in different clustering results, even with the same categorizing variables in subsequent years. As in the previous years, the analysis of voivodeship centres confirmed that the most permanent division is the classification of cities in terms of their population, i.e. 7 cities with over 400 thousand inhabitants (Gdańsk, Kraków, Łódź, Poznań, Szczecin, Warsaw, Wrocław) and other 9 cities with a smaller population, namely, Białystok, Bydgoszcz, Katowice, Kielce, Lublin, Olsztyn, Opole, Rzeszów, Zielona Góra.

In two groups of the analysed cities, the housing situation has slightly improved in 2012, due to deterioration of the majority of fundamental demographic factors. Regional markets were characterised by stability of phenomena observed within the last two years and low activity on the part of buyers. A slight recovery recorded in the final quarter of 2012 resulted from the approaching end of the government scheme *Rodzina na Swoim* (Family on their own) (RNS) and not from improved sentiment in the housing market. As in the previous years, the primary market in voivodeship cities exhibited higher propensity for price reduction than the secondary market. In numerous regional markets the nominal price returned to the level from before the boom, i.e. 2007 (in some even from before 2006), in both the primary and the secondary market.

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[62] Regional Branch of Narodowy Bank Polski in Warsaw.
[63] Regional Branch of Narodowy Bank Polski in Białystok.

The changing situation of consumers in the real estate market in 2012 did not have an impact on the assessment of the housing market as compared to 2011, but the changes are clearly visible from the 5-year perspective (see Figure 67 - Figure 68). The inclusion of such factors as price per one square meter of housing, city population, unemployment rate, remuneration and housing availability in the analysis[64] of data for 2012 resulted in the following two cities at top positions, namely, Katowice (with relatively low prices and high salaries) and Warsaw (with low unemployment rate and high salaries). Gdańsk and Poznań competed for the third place. Places at the opposite end of the scale belonged to Białystok (with its distance from subsequent cities in the ranking increasing), as well as Kielce, Lublin and Rzeszów. There were no substantial changes in the middle of the ranking, but compared to 2011 the differences in the situation of consumers were more pronounced (i.e. in 2012 "the middle of the scale" was more dispersed.

Figure 56. Tree diagram of housing situation in voivodeship cities (average housing area, usable housing area per person, average number of rooms in a dwelling, average number of persons in a dwelling) in 2012
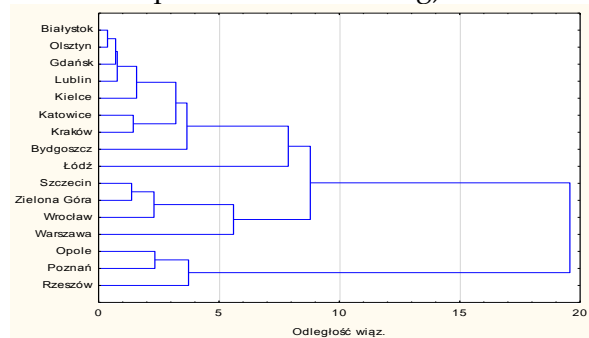
Odległość wiąz.	Distance of nodes

Figure 57. Tree diagram of demographic data (demographic growth, migration balance, marriages per 1000 inhabitants) in voivodeship cities in 2012
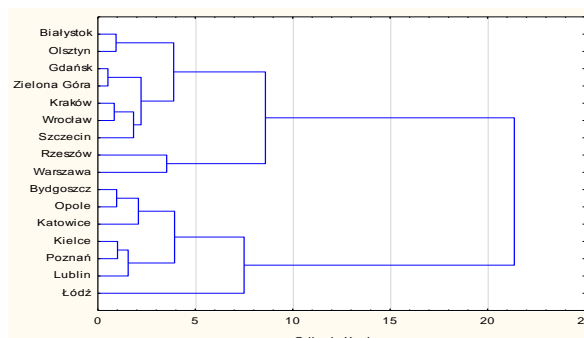

| Odległość wiąz.	Distance of nodes

Source: GUS, NBP.

Source: GUS, NBP.

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[64] The analysis involved clustering with the use of multi-feature similarity (ranking establishment) and establishing linear hierarchy in terms of given variables and summing up their unitized values and dividing by the number of variables.

Figure 58 Tree diagram of population
structure (at pre-production, production or
postproduction age) in voivodeship cities in
2012

| Odległość wiąz.	Distance of nodes
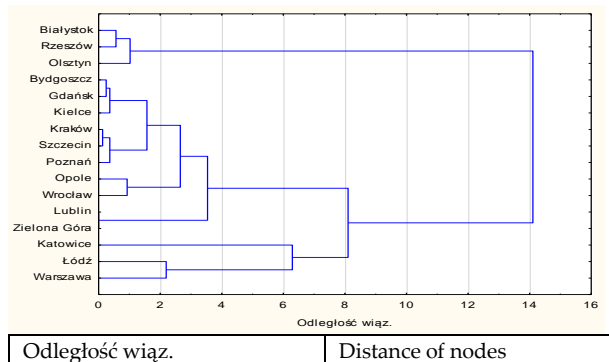
Source: GUS, NBP.

Figure 60 Tree diagram of the effects of
housing construction (completed dwellings
per 1000 inhabitants and per 1000 marriages)
in voivodeship cities in 2012

| Odległość wiąz.	Distance of nodes
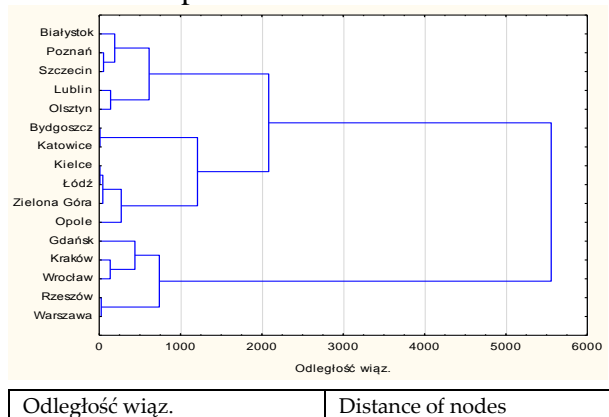
Source: GUS, NBP.

Figure 62. Situation of consumers in the
housing market in voivodeship cities in 2007

Figure 59 Tree diagram of economic and
demographic factors (unemployment rate
and migration per 1000 inhabitants) in
voivodeship cities in 2012

Odległość wiąz.	Distance of nodes
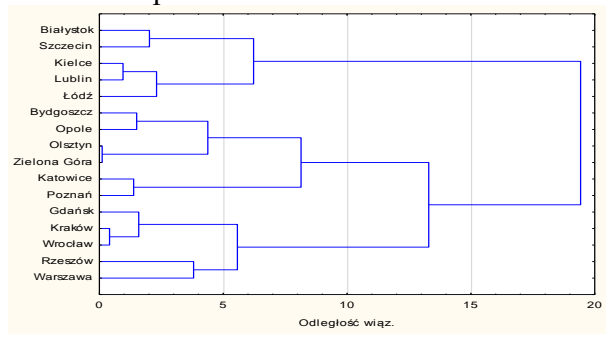
Source: GUS, NBP.

Figure 61 Tree diagram of quarter-to-quarter
price growth in voivodeship cities in 2012
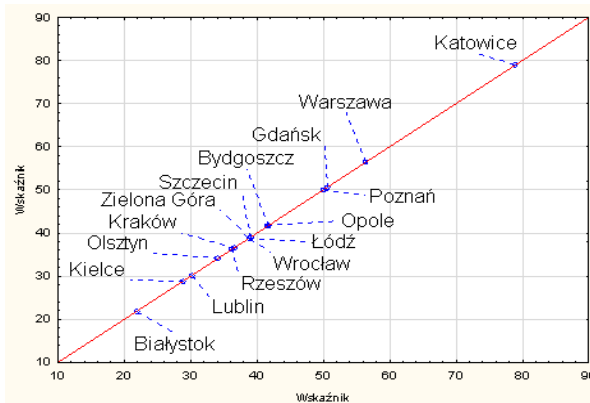(sale transactions in the secondary market)

Odległość wiąz.	Distance of nodes
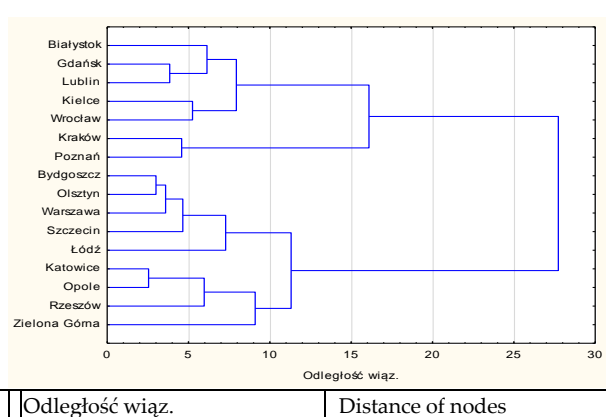
Source: NBP.

Figure 63. Situation of consumers in the
housing market in voivodeship cities in 2012
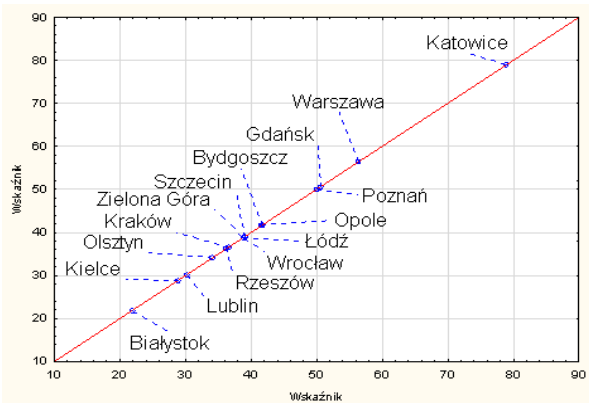
Wskaźnik	Indicator

Source: GUS, NBP.

Wskaźnik	Indicator

Source: GUS, NBP.
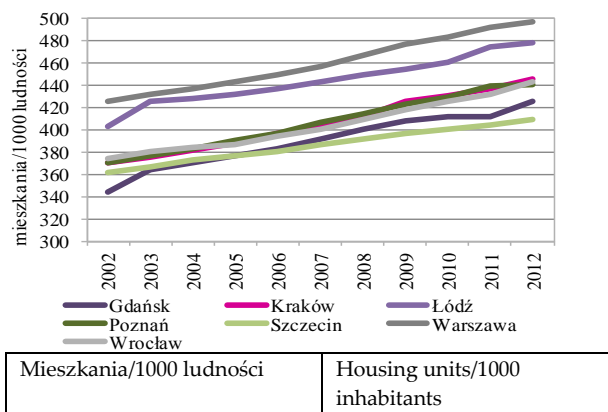
Housing situation in 16 voivodeship cities

The housing situation in Polish voivodeship cities in 2012 has slightly improved compared to 2011 (see Figure 69 - Figure 76). Better housing saturation indicators in voivodeship cities resulted from more intensive activity, compared to other regions of Poland, of investors implementing new housing investments and the small-scale process of demolition and change of intended use of housing. The indicators presenting the fulfilment of housing needs were better in the seven largest voivodeship cities in terms of the population than in the group of nine smaller cities and were similar to the level recorded in the Western European countries. This should be attributed to more favourable fundamental factors in those markets.

Preliminary results of the National Population and Housing Census of 2011 corroborated that voivodeship cities differ in terms of the housing stock age structure. Housing units built in the years 1971-1988 prevailed in the majority of cities, with the exception of Warsaw and Kraków where the housing stock structure was dominated by housing units built in the years 1945-1970. In five cities, i.e. Katowice, Łódź, Opole, Szczecin and Wrocław, housing units from the pre-war period accounted for a significant part of the housing stock. The share of new housing buildings, i.e. built after 2003, was insignificant and ranged between 3.5% in Łódź and 14.5% in Warsaw. Housing units with usable area of 40-79 square meters constituted the largest group in the housing stock in voivodeship cities. Small housing units, i.e. up to 39 square meters, also made up a relatively large group, representing one third of housing units in Warsaw, Łódź and Kraków, and one fourth in other voivodeship cities (except for Opole).

In the years 2013-2014, the number of housing units in the stock should increase as a result of completion of new housing projects and a relatively small decline in the number of the existing housing units. Since real estate developers adjust their supply to market conditions, i.e. they build smaller housing units, improvement in housing indicators (e.g. average usable housing area) may slow down.
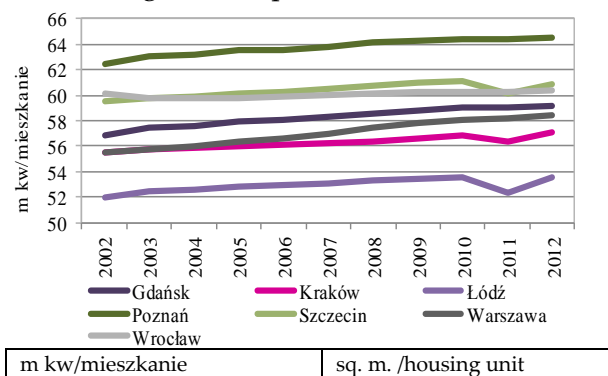
Figure 64. Housing stock per 1000 inhabitants in 7 cities

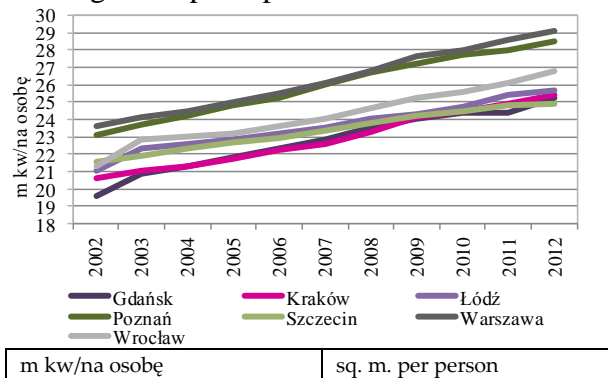Figure 65. Housing stock per 1000 inhabitants in 9 cities

| Mieszkania/1000 ludności | Housing units/1000 inhabitants |

Figure 66. Average usable housing area in the housing stock (square metres) in 7 cities

| m kw/mieszkanie | sq. m. /housing unit |

Figure 68. Average usable housing area in the housing stock per 1 person in 7 cities

| m kw/na osobę | sq. m. per person |

Figure 70. Average number of persons per dwelling in 7 cities
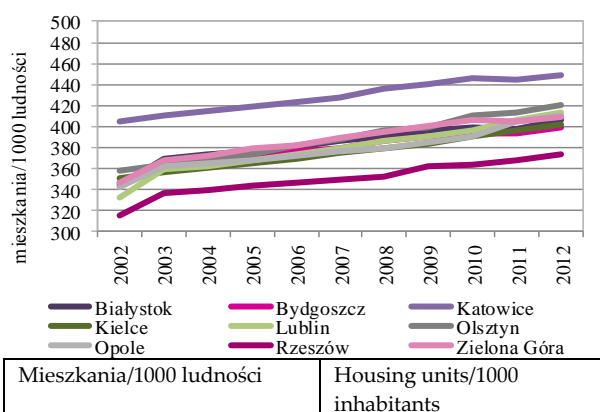
| Mieszkania/1000 ludności | Housing units/1000 inhabitants |

Figure 67. Average usable housing area in the housing stock (square metres) in 9 cities

| m kw/mieszkanie | sq. m. /housing unit |
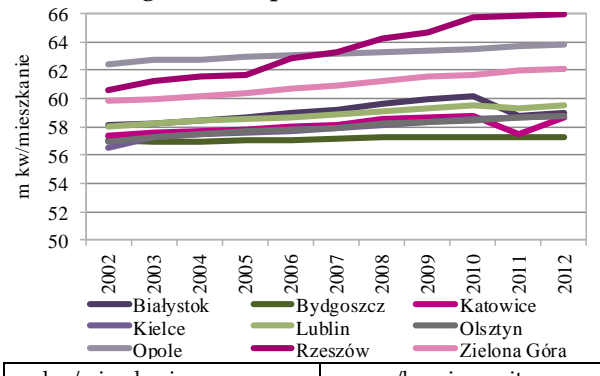
Figure 69. Average usable housing area in the housing stock per 1 person in 9 cities

| m kw/na osobę | sq. m. per person |
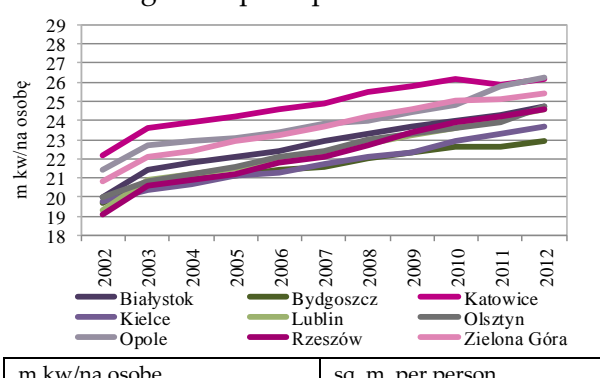
Figure 71. Average number of persons per dwelling in 9 cities

liczba osób | number of persons

Gdańsk, Kraków, Łódź, Poznań, Szczecin, Warszawa, Wrocław

Source: GUS.

liczba osób | number of persons

Białystok, Bydgoszcz, Katowice, Kielce, Lublin, Olsztyn, Opole, Rzeszów, Zielona Góra
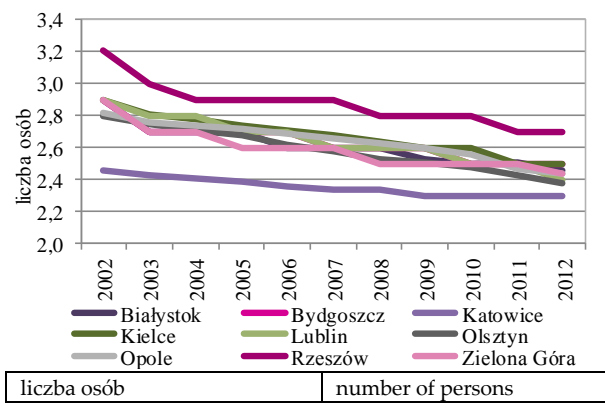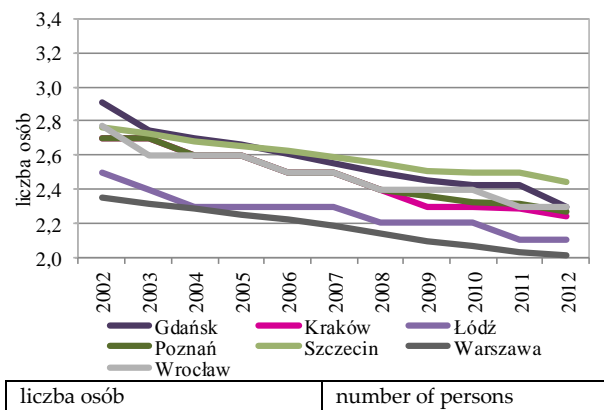
Source: GUS.

Demographic factors in 16 voivodeship cities

The year 2012 was a subsequent year of deterioration in demographic situation in the majority of Polish voivodeship cities. Fundamental demographic factors related to the process of the second post-war baby boom generations starting to get on their own two feet have decreased. In consequence, the indicators of the number of marriages (see Figure 81 - Figure 82) and demographic growth (see Figure 77 - Figure 78) declined in the majority of regional centres. A positive development was an improvement in the migration rate in larger cities (see Figure 79 - Figure 80). This can be attributed to economic slowdown and the movement of people from other Polish regions with higher unemployment rate than in the voivodeship cities. The population decline was often due to the fact that inhabitants of large cities settled down in the surrounding areas constituting the agglomeration. Despite the positive trends in larger cities, smaller cities still recorded a negative migration rate.

Demographic burden indicators in voivodeship cities of Poland reflect the progressing population ageing process. Within the last two years, an increase in the percentage of post-production population and a decline in the population at the production age (except for Katowice) have been recorded. Compared to 2011, in 2012 the percentage of population at pre-production age grew slightly in six cities, decreased in another six cities and remained at the similar level in four cities, thus failing to produce a single trend.

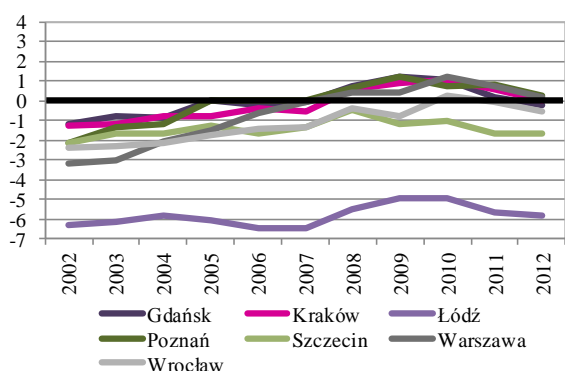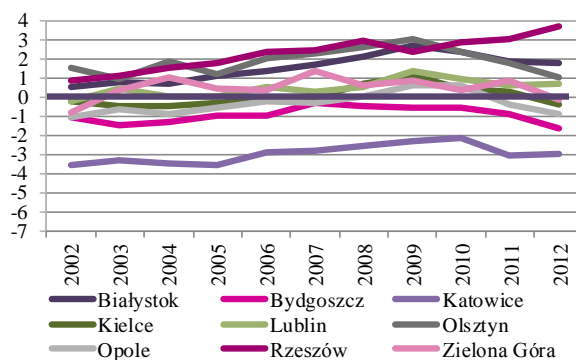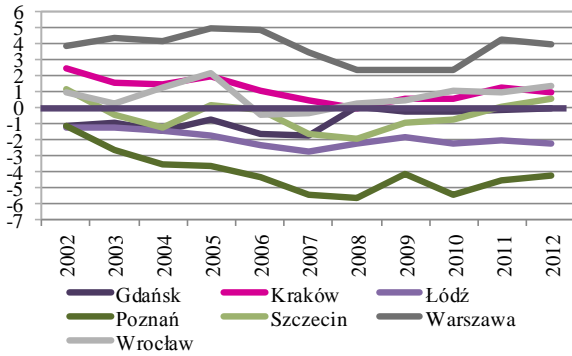Figure 72. Demographic growth per 1000 inhabitants in 7 cities

Gdańsk, Kraków, Łódź, Poznań, Szczecin, Warszawa, Wrocław

Figure 73. Demographic growth per 1000 inhabitants in 9 cities

Białystok, Bydgoszcz, Katowice, Kielce, Lublin, Olsztyn, Opole, Rzeszów, Zielona Góra

Figure 74. Migration per 1000 inhabitants in 7 cities

Figure 75. Migration per 1000 inhabitants in 9 cities

Figure 76. Marriages per 1000 inhabitants in 7 cities
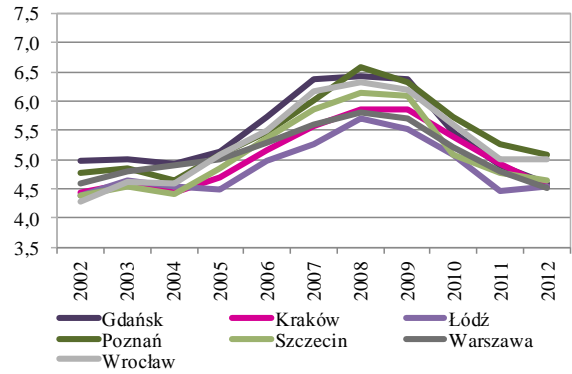
Figure 77. Marriages per 1000 inhabitants in 9 cities

Figure 78. Ratio of population age change in 2012 (2002=100) in 7 cities

produkcyjnym	production
poprodukcyjnym	post-production
przedprodukcyjnym	pre-production
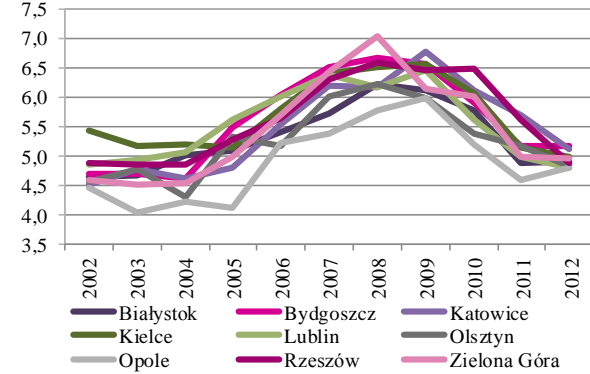
Figure 79. Ratio of population age change in 2012 (2002=100) in 9 cities

produkcyjnym	production
poprodukcyjnym	post-production
przedprodukcyjnym	pre-production
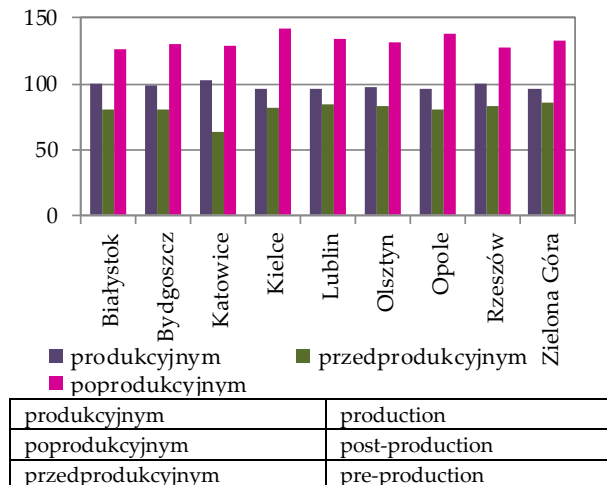
Economic factors in 16 voivodeship cities

In the majority of Poland's voivodeship cities, the impact of economic factors on demand for real estate was less favourable in 2012 as compared to the preceding year. Although both small and large cities recorded a growth of average wages in nominal terms, yet, accounting for CPI inflation, wages in real terms were higher in 5 cities only (in 11 cities in the previous year). The growth was insignificant and ranged from several to several dozen PLN across cities. Similarly to 2011, higher average wages were observed in the cities with the largest population (see Figure 89 - Figure 90), with the exception of Katowice where the largest wage level in the country was generated by wages in mining.

In 2012 the situation in the labour market deteriorated. Higher unemployment rates were recorded in 16 cities, compared to 2011, which may be attributed to persisting economic slowdown (see Figure 85 - Figure 86). Unemployment in voivodeship markets was lower than the average for the whole country. A positive development in the labour market of most voivodeship cities (except for Kraków and Katowice) was the continuing downward trend (started in 2010) in the share of persons up to 34 years of age in the structure of the unemployed (see Figure 87 - Figure 88).

In 2012 the availability of housing has improved as a result of an increase in average wages and a decline in annual average home price (see Figure 91 - Figure 94). As in the previous years, Katowice stood out in terms of housing availability. The city was characterised by a high average wage level and low home prices.

Within the analysed period, a decline (y/y) of potential PLN housing loan availability was recorded in 16 voivodeship cities (see Figure 95 - Figure 96). Loan availability was limited by banks' restrictive lending policy (related to the amendment to Recommendation S) and higher bank margins. In 2012, despite a deterioration of PLN loan availability, a loan allowed to buy a larger dwelling in the majority of voivodeship cities. This is evidenced by the improved indicator of loan availability of housing (see Figure 97 and Figure 98) as a result of positive growth rate of wages and a drop in the prices of housing units.

In the majority of analysed cities (except for Białystok, Olsztyn and Rzeszów), the level of housing loans disbursed at the end of 2012 decreased considerably as compared to the previous year. This was due to adverse trends in the lending market and lower demand for credit as a result of deterioration in social sentiment. A lower annual growth was also recorded with respect to preferential loans granted under the government RNS scheme. The lower interest in such loans within the first three quarters of 2012, similarly to 2011 Q4, was due to the reduction of housing price thresholds for one square meter which decide about the subsidy to loan interest. The mismatch between the RNS limit and the median transaction price is presented in Figures 103 to 106. Increased demand for government-subsidized loans in all voivodeship markets in 2012 Q4 resulted from the approaching completion of the scheme scheduled for 31 December 2012. Despite lower price limits, numerous applications for subsidy were submitted by the end of last year.[65] In 2013 Q1, the number of households using the preferential loans was higher than in the corresponding period of 2012.

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[65] Some applications were processed in 2013 Q1.

The recent interest rate cuts by the Monetary Policy Council will have a positive impact on the situation in the mortgage loan market in 2013 and should facilitate access to mortgage loans. The programme of "Subsidies to loans for building energy-efficient houses", approved by the National Fund for Environmental Protection and Water Management to be implemented in 2013, may also contribute to boosting demand for mortgage loans. The programme will be available to natural persons purchasing a flat in a multi-family energy-efficient building or a passive building or building single-family houses with low demand for energy.

Figure 80. Unemployment rate in 7 cities
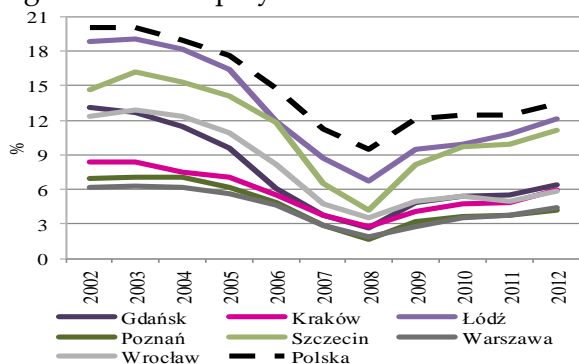
Source: GUS.

Figure 81. Unemployment rate in 9 cities
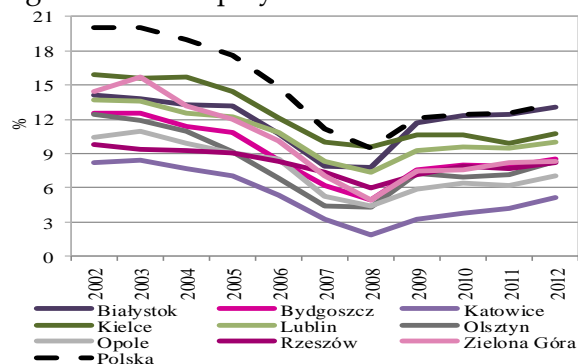
Source: GUS.

Figure 82. Percentage of the unemployed below 34 years of age in 7 cities
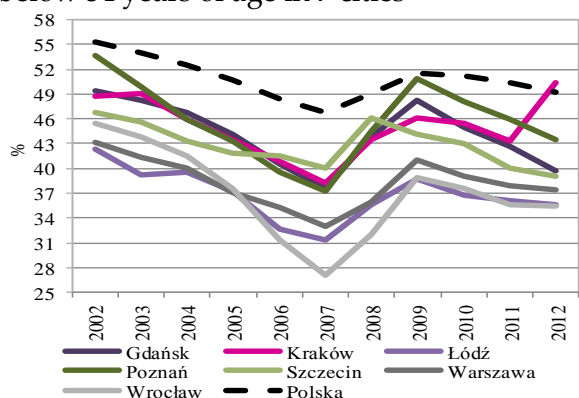
Source: GUS.

Figure 83. Percentage of the unemployed below 34 years of age in 9 cities
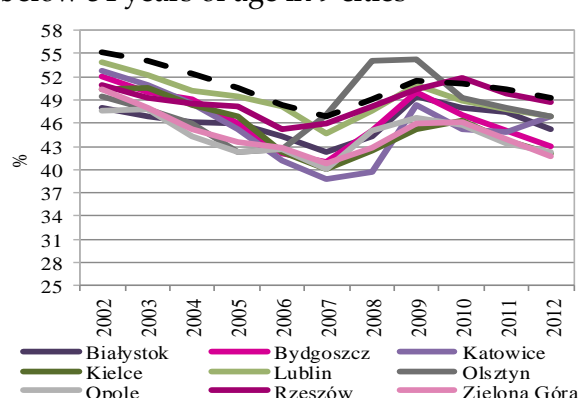
Source: GUS.

Figure 84. Average monthly wages in the enterprise sector in 7 cities

Figure 85. Average monthly wages in the enterprise sector in 9 cities

Gdańsk Kraków Łódź
Poznań Szczecin Warszawa
Wrocław Polska

zł/miesięcznie	PLN/month

Source: GUS.

Białystok Bydgoszcz Katowice
Kielce Lublin Olsztyn
Opole Rzeszów Zielona Góra
Polska

zł/miesięcznie	PLN/month
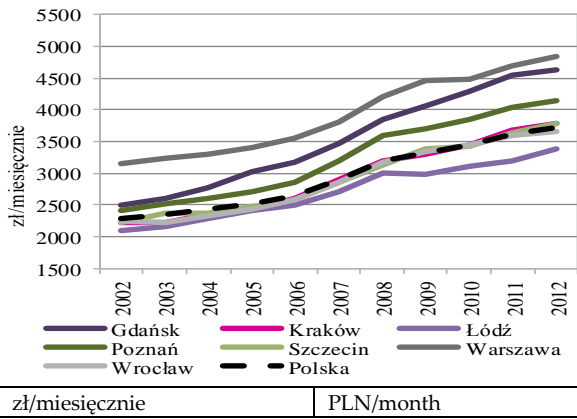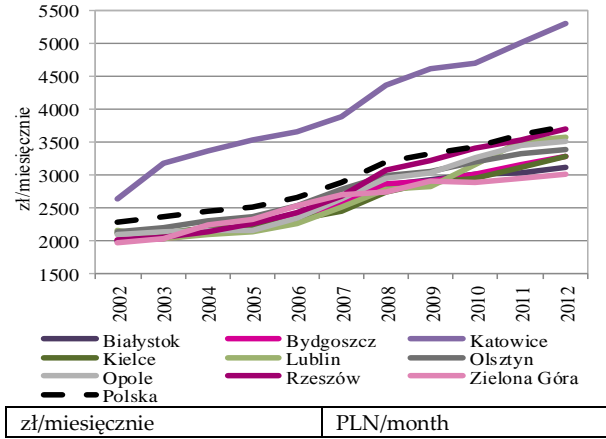
Source: GUS.

Figure 86. Housing availability for an average wage in 7 cities - primary market

Gdańsk Kraków Łódź
Poznań Szczecin Warszawa
Wrocław

m kw/przeciętne wynagrodzenie	sq. m./average wages
kw.	Q
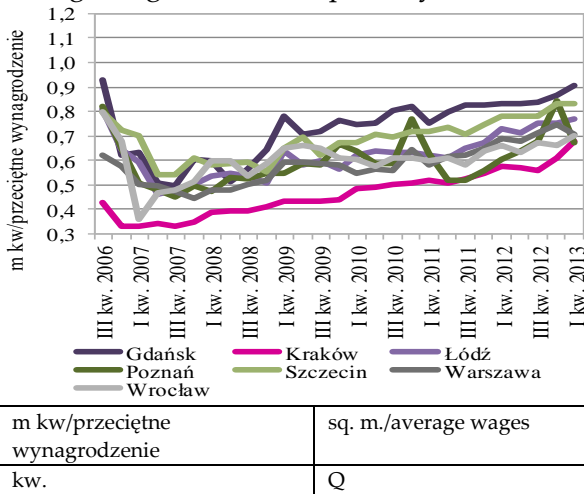
Source: GUS.

Figure 88. Housing availability for an average wage in 7 cities - secondary market

Figure 87. Housing availability for an average wage in 9 cities - primary market

Białystok Bydgoszcz Katowice
Kielce Lublin Olsztyn
Opole Rzeszów Zielona Góra

m kw/przeciętne wynagrodzenie	sq. m./average wages
kw.	Q
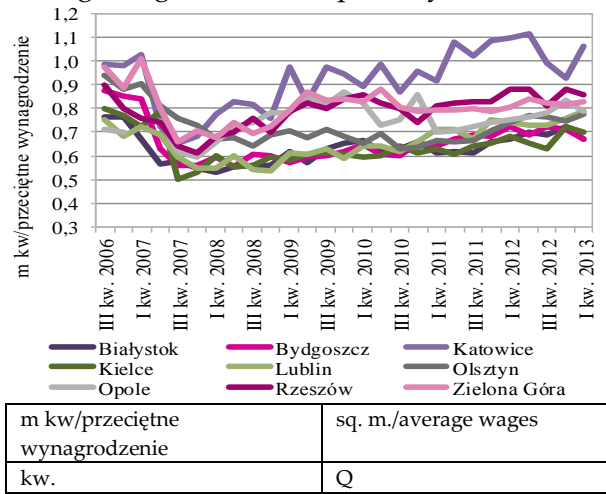
Source: GUS.

Figure 89. Housing availability for an average wage in 9 cities - secondary market
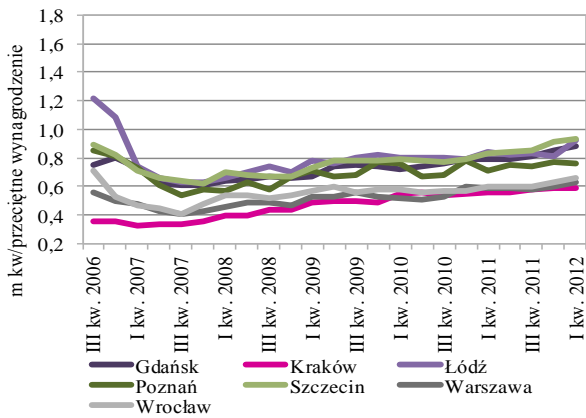
m kw/przeciętne wynagrodzenie	sq. m./average wages
kw.	Q
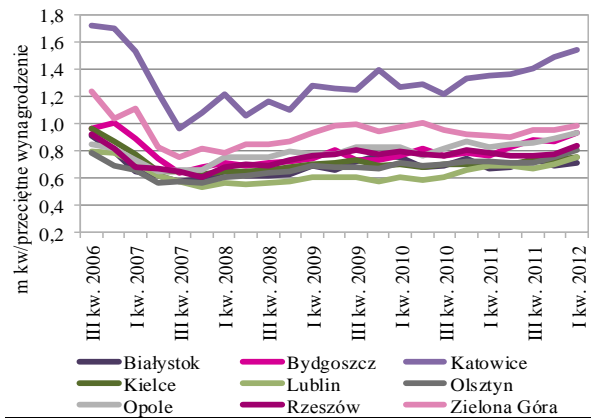
Source: GUS, NBP.

m kw/przeciętne wynagrodzenie	sq. m./average wages
kw.	Q

Source: GUS, NBP.

Figure 90. Availability of PLN loans in 7 cities

Figure 91. Availability of PLN loans in 9 cities
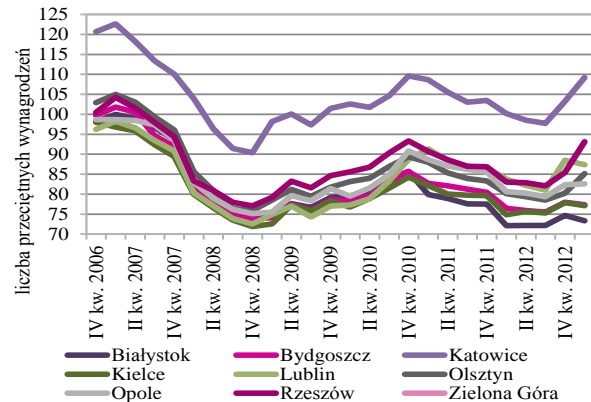
liczba przeciętnych wynagrodzeń	number of average wages
kw.	Q

Source: GUS, NBP.

liczba przeciętnych wynagrodzeń	number of average wages
kw.	Q

Source: GUS, NBP.

Figure 92. Availability of loan-financed housing (PLN loan) in 7 cities

Figure 93. Availability of loan-financed housing (PLN loan) in 9 cities
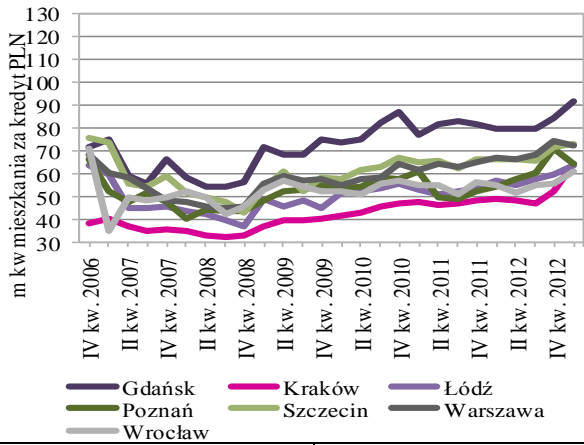
m kw mieszkania za kredyt PLN	sq. m. of PLN loan-financed housing
kw.	Q
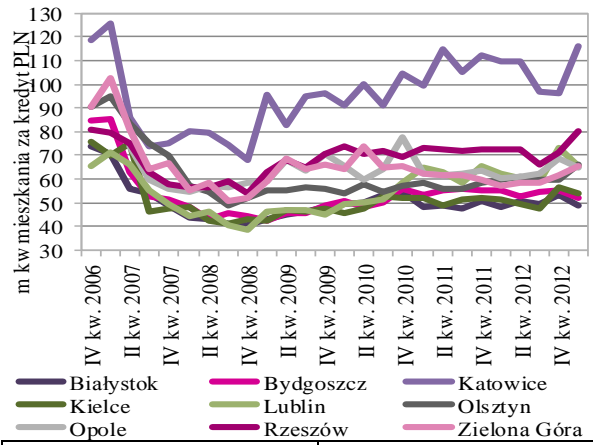
Source: GUS, NBP.

m kw mieszkania za kredyt PLN	sq. m. of PLN loan-financed housing
kw.	Q

Source: GUS, NBP.

Figure 94. Estimated current value of mortgage debt (PLN million) in 7 cities

| mln zł | PLN million |

Source: BIK.

Figure 95. Estimated current value of mortgage debt (PLN million) in 9 cities
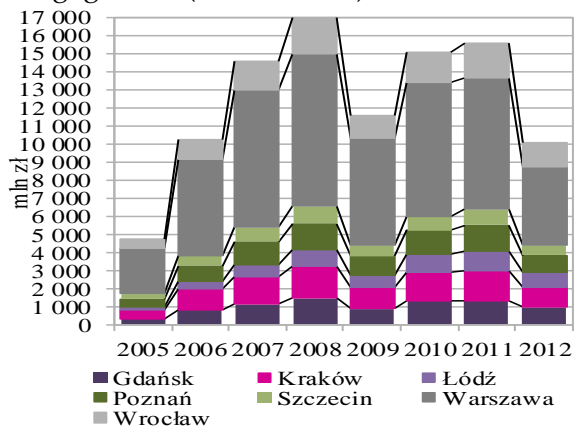
| mln zł | PLN million |

Source: BIK.

Figure 96. Share of government-subsidized (RNS) loans in the value of mortgage loans granted in 7 cities
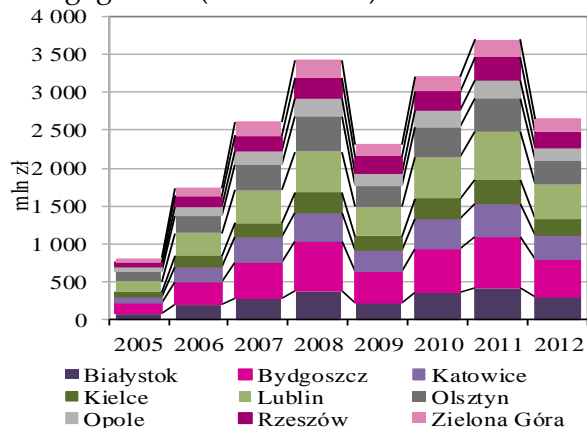
Source: BGK, BIK, NBP.

Figure 97. Share of government-subsidized (RNS) loans in the value of mortgage loans granted in 9 cities

Source: BGK, BIK, NBP.

Figure 98. Gap/surplus between RNS threshold prices and median transaction prices in 7 cities (% of median transaction price) – primary market

| kw. | Q |
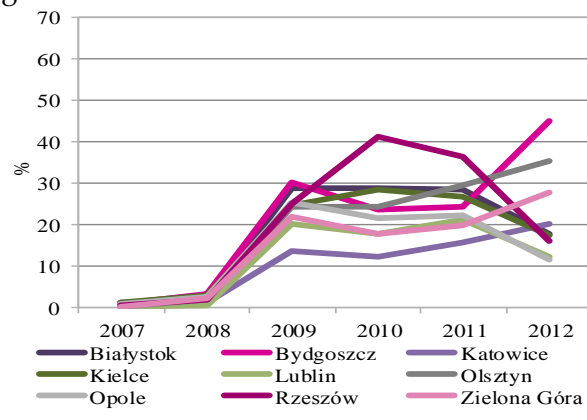
Figure 99. Gap/surplus between RNS threshold prices and median transaction prices in 9 cities (% of median transaction price) – primary market
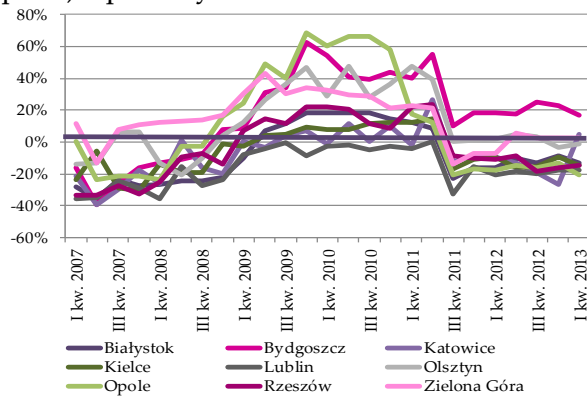
| kw. | Q |

Note to Figures 103-106: The gap is calculated as the difference between the maximum price (limit) under the RNS scheme and the median of the transaction price in the primary market in relation to the

median of the transaction price. If the difference is positive, the scheme finances homes with prices higher than the median, and otherwise.

Source: BGK, NBP.

Figure 100. Gap/surplus between RNS threshold prices and median transaction prices in 7 cities (% of median transaction price) – secondary market

kw.	Q
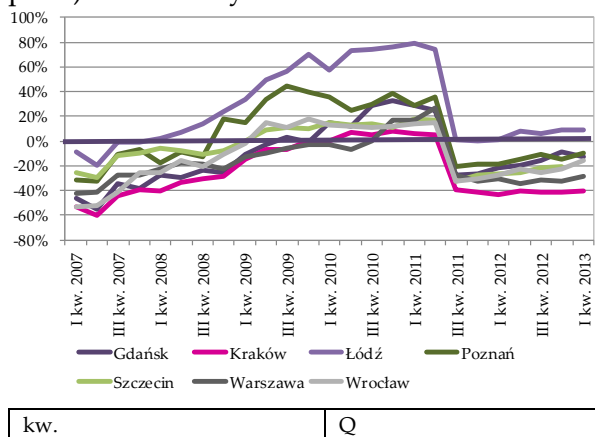
Source: BGK, NBP.

Source: BGK, NBP.

Figure 101. Gap/surplus between RNS threshold prices and median transaction prices in 9 cities (% of median transaction price) – secondary market

kw.	Q
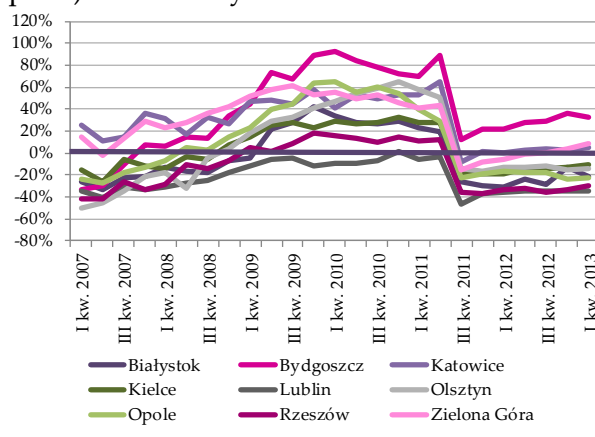
Source: BGK, NBP.

Housing construction in 16 voivodeship cities

In 2012, similarly to the previous years, the growth of housing construction varied across Poland's voivodeship cities. Apart from local determinants related to demographic and economic situation in individual markets, the behaviour of market participants on the supply and demand side was also affected by changes in legal regulations. In the period preceding the entry into force of the Act on the protection of home buyers' rights, whose *vacation legis* expired on 29 April 2012, a high level of new contracts and commenced housing investments was recorded in the majority of voivodeship cities. This was due to the need to postpone the implementation of costly obligations imposed on real estate developers by new legal regulations. Despite intensified activity of investors within the period January-April 2012, in particular those building housing for sale and rental, the number of new housing permits and the number of commenced housing investments have declined in annual terms in the majority of voivodeship cities (see Figure 113 - Figure 114). The decline of planned and implemented housing investments recorded in 2012 was due to a higher base in 2011 which is attributed to the so-called Act on real estate development activity and persisting oversupply of unsold housing unit in the market.

In the majority of analysed cities, the performance of housing construction measured by the number of housing completions was better in 2012 than in 2011 (see Figure 107 - Figure 110) due to the low reference level. The lower number of completed housing units in 2011 resulted from reduced housing investments in 2009. In 2012, a downward trend in usable area and number of rooms in completed buildings was recorded in the majority of cities (see Figure 111 - Figure 112). Such trend was observed in both the investments implemented by companies building for sale and rental and the projects of individual

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investors and resulted from adjustment of supply to demand and financial capacity of home buyers or individual investors. The situation was different in Katowice, Łódź, Szczecin and Warsaw where the usable area of single-family houses completed by individual investors in 2012 was larger than in the previous year. In the case of investors building for sale and rental, a slight increase in the area of completed housing units was recorded only in Rzeszów and Olsztyn, while it remained at a similar level in Kraków and Poznań.

The years 2013 and 2014 are expected to see further decline in average usable area of completed housing, as a result of the trend to execute contracts for smaller size housing in the majority of cities. The reduced scale of commenced new housing investments in 2012 and between January and May 2013, and mainly of housing units for which permits were granted, will contribute to decreasing the number of completed housing in two or three years' time. Due to the duration of investment process, the phenomenon will be more pronounced in 2014. In mid-term perspective, the diminished number of new constructions will result in lower supply. New obligations imposed by the Act on real estate development activity on investors carrying out housing investments may contribute to increased consolidation in the real estate development sector. This will be driven by the fact that an escrow account will be required to implement new housing investments. Smaller companies, which had earlier financed housing contracts from their own funds or contributions of buyers, have problems with opening such accounts, since the banks see them as a group of new clients without any lending history that operate in a high risk sector. Large enterprises, which financed their earlier housing contracts with bank loans, are in a better position in the market. New entities planning to start business activity in the housing sector may also experience difficulties.

Figure 102. Number of completions per 1000 inhabitants in 7 cities
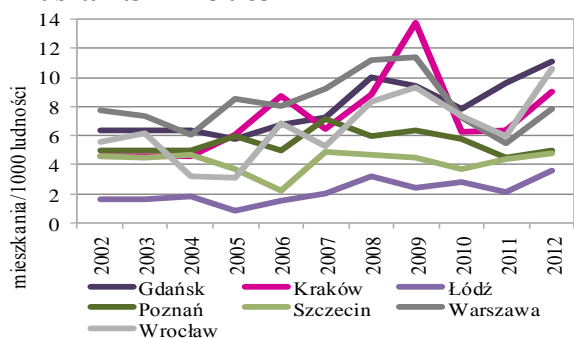
mieszkania/1000 ludności	dwellings/1000 inhabitants

Source: GUS.

Figure 103. Number of completions per 1000 inhabitants in 9 cities
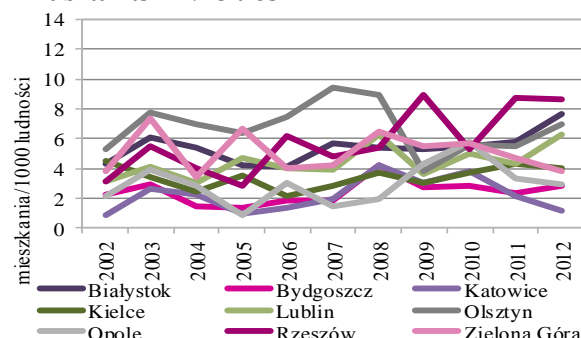
mieszkania/1000 ludności	dwellings/1000 inhabitants

Source: GUS.

Figure 104. Number of completions per 1000 marriages in 7 cities
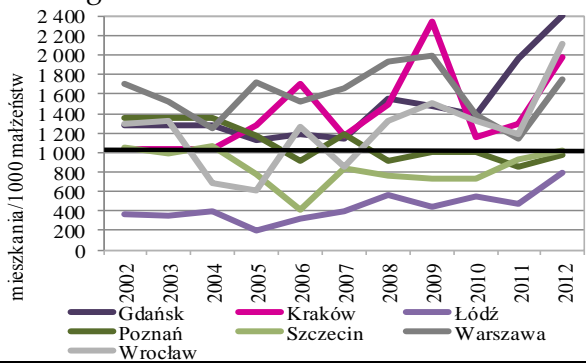
mieszkania/1000 małżeństw | dwellings/1000 marriages

Source: GUS.

Figure 105. Number of completions per 1000 marriages in 9 cities
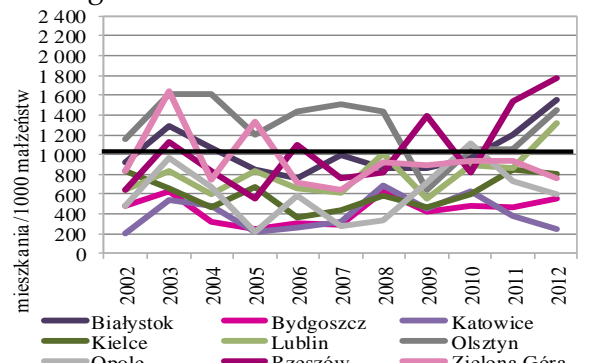
mieszkania/1000 małżeństw | dwellings/1000 marriages

Source: GUS.

Figure 106. Average usable area of completed housing in 7 cities
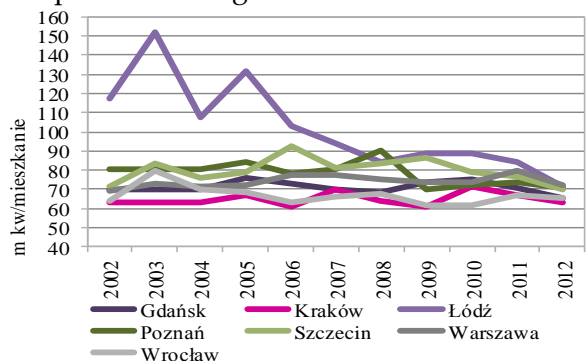
m kw/mieszkania | sq. m. /housing

Source: GUS.

Figure 107. Average usable area of completed housing in 9 cities
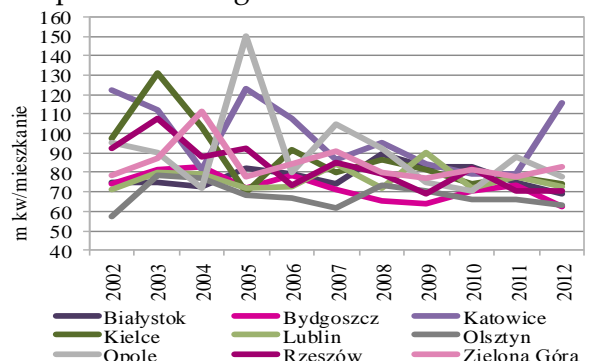
m kw/mieszkania | sq. m. /housing

Source: GUS.

Figure 108. Housing construction in 7 cities
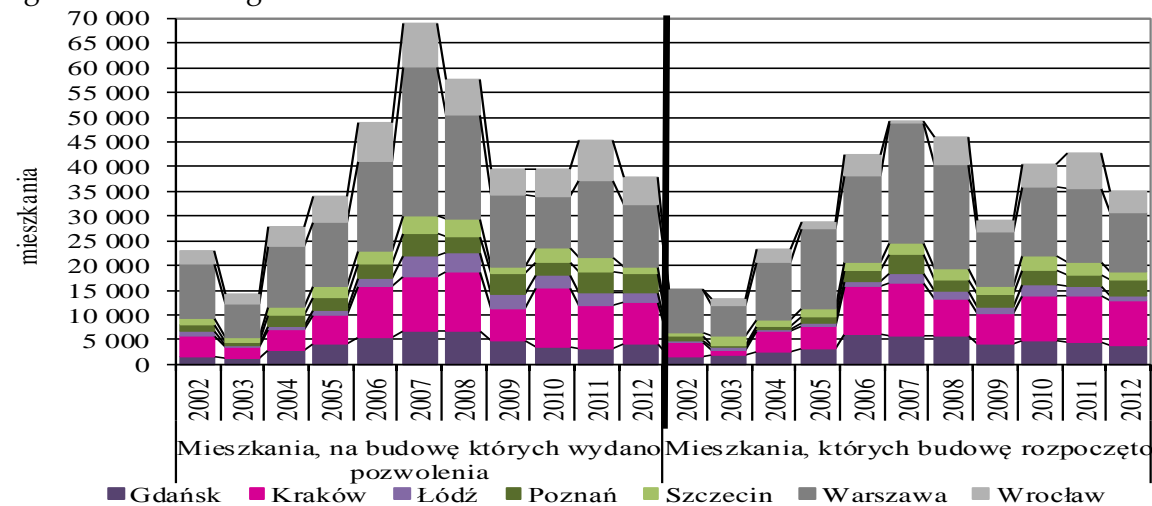
mieszkania	dwellings
Mieszkania, na budowę których wydano pozwolenia	Dwellings for which permits have been issued
Mieszkania, których budowę rozpoczęto	Dwellings started

Source: GUS.

Figure 109. Housing construction in 9 cities
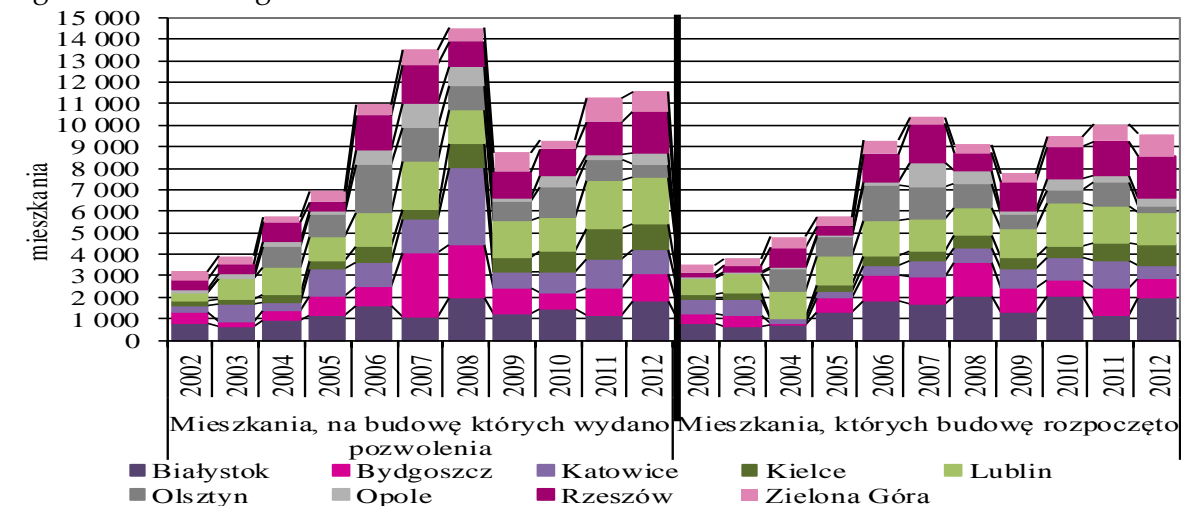
mieszkania	dwellings
Mieszkania, na budowę których wydano pozwolenia	Dwellings for which permits have been issued
Mieszkania, których budowę rozpoczęto	Dwellings started

Source: GUS.

Analysis of BaRN data

Since the beginning of the monitoring of the real estate market, the database (BaRN) on asking and transaction prices in the housing market has been steadily expanding and currently is one of the largest such databases in Poland. Another advantage of its records is the multitude of data sources. This allows to ensure representativeness of the analysed sample in all regional real estate markets, enabling to identify the market trends and correlations. In 2012, the number of collected transaction data (excluding lease) in the primary and secondary markets amounted to almost 27 thousand records (see Figure 115). The volume of collected data on offers grew to the unprecedented level compared to the previous years and approached 150 thousand. The steady increase in the number of registered entries in the BaRN database does not result from a growing number of transactions in the market, but is driven by the higher number of cooperating entities and expanded market coverage. Due to the introduction of statistical obligation, 2013 Q1 saw an increase in the number of transactions by approx. 30% and the number of offers by approx. 26% compared to 2012 Q4.

Figure 110. Number of records in the BaRN database
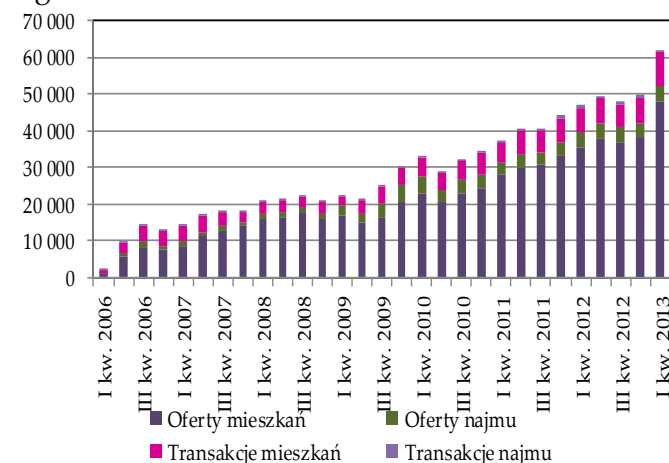
Oferty mieszkań	Housing offers
Transakcje mieszkań	Housing transactions
Oferty najmu	Rental offers
Transakcje najmu	Rental transactions
kw.	Q

Source: NBP.

The majority of analysed cities saw a decrease in transaction prices in the primary and secondary markets in annual average terms in 2012. As regards the primary market, the most pronounced decline (by approx. 10%) has been recorded in Warsaw. An average annual price growth was observed only in Katowice (by approx. 4%) and in Rzeszów (by approx. 2%). In the secondary market, average prices in annual terms remained at a similar level only in Rzeszów. The other 15 markets saw a decline which was the most pronounced in Łódź, Bydgoszcz and Wrocław (9%, 8% and 8%, respectively). Average annual transaction price in the primary market in 16 cities (calculated as an arithmetic mean of average annual data for individual cities) in 2012 was by approx. 3% lower than in the previous year, while in the secondary market it went down by approx. 5%.

The analysed correlation between changes in the transaction price in the primary market and the volume of housing stock in a given city proved to be negative at -0.28, which means that the larger the city the more pronounced decline of prices. With Warsaw excluded, the negative correlation coefficient stood at -0.16. In the secondary market, the correlation between the analysed variables was stronger and the coefficient amounted to -0.33 (-0.42 with Warsaw excluded).

The highest asking and transaction prices are recorded in Warsaw, i.e. the largest market in Poland. In the primary market, the price difference between Warsaw and the second largest Polish city, i.e. Kraków, dropped to 265 PLN/square meter (compared to the previous year when it was around 600 PLN/square meter). In the secondary market, the difference between Warsaw and Kraków went down from approx. 1 500 PLN/square meter to approx. 1 200 PLN/square meter within a year. In smaller cities price differences are definitely less pronounced.

In 2012, the city size and the unemployment rate were the main factors affecting transaction prices in the secondary market. This means that respective correlations are

weaker than in the previous year and amounted to 0.80 and -0.55 for the analysed data pair in 2012.

Small and medium-sized housing units continue to enjoy the highest interest, with their prices and the demand for them being the highest. The size of newly constructed housing in the market follows a downward trend in response to increased demand for small housing units. In the secondary market, the stock is stable and with rigid supply the prices of one square meter of the smallest housing units are usually the highest.

In 2012, the average time of secondary housing unit offer in the market extended by one week for all cities, as compared to the previous year, and equalled 146 days. In the 7 most active markets in Poland (Gdańsk, Kraków, Łódź, Poznań, Warszawa, Wrocław, Szczecin), the average time in the market amounted to 149 days, i.e. was slightly shorter (by 3 days) than in the previous year.

Primary housing market according to the BaRN database

Figure 111. Year-on-year growth in asking prices in 7 cities - primary market
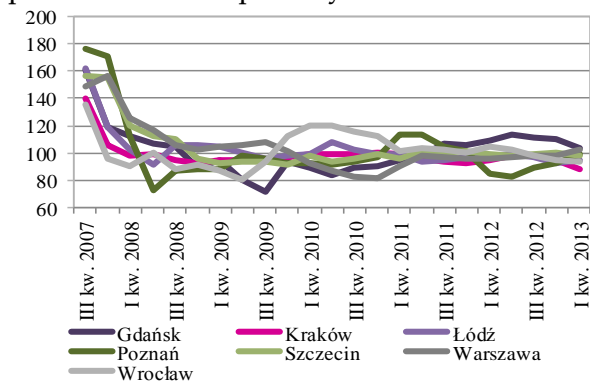
Source: NBP.

Figure 112. Year-on-year growth in asking prices in 9 cities - primary market
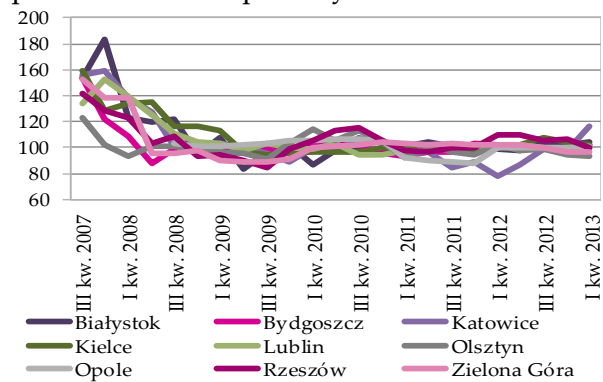
Source: NBP.

Figure 113. Year-on-year growth in transaction prices in 7 cities - primary market
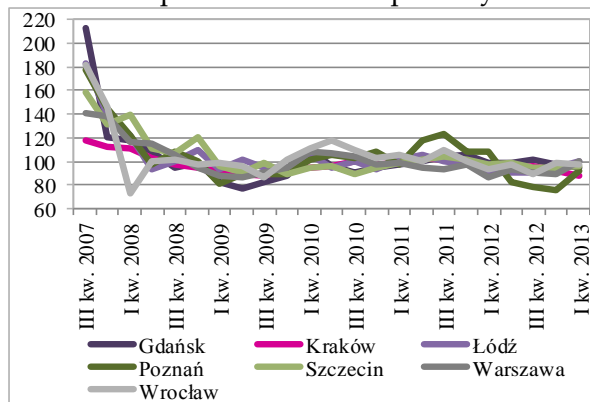
Source: NBP.

Figure 114. Year-on-year growth in transaction prices in 9 cities - primary market
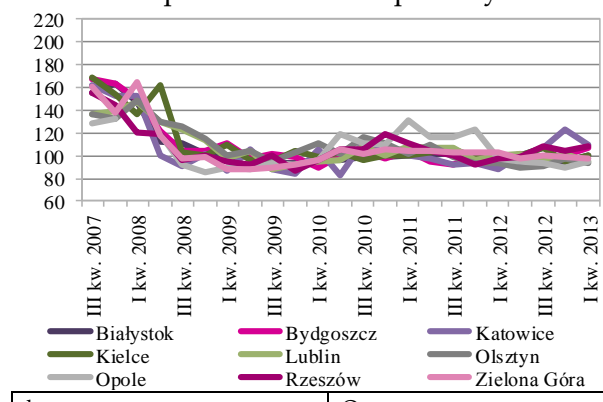
Source: NBP.

Figure 115. Median offer price in 7 cities - primary market

Figure 116. Median sale price in 7 cities - primary market
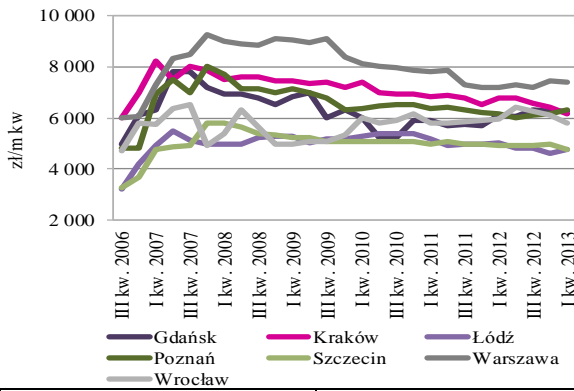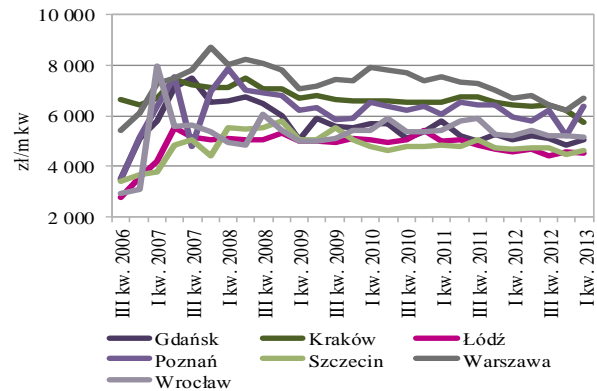
Figure 117. Median offer price in 9 cities - primary market

Figure 118. Median sale price in 9 cities - primary market
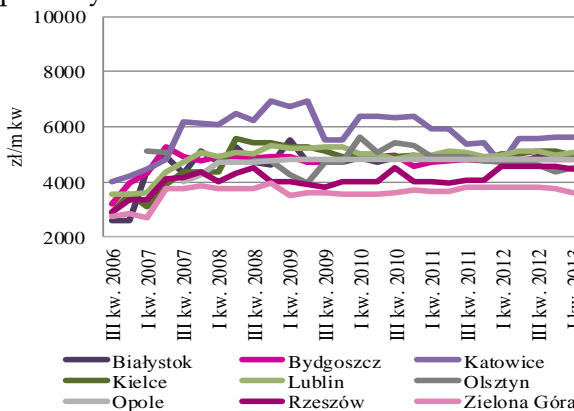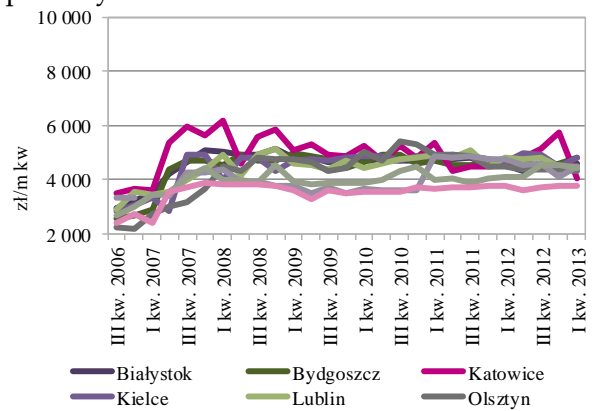
Figure 119. Supply and demand mismatch; units with usable area up to 40 square meters - primary market in 7 cities

Figure 120. Supply and demand mismatch; units with usable area over 40 and up to 59 square meters - primary market in 7 cities
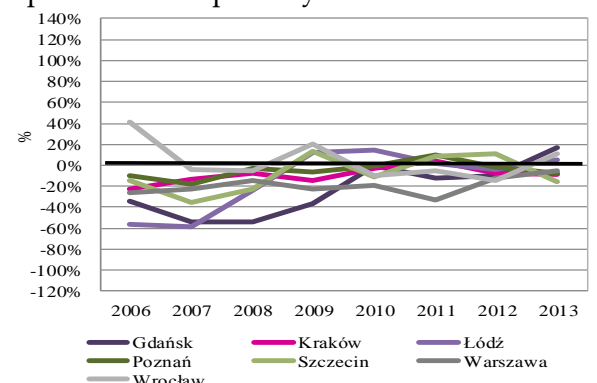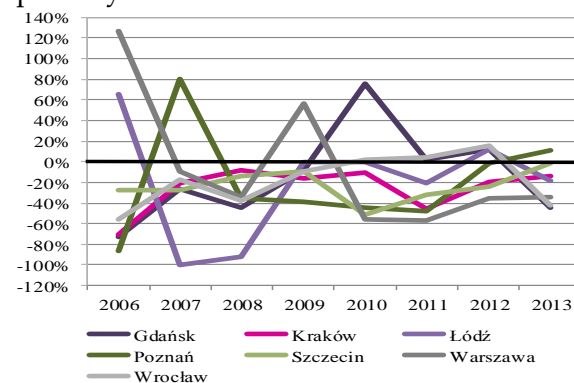
Note to Figure 124: The percentage mismatch between supply (housing offers by real estate developers) and estimated demand (housing transactions) with regard to housing unit area, according to the data from the BaRN database; the mismatch is measured as the share of housing units with

usable area of up to 40 square meters on offer in relation to the share of transactions in housing unit with usable area of up to 40 square meters (average for the last four quarters). A positive result (above the line) indicates the surplus of housing units with the given usable area and a negative - their deficit. The same applies to Figures 125 to 128 and 136 to 143.

Source: NBP.

Source: NBP.

Figure 121. Supply and demand mismatch; units with usable area over 60 and up to 79 square meters - primary market in 7 cities
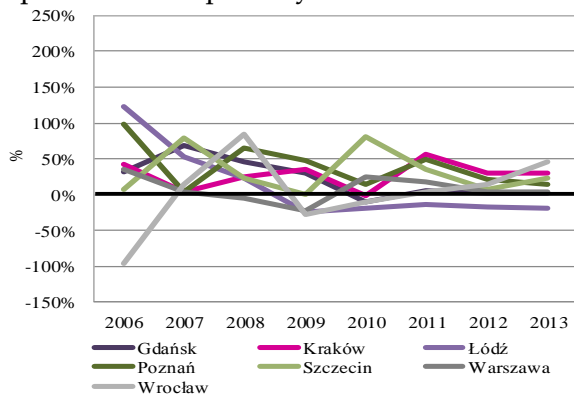
Figure 122. Supply and demand mismatch; units with usable area of 80 square meters and more - primary market in 7 cities
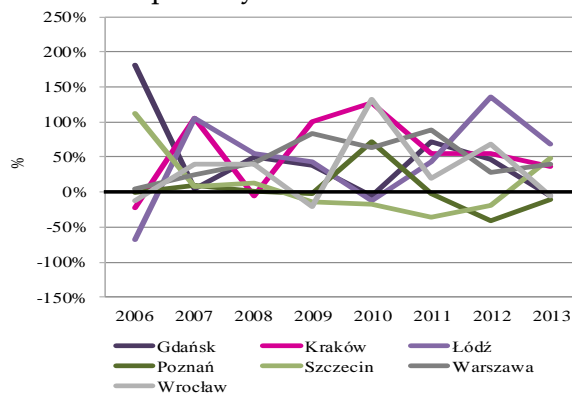
Source: NBP.

Source: NBP.

Secondary housing market according to the BaRN database

Figure 123. Year-on-year growth in asking prices in 7 cities - secondary market
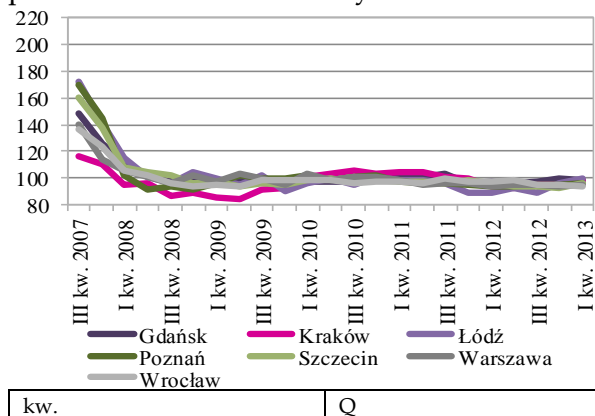
Figure 124. Year-on-year growth in asking prices in 9 cities - secondary market

kw.		Q

kw.		Q
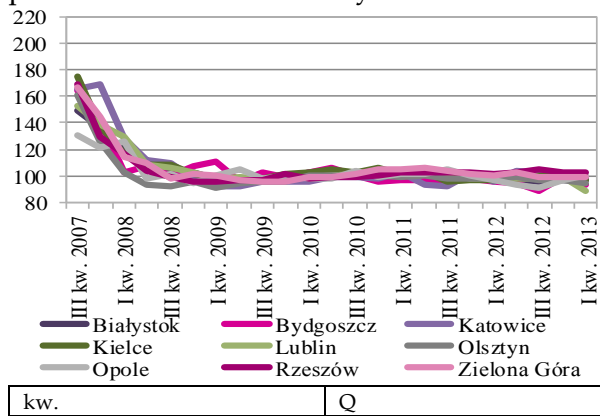
Source: NBP.

Source: NBP.

Figure 125. Year-on-year growth in transaction prices in 7 cities - secondary market

Figure 126. Year-on-year growth in transaction prices in 9 cities - secondary market
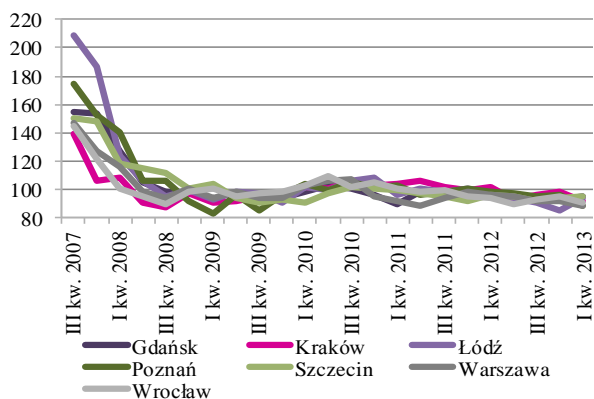
Figure 127. Median offer price in 7 cities - secondary market
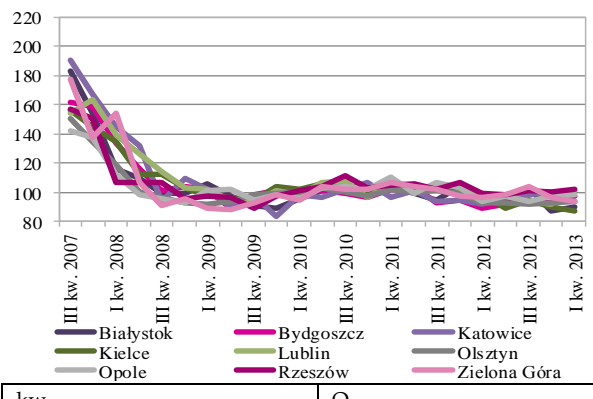
Figure 128. Median sale price in 7 cities - secondary market

kw.	Q
zł/m kw.	PLN/sq. m.

kw.	Q
zł/m kw.	PLN/sq. m.
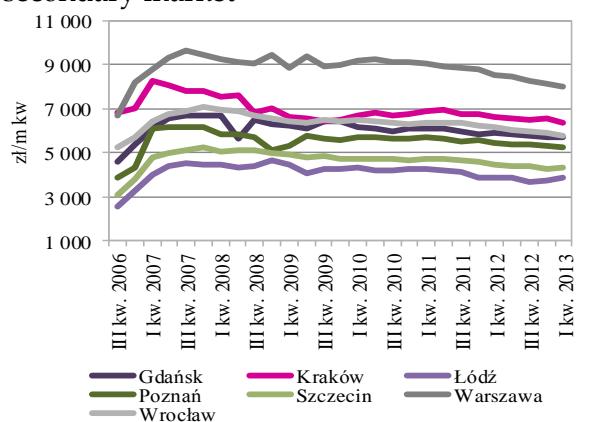
Figure 129. Median offer price in 9 cities - secondary market
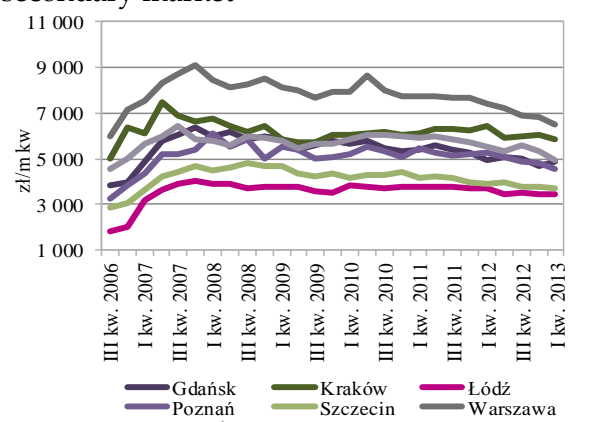
Figure 130. Median sale price in 9 cities - secondary market

kw.	Q
zł/m kw.	PLN/sq. m.

kw.	Q
zł/m kw.	PLN/sq. m.
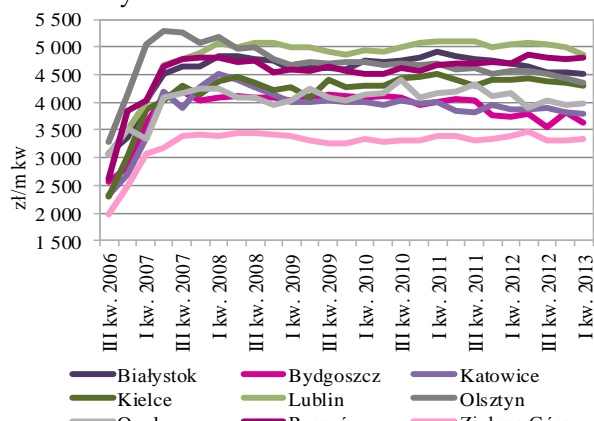
Figure 131. Supply and demand mismatch; units with usable area up to 40 square meters
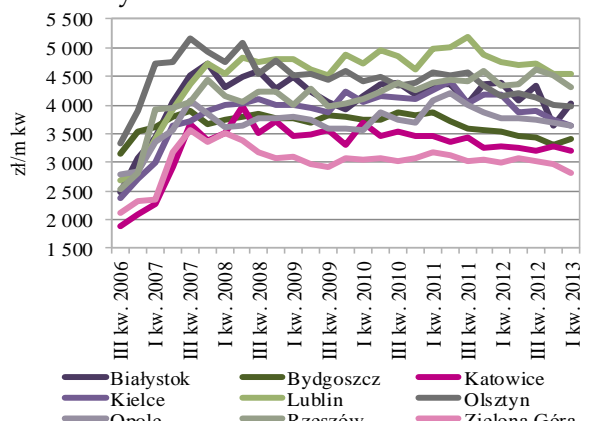
Figure 132. Supply and demand mismatch; units with usable area up to 40 square meters

- secondary market in 7 cities
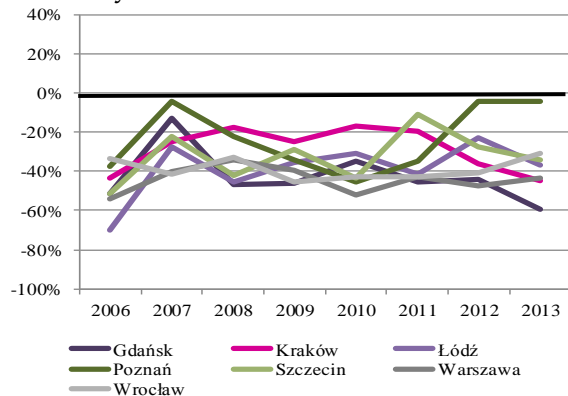
- secondary market in 9 cities

Figure 133. Supply and demand mismatch; units with usable area over 40 and up to 59 square meters - secondary market in 7 cities

Figure 134. Supply and demand mismatch; units with usable area over 40 and up to 59 square meters - secondary market in 9 cities
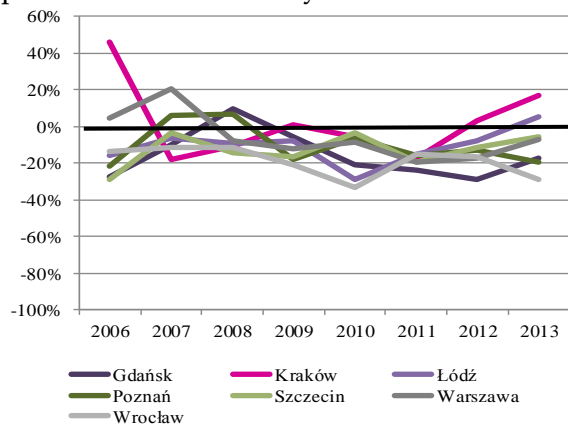
Figure 135. Supply and demand mismatch; units with usable area over 60 and up to 80 square meters - secondary market in 7 cities
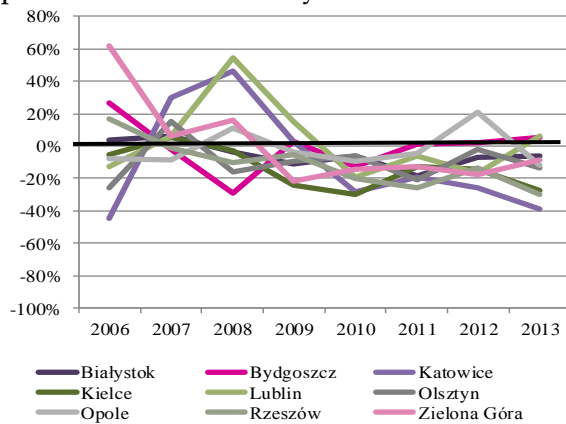
Figure 136. Supply and demand mismatch; units with usable area over 60 and up to 80 square meters - secondary market in 9 cities
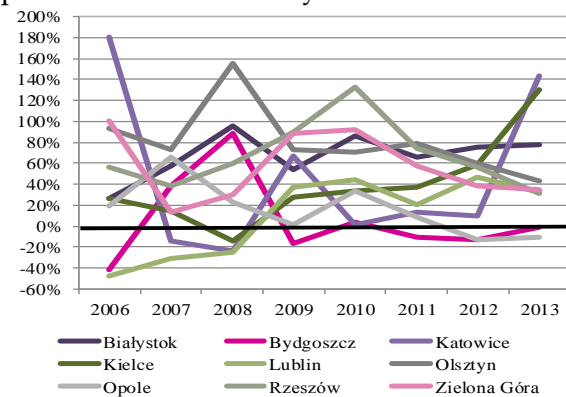
Figure 137. Supply and demand mismatch; units with usable area over 80 square meters - secondary market in 7 cities

Source: NBP.

Figure 138. Supply and demand mismatch; units with usable area over 80 square meters - secondary market in 9 cities

Source: NBP.

Figure 139. Average selling time in 7 cities - secondary market

kw.		Q
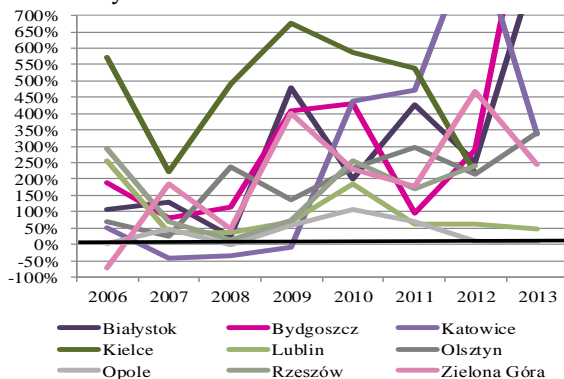
Source: NBP.

Figure 140. Average selling time in 9 cities - secondary market

kw.		Q
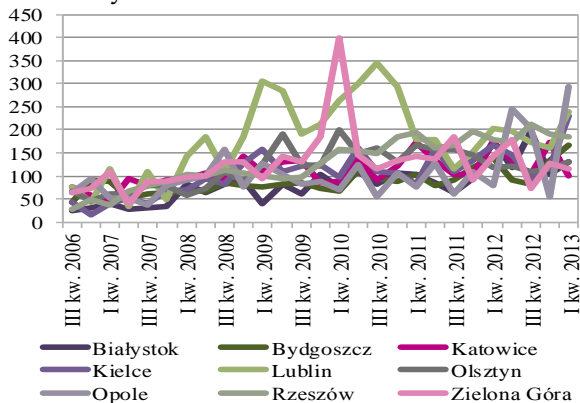
Source: NBP.

Figure 141. Correlation between average transaction price in the secondary market in 2012, average monthly wage in the enterprise sector in 2012, the city's population and the unemployment rate in 2012 [66]
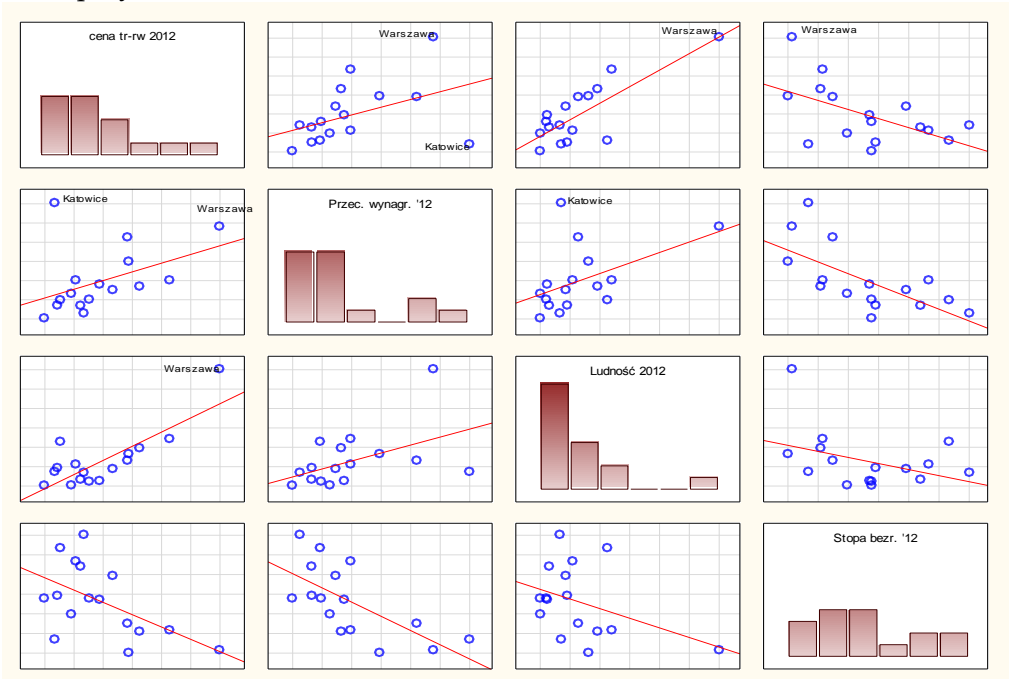
Source: NBP, GUS.

Housing rental market according to the BaRN database

Figure 142. Year-on-year growth in rental offer prices in 7 cities
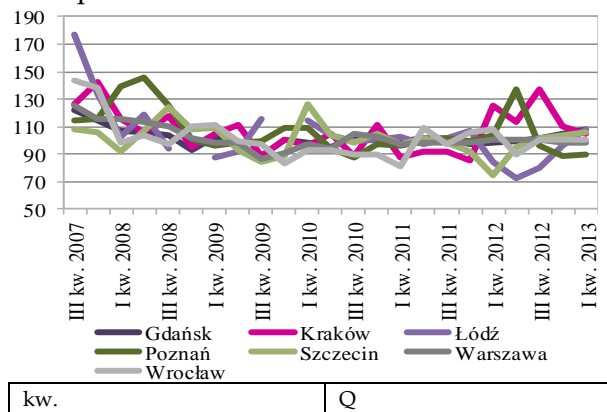
Source: NBP.

Figure 143. Year-on-year growth in rental offer prices in 9 cities
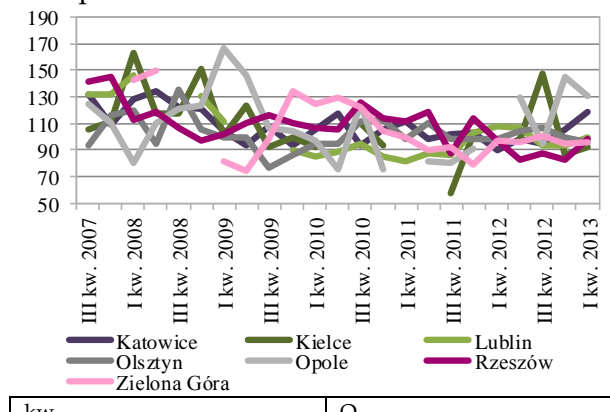
Source: NBP.

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[66] The correlation table presents relations between variables. The crossing point of variables X and Y in the table indicates the strength of their correlation. Correlation ranges from -1 to +1, with -1 meaning a full negative correlation between variable Y and X (when variable X increases by e.g. 1%, variable Y decreased by 1%), while +1 indicating a full positive correlation. Value 0 or around 0 means the lack of correlation between variable X and variable Y. The line on the figures denotes the strength of correlation.

Figure 144. Year-on-year growth in rental transaction prices in 7 cities

Gdańsk — Kraków — Łódź — Poznań — Szczecin — Warszawa — Wrocław

kw.	Q
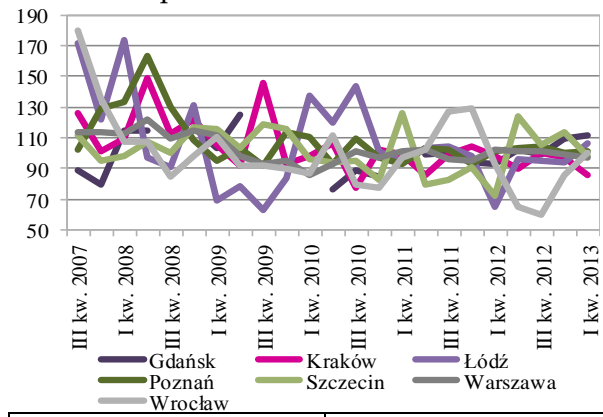
Figure 145. Year-on-year growth in rental transaction prices in 9 cities

Bydgoszcz — Katowice — Kielce — Lublin — Olsztyn — Opole — Rzeszów — Zielona Góra

kw.	Q
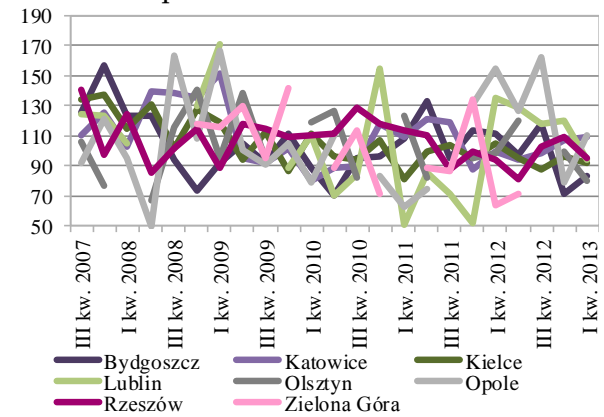
A2 Study of factors that differentiate housing prices and the possibility of their use at NBP

Marta Widłak[67]

Introduction

The aim of this article is to give a brief account of the main results of several years of research into factors that differentiate home prices in the local residential markets in Poland. These studies draw on international experience and our own empirical models using BaRN data.

Identification and quantification of factors differentiating home prices in a particular local market is one of the main stages of the home price analysis. Studies of this type are quite common in the developed economies, whereas in Poland the issue has rarely been addressed until now, in particular due to the lack of data. Identification and subsequent quantification of factors influencing the differences in the valuation of particular apartments, which are the result of a differentiated measurement of particular housing attributes (e.g. location, standard, size), is of great economic importance. In statistical terms, such an analysis enables a reliable measurement of prices and their dynamics in local markets by taking into account specific heterogeneous factors of housing units, and thus making them economically comparable. This makes it possible to predict how home prices in specific markets are shaped by changes in these factors, which is of particular importance for the quality of valuations and urban planning.

In the years 2005 - 2008 the housing market in Poland was marked by a demand shock resulting in high price inflation. The scale of price growth hit Poland's record high since the transformation period and exceeded inflation in other European housing markets. The following years 2008 - 2009 brought about a gradual stabilization of both demand and supply. Since 2010 until now we have experienced a slow adjustment of prices and a significant decline in both demand and supply in the local housing markets.

Fluctuations in the real estate price determine both the conditions in the housing sector and the size of residential construction. Prices in the housing sector, due to economic importance of housing, have a strong impact on the economic situation by affecting consumer and investment demand. The cost of buying an apartment reflected in its price, being a significant component of household spending, has significant implications for housing policy, expenditure from the state budget and local budgets. The issue of financing home purchases remains strongly linked with housing prices and consumer demand. In countries where home purchases are financed through the banking sector, there are strong interactions between the banking and residential property sector. Currently we continue to experience the consequences of the global economic crisis, whose origins lie in this type of

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[67] Instytut Ekonomiczny, Narodowy Bank Polski; Artykuł przedstawia główne wyniki rozprawy doktorskiej Marty Widłak, przewód doktorski przeprowadzono w SGH.

interactions. Excessive growth in home prices as compared to their value (speculative bubble), driven by financial innovations and global inflow of financial capital to the housing markets in the United States, led to the global economic crisis. In the face of this experience, housing prices have become a very important risk factor in the context of macro-prudential policy.

The issues addressed show that housing prices are an important variable influencing economic processes and an indicator of tensions and risks. For these reasons, it is necessary to monitor them on a regular basis and carry out various types of research on housing prices. Housing prices have become one of the key indicators closely monitored by central banks, including NBP, through the financial impact on the economy. At the same time, the experience of the developed countries shows that it basic monitoring of housing prices is impossible without answering a simple question about the factors contributing to housing price variations in the local market. Therefore, since 2006, Narodowy Bank Polski has conducted in-depth analysis of home prices, and one of its aspects is the impact of individual characteristics of housing on the total price of the property and the measurement of "pure" growth in housing prices.

Aim and scope of research

Heterogeneity of housing is one of its main features and is reflected in prices. Both basic monitoring of the housing market based on home price indicators, as well as other empirical studies using these indicators should take into account the diversity of the housing stock, and consequently their prices. Thus, understanding the mechanisms of how market prices of dwellings are shaped and their appropriate quantification are therefore of crucial importance. More advanced research is not feasible without more detailed insight into the nature of simple phenomena observed on a daily basis.

Analysis of the components of housing prices, which determine price differences in the housing market is important to measure price growth. In examining the factors differentiating housing prices in local markets, we ask a simple question: what determines the difference in price between x apartment and y apartment located in the same urban market and sold at the same time? The intuitive answer was suggested above – price diversity in the housing market is due to the widely understood heterogeneity of housing. The study verified this intuitive perception of local housing markets in Poland.

In economic theory, formal hypothesis consistent with that intuition was set up by Lancaster (1966) and is known as hedonic hypothesis. The is explained as follows: *goods vary in aggregates of characteristics, and the basis of economic choices are precisely those characteristics, not goods themselves*. Rosen (1974), assuming this hypothesis to be correct, gives a formal description of choices made by the consumer and the producer and the equilibrium in the differentiated goods market.

The conducted research is aimed to verify the hedonic hypothesis for the local housing markets in Poland. It was done by examining whether in the Polish housing markets prices are significantly differentiated by housing attributes as assumed in the hedonic hypothesis by Rosen and the hedonic equilibrium model. "Factors differentiating housing prices," or, in other words: "attributes, features, characteristics of housing" include,

for example, housing area, its location, standard, year of construction, proximity to public transportation, proximity of green areas, neighbourhood, etc.

The observed differentiation in home prices in the local market makes reliable measurement of price growth far more difficult. The hitherto research shows that reliable price growth results may be obtained only with the use of information which factors and to what extent determine home price differentiation. This is the so-called concept of hedonic price indices. A reliable measurement of price growth trends should be understood as measurement of "pure" price growth, which does not result from changes in the quality of housing sold in subsequent periods. Creating a "clear" housing price index was the second aim of the study.

The study sought to answer a number of specific research questions. The first question concerned economic theories explaining the phenomenon of differentiation in home prices in a particular local market. The second question referred to international research on factors differentiating home prices and the use of their results in practice. Third, the study attempted to compare the results of the author's own studies involving Poland's sixteen voivodeship cities and similar studies conducted abroad. The study paid special attention to reliable measurement of home price growth. Finally, it sought to answer the question whether the hedonic index, in contrast to the average price growth and median price growth provides a more reliable measure of price growth trends in the housing market?

Empirical research focused on the secondary residential market in multifamily housing construction in Poland's sixteen voivodeship cities. This choice was dictated by the availability of data in the BaRN (Database of Real Estate) database created by NBP. The study took into account transaction prices of apartments, since, as indicated by theoretical research, empirical estimation of hedonic models is justified for such prices only. For the purpose of empirical studies 96 separate hedonic regression models were evaluated. The first part of the study focused on transactions concluded in 2008, which was the year of a relative stability in the housing market (models labeled as M4 2008 in Table 1). The second part of the study was conducted for the period from 2006 Q3 to 2010 Q3 (all data available at the time of calculation, models designated as M1 in Table 1).

Major results and findings of research

The studies have confirmed the importance of the impact of selected structural and locational attributes on the market price of housing in the case of transactions recorded in the Polish local residential markets. The results, to the extent commensurate with the accuracy of empirical models (determined by the R^2), confirm the hedonic hypothesis in Polish conditions and, with some restrictions, may be applied in other empirical studies (see Table 1).

For all the cities, a correctly specified hedonic model was obtained, which confirmed the hypothesis of a relationship between the price of an apartment and its attributes. The coefficient of determination in the models estimated for Poland's sixteen urban markets averaged 45%. The corresponding value in the analysed foreign studies equals 73%. R2

below 40% was assumed the "weak" model criterion. Out of the 32 models examined in the first part of the study, 19 explained more than 40% of home price volatility. The quality of the estimates is not improved by another functional form or estimation method. As shown by subsequent results, the accuracy of the match can be boosted by including a detailed description of the location and neighbourhood. The quality of the data itself and inefficiency of the market (defined as non-compliance of the price of housing with its real value) is undoubtedly of importance. However, the result obtained can be considered satisfactory, and further research (e.g. based on alternative sources or obtained with the use of other econometric techniques) should help to resolve the issue of mismatch between the theoretical model and the reality.

Table 1 Hedonic models of home price in Poland's 16 local markets

Model	M1			M4 2008		
Statistics	Liczba obs.	R2	p-value w teście RESET	Liczba obs.	R2	p-value w teście RESET
Białystok	620	68%	0,18	111	65%	0,93
Bydgoszcz	1060	61%	0,00	275	36%	0,30
Katowice*	452	37%	0,00	118	41%	0,05
Kielce	1161	72%	0,28	220	46%	0,48
Kraków	1517	29%	0,20	147	58%	0,71
Lublin	1455	51%	0,00	344	33%	0,20
Łódź	652	78%	0,09	124	60%	0,39
Olsztyn	920	33%	0,33	74	29%	0,52
Opole	1340	11%	0,72	60	38%	0,16
Poznań	702	59%	0,14	44	55%	0,42
Rzeszów	903	26%	0,78	105	49%	0,12
Szczecin	1478	26%	0,09	163	38%	0,05
Trójmiasto	2900	49%	0,07	161	53%	0,83
Warszawa	1846	60%	0,19	399	63%	0,09
Wrocław	3526	16%	0,80	917	12%	0,63
Zielona Góra	353	49%	0,05	80	47%	0,14
Suma końcowa	20885	45% (średnia)		3224	45% (średnia)	

Source: Own study

Remarks to Table 1:
* Due to the absence of data, the results of the M4 2009 model are presented for Katowice.
** In the table, small samples are marked in grey colour - less than 100 observations, R2 value below 40% and p-value less than 0.05 which demonstrates the need to reject the null hypothesis of correct model specification at the adopted significance level of 5%. Names of cities for which at least one of the models had R 2 coefficient above 40% are bolded.

The second aim of the study concerned appropriate measurement of home price growth. Theoretical considerations and international experience suggest that information which factors and to what extent determine home prices differentiation, is particularly useful in the measurement of "pure" home price growth. The use of so-called hedonic indexes increases the reliability of the measurement thanks to replacement of simple median and average measures. The studies show that this statement is true for the

secondary housing market in Warsaw. As shown in the summary of the different measures (figures below), a change in housing quality significantly distorts the value of simple growth measures (average, median and simple stratification). A specially designed structure indicator shows that the largest differences between simple measures and the hedonic index are actually observed in quarters in which qualitative differentiation of sold apartments grows. The study shows the possibility and legitimacy of using hedonic indexes in the Polish residential markets.

Figure 1 Home price indices for Warsaw – simple methods and the hedonic index (2006 Q3 = 100)
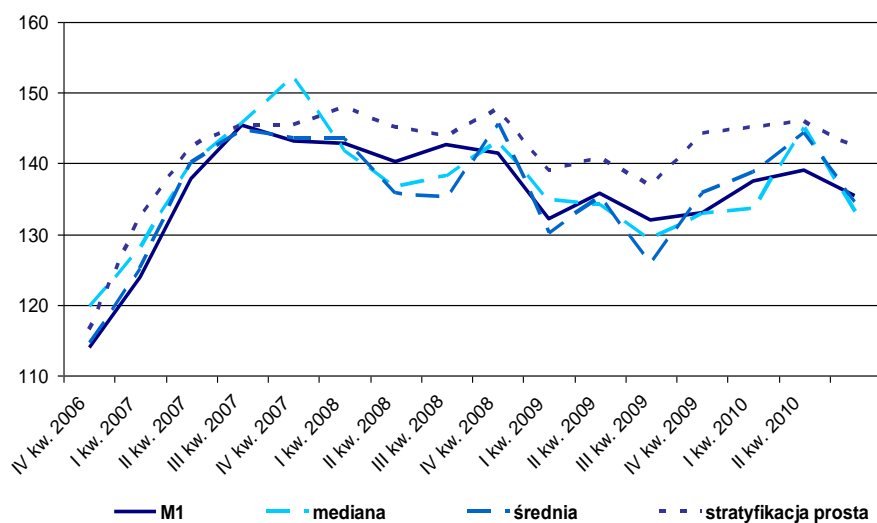
Source: Own calculations, BaRN data. Details of the methodology are presented in Widłak (2010).

Figure 2 Change in housing quality and selected price growth indicators for Warsaw (previous quarter = 100)
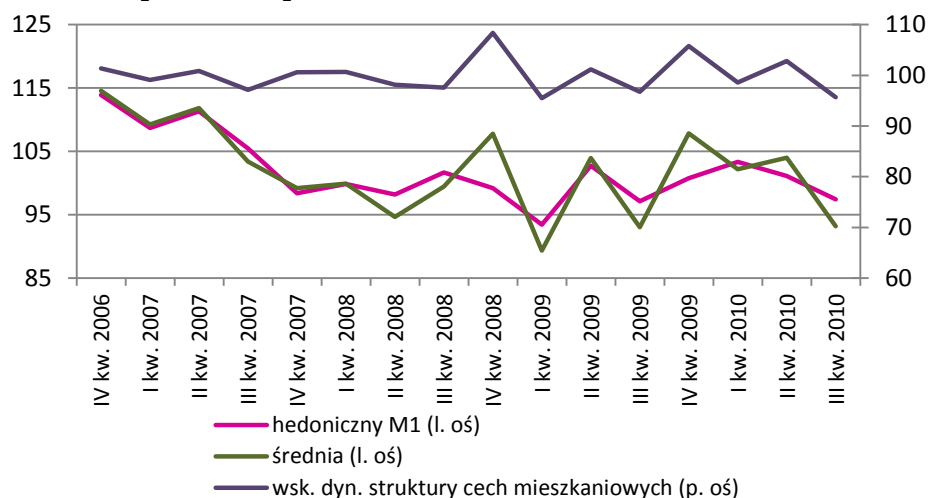
Indicators of changes in the structure of housing prices shows changes in the structure of major price attributes of housing
Source: Own calculations based on BaRN data.

Studies on factors differentiating housing prices and the strength of the impact of particular characteristics on the total price of residential property enhance the transparency of the market, and thus the efficiency of the search for and match between home buyers and sellers. This is probably the most important economic and social benefit of this type of research, although it becomes tangible in the long term.

Key detailed conclusions from the research have been presented below
It is only approximately that empirical hedonic models make it possible to identify characteristics that differentiate home prices and the strength of the impact of each of them on the total price of housing. The Rosen's market balancing mechanism implicitly assumes perfect clarity of the market and rationality of all market participants. Inefficiency of the real estate market is inherent in its nature, which means that, as a rule, there is no perfect match between the value of housing and its price. As a result, actual prices of housing do not correspond to the theoretical, hedonic price schedule, and empirical models can present this imperfect (in terms of the model) reality more or less perfectly. Using the Rosen's conceptual model we may suggest a graphic approach to the measure of inefficiency of the housing market (see Chart 3), and show how to distinguish this measure from the rest of the empirical regression model (see Figure 4).

Transactions illustrated by points A and E of the chart correspond to the market equilibrium. At point B there is no transaction, even though there is demand and supply for a given set of characteristics of z_B housing. This situation is caused by various reasons, such as information asymmetry, lengthy search for the buyer and the seller or on-going price negotiations. As a result, prices offered by the buyer and the seller vary greatly from each other and from hedonic prices. On the other hand, point C corresponds to the transaction, yet the transaction price of housing with z_B characteristics is not compatible with the

hedonic price schedule at point p (*zc*). Market inefficiency at this point may result from greater bargaining power of one market participant (in this case the seller), asymmetric information or other reasons, for which the buyer gives up and accepts the seller's inflated price. A similar situation occurs at point D. In the described situations (points B, C and D) values corresponding to market inefficiency measures are marked in coloured lines.

Analysis of the theoretical model leads to the conclusion that the residuals of the econometric model are the closer to market inefficiency measures 1) the closer the market to the equilibrium – actual prices "lie on the curve" *p (z)*, 2), the econometric model the better fits the actual data. Figure 4 shows the differences between the residual of the econometric model and the measure of market inefficiency. The curve *p (z)* represents the theoretical value of the estimated hedonic regression model. Point D, similarly as in Figure 3, corresponds to a situation where the actual transaction price is beyond the hedonic pricing scheme.

Figure 3 Housing market inefficiency in the Rosen's model

Figure 4 Empirical hedonic model and theoretical hedonic price function
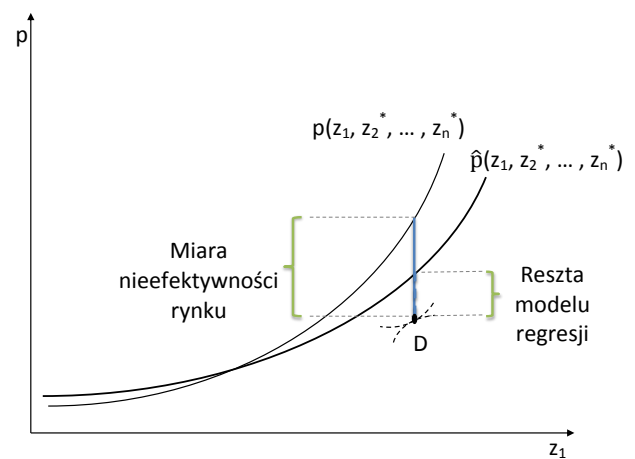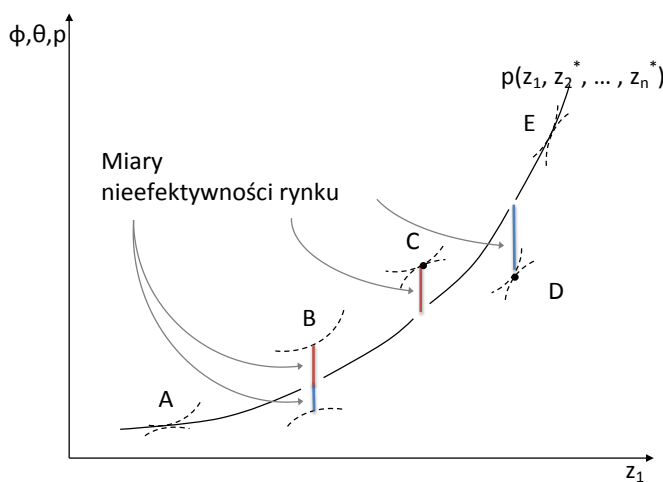
Source: Own study.

Source: Own study.

Based on the overview of international empirical studies it was found that factors differentiating home prices can be divided into four groups: structural factors, location, neighbourhood of the property and other factors. The most common structural features include: area, age of the building, number of bathrooms, garage, area of the plot etc. Location refers to variables determining the exact geographical or administrative location of the property. Alternatively, it may be expressed as the distance from the city centre. In the group of variables describing the property's neighbourhood is the information describing social and economic situation of residents in the near vicinity of the housing (income, education, age), as well as aesthetic aspects or landscape of its immediate environment (the view from the window, vicinity of green areas). The last group consists of

variables that capture other factors, such as: time needed to sell the apartment, growth in general price level, interrelation of other attributes.

Estimation of 96 econometric models, separately for sixteen urban markets in Poland, made it possible to identify and verify basic price-setting factors. The availability of data allowed the author to examine structural factors and generally defined location. As relevant data was missing it was impossible to verify factors determining neighbourhood of the property. The search for appropriate econometric models for particular local markets showed that there was no single, common specification of these models. Key features present in two or more cities include: size of the apartment, its location, standard of the finishing, building technology, floor, year of construction, type of ownership, type of the kitchen, and number of floors in the building (frequency of their occurrence in the local markets is shown in the table below). Potentially influential variables, such as garage, surface (balcony, terrace, loggia), the overall technical condition of the entire multi-family building or elevator proved of no importance.

Table 2 Housing features the most common in hedonic models in Poland's 16 cities

Type of variable	Models M4 2008 (number of occurrences of the variable)	Cities in which the variable was non-existent
Size of housing	13	Katowice, Łódź, Trójmiasto
Location (district, housing estate, sub-district or their assessments)	13	Olsztyn, Opole, Zielona Góra
Standard of finishing	12	Olsztyn, Rzeszów, Wrocław, Zielona Góra
Technology of construction	12	Cracow, Opole, Warsaw, Wrocław
Floor	10	
Year of construction	9	
Cooperative ownership	8	
Kitchen	6	
Number of floors	5	
Interaction	2	
Other variables (pz, x8, SO, garage)	1	

Source: Own study .

The estimated models confirmed the theory of nonlinear relationships between the price of housing and its attributes. On the other hand, correlation of prices of particular attributes was not so evident in the empirical models, as expected on the basis of the theoretical model. It is surprising that both in the author's our studies, as well as in foreign studies, interaction variables proved to be significant only in 10 out of over 32 analysed markets (6 times in foreign studies and 4 time for the local markets in Poland).

Empirical hedonic models have other practical application, apart from measurement of home price growth, namely:

- Knowledge of estimates of the hedonic function and implied housing characteristics allow for an objective and automatic valuation of the market value of the property. Hedonic pricing provides the basis for cadastral tax systems and can raise the quality of property appraisals made by professional appraisers.

- The use of hedonic home price models makes it possible to assess the importance of particular characteristics of the urban space, which include, among others, public goods and environmental aspects. Factors such as availability of educational infrastructure, health

care facilities or transport infrastructure, green areas, safety and many other values are "purchased" with the apartment. Market valuation of these factors is an objective measure of the value attributed to them by market participants and can be used, for example, in urban planning or assessment of cost effectiveness of public investment. Knowledge of this appraisal makes it possible to objectively assess the decisions and measures taken by the central and local government units. As shown in the overview of international studies, the use of hedonic models is relatively the most common abroad.

- Decision-making of home buyers based on the results of such studies is more reasonable and may facilitate price negotiations. Such results also make it possible to form appropriate expectations of the transaction price, so that it corresponds to the actual market value of the property and allows producers to adjust the structure of housing supply and demand. The latter concerns both real estate developers and home owners engaged in renovation and modernization of the existing housing stock.

- Measuring home price growth is a particularly important area where the results of the analysis of home price factors can be used. Reliable price indexes are the basis for monitoring the sector and conducting further studies of structural relationships in this market and macroeconomic research. These measures allow for an appropriate conduct of the state's economic policy.

There are several different methods of constructing hedonic home price indexes. These methods can be classified according to the proposed scheme (see Figure 1). The detailed description and comparison of the methods suggests that it is possible to use four of the six methods provided data on the Polish property market are available. For theoretical reasons (compliance with the statistical index theory), the preferred method is the price characteristics method. The author's own empirical studies involving the Warsaw market suggest, however, that the index specified by temporal dummy variables or direct imputation method should be used.

The conducted analysis shows that for Polish residential markets, it is possible and desirable to replace simple price indexes with hedonic indexes. Hedonic home price indexes based on the method of time dummy variables of all and neighbouring periods and on the direct imputation method, give parallel results. The least favourable and reliable, probably due to the small samples of data is the characteristic price method, although considered the best in theory. In the case of poor quality measures and partial databases, home price growth should be tracked with the use of several alternative indexes. In particular, if the use of hedonic methods is not possible, it is recommended to use indexes based on a simpler "quality" adjustment method such as stratification. The design of a structural change indicator may be another area of potential research. However, in the latter case, the data requirements are similar, if not the same as in the hedonic price indexes.

Figure 1 Breakdown of method of constructing hedonic indexes/indices .

| METODY KONSTRUKCJI HEDONICZNYCH INDEKSÓW CEN |

POŚREDNIE
- Pośrednia metoda imputacji
- Metoda hedonicznego dopasowania jakości

BEZPOŚREDNIE
- Bezpośrednie metoda imputacji
- Metoda cen charakterystyk
- Metoda ze zmiennymi zero-jedynkowymi czasu (ZZC)
  - Metoda ZZC sąsiadujących okresów
  - Metoda ZZC wszystkich okresów
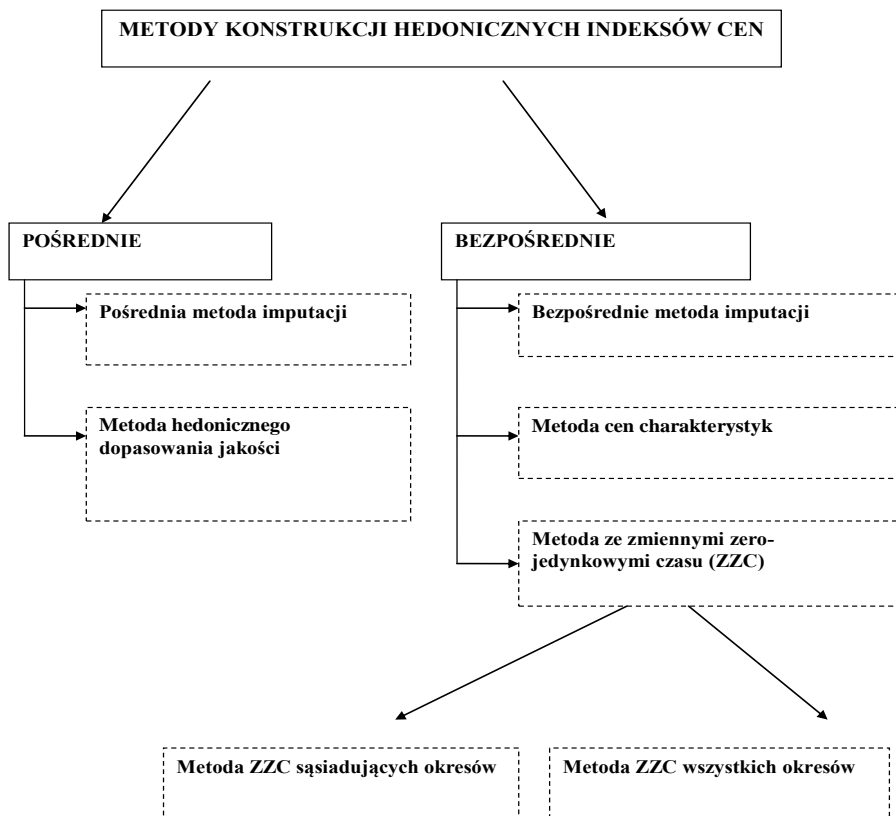
Source: Own study based on literature.

Methods of constructing hedonic price indexes

Indirect	Direct
Indirect imputation method	Direct imputation method
Hedonic qualify adjustment method	Characteristic price methods
	Time dummy variable method
Time dummy variable method of neighbouring periods	Time dummy variable method of all periods

Source: Own study based on literature.

Directions of further research

The conducted analysis has opened several new directions in which research should be continued and expanded. These include the following:

Improving the quality of empirical model adjustment. As noted earlier, the estimated econometric models do not exhaust the list of factors that differentiate prices: first, due to the multitude of factors determined by needs and preferences of buyers and users of housing, and second, due to the absence of opportunities to expand the database to include an extensive set of additional variables. Further research relies on more common and available technology capabilities and sources of data from the GIS (Geographical

Information Systems), to conduct more detailed analysis of the impact of the location and neighbourhood of the property on its price. Preliminary results of this type of research conducted at NBP confirm a significant improvement in estimation results with the use of these variables.

Use of spatial econometric methods to exclude the impact of spatial relationships between home prices on the efficiency of the LSM estimator (Least Squares Method). In some international studies, spatial autocorrelation of the random component turns out to be significant. Therefore, it is also worth considering whether we should measure the impact of the identified problems (estimation method and functional form, absence of important explanatory variables, poor data quality and inefficiency of the market) on moderate quality of empirical models for the Polish market.

Identification of causes of different specifications of hedonic models and differentiation of implied characteristic prices across the cities. Potentially interesting conclusions can be drawn from the comparison of implied characteristic prices between the cities and their reference to the fundamental factors affecting demand and supply of housing. Comparison of regression coefficients between markets itself is difficult to make due to different specifications of models and classification of output variables, as well as a large variance of statistical significance of estimates. The analysis of this type refers to the so-called second phase of the hedonic analysis, involving identification of the implied curves of supply and demand of housing characteristics. This is a difficult problem in theory, but in practice, the lack of relevant data is a barrier for Poland.

Choosing the right method of constructing home price index. It should be noted that the studies of the time dummy variable method of all and neighbouring periods gave almost identical price growth values, although, in theory, they differ in the fundamental assumption of the alleged characteristic price stability. Identification of the reasons therefor opens up a new field of research. Statisticians using the statistical index theory and, at the same time, trying to answer the question of whether the indexes based on the time dummy variable methods have formal properties of statistical price indexes.

In the subsequent years, the Real Estate Market Team at NBP plans to launch similar studies for the primary market apartments and single-family housing, which in many cities are an important segment of the market.

Literature:

Lancaster, K.J. (1966), *A new approach to consumer theory*, Journal of Political Economy, No 74 (2), p. 132.

Rosen, S. (1974), *Hedonic prices and implicit markets: product differentiation in pure competition*, Journal of Political Economy, pp. 34-55.

Tomczyk, E. i M. Widłak (2010), *Konstrukcja i własności hedonicznego indeksu cen mieszkań dla Warszawy*, Bank i Kredyt, no. 1.

Widłak, M. (2010), *Metody wyznaczania hedonicznych indeksów cen jako sposób kontroli zmian jakości dóbr*, Wiadomości Statystyczne, no. 9.

Widłak, M. (2013), *Czynniki różnicujące ceny mieszkań na lokalnych rynkach w Polsce*, rozprawa doktorska, przewód doktorski przeprowadzono w SGH [doctoral dissertation at Warsaw School of Economics]

A3 Housing in consumer's theory

Jacek Łaszek[68]

1. Introduction

The residential sector, as a socially important one, has been of interest to economists already for decades. The 20th century, with increasing stock of residential property, related home construction and mortgage debt, apart from purely consumer and social function, saw growing role of the housing sector as a driver of economic growth and stability of the financial sector. This was reflected in the massive abundance of studies dealing with the subject, especially after the recent real estate crisis. These studies, addressing various aspects of the sector's impact on the economy, and vice versa, generally adopt quite simplistic assumptions about microeconomic nature of housing and related consumer and investment choices of households (see Allen and Carletti, 2011). Meanwhile, as the recent experience and traditional economics teach us, macroeconomic models based on insufficient microeconomic assumptions, generally fail to adequately reflect the surrounding reality. The housing market, considered both locally and as an aggregate at the macroeconomic level, is an imperfect market, subject to cycles and crashes (a rapid collapse in prices driven by a massive default on mortgage loans). This is due to balancing market mechanisms (long delayed response of supply, demand shocks impossible to be offset, accumulating tension, over-regulation and temptation to act on speculation), as well as the conditions of its functioning (strong and nationally differentiated impact of the government's policy and related common over-regulation as well as multiplicity of market participants). The literature points to numerous cases of particular vulnerability to manipulation and speculation, low transparency due to difficulty of data access, strong political orientation, related to the type of needs, often affecting the financial system that requires extensive regulation, and therefore is often subjected to incompetent and pro-cyclical interventions (see Case., and Shiller, 2003, Herring and Wachter, 1999).

These characteristics, widely discussed in the sector's literature, are, to some extent, the result of housing characteristics which make housing different from most other consumer goods (see Yang, 2006). This articles focuses on those differences that have an impact on consumer choices without going into the mechanism of market functioning, arbitrage between its elements and mechanism of business cycles (see Wheaton, 1999).

This article aims to deepen the knowledge on consumer choices from the microeconomic perspective so as to better understand the behaviour of home buyers and its impact on the housing market. Chapter 2 presents basic aspects of consumer analysis in the housing market. Chapter 3 provides an analysis of housing understood as consumer and investment goods. We then discuss its market value and cost. This analysis helps to better understand housing choices of consumers. Then, we take a detailed look at the choice of housing as a heterogeneous good. Taking into account conclusions derived from the above

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[68] Warsaw School of Economics and Economic Institute, Narodowy Bank Polski.

points, we demonstrate the complex choice of the housing demand structure in the form of savings and consumption. Conclusions are presented in Chapter 4.

2. Basic areas of consumer analysis in the housing market

The basic problem which we face while analysing housing as a consumer good is its duality leading to its heterogeneity both as a durable consumer good or a capital good generating consumer services and, at the same time, an investment good, bringing income and appraised by the market. In the case of OOH housing, both choices are correlated, because what we see in the market as housing demand is the sum of investment and consumer demand.

Housing is a durable consumer good, or alternatively interpreted, productive capital generating a stream of services to meet consumer needs. As a result, there is a market of housing services and capital markets (housing stock), where market prices of services and capital goods are shaped. The financial market is involved in allocating the capital, as a result of which financial assets are created on the basis of housing capital. In the case of OOH housing, we have to do with capital and different services generated to meet home owner's needs, which means that housing is perceived as a durable consumer good with specific attributes.

Heterogeneity of housing affects choices of housing consumers, both in terms of consumption and investment. Both these decisions create the total housing demand, although in both cases the expected characteristics are different. However, even if we look at consumer's choice between OHH and rented housing alone, the choice of OOH always involves an element of investment in the form of down payment.

In each of those two functions, housing is a heterogeneous good (see Tomczyk and Widłak, 2010), which means that its utility value is not determined by points, but as a range[69]. Additionally, each feature differs in quality or quantity. This means that individual value of housing for consumer is the sum of its attributes weighted by consumer's preferences, similarly as in the case of the seller (purchase on the secondary market). In the case of real estate developers the issue is more complex – they have to produce housing to individual order, or based on market research. From the point of view of consumer and producer optimization this is a major problem as the bundle of attributes (qualities) is subject to optimization. We optimise its composition and quantity of quality for each attribute and the number of produced goods (more on the producer's side).

As a result, the main problem that we face when analysing consumer's and investor's choice in the housing market is a multi-dimensional character of housing and, in consequence, its choice, which is optimization of numerous variables. For analytical purposes it is better to reduce the number of dimensions of decisions taken. Household's

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[69] Simplifying, it can be said that in the case of homogeneous goods, the price of the good is defined by points on the supply and demand curves (e.g. kilogram of sugar). However, for heterogeneous goods there is a certain range of quality and related prices, which consumers can choose, for example, by choosing different standards of interior design will have to deal with different prices per square meter (see Rosen, 1974).

actual optimization possibilities suggest a similar approach. Also monitoring of the housing market and households and as well as analysis of the recent literature on the functioning of the human brain[70], lead to a conclusion that household's basic behaviour is optimisation limited to a few, maximum six to eight dimensions, whereas other variables are seen as auxiliary conditions or forms of itinerary procedure (consultation with wife, friends, further research, consultations, etc.). We also do not know the interaction between variables and we have no guarantee that clients' expectations will not change in time and space. As a result, it is difficult to predict which attributes of housing will affect optimization of the choice and which will only be auxiliary conditions temporarily taken into account by a household, as what we observe in the market is the final result of the entire process. This behaviour is more like a series of partial optimizations. On the other hand, the use of methods of experimental economics may be a good way to approximate the final solution. However, since the number of choices and variables is limited, we can talk about the distribution of probability of decisions, which may be a better option than relying on multi-dimensional deterministic models of optimization. Many studies have shown that theoretical models can explain consumer's behaviour, yet the problem is the number of errors. The question then arises whether the number of errors can be reduced or whether it a structural feature of this market.

An important additional factor affecting choices is the fact that the housing market is an imperfect local market, with poor flow of information, where choices are made on individual basis by matching housing features with buyer's preferences.

Weaknesses in the functioning of the housing market make matching the structure of supply with the structure of demand very difficult. As a result, valuation of characteristics is ambiguous and each transaction unique in nature. In contrast to homogeneous goods we do not have to do with a single point of equilibrium, but a locus of points of equilibrium. While analysing consumer choices of households we look at consumption as a stream of services. Basic consumer choices are decisions on housing consumption (how much housing versus other goods and how much housing versus savings) and the choice of the form of consumption between home ownership and home rental (see Augustyniak et al., 2013). Depending on the form of ownership, the cost of service is impacted by the effective interest rate and changes in the value of housing (OOH) or market rents. They affect the household's budget line. In the case of OOH, the interest rate affects the cost through interest charged on mortgage loan or the foregone interest (alternative cost) in case housing is debt free and the capital could be invested elsewhere. Both interest rates usually differ from each other[71], yet, for the sake of simplicity, it can be assumed that in this case they are similar. It is also worth noting that in the short term there is no clear correlation between the rent, whose level is determined by supply and demand in the rental market, and the

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[70] Kahn, Moore and Glazer (1987) argue that cognitive limitations of the human mind do not allow simultaneous processing of large sets of information, which imposes hierarchical decision-making.

[71] In the case of Poland, they are different, but they can also be the same in the case of the so-called personal loan, provided by the home owner to the home buyer without bank's assistance.

cost of OOH purchased with a mortgage or estimated with the use of alternative cost of own capital. In the latter case, the situation on the capital market and the OHH market is the decisive factor. Thus, while the choice between home ownership and home rental involves no difference in the level of consumption, there may be differences in the short- and long-term costs of financing this consumption and non-cost elements affecting the choice (attachment to the dwelling, social security), where the basic cost are the loan instalments of the investment asset in the case of ownership. Thus, purchase of OOH is a form of saving.

In the OOH model, decisions become more complex, as apart from the decision on the quantity of housing consumption, there is another choice to be made "how much housing as savings" associated with the nature of housing investment and property market. On the other hand, investment (savings) may be considered as a combination of two choices, namely "how much housing, taking into account changes in its value" (which we identify with the short-term, speculative element) and, "how much housing taking into account maintenance of its real value, or/and regular rental income " (which we can identify with the long-term precautionary aspect). Both investment choices are reflected in the market in the form of additional housing demand, yet, in the former case, housing will be sold when it reaches the assumed price. In the latter case, however, housing will be kept as a an asset and leased to generate current income. As a result, housing demand is a combination, in specific proportions, of two choices, "how much housing as consumption" and "how much housing as savings".

Yet, the problem of choosing between "housing as consumption" and "housing as investment" is more complex. The aim of the speculative housing investment also may have a housing aspect. Indeed, such situations are observed in the market ("I will buy additional housing units with a mortgage to sell them and earn for my own home"). The basic analytical problem consists in the fact that demand for housing observed in the market has no attributes and it is difficult to break it down into the discussed categories (see analysis by Henderson and Ioannides, 1983 and Ioannides and Rosenthal, 1994).

Housing as a heterogeneous good is a combination of its characteristics, which decide whether housing needs will be met and make up the market and individual appraisal of its value. Consequently, the choice of housing is always the choice of its characteristics. Consequently, this decision affects other consumer choices. Looking conversely, every change in prices in other markets affects housing choices, demand for housing characteristics and their market appraisal.

As a result of durable character of housing and performance of services in the horizon beyond the household's lifetime, we have to take into account a different behaviour of households that already have housing, and those who intend to buy it. Moreover, households already in possession of housing will be in another point of utility function and will differently appraise the value of additional living space. Changes in the value of housing will also cause changes in household's assets, thus changing their point of equilibrium, including the one concerning housing consumption and choice of home attributes.

The durable character of housing, understood as possession of a housing asset or generally, the current level of housing consumption, will also significantly impact consumer choices at the macroeconomic level. Although each individual consumer may sell his small apartment and possibly buy a new, as large as possible one, at the macroeconomic level this is not so simple. The rise in households' income and related increase in demand for a higher quality housing can only be realized if larger housing stock is produced. At the same time, unlike other consumer goods, where a significant increase in consumption of a particular good may rise significantly in a relatively short period, in this case this increase is spread over the years. As a result, the consumer does not move along the utility curve by choosing subsequent housing baskets, but moves along the chord, appraising subsequent housing units separately. This has a significant impact on the valuation of housing consumption, which has the form of additional units rather than packages as in the case of perishable goods. Moreover, when analysing housing consumption, we should bear in mind that unlike with other goods, most people, especially in our climatic conditions, have already satisfied their housing needs in one way or another, so the choice is made not from the very beginning, i.e. from the point of living in the street to the point of possessing a home. We can clearly distinguish the category of the so-called first-time buyer, namely, for example, young couples renting an apartment or living with their parents, for whom independent living is a very strong need (Reed and Mills , 2007). Yet, a lot of households already have their own housing (according to Eurostat) and possibly consider getting a bigger one. When compared to the choice of perishable goods this is the situation where, for example, we wonder whether to buy a pear or an apple, having already eaten one pear , and not having an empty stomach.

The model of Aoki, Proudman and Vlieghe (2002) well illustrates choices of consumer who, already in possession of housing, buys or sells subsequent units. In the case described in this article, consumer is owner of housing and can increase it or decrease it in subsequent periods. Consumer's intention is to maximize the utility over his lifetime (*maxU (C, H)*) by trying to balance between the level of housing consumption (*H_t*) and consumption of other goods (*C_t*) in various periods. In order to compare utility of housing and utility of other goods, we take into account the imputed rent calculated as the value of housing $p_t H_t$ multiplied by coefficient *k*, reflecting the rent to price ratio (see Bajari et al., 2013). Moreover, β <1 is a parameter that takes into account decreasing utilities in the time function. Periods of consumer's lifetime are marked with *t* indexes:

$$\max U(C,H) = \sum_{t=0}^{\infty} \beta^t \left(\theta C t^\mu + (1-\theta)(k p_t H_t)^\mu \right)^{\frac{1}{\mu}}$$

In the analysis, budget constraints were introduced for the two subsequent periods (*b_t, b_{t+1}*):

$$b_t = c_t + r_t p_t H_t + S_t$$

$$b_{t+1} + (1 + r_t)S_t = c_{t+1} + r_{t+1} p_{t+1} H_{t+1}$$

$$b_{t+1} + (1 + r_t)(b_t - c_t - r_t p_t H_t) - c_{t+1} - r_{t+1} p_{t+1} H_{t+1} = 0$$

Thus, the Lagrange equation was obtained,

$$\mathcal{L} = \sum_{t=0}^{\infty} \beta^t \left(\theta C t^{\mu} + (1-\theta)(kpHt)^{\mu} \right)^{\frac{1}{\mu}} + \lambda \left(b_{t+1} + (1+r_t)(b_t - c_t - r_t p_t H_t) - c_{t+1} - r_{t+1} p_{t+1} H_{t+1} \right)$$

Optimal solutions show the correlation between the quantity of housing and consumption in two different periods (inter-temporal choice):

$$H_t = \left[r_t p_t (1+r_t) p_{t+1}^{\mu} H_{t+1}^{\mu-1} \frac{\beta}{r_{t+1} p_{t+1} p_t^{\mu}} \right]^{1/(\mu-1)}$$

$$C_t = \left[(1+r_t) C_{t+1}^{\mu-1} \beta \right]^{1/(\mu-1)}$$

and the correlation between the quantity of housing and consumption in the first period and the second period (intra-temporal choice):

$$H_t = \left[\frac{r_t p_t \theta C_t^{\mu-1}}{(1-\theta)(kp_t)^{\mu}} \right]^{1/(\mu-1)}$$

$$H_{t+1} = \left[\frac{r_{t+1} p_{t+1} \theta C_{t+1}^{\mu-1}}{(1-\theta)(kp_{t+1})^{\mu}} \right]^{1/(\mu-1)}$$

Purchase of additional units of goods, when one is already in possession of the stock of goods, is particularly important in the case of residential property, where, on the one hand, income is variable and, on the other hand, the stock relatively rigid. With rapidly changing income, housing becomes a relatively rare good and its prices rise. In case the trend is reversed, when during the crisis income falls, this is often accompanied by price bubble burst and a surplus of unsold housing put on the market.

This problem can be easily presented in graphical and tabular format using the simplest indifference curve (Figure 1, Table 1). We analyse two goods, where z means housing consumption and x means consumption of other goods.

Figure 1 Household indifference curve when choosing housing and consuming other goods

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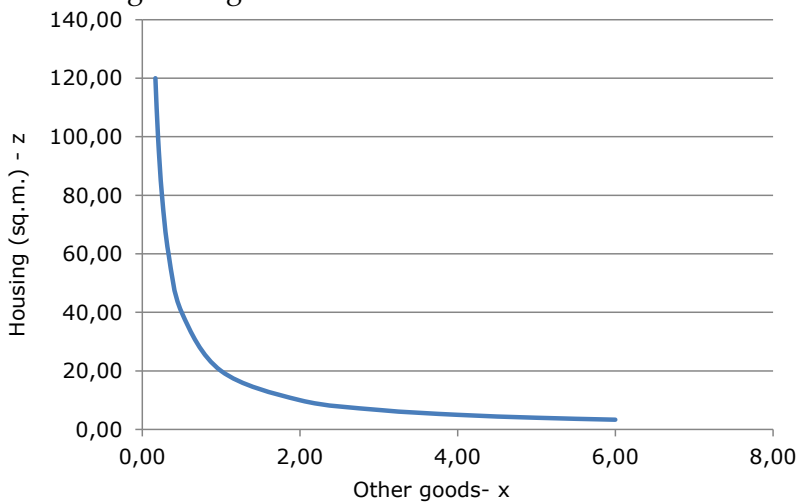
All combinations of good x and z on the curve are equally preferred and with the assumed budget b, consumer appraises the good z, depending on its quantity, and denotes average prices of subsequent bundles of goods as p_z. p_z , whereas p_z'' is the price consumer can pay for additional housing units.

When income of the society and that of individual consumers increases, demand for housing, which is almost proportional to income, will rise too. Housing becomes a relatively rare good and its price accepted by consumers, fitting within their budget and meeting their preferences, will grow. However, as already mentioned, in the case of housing, the mechanism is modified. If you already own 20 square meters of housing, and want to have 30 square meters, then you do not buy 30 square meters, paying 333 PLN per one square meter (which is of course included in the monthly stream of expenses), but only buy 10 square meters paying PLN 333 per one square meter to add to the already possessed 20 square meters of housing, for which you paid PLN 500 per square meter. Thus, you do not buy goods in packages, but move along the utility curve. As a result, your prices are average prices of such a combination. Dependence of home prices housing on the quantity of housing consumption is presented in Table 1.

Table 1 Home prices and household income

x*z=n; n=	20				t. kons	Increase	decrease					
budget b=	20000	x	z	px	pz	pz'	pz"	pz-pz'/pz	pz	pz"	z	pz-pz"/pz
quantity x=	6.00	6.00	3.33	1666.67	3000.00	3000.00	1020.45	0%	83.33	83.33	120.00	66%
	5.00	5.00	4.00	2000.00	2500.00	2750.00	822.50	-10%	100.00	91.67	100.00	67%
	4.00	4.00	5.00	2500.00	2000.00	2500.00	636.11	-25%	125.00	102.78	80.00	68%
	3.00	3.00	6.67	3333.33	1500.00	2250.00	465.63	-50%	166.67	118.75	60.00	69%
	2.00	2.00	10.00	5000.00	1000.00	2000.00	317.86	-100%	250.00	145.00	40.00	68%
	1.00	1.00	20.00	10000.00	500.00	1750.00	204.17	-250%	500.00	204.17	20.00	59%
	0.50	0.50	40.00	20000.00	250.00	1535.71	145.00	-514%	1000.00	317.86	10.00	42%
	0.33	0.33	60.00	30000.00	166.67	1364.58	118.75	-719%	1500.00	465.63	6.67	29%
	0.25	0.25	80.00	40000.00	125.00	1226.85	102.78	-881%	2000.00	636.11	5.00	18%
	0.20	0.20	100.00	50000.00	100.00	1114.17	91.67	-1014%	2500.00	822.50	4.00	8%
	0.17	0.17	120.00	60000.00	83.33	1020.45	83.33	-1125%	3000.00	1020.45	3.33	0%

This mechanism alters household choices. In the "catch-up" for housing consumption, the household pays more than it would should it purchase the target level of housing at the beginning, providing real estate developers with a specific premium. This mechanism also works the other way round. When there is too much housing, for example, after the crisis, the gradual sale of housing on the market means that prices effectively paid to real estate developers are much lower and grow slower. What real estate developers have gained during the boom may be forced to give away during the recession. This phenomenon is additionally explained by accelerating prices during the housing boom and developers' problems with getting out of the recession (see Figure 2).

Figure 2 Changes in home prices during the boom and during the recession
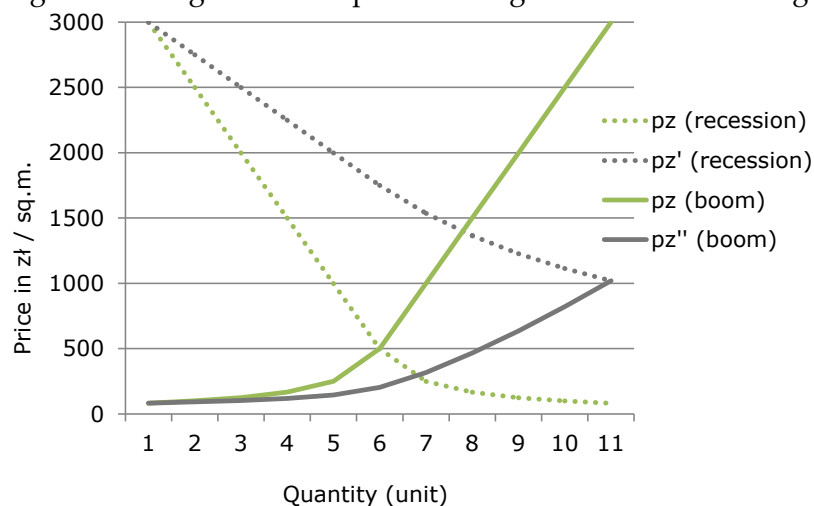
Average prices paid by consumers in this market for the achieved level of consumption are significantly higher than prices they would have paid for other goods. Amidst growing demand, the housing market provides real estate developers with an additional premium, which may explain the generally higher profitability of home construction and low profitability of home rental (see NBP, 2013). This correlation also works the other way round – in the case of decline in housing consumption, namely shift from high to lower housing saturation, prices rise relatively slower than suggested by the logic of consumer theory or a relative scarcity of goods. This may partly explain the violence of collapse in housing prices amidst bursting price bubbles as the reduction in consumption only slightly translates into growing scarcity of housing and the ensuing rise in its value.

A thorough analysis reflecting the realities of the housing market should also take into account two types of home purchase financing (fixed and floating interest rates) resulting in different behaviour in the case of interest rate fluctuations and various restrictions imposed on the home rental market (mostly, the average length of the contract and the possibility to raise the rent during the term of the contract) as well as the OOH market (subsidies, rises in cadastral tax rates). As a result, the market departs from equilibrium, tension accumulates and there is arbitrage between the OOH and the rental market.

Analysing household's behaviour in the housing market we have to consider the social context. Thus, we have to take into account the household development phase both from the point of view of the so-called housing cycle (changing housing needs over the household's lifetime), as well as the life cycle (consumption to assets ratio in accordance with the permanent consumption theory).

In the American, intergenerational housing model, frequently encountered in the literature[72], older pensioner households in the possession of housing and savings sell their homes to young households on credit – credit repayment (interest) constitutes an additional income for these households, supplementing their pension benefits. However, investments in mortgage debt securities may also be made by other households and constitute an instrument of saving for future home (down-payment) or non-housing purposes. Therefore, the complete sector's model of household's housing behaviour, especially for countries with a developed housing market and highly indebted housing sector, should also include an analysis of household over time, and as an investor in mortgage debt securities (as an additional choice between consumption or savings with a bank as a financial intermediary).

Mortgage loans, and especially underlying securities (bonds, shares of mortgage banks, shares in real estate funds) may provide a better alternative to direct housing investment and limit direct individual demand for housing units treated as investment or savings. Thus, it may be assumed that increasing credit supply and equity-type financing by funds, will, on the one hand, increase demand for housing as consumption, yet, on the other hand, as supplementary goods may curb investment demand for housing.

3. Housing as a good. Housing consumption, its market appraisal and cost. Housing choice.

Housing is a durable consumer good, whose consumption is counted in tens of years, and often goes beyond the time horizon of a household's lifetime. Consequently, there is a serious doubt whether housing should indeed be regarded as a durable consumer good, or rather as a capital good generating housing services. This would be consistent with the method of recording housing investment in GDP accounts, both in the SNA and the MPS method, as capital investment or productive investment. When interpreting "capital and services" our attention is drawn to a very high share of capital in relation to labour in housing services. Consequently, the housing market where the household functions, is a market of services or space for rent, and a market of buildings or housing units. This duality is widely analysed in the literature on commercial real estate. In the case of housing, these are markets of services and consumption and tangible capital assets. The consequence of this situation is altered consumer behaviour. Changes in home prices differently affect households in possession of housing (wealth effect), and differently households not being home owners (price and income effects). This aspect has, however, another dimension. In the case of non-durable consumer goods every choice is a choice "from the very beginning" because a good is consumed entirely within a specified period of time. As far as housing is concerned, we have to do with a similar situation in the case of rental housing, or the consumer services market, where we can extend the existing contract or not. In the case of

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[72] Bajari et al. (2010) present a life cycle model. In each period, households choose between consumption of housing and consumption of other goods and make decisions whether to borrow or save.

OOH the situation is different, because in parallel with consumption we are in possession of a capital good. As a result, the already possessed tangible capital and the related, existing stream of housing services, generated by owner occupied housing, modifies consumer's choice (see Chapter 1). Below we show factors affecting the market price of services and goods that determine consumer decision-making.

3.1. Market appraisal and cost of housing

Housing generates services that are sold on the market and generate rental income. In the case of OOH instead of rents we have to do with imputed rents, namely the amount saved by home owners resulting from the fact that they do not have to pay rent, and amount is taken from the home rental market[73].

On the other side of the account there are costs of gaining this income. The full cost of the provided housing services will include current incurred material costs (repairs, home maintenance expenses), fees and taxes, cost of capital (understood as the percentage of the value of housing and land rent and municipal rent in the case of housing located outside of agricultural areas, when we lease the land or simply the cost of purchase multiplied by interest rate, in case we bought the land) as well as capital gains, if any, resulting from the appreciation of housing. In simple terms, this formula as an (annual, quarterly) stream can be written as:

$$TCH = (K_b + K_z) * r + K_e + K_r + K_f + A,$$

where:
TCH –total cost of housing
K_b- cost of construction
K_z- cost of land
r – rate of return without risk
K_e- operating expenses
K_r- repair expenses
K_f- financial costs (e.g. insurance, taxes)
A - appreciation

If housing is financed with a mortgage, then, in lieu of cost of capital there is interest on mortgage and lost interest on our down-payment. The difference between the cost and the income, is the profit generated during a given period. From this perspective, we considered housing as flows of services (income) and costs generated by it. To get back to the capital stock account these streams should be discounted.

Should we treat housing as a capital good, used during time t_0 - t , for whose construction traditional factors of production were used (capital, labour, land), then its market value, calculated in the simplest way, in the property market per time t_0 is the

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[73] In Switzerland in 2010, the home rental market accounted for approx. 56% of the housing stock. In this country, in order to calculate the income tax, imputed rents are included in income, which reduces the society's desire to own housing (see Bourassa et al., 2010).

discounted sum of rendered services, namely rents, less the costs of services, plus a residual value, if any, at which we sell housing after time t.

$$W_{t0} = \sum_{t=0}^{T-1} \frac{R_{Nt}}{(1+r_d)^t} + \frac{R_{ZT}}{(1+r_d)^T},$$

where:

R_N- value of rent

r_d- rediscount rate assumed to be fixed over time,

R_{ZT} -residual value

Consequently, housing becomes a tangible asset generating regular income in the form of dividends and income from capital gains and may become the basis for the issuance of financial assets whose value is the sum of the risk-adjusted discounted income. In the long term, the rent depends on the correlation between supply and demand for housing stock, namely traditional, fundamental factors affecting demand (income, demographic situation, migration) and supply of the stock (historical housing stock - losses – change of the intended use + construction). Similar reasoning may be applied to OOH.

Comparison of the full value of provided services to their market value gives an answer to the question about the extraordinary rate of return on housing investment, achieved on average over the analysed period and the economic rationale behind the provision of housing services.

$$IRR = r$$

For a balanced economy, rents, in addition to operating costs, should cover the cost of capital. If the rent exceeds the full cost of capital, as broken down into periods, this means extraordinary profits. Thus, and it may be expected that capital will be relocated to the sector, savings will increase, and, consequently, the housing stock will grow. Otherwise, we will see an increasing outflow of capital from the sector. Flows concern both the home rental sector and the OOH sector as well as and the housing sector and the rest of the economy.

While analysing consumer choices in the market we usually consider the optimal choice, in the short-term and on a case-by-case basis, as the tangibly observable in the market. In the short term, supply in the market is determined by the number of homes put up for sale, rather than by the housing stock, whereas demand means people looking for housing.

The household chooses housing consumption taking into account its budget, price of housing services in the accessible form of tenure and its preferences. Thanks to interest rates and imputed rents we may analyse housing choices comparing housing with other, non-durable consumer goods. We may also compare the choices between rental housing and OOH (see Figure 4).

In Figure 4 the interest rate is represented by the angle α. Decline in interest rates will increase the angle α to α 'and, consequently, will change budget constraints towards potentially higher housing consumption. Given a particular utility function this will result in the substitution effect and income effect, and, consequently, higher housing consumption. The cost of OOH is interest on the mortgage or alternative cost of own capital calculated on the market value of housing. In the case of social housing, these are

rents and there is no short-term dependence on market prices and interest rates. Yet, this correlation will be observed in the long term and will cause capital flows between these markets. Actual household's expenditure on housing, is, however, higher by the amount of repaid mortgage principal, which is part of an investment element of an OOH purchase.

Figure 4. Housing consumption (H) versus consumption of other goods (L)

$$\begin{cases} H = i * p \\ H = r \end{cases}$$
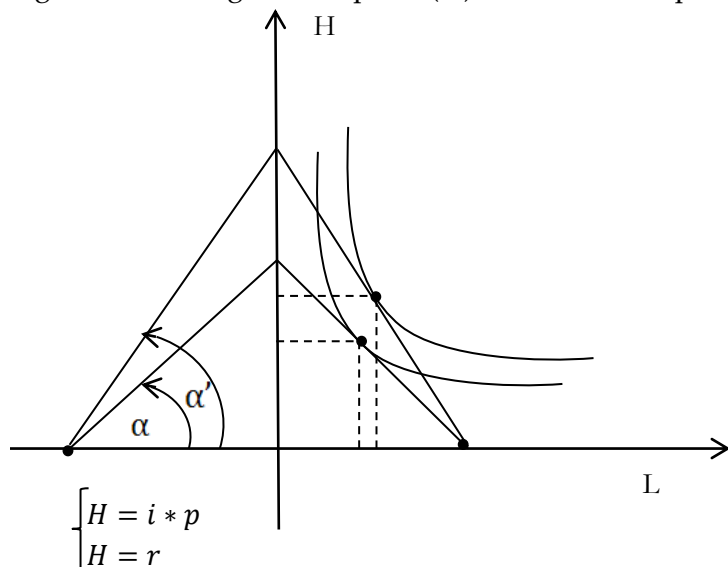
3.2. Choice of homeownership

The choice of homeownership may be considered as the choice of substitute forms of consumption.

The object of the comparison can be cost of homeownership versus home rental cost or the cost of interest on mortgage and alternative cost of own capital adjusted for taxes and subsidies, and taking into account future capital gains versus net rent (rent payments exclusive of home maintenance charges). The indifference curve is the substitution correlation between the cost of credit and net rent, adjusted for preferences (for example, job requiring employee flexibility and reluctance to be committed to a fixed dwelling place), and consumer expectations (for example, higher prices). The budget line is the actual value of housing consumption that can be achieved in these two forms, taking into account the existing taxes, incentives and OOH and rental housing subsidies, affecting the actual consumption possibilities.

The issue of mortgage principal repayments made by owners of OOH who finance them with a mortgage, needs a little more attention. In the long term, in the state of equilibrium, rents should cover alternatives costs of capital and its depreciation. Alternative cost of capital, taking into account rent risk should be close to the cost of mortgage financing. Yet, in reality, this is far more complicated as housing depreciation takes several dozen years, during which housing undergoes repeated repairs, including overhauls and changes owners several times. As a result, it is difficult to calculate the full instalment of mortgage principal and the full alternative cost of capital. In the short term, the level of rents and prices in the OOH markets is determined by short-term changes in

demand. However, the amount of depreciation charge will usually be lower than the principal instalment, which is an element of forced savings. Consequently, this may result in lower cost of rental. In fact, the current relationship between supply and demand in the OOH and home rental market will be the decisive factor.

The factor which decides about stability of OOH housing versus rental housing are costs related to change of ownership transaction. In the case of small differences in the angles of slope of the budget curve and the indifference curve, even small changes in their shape caused by changes in prices, rents, subsidies and taxes, and interest rates or household preferences (propensity to invest or greater mobility), would result in frequent shifts between one form and the other form. In fact, the market does not observe such phenomena due to high transaction costs (costs of sale and purchase of property, cost of termination of home rental contract). One of possible ways to approach the problem of choosing housing is shown in figure 5a, 5b and 5c.

Figure 5a, 5b and 5c The impact of transaction costs (Tc) on the choice of OOH versus rental (R)
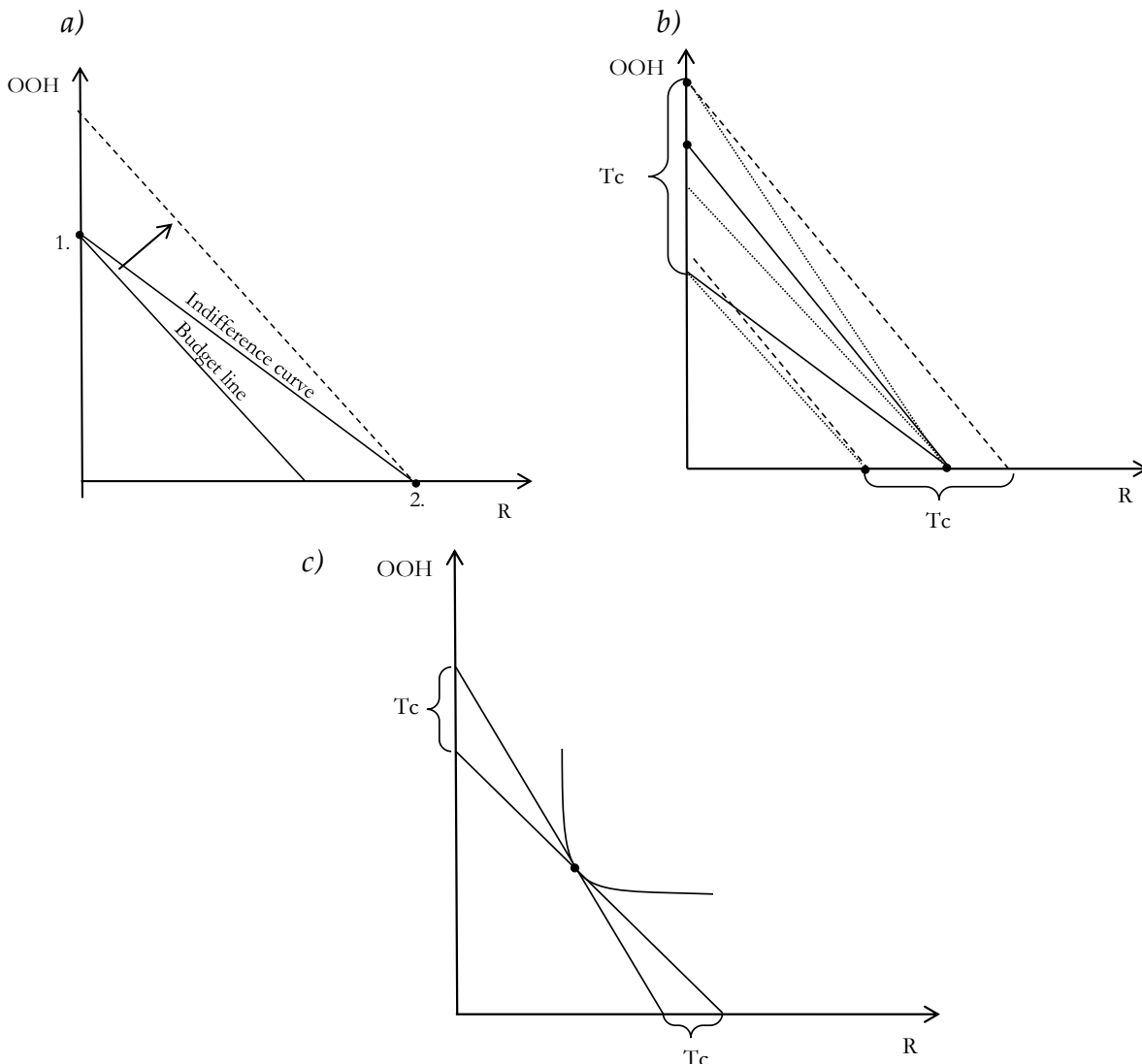
When treating an apartment as a market rent and its purchase financed with a mortgage or own capital are considered as perfect substitutes, cost-effectiveness of transactions for the consumer, understood as maximization of its utility within a particular budget and prices of housing services (rental versus ownership) will the decisive factor. In the state of equilibrium, the consumer will not know what to choose (ambivalent choice) - Figure 5a, however, each change in rental terms and conditions, which can be priced, as well as cost of ownership (cost of capital and other charges) will cause abrupt changes in ownership or rental decisions and movements along the consumer's indifference map (see Figure 5a). In this case, the slope of the consumer's budget line will change. As a result of rising rental costs and declining availability of housing in this form consumers will opt for homeownership (point 1). On the other hand, lower rental costs will urge consumers to choose home rental (point 2). The situation is similar as regards changes in ownership costs. In fact, the choice is impacted by these additional factors, which are not only differently valued by different households and affect them to a different extent (for example, credit constraints). They are also assigned a different likelihood of future realization (for example, prices will rise, rents will fall or higher taxes will be imposed, tenant protection will be liberalized, etc.). On the contrary, these factors are located on the indifference map of the consumer, who, depending on the economic situation, may give priority to savings in the form of home ownership or mobility associated with home rental. As a result, the actual curves of individual household choices cease to be curves characteristic for perfect substitution goods. Depending on market relationships between interest expenses and net rent they go upward and downward on a case-by-case basis. At the macroeconomic level, this will cause a specific distribution of choices between the discussed forms of ownership, resulting in economically important proportions between rental housing and owner-occupied housing (Figure 5c). It is also worth noting that in the real economy, there are generally various intermediate forms between market rental and home ownership (subsidized rental, rental in community housing stock, forms of ownership such as co-operative ownership right or tenant ownership right), which means that the actual preference map and the budget line are not bimodal, and the choice is more complex.

The analysed model, due to bimodality of decisions and volatility of expectations and preferences of households and the actual cost of rental housing and owner-occupied housing (expectations about home prices, interest rates and subsidies) is marked by high volatility of decisions, which is not observed in the real markets characterized by stickiness and accumulating tensions. The factor behind this discrepancy are high transaction costs (deposit, restrictions in the case of early termination of the rental contract, the cost of buying and selling the property and obtaining a mortgage). As a result, ownership structure is relatively stable, and arbitrage understood as the flow of stock between the two markets, limited (Figure 5b). Therefore, when analysing aggregated choices in the market (Figure 5c), it can be seen that the equilibrium point (the current structure of rental housing and owner-occupied housing) will be very stable and will fuel adjustment processes only after profits from the transaction significantly exceed transaction costs.

3.3. Choice of housing as a heterogeneous good

Another important factor to be taken into account in the analysis, is heterogeneity of housing, understood as defined in the theory of heterogeneous goods by Rosen (see Rosen, 1974). It means that the value of housing is the sum of the values of its attributes constituting the value for which we pay at market rates. In the case of housing, these attributes may range from purely functional features, through aesthetic ones, to features related to the social sphere (social structure of the residential estate and its environment, proximity to public services). The previously discussed form of ownership is another feature of housing. These features are valued by different households, and their value also changes in the evolution function of household (household's developmental cycle). According to Rosen, although we cannot observe the market of particular features and partial values of the good (hence the name "hidden markets" and "hidden prices"), they do exist and these markets together with hidden prices can be estimated indirectly. Heterogeneous nature of housing as a good is, however, considerably broader in scope than commonly assumed in the appraisal of the market value of housing and in the theory of Rosen where it basically concerns one type of utility value defined by a series of detailed features. Rosen's analysis of the market differs quite significantly from the classical analysis of the consumer both in terms of technical aspects as well as theoretical ones. First of all, there is a classical equilibrium price as the consumer does not purchase the quantity of goods, but their quality. Market price is therefore described as a curve rather than by points, whereas the market is understood as a compilation of its segments. Thus, the choice concerns the amount of quality in a good and the quantity of a good. As a result, it cannot be measured by points and is not subject to classical optimization. Consequently, Rosen introduces unintuitive, individual curves of offer and choice as equilibrium points for the overall curve describing the relationship between the quality of a good and its price. Optimization, especially by the real estate developer, assumes optimization of the amount of quality of good and the volume of production of goods, which, in the case of a real estate developer, does not necessarily have to give clear-cut solutions. Fortunately, in the case of housing, which is a typically heterogeneous good, while conducting the analysis involving the consumer, the first choice is generally one housing unit, which boils down the problem of optimization to the choice of quality which in the case of housing means the choice of the basket of characteristics. Under the assumption that quality may also be quantified and valued, this means that it is possible, at least at a basic level of analysis, to use the classical theory of consumer.

However, there are also problems related to adjusting the housing market to this theory, especially as regards housing market research. In the Rosen's model, the quality is somewhat standardized and concerns perishable goods. Consequently, the buyer has no problem to adapt it both in the case of individual transaction, as well as when choosing a particular market segment. In the case of the residential market, each housing unit and the related quality is different, and its supply is largely based on the already existing stock. As a result, the normal situation is when consumer's preferences and the structure of supply mismatch slightly, which must lead to a natural inconsistency (ambiguity) in the valuations of housing attributes.

Also the breakdown of variables into purely quantitative and qualitative ones may be an oversimplification. In the case of housing, one of its characteristic, namely its size is also heterogeneous in nature. It can be understood as the size of housing expressed in meters, number of rooms, or in a specific case, as the choice between one, two or three dwellings (for example, at the household's level, a house shared with the child's family or two independent apartments, and perhaps even one more housing unit as investment of savings). This element is particularly important when analysing demand at the macroeconomic level, as the use of an inadequate measure of quantity (number of dwellings per 1 000 inhabitants, number of square meters per 1 000 inhabitants, number of rooms per 1 000 population or number of households per 1 000 inhabitants), will result in an erroneous assessment of market processes. If housing demand is the result of growth in a household's size (more children), then the market will see, first of all, growth in demand for new space, through rising demand for the size of housing expressed in square meters. If, however, the rise in demand will be driven by bigger number of households (aging of population or, on the contrary, growing number of young couples), this rise in demand will mean growing demand for independent housing, often built in a special formula for the elderly or smaller housing as the first home for young households . This will also mean that unit prices (per square meter) of larger or smaller housing in the market will change accordingly.

Consequently, when speaking about consumer's choices in the housing market at the microeconomic level we mean *de facto* two choices which, however, correspond to the following correlations:

- Classical microeconomic choice is the choice between housing, other goods and savings. When speaking of savings we mean savings for housing (consumption over time) and housing as savings (housing as a tangible fixed asset).
- Choice, let's call it conventionally a hidden choice to distinguish it from the previous one, is the previously discussed choice of quality, namely, in the case of housing the choice of the bundles of housing features.
- Equilibrium, let's call it conventionally – hidden micro-choices. The choice of housing characteristics is obviously connected with the choice of housing. Formally, this means that in the consumer's utility function, housing is a nested utility function of its features. Consequently, the choice of housing consumption is always the choice of a bundle of characteristics. This means that a change in prices of other goods affects the choice of housing and the choice of its characteristics, and vice versa.

For graphical presentation of the chosen attributes of housing, housing quality may be, with some simplification necessary for the model analysis, reduced to housing standard, its location and legal status. Thus, the standard of housing may be broken down into the standard of the building, the housing and the neighbourhood or the so-called standard of internal and external housing. On the other hand, location is the location of the housing itself in the building , location of the building, the residential estate, the district and the city. Legal form is related to the strength of ownership rights. This means that the housing market gives priority to stronger rights (for example, ownership is valued higher than co-ownership or perpetual usufruct), or rights without restrictions (rights of way, right to life-

annuity, etc.). Basic choices of housing attributes made by consumers determining the size and the structure of home value as a consumer good are presented in Figure 6a. For the purpose of graphical presentation, the real choice which takes place in the six dimensional space is reduced to 4 dimensions, disregarding the choice of quantity-legal form and standard-location.

Figure 6a. Basic choices: quantity-legal form and standard-location
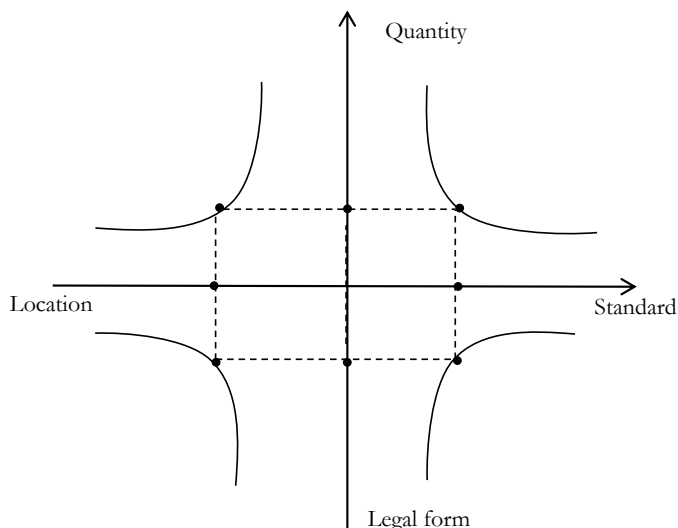
While discussing the issue of a hidden choice, we usually present the consumer's budget line in a simplified manner, suggesting its classical shape (see Figure 5a, b, c). In fact, the budget line will be non-linear; it may be discontinuous, and may be represented by points, or broken lines, without approaching the axis (see Figure 6b). This is due to the fact that certain qualitative characteristics are determined by points (e.g. ownership). In certain sub-sector of the market correlation between quantity and quality will vary, so the consumer will move along the envelope. In the case of other characteristics, these correlations will vary non-linearly. No contact with the axis is due to the fact that a certain minimum quantity of housing is necessary to make qualitative choices and vice versa, each quantity represents a certain quality.

Correlations between the choice of a good and the choice of its attributes may be illustrated by analysing the choice of housing consumption, combined with the optimization of the quality of housing. In the first correlation, fall in the market appraisal of particular characteristics (for example, a specific location) results in growing demand for a particular feature, and consequently, for housing, and falling demand for other consumer goods. Also the decline in home prices will boost both housing demand and demand for a particular housing feature. On the contrary, the price of housing as a consumer good will drive down residential consumption and consequently, demand for a particular housing feature.

Figure 6b. Budget line of a households in the case of a hidden choice in the residential market
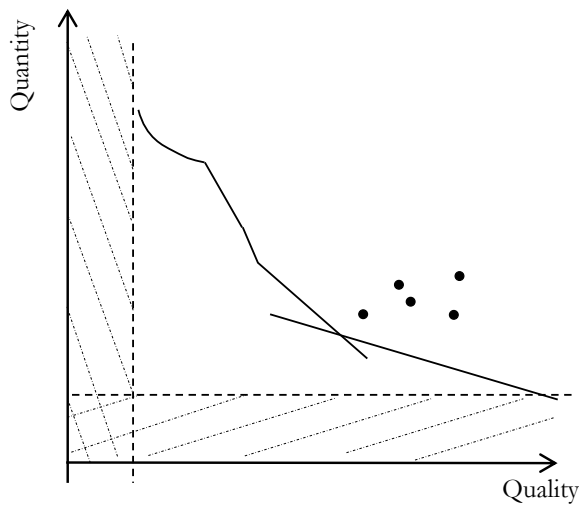
Figure 7 The choice of housing, at the left-hand side - choice of a good, on the right-hand side - choice of housing characteristics.
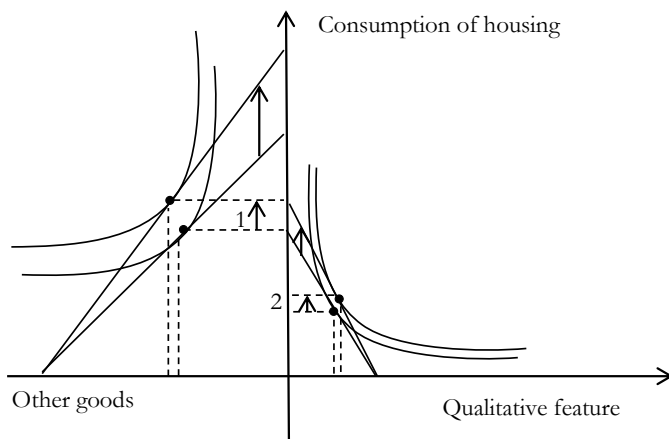
The second correlation is putting together the choice of housing as the sum of investment demand and consumer demand, yet, analysed from the point of view substitution or assessment of particular characteristics of a dwelling. Both demands are broken down into demands for particular housing characteristics. Purely consumer demand for housing can be, to some extent, identified with the already discussed, home rental. So the choice of OOH will always be connected with investment aspect, yet its scale and motifs may differ. As a consequence, both choices will be correlated through budget and preferences between consumption and investment aspect of housing.

Consumption choice, like investment choice, translates into preferences for a certain bundle of features. Consequently, this leads to the assessment of consumption characteristics also from the point of view of investment (in this specific case, assessment of

location attributes from the perspective of liquidity, i.e. how much the location is attractive as a consumer good and how much it is liquid, which will be decide about its choice on the preference curve which is more consumption- than investment-oriented one). We may also consider the choice between these characteristics. This problem is discussed in more detail in the next section.

3.4. Choice of housing demand structure (housing as savings and consumption)

Housing itself can be analysed as a complex consumer good, either directly or from the point of view of a stream of generated services, meeting consumer needs or as a tangible fixed asset generating income in the market game. In both functions housing will be a heterogeneous good, because in order to meet the needs of the owner or a commercial tenant it must offer utility features expected by the market. Together with savings functions[74], however, these utility features will be assessed from the point of view of the ability to generate income and minimize investment risk, rather than from the point of view of the ability to meet their owners' needs. As a consequence, the utility function and internal valuations of discussed features will change. Thus, the utility function will change in the investment function, because we will not buy housing according to our own preferences, but average preferences in the marketplace, further filtered with an individual assessment of risk and profitability.

Figure 8. Consumer and investment demand for housing (taken as a whole or its particular characteristics)
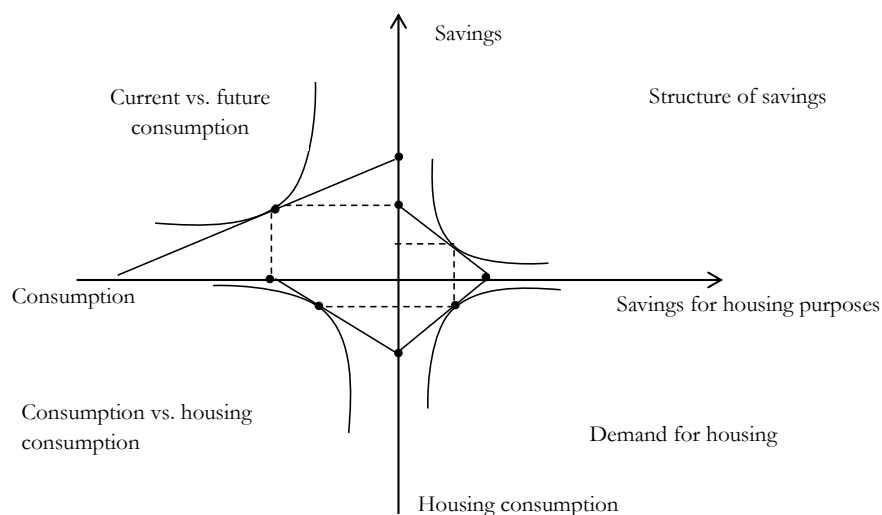
Consequently, also new features will appear, such as liquidity, which are absent in the analysis of housing as a consumer good. As OOH, in almost every case, has both consumption and investment aspect, when speaking of housing demand will have to combine investment and consumer demand for both the entire housing unit, as well as for

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[74] Accumulation and keeping of assets.

its individual characteristics. Change in valuation (utility function) of any of the elements will affect the equilibrium of the entire system (see Figure 8). The above reasoning can also be performed iteratively, starting with classical consumer choices (see Figure 9).

Figure 9 Consumer's choices and investment and consumption demand for housing
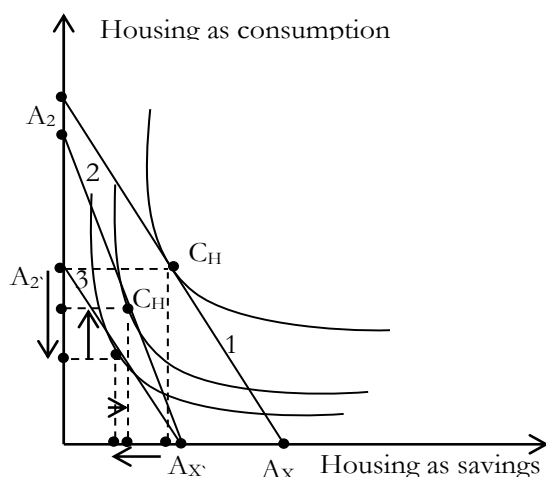
Full, classical model of consumer's behaviour in the residential market should include at least 7 choices:

1. Consumption and savings. How much is spent on consumption (including housing) today, and how much will be spent tomorrow. In this module, housing constitutes an element in aggregate consumption and aggregate savings and it is a classical inter-temporal choice. It is the starting point for other choices.
2. Housing consumption today and savings on housing, or housing consumption tomorrow, when we consider home purchase over time. From the point of view of housing demand, this presents a dilemma: housing consumption today or savings for housing tomorrow.
3. Consumption and saving in the form of housing. In this case, housing is treated as an investment of savings to be used over the subsequent period to finance consumption.
4. Consumption of housing and consumption of other goods. This is a classical intra temporal choice.
5. Consumption of housing and the overall savings, including savings in the form of housing, which will be allocated to finance future consumption.
6. Housing consumption and savings in the form of housing, when we expect home prices to appreciate or maintain their value and generate income from rental.
7. Savings in the form of housing (home price appreciation and higher income from rent) versus other savings when we analyse the structure of assets from the point of view of return on investment and risk.

From the point of view of the housing sector, the basic consumer choice model will be choice no. 5, namely housing as a consumer and investment good, which reflects the

previously discussed dual function of housing. In this correlation, although we analyse the choice, the cumulative effect of consumption and investment demand is visible in the market.

To explain this choice, the model may be reduced to conditions no. 1, 3, 5 and 6, which allows to present it in two dimensional four quadrant coordinate system.

The full sector model is the sum of consumption and investment demand combined with savings for housing purposes. It shows the relationship between the financial sector and monetary policy and the housing sector (see Figure 10). This model in the lower quadrants is supplemented with a choice between saving for housing in universal institutions (banks, investment funds) and sector institutions (purchase of mortgage-backed securities, contract loan systems) and the choice between housing investment (direct investment) and investment in sector's debt securities and the saving system. The main factor affecting this model is the interest rate. Short-term movements in interest rate affect housing demand and the size and structure of savings.

Figure 10 Housing demand and housing savings of households
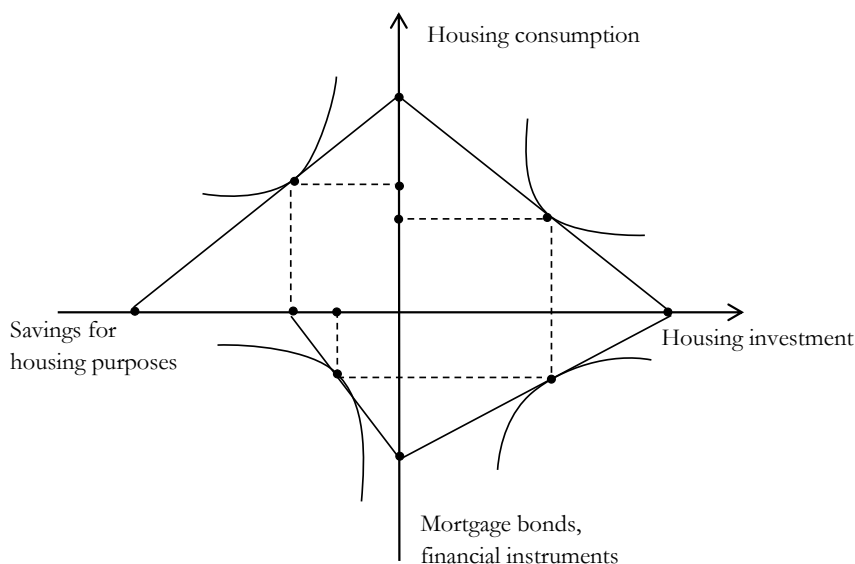
The functioning of the model will depend on how much consumers and investors rely on current processes, and to what extent they predict future sequence of events, especially on the basis of the past experience. It can be assumed that consumer behaviour will be more based on current trends, while investment behaviour will include, to more extent, an element of prediction. In general, the model may include many assumptions to test the flow of funds as well consumption and savings in the sector.

For example, interest rate hike will reduce housing demand through higher costs of housing services. At the same time, investors can expect fall in real estate prices, in the medium term, driven by limited demand. Consequently, they will refrain from investment purchases. On the other hand, higher interest rates on deposits will urge households to increase savings for housing purposes in the banking sector.

If, however, there is a possibility of indirect investment in the housing sector through the purchase of mortgage-backed securities, especially the most popular instruments with fixed interest rates, interest rate hike will decrease their value and increase profitability. If they are instruments with fixed interest rates, interest rate increases will not raise the risk (credit risk). Conversely, interest rate cuts will increase consumption and investment demand, given cheaper credit and expected price increases. At the same time, households with fixed-rate loans will refinance them on a mass scale, which will result in liquidity surplus faced by investors.

4. Summary

Many studies examining the impact of the housing sector on the economy use simplified realities, disregarding heterogeneity of housing and complex housing decisions, both in terms of consumption and investment. This often leads to erroneous conclusions derived from these models.

The purpose of the article was to deepen the knowledge about consumer' choices at the microeconomic level, in order to better understand home buyer's behaviours and their impact on the housing market.

The key issue in the analysis is to take into account consumer's choice between different types of consumption (including housing consumption), housing investment demand and housing consumption demand and various forms of home tenure.

Also consumers' appraisal of housing significantly influences their decisions . It is worth noting that households ascribe a different value to the additional amount of housing, already in possession of a certain quantity of housing and a different value when purchasing their first housing.

It is worth noting that by relying on hedonic models, not commonly used in Poland, we may distinguish attributes that have a significant impact on the value of housing and attempt to make an objective appraisal of the property.

Only an analysis which combines these aspects of consumer's choice can adequately describe and explain the actual developments in demand in the residential market.

Literature:

Allen, F., and E. Carletti (2011), *Systemic Risk from Real Estate and Macro-prudential Regulation,* W: Federal Reserve Board and Journal of Money, Credit and Banking Conference 'The Regulation of Systemic Risk', Washington DC, s. 15-16.

Aoki K., Proudman J. and Vlieghe G. (2002). *House prices, consumption, and monetary policy: a financial accelerator approach.* Bank of England Working Paper nr 169.

Augustyniak, H., J. Łaszek, K. Olszewski and J. Waszczuk (2013), *Kupić czy wynająć? Analiza decyzji podmiotów na rynku mieszkaniowym determinowanych polityką mieszkaniową,* W: *Raport o rynku nieruchomości mieszkaniowych i komercyjnych w Polsce w 2012 r,* NBP.

Bajari, P., P. Chan, D. Krueger and D. Miller (2010), *A Dynamic Model of Housing Demand: Estimation and Policy Implications,* NBER Working Paper No. 15955

Bourassa, S., M. Hoesli and D. Scognamiglio (2010), *Housing finance, prices, and tenure in Switzerland,* MPRA Paper No. 45990, s. 262-282.

Case, K. E. and R. J. Shiller (2003), *Is There a Bubble in the Housing Market*?, Brookings Papers on Economic Activity 34(2), s. 299-362.

Yang, F. (2006), *Consumption Over the Life Cycle: How Different Is Housing?*, Federal Reserve Bank of Minneapolis, Working Paper 635.

Henderson, J.V. and Y.M. Ioannides (1983), *A Model of Housing Tenure Choice*, The American Economic Review, Vol. 73(1), s. 98-113.Herring, R. J. i S. Wachter (1999), *Real Estate Booms and Banking Busts: An International Perspective*, The Wharton School - Financial Institutions, Center Paper Nr 99-27.

Ioannides, Y.M. and S.S. Rosenthal (1994), *Estimating the Consumption and Investment Demands for Housing and Their Effect on Housing Tenure Status.*, The Review of Economics and Statistics, Vol. 76(1), s. 127-141.

Kahn B., W. L. Moore and Glazer R. (1987), *Experiments in Constrained Choice*, Journal of Consumer Research 14(1), s. 96-113.

NBP (2013), *Raport o rynku nieruchomości mieszkaniowych i komercyjnych w Polsce w 2012 r.*

Reed, R. and A. Mills (2007), *Identifying the drivers behind housing preferences of first time owners*, Property management, vol. 25, No. 3, s. 225-241.

Rosen, S. (1974), *Hedonic prices and implicit markets: product differentiation in pure competition*, Journal of Political Economy 82(1), s. 34-55.

Tomczyk, E. i M. Widłak (2010*), Konstrukcja i własności hedonicznego indeksu cen mieszkań dla Warszawy*, Bank i Kredyt, nr 1 (2010), Warszawa.

Wheaton, W. C. (1999), *Real Estate "Cycles": Some Fundamentals,* Real Estate Economics 27(2), s. 209-230.

A4 To rent or to buy – analysis of housing tenure choice determined by housing policy

Hanna Augustyniak[75], Jacek Łaszek[76] , Krzysztof Olszewski[67], Joanna Waszczuk[67]

Summary

The article discusses the relatively large share of owner-occupied housing in the housing stock in selected European countries with relatively low per capita income and describes the underlying causes of this phenomenon. We identify the economic implications of the growing number of owner-occupied housing and poorly developed rental market. The paper analyses home purchase or rental decisions and explains the correlations between housing availability, consumption and households' savings, as well as housing policy. The way in which the development of the rental market can affect the situation in the property market is presented on the basis of a simple model.

1. Introduction

Home ownership is of considerable importance for households as it generates a stream of utility, can be used as collateral and usually constitutes the biggest asset. Most new homes are purchased with a mortgage, which has a major impact on the banking sector. Housing is a good way to allocate savings, yet, hinders worker mobility. In Central and Eastern Europe (CEE) countries we observe a very high share of owner-occupied housing (OOH) as compared to rented housing. The purpose of this article is to explain in detail the underlying causes of this phenomenon and its economic implications. We present the share of owner-occupied housing and rental housing in selected European countries, as well as the determinants of the situation, such as legal regulations providing tenant protection or the tax shield. We explain how this legislation may affect the housing market, for example, result in the expansion of the grey economy or undermine labour mobility.

A rapid growth in real estate prices enhanced by excessive lending, which grew into the most serious economic crisis since the Great Recession, was one of the key developments in the global economy during the 2005-2007 period. The boom in the American housing market was driven by banks that had eased housing loan criteria and granted loans to individuals with insufficient financial capacities and high repayment risk. The increased availability of credit in the United States was driven by the relaxation of

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[75] Economic Institute, Narodowy Bank Polski, ul. Świętokrzyska 11/21, 00-919 Warsaw, Poland. Krzysztof.Olszewski@nbp.pl. Corresponding author.
[76] Warsaw School of Economics (SGH) and the Economic Institute, Narodowy Bank Polski.

lending criteria as early as 1990 (see Ligon, 2013) and cuts in interest rates by the Fed. Chambers et al. (2008) show that these regulations were intended to increase the share of property owners by expanding the range of credit services and reducing the amount of buyer's down-payment. Many European countries undertook similar measures, expecting the growing share of owner-occupied housing in the housing stock to exert a positive impact on the economy. Yet, these actions brought major economic problems. Andre et al. (2013) show that in the majority of the OECD countries, the price to rent ratio (PR) and the price-to-income ratio (PI) were on an upward trend over a long period of time, until the rise in prices slowed down. At the same time, rents increased only slightly. This indicates the occurrence of a speculative bubble in the market as the non-arbitrage condition between rental income and alternative capital income was not met.

We give an overview of the determinants of housing demand and the housing price mechanisms in Augustyniak et al. (2012) and Augustyniak et al. (2013). The purpose of this article is to explain households' decisions about housing tenure in Poland but also in other European countries with a particular focus on Central and Eastern Europe. Based on the literature, we focus on housing policy and tenant protection regulations that, in our opinion, have a significant impact on households' decisions. The United States are an example, where the growing share of home ownership was supported by the government through easy credit (see Andrews and Sanchez, 2011a). In Poland, as a result of tenant protection regulations renting became risky for the landlord, which translated into growing rents or high deposits (see Gromnicka and Zysk, 2003 and the analysis in NBP, 2012a). Often, the amount you pay for renting an apartment exceeds the instalment of the mortgage loan, as it has to be high enough to cover the landlord's risk. What's more, housing offered in the rental market is not always suited to meet the tenant needs, for example, it is too small (for families) or too large (for a student or an elderly person). As a result, some people are "forced" to buy a property, even though they would prefer to rent it and remain mobile. Our article does not question the positive aspects of home ownership, yet emphasizes that not everybody has such a need in a given period of life. There are also households that do not have the necessary funds to purchase housing, or are in need of social housing. It is necessary to identify the society's housing needs in order to develop a reasonable housing policy.

Chapter 2 provides an overview of the housing market in Europe. Chapter 3 presents a simple model of choosing between home ownership and rental while Chapter 4 shows the impact of various housing policies on decisions of housing market participants and sums up the analysis.

2. Home ownership, home rental and tenant protection in Central and Eastern Europe and some other countries in Europe

In their comprehensive analysis, Andrews and Sanchez (2011a) show that the increase in the number of owner-occupied housing in the OECD countries is driven by demographic factors, interest rates and housing policy. Another article by these authors (2011b) identifies common elements of OECD countries' policy designed to facilitate home ownership thanks to special taxation and easy credit policy.

Based on Eurostat data it can be seen that countries with lower per capita GDP have a higher share of owner-occupied dwellings (see Figure 1). This situation may be observed in CEE or Mediterranean countries (Edgar et al., 2007) rather than in Western Europe. In the Mediterranean countries the high proportion of owner-occupied dwellings has a very long tradition associated with cultural aspects and the absence of a fully developed financial system (see Scanlon and Whitehead, 2004). The main reason behind this phenomenon in CEE countries is the 1990s privatization, which transformed social housing into owner-occupied housing. In Poland, the preferential sale of dwellings was a kind of compensation for very low wages in the socialist times, but also acted as a social shock absorber, easing high unemployment and mitigating other costs borne by the society during the transition period. Such a move was desirable from the point of view of social policy, since home owners tend to be, in many ways, better citizens (DiPasquale and Glaeser, 1999), and their offspring do better at school (Haurin et al., 2002). There are also research papers which confirm that home owners perform better than tenants in the labour market, even though they are less mobile (Coulson and Fisher, 2002). An excessively high proportion of owner-occupied dwellings, however, has detrimental effects on employment in general (see Blanchflower and Oswald, 2013). The main negative consequence is lower worker mobility, commuting problems and a declining number of new businesses. The authors show that regions with a higher proportion of owner-occupied housing are typically marked by higher unemployment levels. What is important is the fact that the above effects are seen with a considerable time lag. This may explain why this situation is not usually the subject of analysis performed by researchers or policy-makers.

Amann (2009) estimated the share of rental housing in CEE countries. These countries, according to him, usually feature a small proportion of rented housing, i.e. less than 10% of the housing stock, while in the case of the 27 EU countries rented housing accounted for approx. 29% in 2007. Moreover, in EU countries with high per capita GDP (above EU average), this share is around 40%, most of which is rented on a preferential basis. Such a situation in the housing market allows households to rent suitable housing and the poorest ones to find shelter. Yet, such solutions require costly government subsidies.

The Eurostat data (2011) confirms the results of Amann. CEE countries have a larger share of owner-occupied dwellings, mainly due to privatization, mentioned in the introduction. Yet, the data may contain some irregularities as they fail to account for people who are currently living in a bigger city, renting an apartment unofficially, while still being registered as permanent residents with their families. Furthermore, there is probably a large number of young people who actually live with their parents, but would prefer to rent or buy a dwelling, if only had the necessary funds. For these reasons, the share of prospective apartment buyers or tenants may be higher than suggested by the data. An open question remains the optimal ratio of owner-occupied housing to rented housing in the times of economic growth when labour mobility is an important factor.

Figure 1 Breakdown of the population in terms of home ownership, 2011 (% of population)
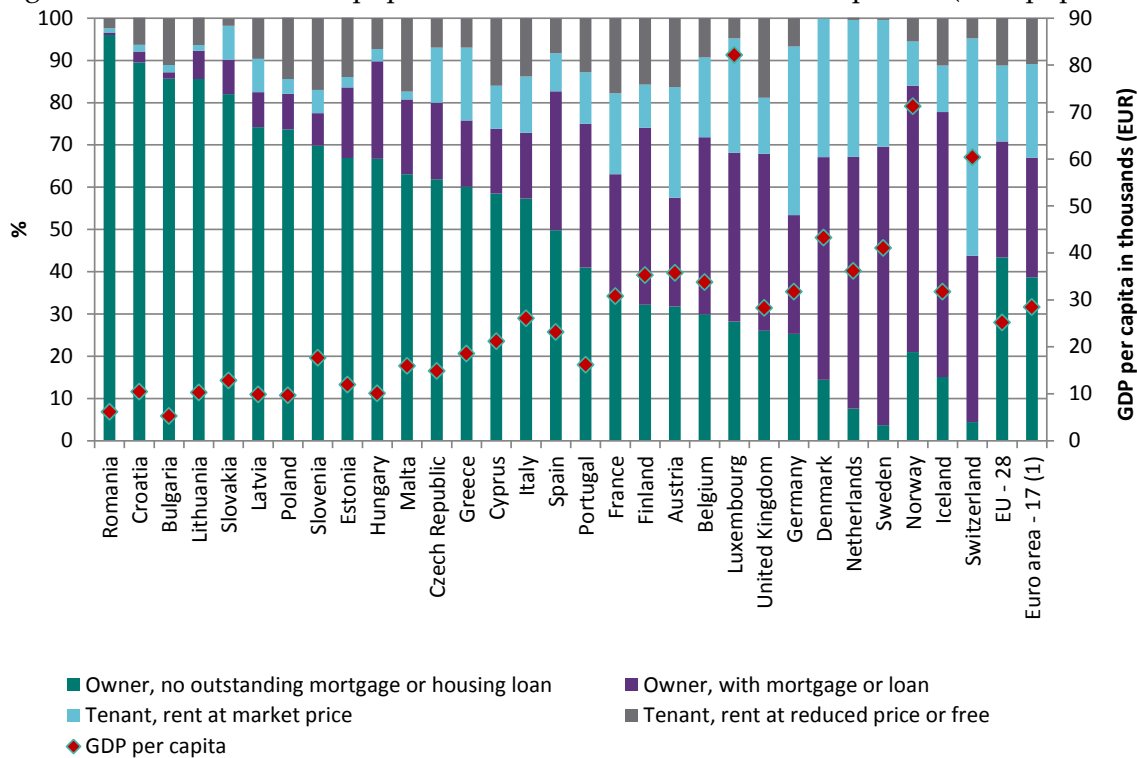
Source: Eurostat.

Figure 2 present the breakdown of the population in each country in terms of home ownership and income level. It may be noted that in households with incomes exceeding 60% of the median, the share of owner-occupied housing is higher. In countries with lower per capita GDP levels, most home owners do not have any outstanding financial obligations. In countries with higher GDP per capita levels, higher-income individuals (above 60% of the median income) generally finance home purchase with a credit (e.g. the Netherlands), while others (below 60% of the median income) prefer rented housing. Attention should be drawn to the high proportion of home rentals in Western Europe, which may have a positive impact on the mobility of the working population. Research by Barcelo (2006) conducted on European Community Household Panel (ECHP) data for France, Germany, Italy, Spain and the United Kingdom shows that people renting an apartment at market rates were much more likely to move for professional reasons than those owning an apartment or renting at prices below market prices (social housing stock). Their analysis also showed that people burdened with a mortgage are also more likely to move than home owners without a financial burden.

Figure 2 Breakdown of the population in terms of home ownership and income level, 2011 (% of the population, left bars - income above 60% of the equivalent income median, right bars - revenue below 60% of the equivalent income median)
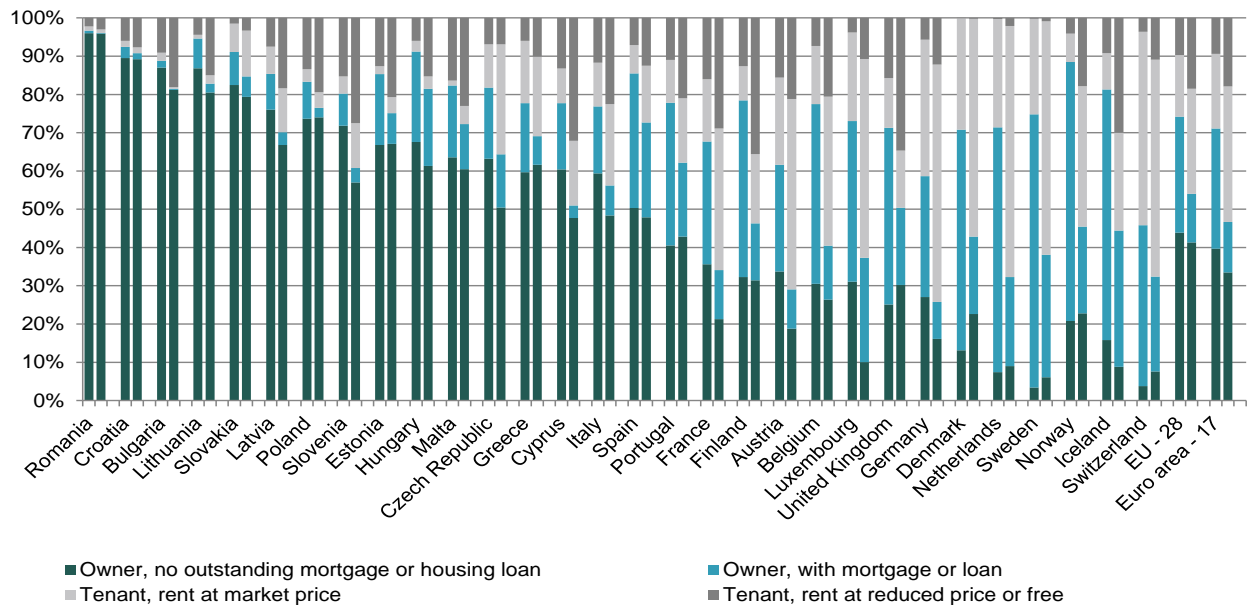
Source: Eurostat.

Figure 3 shows the breakdown of the population in terms of home ownership and children. In CEE countries, the share of home owners without mortgage is very high, and the fact of having children only slightly affects their propensity to take a mortgage. However, in the case of the Western Europe, in households with children the percentage of owner-occupied dwellings is higher. Yet, they are burdened with a mortgage.

Figure 3 Breakdown of the population in terms of home ownerships and type of household, 2011 (% of the population, left bars - households without children, right bars – households with children)
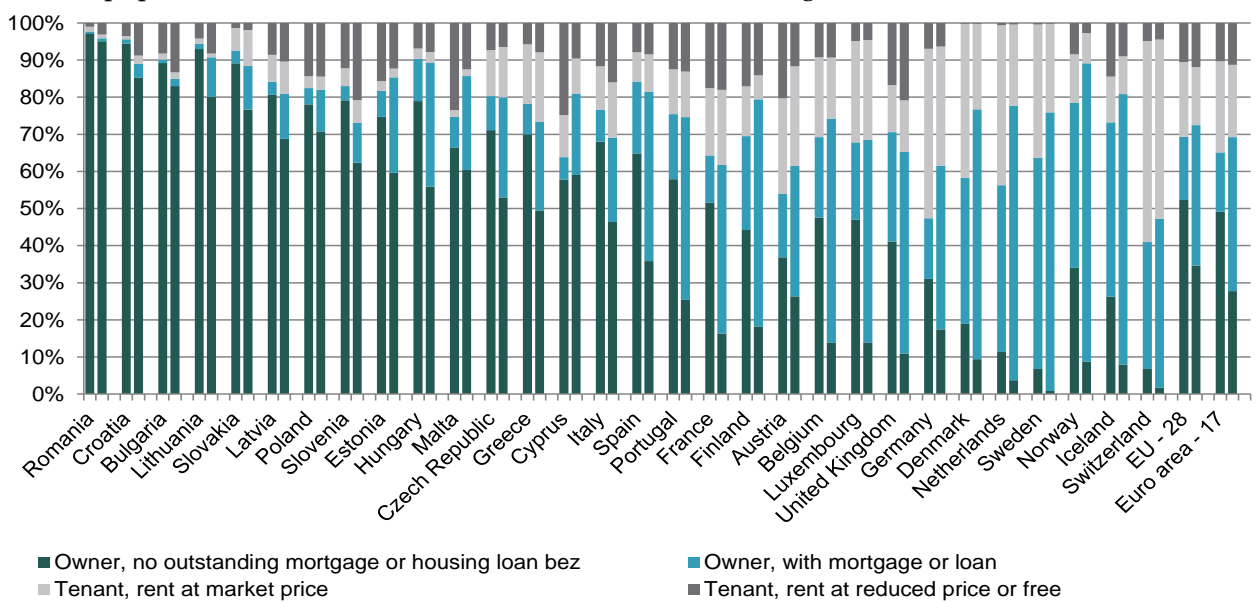
Source: Eurostat.

The situation that we observe in Europe is determined by four main factors: the historical and current economic situation, the banking sector, housing policy and demographic situation. In this paper we focus on housing policy, which regulates owner and tenant protection, subsidies and taxation. We present solutions adopted in other countries that have an impact on the economic situation.

According to the 2011 Eurostat data, in **Germany** as many as 46.6% of households lived in rented housing. Scanlon and Whitehead (2004) argue that private home rental is considerably less expensive than home ownership. Moreover, rents are regulated by the *Mietspiegel* index, which determines the annually updated, average rent level for particular locations. It is a form of tenant protection. If the rent exceeds the index by more than 20%, the tenant can sue the landlord. The high share of rented housing is the consequence of a growing number of social programs launched in the past. Already in 1980, German investors had the possibility to take out subsidized loans for the construction of social housing, subsequently rented at lower prices. Once the loan was repaid, the property could be rented at market prices. In 1996 subsidies for households buying an apartment for the first time (*Eigenheim - Zulage*) were launched. The main objective of these measures was to ease financial constraints of low income young people. Aid was disbursed during the period of eight years after the purchase. Money was granted both for the purchase in the primary and in the secondary market. Moreover, additional aid was provided in respect of every child. It should be noted that the grants were small, and prudential appraisal of the apartment, based on the replacement value, did not allow property prices to rise. *Bausparkassen* loans offering lower interest rates as compared with other available credits are another incentive, encouraging home purchases. Under this scheme, future owners are required to have saved a certain amount of money for a period of approx. seven years before getting a loan. The interest rate is fixed and lower than interest rates on usual mortgage loans, however, the repayment period is short, which means high repayment instalments, likely to cause liquidity problems of the borrower.

In **Great Britain**, the OOH rate in 2011 was approx. 68%. That figure results from low real interest rates (Levin and Pryce, 2009) and readily available innovative banking products (such as offset credits[77], loans with flexible repayment options[78] or interest-only mortgages, Scanlon and Whitehead, 2004). The high share of owner-occupied dwellings was supported through enabling citizens to purchase cooperative and municipal housing stock at lower prices. Moreover, many programs have been launched with the aim to help low-income individuals. Assistance was also provided to borrowers in the event of unemployment or sickness[79]. In the rental market, low-income households may also receive cash assistance.

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[77] Mortgage offset account - the amount of savings accumulated in the offset account reduces the capital on which interest is charged.

[78] Loan with flexible repayment options – possibility to adjust the amount of loan instalments to borrower's potential needs.

[79] *Income Support for Mortgage Interest and Private Mortgage Protection Insurance* Programme.

The situation in the **Swiss** housing market differs significantly from that in other countries (Bourassa et al. 2010). The state has an ambivalent attitude to owner-occupied housing and does not take any measures to increase the share of owner-occupied dwellings. However, many programs have been launched to strengthen the rental market, which accounts for 56% of the housing stock. It is worth noting that institutional investors in Switzerland hold approximately 28% of property for rent. Investors can borrow on preferential terms (at zero or low interest) if the apartments are available at a lower rate to a particular group of people for a limited time. Moreover, a number of tenant protection regulations have been put in place (e.g. controlled rents, subsidies, rent deduction from taxable income). On the other hand, home owners are heavily taxed. In Switzerland, unlike in other countries, imputed rents are included in income for the purpose of income tax calculation. Moreover, hedonic models are used when calculating the price of a property for tax purposes and the value of collateral in the case of mortgage loans. The results of this method are more objective and the value more resistant to overvaluation during booms than those from the standard valuation method. The Swiss system encourages landlords to enter into long-term lease contracts. It gives a preferential treatment to tenants, being less attractive to investors.

In **the Czech Republic** the share of OOH is approximately 80% of the housing stock and, as in the case of Poland, is the result of privatization of the former state-owned assets (see Scanlon and Whitehead, 2004). The rental market is partially regulated, but does not solve the problem of housing shortage. Government support is not extensive, assistance is provided only to first-time home buyers. There are grants allocated to support municipal housing construction. It should be noted, however, that this is not a social housing stock, as 90% of housing is rented at market prices.

In **Hungary**, from 1989 to 1997, housing got privatized (see Scanlon and Whitehead, 2004). During this period, approximately 20% of the housing stock changed ownership from state-owned to privately-owned housing for approximately 15% of its market value. Currently, as much as approx. 90% of the housing stock is privately owned. Approximately 23% of dwellings are mortgage financed, which, as compared with other CEE countries, represents a large proportion. A home mortgage interest deduction was introduced in 1994. Initially, it concerned solely the primary market, only since 2002 it was extended to the secondary market. In 1996 a system of building and saving societies, similar to the German *Bausparkassen* was launched. The private rental market accounts for approximately 3% of the total housing stock, while 7% are rentals on preferential terms. In order to develop the social rental housing sector, the government launched in 2005 a program aimed to subsidize market rents for low-income families with children, yet its effects are still insignificant.

In **Poland** in 2011, about 82% of housing was owner-occupied, while approximately 18% of housing stock was rental housing (including approximately 14.5% of apartments rented at a preferential, lower rate). The OOH market seems to be gradually supported by interest rate cuts. Moreover, the situation of the housing sector is under considerable, positive impact of the government-subsidised housing scheme RNS (Family on their Own), started in 2006 and terminated in 2012. It was aimed to help households to purchase an

apartment. Works on a new Act, which is likely to be enacted in 2014 are underway. The Act will regulate the MDM (Housing for the Young) scheme, including both the real estate development market and secondary market as well as the construction of single-family houses. Moreover, the Act on the Protection of Home Buyers Rights, in force since April 2012, is intended to reduce buyer's risk associated with buying a property from a real estate developer. The Polish real estate market demonstrates a shortage of rental housing, both private and social housing. In Poland, the systems of Social Housing Associations (TBS) created by the Act of 26 October, 1995, was supposed to provide rental housing to low- to middle-income individuals, yet, the program failed to bring the expected results. On the other hand, private residential development is subject to considerable rental risk (risk of vacancy, breached contracts as well as unsolved eviction or defaulting tenant problems). Rents are not regulated, yet are at a relatively constant level.

The above analysis shows that the current situation in the housing market in particular countries is largely determined by governmental regulations. The situation is largely affected by programs intended to facilitate home ownership or rental. It should be noted that measures taken should provide an adequate response to specific needs of the society.

3. Factors impacting housing decisions

This section provides insight into housing decisions taken by households. First, we demonstrate the importance of housing in people's life and we explain how regulations as well as monetary and housing policy affect the choices of real estate market participants. We refer to the article by Łaszek (2013), who analyses the purchase of a real estate both as a consumer good and as an investment good, which translates into individual decisions of potential buyers. The purpose of this article is to show that if renting is as expensive as purchasing, with inadequate housing policy, households will prefer to buy, even if they value mobility. Since the apartment is treated, sometimes erroneously, as a relatively safe and profitable way of allocating savings, it enhances the desire to own property. Yet, also high transaction costs[80] should be taken into consideration. Housing is also an asset protecting against inflation and may be used as collateral. The above factors encourage home ownership in Poland. However, demand shocks, caused by relaxed loan granting criteria, inflate home prices.

The crucial role of housing is to generate a stream of housing services. In this respect, in the short term there is no difference between owner-occupied and rented housing. Yet, in

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[80] Transaction costs incurred upon purchase and sale of the property are an important factor influencing the choices of housing market participants. They are estimated for different countries by EMF (2010). Direct costs related to the purchase and credit usually account for a few percentage points of the property value. There are also indirect costs, so the total cost may account for as much as 15% of the property value. Sanchez and Andrews (2011) present a detailed description of transaction costs, paying attention to the situation in the rental market and the likelihood of home change in the OECD countries. According to the results of their research, regulation of rents and protection of tenant rights limit the mobility of households. On the other hand, also high transaction costs usually borne by the buyer, reduce mobility of home owners.

the long term, the difference becomes more pronounced. In the short term, utility is provided by housing services, but in the long term, the utility of housing as an asset starts to outweigh. Housing ownership is generally the largest part of the household's wealth, which is usually a good protection against inflation and against rent increases[81]. The property can be used as collateral for a loan taken to generate revenue (e.g. in the case of a newly established business) or to smooth current consumption. Before undertaking a thorough analysis of decisions taken in the housing market, attention should be paid to household preferences which depend, among other things, on age and income. The age of tenants affect the rent they have to pay to the landlord. For example, young and mobile people are perceived as relatively risky tenants (e.g. less stable working conditions), and therefore pay higher rents than middle-aged persons. Older people prefer owning a property, considering it an asset for the future which they may let to obtain additional income. Moreover, the apartment may be later bequeathed to family members.

According to the literature, the optimal housing decision depends also on the cost of housing. Taxation of income and tax relief may make purchased apartments more attractive than rented housing (see Poterba, 1984). Banks' prudential regulations, especially those concerning buyer's down-payment, may hinder purchase decisions (see Stein, 1995). As we show in another article (Augustyniak et al., 2012) housing demand is also affected by multiplier effects. This means that small variations in the cost of credit lead to strong fluctuations in demand. Likewise, preferences, alternative saving methods and housing policy can have a direct impact on purchase decisions. There exists an extensive literature that presents models of choosing between home ownership and rental and verifies them empirically. In 1983 Hendreson and Ioannides introduced a model which analysed the apartment both as a capital good and a consumer good. The authors concluded that if there are no transaction costs in the economy, tax distortions or credit limitations, the purchase decision is driven by demand for housing seen as both investment and a consumer good. This model was used as the basis for numerous analyses undertaken over the years and pursued in different directions. In 1994, Ioannides and Rosenthal empirically verified this model on data for the United States. Arrondel and Lefebvre (2001) developed a model that shows that there is a difference in consumption and investment demand, which determines the decision to purchase or rent housing. Banks et al. (2011) presented a study conducted for the United States and England, concerning housing consumption and the tendency of the elderly to change their apartment for a smaller dwelling. Sinai and Souleles (2005) found that owner-occupied housing provides protection against rising rents.

It should be noted that analytical results of the above studies depend on the assumed functional form of the utility function. Yet, in the absence of adequate unit data at the microeconomic level to calibrate the Henderson and Ioannides (1983) model for CEE

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[81] Yet, according to the NBP BaRN data (see NBP(2013)), during the last boom, rents were relatively stable or increased slightly, which undermines this statement. In the long term, rents show a slight upward trend. Especially for the elderly, who cannot expect significant revenue increase, home ownership can really boost their morale.

countries, we used generally available average data (income, prices, rents). We present an analysis of housing indicators which will be the basis for our conclusions[82]. In the further part, we focus only on households that make housing tenure decisions at present, not on the entire housing stock. The model by Henderson and Ioannides (1983), empirically verified by Ioannides and Rosenthal (1994), seems to be best suited to the reality of CEE countries. We describe it briefly. The model by Henderson and Ioannides (1983) describes the current and future utility of a household. The stream of housing services (h) depends on the size of the property h_c and the level of intensity of its use, described by the f(u) function (see equation 1).

$$(1) h = h_c f(u); f' > 0, f'' < 0$$

The parameter u reflects the intensity with which the apartment is used. For example, a permanent abode will be used on a regular basis, whereas a cottage will be used only occasionally. The utility of housing of a particular size increases with the growing intensity of its use, yet, marginal gains decrease. Home rental generates the same utility as ownership, but there are certain reasons why it is cheaper than purchase. Henderson and Ioannides (1983) assume that the landlord may not transfer all the maintenance cost[83] to the tenant. In our opinion, the landlord may transfer all permanent maintenance costs to the tenant, yet there are significant transaction costs incurred exclusively by the owner at the time of sale (see also Augustyniak et al., 2012). In this article we want to emphasize the role of transaction costs. First, they include fees (notary's fees and real estate agent's commission) and taxes. What's more, when selling an apartment, the owner incurs a risk of not being able to recover funds spent on fixing or refurbishment of the apartment. Moreover, it takes time to find a buyer and conclude the transaction, which generates additional costs. Maintenance costs and subsequent costs associated with the change of housing are described by the *T(u)* function for the owner and the *τ(u)* function for the tenant. At each level of home use, costs incurred by the owner are significantly higher than costs borne by the tenant *(T(u)> τ (u))*. These costs are rising with an growing level of utilization u.

$$(2) T(u); T' > 0, T'' > 0.$$
$$(3) \tau(u); \tau' > 0, \tau'' > 0$$

When a household chooses between home rental and ownership, it optimizes its multi-period utility. According to the Bellman equation, optimization in the multi-period model requires optimal decisions in two consecutive periods. Then all other decisions are also optimal. Therefore, the model assumes the existence of two consecutive periods: the current period (1) and the future period (2). To simplify the notation and the model,

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[82] The indicator analysis is rather commonly used in the NBP's property market analyses and allows for an in-depth assessment of the market.

[83] Maintenance costs include not only monetary costs but also the time spent on housing maintenance, its depreciation, etc.

Henderson and Ioannides (1983) assume that maintenance costs are incurred in the second period. In the subsequent part, we describe the problem of housing tenure choice.

If a household decides for home ownership, it maximizes its current utility U as well as the future utility from its wealth $V(w)$. This is done by choosing the optimal size of housing h_c, the level of its use u, the value of savings S and other consumer goods x, taking into account the household's budget constraints arising from its income in subsequent periods (Y1 and Y2) and housing price P and the value of its assets at the beginning of the following period w. For the further analysis, the value of housing Ph_c (price of sq. m times the size of housing in sq. m) is multiplied by the interest rate r, to capture the fact that the purchase of housing is financed by a loan, thus the loan repayment[84] is the owner's current expense. The owner therefore solves the problem described by equations (4).

$$(4) \; maxU(x, f(u)h_c) + V(w)$$

$$y_1 = x + Ph_c + S$$

$$w = y_2 + S(1 + r) + Ph_c - T(u)h_c$$

The tenant has a similar utility function, yet, he has to pay the rent R and in the next period has savings from the previous period only.

$$(5) \; maxU(x, f(u)h_c) + V(w)$$
$$y_1 = x + S + Rh_c$$
$$w = y_2 + S(1 + r) - \tau(u)h_c$$

The rental market will be in equilibrium if the alternative cost of capital invested in the apartment will be covered by the stream of discounted income generated by the rent (6).

It should be remembered that the landlord has a higher cost of living than the tenant, and the effective rent income will be reduced by the difference between these costs. The property price may vary from period to period, and it is assumed that the rent will adjust to the price accordingly.

$$(6) \frac{rP}{1+r} = R - \frac{(T(u) - \tau(u))}{1+r}$$

The analytical solution of the model and the existence of an equilibrium are presented in detail in Henderson and Ioannides (1983). Based on their analytical model, we present a graphical analysis of choices made by participants in the property market as suggested by Ioannides and Rosenthal (1994). They used figure 4 to show how the ratio of housing consumption H_C to housing investment H_I affects the overall demand for housing. The

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[84] To make things simpler, at this point we do not take into account the buyer's down-payment, but the fixed loan instalment only.

desire to consume housing or to own it in the form of investment depends on a set of variables X, which are factors affecting demand (e.g. income, etc.). The magnitude of the difference between the desire to consume and invest, determines whether a household will buy or rent housing.

We rely on the graphical analysis by Ioannides and Rosenthal (1994)[85] and adapt this analysis to the situation observed in CEE countries (see Figure 4). In Central and Eastern Europe there is a relatively large group of people living in social or subsidized housing (Rent 1) - see Figure 1. A relatively small number of households rent apartments at market prices (Rent 2). The largest group of households have one residential dwelling (Owner 1). There are also households that have more than one apartment and put some of them for rent in the rental market (Owner 2).

Figure 4 Demand for housing consumption and housing investment in the Henderson and Ioannides model (1983)
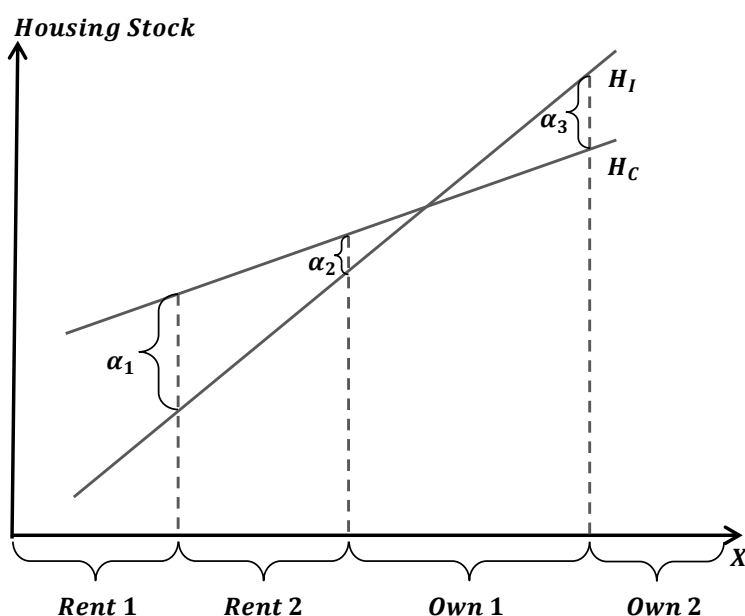
Source: Ioannides and Rosenthal (1994).

What needs to be emphasised is the difference between the existing housing stock as shown in Figure 1, and the society's housing needs, which we analyze. We observe a strong need for housing in various age groups in CEE countries (this was especially reflected in the recent price boom). Due to the relatively high cost of rental, the housing investment function is inclined towards the housing consumption function, which explains the housing booms caused by the growth in bank lending. As we point out in Augustyniak et al. (2013), demand shocks generate strong price increases and an excessive production of real estate

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[85] The authors divide the market into 4 parts. Rent 1 means households which rent housing only, Rent 2 are home owners which, for various reasons, rent different housing. Owners 1 own a property which they use by their own, whereas Owners 2 own a number of dwellings for rent and live in one of them.

development housing. An adequate housing policy, likely to provide much cheaper rental, would significantly reduce the need and desire to purchase housing, which would, in turn, ease the cycle in the residential market. What should be done then? The group Rent 1 should have their needs fully satisfied with social housing as their income allows them neither to purchase housing nor rent housing at market rates. This small percentage of households is in need of government's assistance. Individuals belonging to the group Rent 2 are interested in renting at market rates, and therefore, would welcome an appropriate regulation of legal issues. They do not need home ownership but are looking for a dwelling tailored to their housing needs. If appropriate legal regulations are in place, protecting both tenants' rights and home owners' interests, a sizeable group of home owners (Own 2) will be formed. They will have both their own dwelling as well as one or more apartments for rent to meet the needs of households belonging to the group Rent 2. Moreover, they do not have to own housing directly, if they can own shares in an investment fund, which provides professional tenant services. This solution is more transparent and less time consuming for the home owner. Appropriate legal regulations will enable landlords to benefit from a tax relief, and, at the same time, will force them to leave the grey economy. They will have to pay taxes and sign formal lease contracts. Obviously, such a solution is costly for the government, but contributes to the appropriate operation of the housing market. Finally, the group Own 1 will consist of individuals actually wishing to buy housing. If they purchase housing with cash, they will appraise it themselves and keep prices low. If, however, housing is financed with a loan, prudential housing appraisal methods need to be applied when granting a mortgage. Otherwise, as our analysis in Augustyniak et al. (2013) shows, excessively easy access to credit inflates house prices and leads to price bubbles.

Moreover, if the rental market performs well, individuals who are just looking for a place to live but do not wish to purchase housing, will not add to the homeowners' group and therefore will not generate an upward pressure on prices.

4. Summary

Based on detailed recommendations for Poland, proposed in NBP (2010), we present a possible solution, which, in our opinion, should sort out the housing problems of CEE countries, discussed in this analysis. Appropriate regulations, designed to increase home rental availability and reduce prices in the rental market, improve the working of the housing market and increase the worker mobility and strengthen the stability of the financial system.

In order to improve the situation in the housing market it is necessary to distinguish between different types of households, taking into account their income and housing needs. Low-income households should be provided assistance in the form of social housing stock. There are several possible solutions. First, local governments may enter into contracts and let their social housing stock to private individuals on a short-term basis. Another option is to create a program of a relatively low-cost, medium-quality housing. As mentioned above, some EU countries are trying to meet housing needs with homes built by private investors with the government's assistance. In Poland, the system of Social Housing Associations

strove to reach a similar aim, yet, it failed to bring the expected results, while generating huge costs to the state budget.

Moreover, the Polish residential market does not have a fully developed system of private rental housing. Private rental housing, which accounts for less than 10% of the total housing stock, is not intended as social assistance, but it is addressed to people wishing to rent housing at market rates. In the case of Poland, the key issue is to regulate the landlord-tenant relationship through contracts with clearly defined terms and conditions. The existing tenant protection laws are a huge obstacle to the development of the rental market. We believe that both parties should be guaranteed protection under the law - the landlord against abuse by the tenant, the tenant against excessive rent increases or groundless eviction. However, excessive protection may adversely affect the development of the rental market (e.g. by protecting the defaulting tenant we discourage potential investors from entering professional rental services). Moreover, proper regulations governing site management and construction ensure safety and improve the environment as well as neighbours' relations.

On the other hand, a careful, prudential method of real estate appraisal and appropriate loan granting criteria are necessary to limit the possibility of fast home acquisition by individuals without the necessary funds.

Literature

Amman, W. (2009), *New Policies to Facilitate Affordable Housing in Central Eastern Europe,* Housing Finance International, Vol. XXIV No 2.

André, C., L. A. Gil-Alana and R. Gupta (2013), *Testing for Persistence in Housing Price-to-Income and Price-to-Rent Ratios in 16 OECD Countries*, University of Pretoria, Working Paper: 2013-21.

Andrews, D. and A. C. Sanchez (2011a), *The Evolution of Homeownership Rates in Selected OECD Countries: Demographic and Public Policy Influences.*, OECD Journal: Economic Studies, Vol. 2011/1.

Andrews, D. and A. C. Sanchez (2011b), *Drivers of Homeownership Rates in Selected OECD Countries.*, OECD Economics Department Working Papers, No. 849.

Andrews, D., A. Caldera Sánchez and Å. Johansson (2011c*), Housing Markets and Structural Policies in OECD Countries*, OECD Economics Department Working Papers, No. 836.

Arrondel, L. and B. Lefebvre (2001), *Consumption and Investment Motives in Housing Wealth Accumulation: A French Study*, Journal of Urban Economics 50, 112–137.

Augustyniak, H., J. Łaszek, K. Olszewski and J. Waszczuk (2013), *Housing market cycles – a disequilibrium model and its calibration to the Warsaw housing market* In: Report on the situation in the Polish residential and commercial real estate market in 2012, NBP.

Augustyniak, H., J. Łaszek, K. Olszewski and J. Waszczuk (2013), *Modeling of cycles in the residential real estate markets – interactions between the primary and the secondary market and multiplier effects.*, National Bank of Poland Working Paper 143.

Banks, J., R. Blundell, Z. Oldfield and J. P. Smith (2011), *Housing Mobility and Downsizing at Older Ages in Britain and the USA*, Economica, London School of Economics and Political Science, Vol. 79(313), 1-26.

Barcelo, C. (2006), *Housing Tenure and Labour Mobility: A Comparison Across European Countries*, Banco de Espana Research Paper No. WP-0603; CEMFI Working Paper No. 0302

Blanchflower, D. G. and A. J. Oswald (2013), *Does High Home-Ownership Impair the Labor Market?*, NBER working paper nr. 19079.

Bourassa, S., M. Hoesli and D. Scognamiglio (2010), *Housing finance, prices, and tenure in Switzerland*, MPRA Paper No. 45990, 262-282.

Case, K. E. and R. J. Shiller, (1989), *The Efficiency of the Market for Single Family Homes*, American Economic Review 79, 125–137.

Chambers, M.S., C. Garriga, and Don Schlagenhauf (2008), *Mortgage Innovation, Mortgage Choice and Housing Decisions,* Federal Reserve Bank of St. Louis Review, 90(6), 585-608.

Coulson, N. E. and L. M. Fisher (2002), *Tenure Choice and Labor Market Outcomes.,* Housing Studies, Vol. 17, (1), 35–49.

DiPasquale, D. and E. Glaeser (1999), *Incentives and Social Capital: Are Homeowners Better Citizens?*, Journal of Urban Economics, 45(2), 354-384.

Edgar, B. M. Filipovic and I. Dandolova (2007), *Home Ownership and Marginalisation.,* European Journal of Homelessness, Vol. 1, 141-160.

Eurostat (2011), *Housing statistics - Statistics Explained (2013/8/3)* <http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Housing_statistics/pl>

Fisher, L. M. and A. J. Jaffe (2003), *Determinants of international home ownership rates.,* Housing Finance International Journal, 34-35.

Gromnicka, E. and P. Zysk (2003), *Polish Tenancy Law and the Principles of European Contract Law.,* available at SSRN.

Haurin, D., T. Parcel and R. Haurin (2002), *Does Homeownership Affect Children''s Outcomes?*, Real Estate Economics, No. 30, 635–666.

Henderson, J.V. and Y.M. Ioannides (1983), *A Model of Housing Tenure Choice.,* The American Economic Review, Vol. 73(1), 98-113.

Ioannides, Y.M. and S.S. Rosenthal (1994), *Estimating the Consumption and Investment Demands for Housing and Their Effect on Housing Tenure Status.,* The Review of Economics and Statistics, Vol. 76(1), 127-141.

Łaszek, J. (2013), *Housing and consumer theory*, In: Report on the situation in the Polish residential and commercial real estate market in 2012, NBP.

Ligon, J. (2013), *How Government Housing Policy Led to the Financial Crisis. Testimony before the Committee on Financial Services.,* Subcommittee on Capital Markets and Government Sponsored Enterprises United States House of Representatives March 6, 2013.

Lowe, S. (2004), Overview: *Too poor to move, too poor to stay.* in J. Fearan, (ed.) *Too poor to move, too poor to stay: A report on housing in the Czech Republic, Hungary and Serbia.,* LGI Fellowship series, Budapest: Open society institute.

NBP (2010), *Report on the situation in the Polish residential real estate market in 2002-2009.*

NBP (2011), *Report on the situation in the Polish residential and commercial real estate market in 2010.*

NBP (2012a), *Report on the situation in the Polish residential and commercial real estate market in 2011.*

NBP (2012b), Information on home prices and the situation in the residential and commercial real estate market in Poland in 2012 Q4.

Poterba, J. M. (1984), *Tax Subsidies to Owner-Occupied Housing: An Asset-Market Approach*, The Quarterly Journal of Economics, Vol. 99, No. 4, 729-752.

Sánchez, C. A. and D. Andrews (2011), *Residential Mobility and Public Policy in OECD Countries.*, OECD Journal: Economic Studies, Vol. 2011/1.

Scanlon, K. and C. Whitehead (2004), *International trends in housing tenure and mortgage finance*, London School of Economics, ISBN: 0-9544578-6-2.

Sinai, T. and N. Souleles (2005), *Owner Occupied Housing as Insurance Against Rent Risk*, Quarterly Journal of Economics, Vol. 120 (2), 763–789.

Stein, J. C. (1995), *Prices and trading volumes in the housing market: a model with down-payment effects*, Quarterly Journal of Economics, 379-406.

A5 Housing market cycles – a disequilibrium model and its calibration to the Warsaw housing market

Hanna Augustyniak[86], Jacek Łaszek[87] , Krzysztof Olszewski[78], Joanna Waszczuk[78]

Abstract

This paper presents a simple disequilibrium model in the housing market, calibrated to the Warsaw market. We discuss the last cycle and show how a combination of slight demand shocks with short-term rigid supply leads to strong fluctuations. The cyclical character is a permanent feature of the property market and can be explained by the inelasticity of supply. Market participants form price and demand expectations based on past observations. This causes frequent cycles that, under specific conditions, can lead to economic crises. We believe that the model describes the reality of the real estate market better than equilibrium models do, so it can be useful for central banks and financial supervision institutions in the analysis of the impact of fiscal and monetary policy and regulations on the real estate market.

Key words: Cycles in the housing market, disequilibrium, imbalances, banking sector, banking regulations.

JEL Classification: E32, E44, E37, R21, R31;

1. Introduction

While modelling the real estate market one usually assumes it to be in equilibrium. However, as a result of a delayed response of supply and rapidly changing demand, largely determined by loan availability, the market oscillates around the equilibrium point, fluctuating in time. In this paper we propose a model that accounts for household needs, which are reflected in fluctuating demand. Supply, which is constant in a short-term, responds with price increases first. Only after a period of time, new homes are built. This allows us to analyze the response of the housing market to changes in nominal interest rates or household preferences.

Analysis of consumer goods requiring a long construction process was described in 1928 by Hanau on the example of a "hog cycle". The investment process and construction of new housing was described by Topel and Rosen (1988), while the price elasticity of demand is estimated for different countries by Phang, Kim and Watcher (2010). Our observations indicate that households purchase not only completed housing, but also real estate development contracts for home construction. When demand is largely unmet, real estate developers sell contracts to provide housing, whose construction has already begun.

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[86] Economic Institute, Narodowy Bank Polski, ul. Świętokrzyska 11/21, 00-919 Warsaw, Poland. Krzysztof.Olszewski@nbp.pl. Corresponding author.

[87] Warsaw School of Economics (SGH) and the Economic Institute, Narodowy Bank Polski.

Typically, contracts are sold after approximately one year from the construction start date. Another two years elapse before the apartment is completed. However, after the housing has been constructed, it ceases to affect the housing market, as the contract had already been sold in the past. It should be noted that real estate developers have some of work in progress, which allows them to respond to the market needs relatively quickly[88]. In Western Europe, housing pre-sale contracts are not commonplace, while in Poland, as well as in Asia (see Chang and Ward, 1993), this system has had a long history. Such solutions increase the support elasticity, shorten the cycle and reduce the amplitude of fluctuations. This helps the supply side to respond faster to strongly rising demand, yet, it involves certain risk. The advantage for clients is that they buy housing at a fixed price, thereby financing the real estate developer's project. Consequently, the developer can continue construction without the need to borrow funds. Yet, the buyer bears the risk of the developer's bankruptcy. On the other hand, the producer of housing will not be able to increase home prices in the future, along with rising prices or costs.

Figure 1 Commenced housing construction, sold real estate development housing (units, left-hand axis) and real price per square meter (2004 constant prices in PLN, right-hand axis)
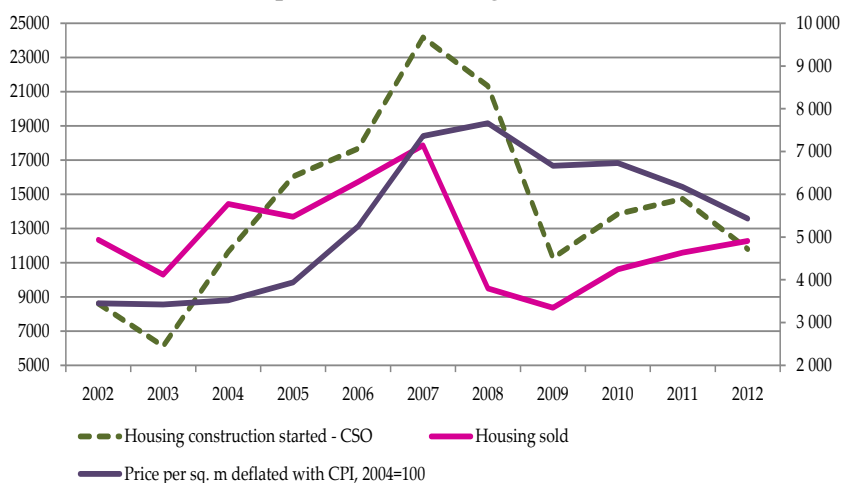
Source: GUS, NBP BaRN, PONT Info, REAS.

Our analysis focuses on Warsaw, the largest Polish market. Available data allow us to capture the last cycle in the Warsaw residential market. It began with stable prices (2002-2004), which then followed an upward trend with rising income, growing supply of credit and declining interest rates (2005-2008). In the subsequent period (2009-2011) prices slowly decreased as a result of economic downturn, oversupply of housing and limited supply of credit. The relationship between loan availability, growing housing demand and rising home prices in the primary market in Poland is discussed in detail in the NBP (2011, 2012a,

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[88] The number of building permits obtained by real estate developers usually exceeds the number of actually started constructions. Moreover, not all the constructions started are immediately sold. The real estate developer can extend this process when prices fall and speed it up when prices rise.

2012b) reports. Looking at real prices, deflated by CPI (2004 is the base year), it can be seen that the actual rise in sold housing and real estate development contracts, in response to growing demand, led also to a rise in transaction prices (see Figure 1).

Very complex models constitute a problem in the world of economic science, which is encountered when analysing real estate market cycles. When solving those models, economists used to adopt assumptions which were inconsistent with the reality. In particular, the assumption of the market's rapid search for equilibrium is quite problematic. Such simplifications often led to trivial or even erroneous conclusions. The model presented by us is rather simple and can be replicated on a spread sheet. We show that fairly simple methods allow to analyze imbalances and cycles in the housing market. This requires, of course, relevant data, which, for most of the analysed period, are publicly available on the NBP and CSO website. In our model we get back to the tradition started by DiPasquale and Wheaton (1992), who in a rather simple way explain the working of the market.

Our article presents the non-equilibrium model, analyses cycles and the impact of shocks to the cyclical nature of the housing market. Chapter 2 presents the model of housing demand. In Chapter 3 we present the model of supply and calibrate it to the Warsaw residential market. Chapter 4 introduces shocks, and Chapter 5 concludes the article.

2. Housing demand

In this section we present a simple demand model. We focus on the primary market only and we assume that households finance home purchase with a loan. The cost incurred in a particular period by the household is loan repayment. Burnham (1972) quotes a Fed survey, according to which credit supply determines housing construction. Currently, we see that housing demand both in Poland and across the world is driven by credit supply (see NBP, 2012a,b). Moreover, demand is affected by consumer preferences as regards consumption of other goods C and housing services $k * p * H$. Like Bajari et al. (2013) we include the imputed rent in the utility function. It results from the size of the apartment H, its price p and the parameter k, which reflects the monetary value of the stream of housing services. Utility is described by the CES function, where θ is the weight of utility resulting from consumption, whereas the parameter μ denotes the elasticity of substitution between consumption and housing, $\varepsilon = 1 / (1-\mu)$. Accounting for appreciation, $A = \frac{p_t}{p_{t-1}}$, we take into consideration consumer expectations about future housing prices (see Dunsky and Follain, 1997 or Sommervoll et al., 2010). Such specification of the utility function takes into account the fact that housing is bought both for consumption and investment purposes (see Henderson and Ioannides, 1983 and Łaszek, 2013). It also reflects the fact that households extrapolate past prices and are prone to collective behavior. The utility of household is described by the following equation:

$$U(C,H) = (\theta C^\mu + (1 - \theta)A^\gamma (kpH)^\mu)^{\frac{1}{\mu}}$$

The consumer divides his income between the loan repayment and consumption of other goods. The income allocation problem is solved by taking into account the budget constraint (b), where $b = rpH + C$ (r – loan constant based on fixed loan instalments, p - price per square meter of housing), which gives us the optimal choice of the size of housing and consumption of other goods in each period.

$$\theta C^{\mu-1} rp = (1 - \theta) A^{\gamma} (kp)^{\mu} H^{\mu-1}$$

By combining this equation with the budget constraint we get the optimum allocation of funds between consumption of housing services and consumption of other goods.

$$C^* = \frac{b}{1 + rp \left(\frac{\theta}{1 - \theta} \frac{rp}{A^{\gamma}(kp)^{\mu}} \right)^{\frac{1}{\mu-1}}}$$

$$H^* = \frac{b}{rp + \left(\frac{1 - \theta}{\theta} \frac{A^{\gamma}(kp)^{\mu}}{rp} \right)^{\frac{1}{\mu-1}}}$$

Lin and Lin (1999) argue that income elasticity of demand is approx. 1, consequently, income growth should lead to a commensurate increase in housing demand. The household is not limited by the budget only, but also by the loan availability and supervisory regulations. The bank calculates the loan availability based on household's income, nominal interest rate and prudential regulations, which determine, among other things, the longest possible period of loan repayment (the longer the maturity of the loan, the lower the loan constant and the higher the household loan). When buying an apartment, households usually look at the current market situation and credit granting criteria, without taking into account potential changes in interest rates or fluctuations in exchange rates, if they had taken out a foreign currency denominated loan.

In order to curb excessive debt and reduce the risk to the financial system, restrictions are imposed concerning the part of consumer's income which can go towards debt repayment (DTI – debt to income ratio) as well as restrictions on the loan to value ratio (LTV) For the ease of the analysis, we have considered DTI limits only, so that the household can devote only part of their income ($x \in (0.1)$) to repay the loan, and the monthly instalment payment is maximum b_H, whereas:

$$b_H = xb \leq b$$

In this situation, the choice of the size of housing will not always be the optimum allocation of funds between C^* and H^*, but:

$$H = \begin{cases} H^*, & rpH^* \leq xb \\ \dfrac{xb}{rp}, & rpH^* > xb \end{cases}$$

$$C = \begin{cases} C^*, & rpH^* \le xb \\ (1-x)b, & rpH^* > xb \end{cases}$$

Prudential limitations may result in the household's inability to consume a sufficiently large apartment. On the contrary, the household will be forced to consume more other goods than it needs. Figure 2 shows consumer's choice in the case of a normal budget (point A) and a budget limited by prudential restrictions (point B).

Figure 2 Consumer's choice without budget constraints (left-hand panel) and with budget constraints (right-hand panel)
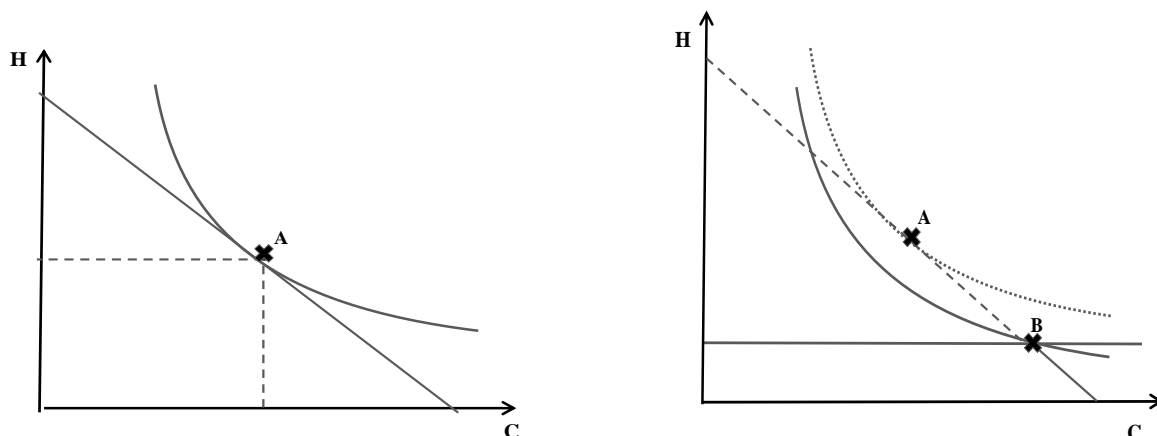

If prudential requirements are restrictive (the household would like to borrow a higher loan than it can), even a slight easing may trigger strong fluctuations in housing demand. Typically, the household is willing to give up some consumption of other goods only to buy more housing. This explains why the availability of foreign currency denominated loans caused a boom in housing demand in Poland.

In order to provide a more thorough explanation of the price bubble, we should present the response of demand to price increases based on a graphical analysis. With the classical utility function, when housing is considered as consumption only, rising prices would lead to a decline in residential consumption from point 1 to point 2 (see Figure 3). However, as housing is seen as both a consumption good and an investment good, the housing appreciation causes a significant shift of the utility curve. As a result, amidst rising prices housing becomes even a more desirable asset and the buyer will choose the allocation described in point 3 of the left-hand panel of Figure 3. He will decides to sacrifice even a significant part of consumption of other goods, to buy more housing than he would buy at the former, lower price.

It should be added that prices increased amidst rising incomes and considerable cuts in interest rates. Figure 3 right shows that, in the first place, as a result of rising income the budget line shifts to the right from point 1 to point 2, thus, the consumer can buy more housing and other goods. Yet, prices rise, so as previously explained, he will choose point 3. However, a significant decline in interest rates means that the price increase is, in budgetary terms, almost entirely offset, so the budget curve returns to its position before the price increase, and the buyer finally chooses point 4. The analysis presented in NBP

(2013) shows that during the price boom, the loan availability calculated per square meter of housing was on the rise which allowed households to purchase increasingly bigger housing. Only a combination of changes in prices, income and interest rates makes it possible to explain a seemingly irrational behaviour of buyers who amidst rising prices expressed demand for increasingly bigger housing. In the aggregate, this translated into a growing demand for housing.

Figure 3 Consumer's choice amidst higher prices (left-hand panel) and an additional increase in revenue and interest rate cuts (right-hand panel)
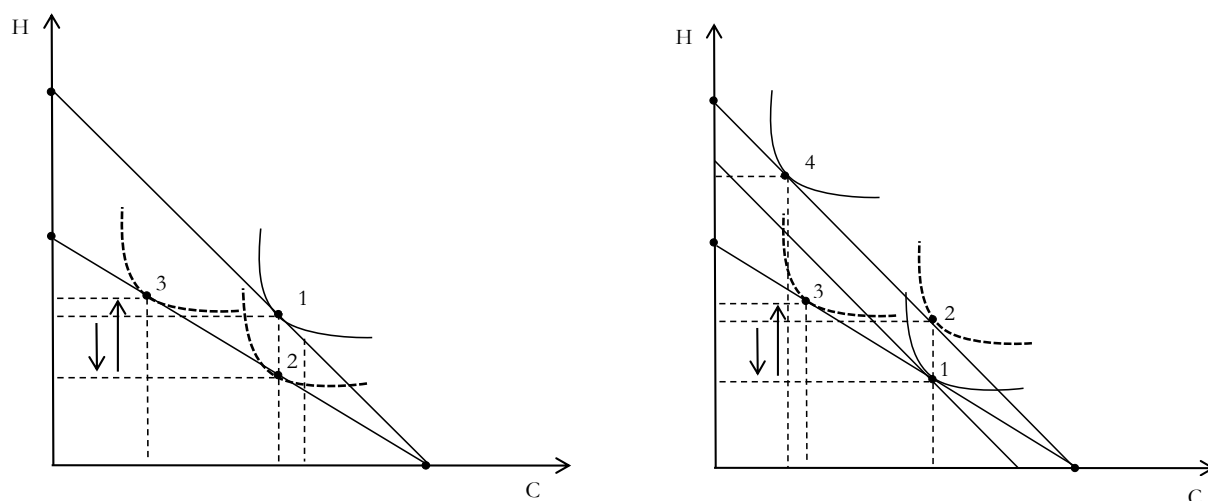
It is worth noting that in terms of the credit boom, households are able to exceed their budget by taking Ponzi loans. From the perspective of a household's individual decision this can be reasonable, as it optimizes its inter-temporal consumption and will repay the excessive debt in the subsequent period through capital gains on housing. This situation was not observed in the Polish market, thus we do not analyses this variant.

2.1 Calibration of the demand model and analysis of the impact of interest rates on demand

The housing demand model was calibrated in such a way so as to reflect, as accurately as possible, the actual rise in demand and prices in the Warsaw property market in the years 2002-2012. When calibrating the model, we adopted the parameters θ, μ k close to the values proposed by Bajari et al. (2013) ($\theta = 0.77$, $\mu = 1.32$, $k = 0.075$). We used an identical parameter to calculate the substitution elasticity $\mu = 1.32$, but modified the importance of utility to $\theta = 0.63$, as than the model is better suited to empirical data. The smaller parameter θ reflects a strong desire to own housing. The parameter k, necessary to calculate the imputed rent, was calculated as the average of the actual rental data and transaction prices (from the NBP BaRN database) and amounts to 0.065. Moreover, we choose the parameter, which determines the strength with which buyers react to housing appreciation as $\gamma = 0.5$. As the household budget we take the twofold value of the average net wage in

the enterprise sector in a particular year. In total, the model replicates the last demand cycle in the Warsaw real estate market well, as shown in Figure 3. The demand for square meters of housing was calculated as follows: the model demand for one square meter of housing of an average household is multiplied by 13 000 - the average number of homes sold during the analysed period, and finally scaled down (by 10 000) in order to harmonize the scale. To calculate the total area of actually sold housing, the number of apartments sold by real estate developers was multiplied by their average size of 58 square meters, and then the score was scaled down (by 10, 000). The loan constant was scaled up by 10.

Along with a strong decline in the weighted interest rate, a rise was observed in housing demand. Growth in the model demand largely exceeded growth in actual transactions, which was driven by two reasons. At the beginning of the boom, real estate developers were unable to generate a sufficient number of contracts for housing construction. Only with one year's delay, did they put new contracts on the market. Although demand slowed down in the later phase of the cycle, real estate developers sold a lot of contracts – meeting the needs of clients who had expressed their demand a year ago. Moreover, growing income and declining interest rates failed to directly translate into bank lending, which began to pick up with some delay.

The demand model allows us to analyse household behaviour in the boom period. Although the price of a square meter of housing began to increase rapidly, demand continued to grow. This was driven by three major factors: falling interest rates (weighted with the currency structure of housing loan increase), growing income and expectations of further strong appreciation of transaction prices. This overlaps with the desire to own housing (see Augustyniak et al. 2013) and banks' very lenient lending criteria. A longer crediting period, despite the price growth and a slight increase in the average weighted interest rate was a factor behind rising demand. In this way, the loan instalment remained at a low level for a relatively long time. However, if banks had refused to lend for longer periods much earlier, demand would have probably been lower. Figure 4 shows the development in housing demand, under the assumption that both foreign currency denominated and PLN loans were granted (left-hand panel) or under the assumption that only PLN loans were granted (right-hand panel).

Figure 4 Housing demand, home prices, interest rates and the number of purchased housing units (left-hand panel- under the assumption that both PLN and foreign currency denominated loans were granted, right-hand panel- under the assumption that only PLN loans were granted)
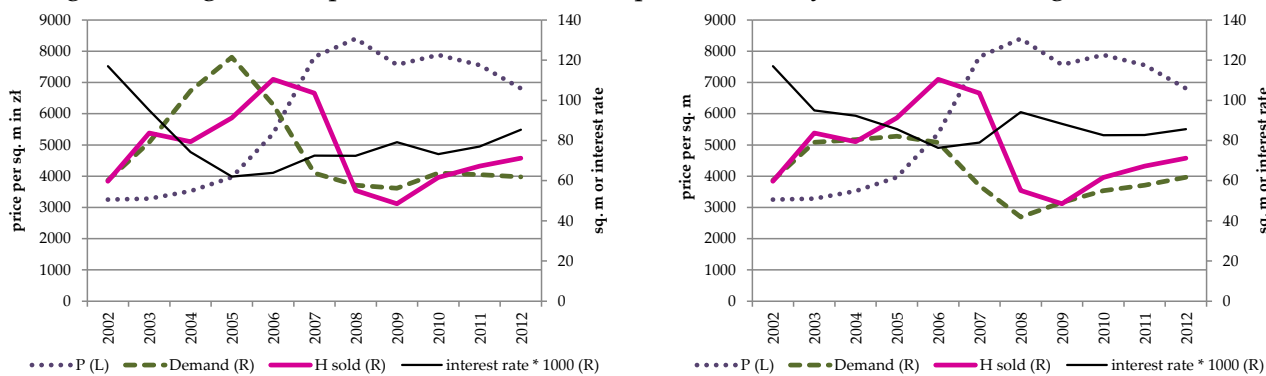
Source: GUS, NBP BaRN, PONT Info, REAS.

The presented model is a partial equilibrium model in which we assume that prices were fixed by real estate developers, and households chose the size of housing only. In fact, reduced demand, resulting from rising interest rates in the absence of foreign currency loans should not lead to such a strong price increase (see Figure 4, right-hand panel). It is worth noting that the panel analysis presented at NBP (2013) suggests that real estate developers were quick to raise prices during the boom, yet reluctant to cut them down during demand slump.

3. Supply of real estate developer housing

Although the price elasticity of housing was already analysed in 1960 by Muth for the United States, the supply side was given relatively little attention in the literature[89]. One of the more extensive publications on this subject is the article by DiPasquale (1999). While analysing housing supply, we must take into account the situation in the local real estate markets. Stover (1986) pointed out that the aggregation of data from individual, distant cities leads to significant errors in the estimation of the price elasticity of housing supply. A detailed analysis of the real estate development sector, as well as the profit and cost accounting may be found in Augustyniak et al. (2012), but here we focus on the supply curve only.

Short-term supply of developer housing is rigid because it usually takes 4-5 years from the start to completion of construction. Supply becomes more flexible in the medium term as real estate developers sell contracts, if this is permitted by the law and approved by market participants. Thus, real estate developers put onto the market contracts for home construction, which has only just begun (see Augustyniak et al., 2012) and the whole project will take two more years to complete. During the price boom, the sale of construction contracts began even earlier and the so-called "holes in the ground" were bought. Then, after a period of 3-4 years, completed apartments were delivered to the buyer.

Basing on the relationship between the cost of production and the supply curve of real estate developers, we know that in the medium term the real estate development sector is able to build more housing units at a higher cost. The cost curve will be located close to the marginal cost curve. According to our observations, the mid-term curve of real estate developers' supply may differ significantly from the cost curve, as developers plan future investment based on current prices. They erroneously underestimate the rise in production costs, driven by growing demand and respond only to nominal changes in home prices.

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[89] The modelling of housing supply causes many problems, including analytical ones. Eg. Epple, Gordon and Sieg (2010) estimated the home production function based on the price of land. The main problem was that housing consists of attributes that are difficult to valuate objectively, separately, qualitatively or quantitatively (e.g. quality of housing). It should also be noted that housing features are the result of complex decisions made by real estate developers and home owners (see DiPasquale, 1999). In the case of Poland, the problem is also to gain access to full and accurate data series.

In the medium term, the capital inflow to the residential construction sector pushes the cost of capital down to the level of the minimum average cost (long-term cost). As a result, the supply curve will become even more flexible, as new real estate development companies will enter the market, while the existing ones will increase their production. However, if supply rises too much, the average cost will rise as a result of the negative scale effects (infrastructure, costs of transport, materials, land, etc.).

Moreover, real estate developers often fund their operations using financial leverage, which changes profitability indicators, as increased production financed in this way offsets the growing unit costs. In some countries, it is possible to finance construction with buyers' pre-payments, enabling developers to save the equivalent of interest they would have to pay on the loan, thus increasing the return on investment. Therefore, due to higher prices, the supply of development contracts may be more flexible in the short-term than suggested by marginal costs.

In the long term, supply of housing will be more flexible thanks to a wider range of possibilities of increasing production. The whole economy will be subject to structural adjustments aimed at adjusting the supply of housing to meet the society's needs[90].

3.1 Real and virtual supply curve

As in most productive sectors, the supply curve is affected by marginal costs and the price. Firms involved in home construction have generally in place similar, standardized construction methods, so that the aggregate supply curve is the sum of supply curves of individual real estate developers. We can determine two supply curves: the virtual and the real one.

The virtual supply curve (V) is the result of real estate developer's calculation of future return on investment. This calculation is an estimate based on current housing prices, cost of materials and labour. In contrast to the production company, which has a fixed capital stock and an optimal production level above which costs rise substantially, the real estate developer relies on outsourcing of construction services and buys a lot of production factors in small batches. For this reason, the individual cost curve is flat and rises with a considerable delay (see Figure 4, left-hand panel). The real estate developer usually operates as a holding, which allows it to create a special purpose vehicle to start new investment projects.

Furthermore, the number of housing units in a particular location can be adjusted to meet current market needs. Its supply is limited by the access to capital generated by the stock and bonds market and by loans. We should also mention another restriction in the form of limited number of qualified people who can conduct the construction process and the availability of production factors. Consequently, real estate developers supply curve (S)

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[90] It is worth noting that the economy may be subject to erroneous, socially expensive and excessive adjustments made to match new housing supply with demand. We have observed this recently, for example in Spain. Too many factors of production (capital and human resources) were transferred to the real-estate development sector, which generated huge costs: a high vacancy rate and mismatches in the labour market.

will be less inclined. It will move to the left, if the real estate developer expects the cost of land, materials and labour to increase or the diseconomy of scale starts to emerge.

Furthermore, the real estate developer can continue a project that was already started and then stopped, should demand increase. In this case, the supply curve of the developer is virtual and subjective as it is based solely on self-estimates and usually does not take into account the behaviour of the competition.

Figure 5 The virtual and actual supply curve (left-hand panel) and changes in the market in response to rising demand (right-hand panel)
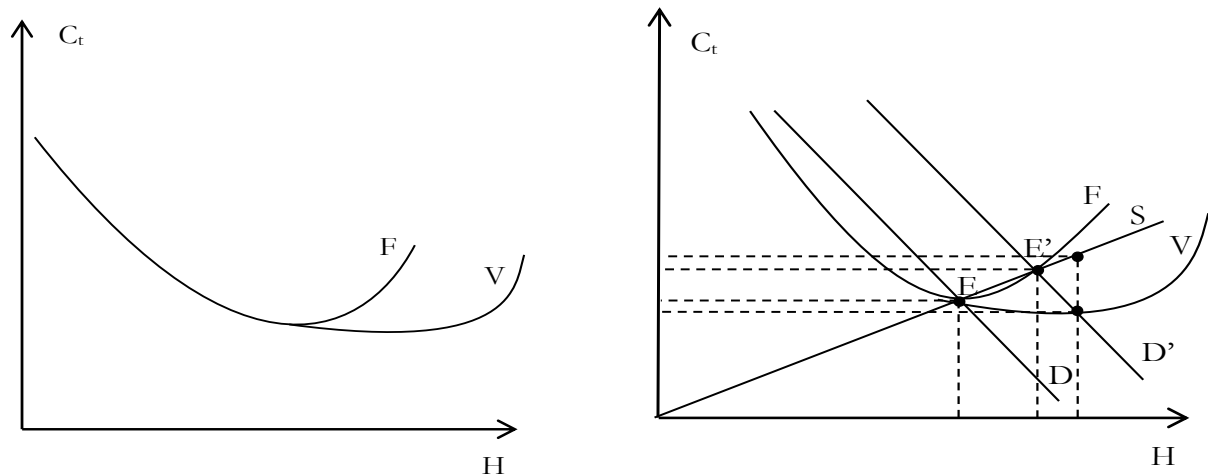
The real supply curve (F) of the entire development sector reflects the actual changes in investment profitability, taking into account diseconomies of scale and increasing costs of production factors, when production reaches too high levels. For example, real estate developers will buy less attractive plots of land and will have to adapt them to meet the actual needs or will have to pay more for work and materials. This gives a curve that shows how flexible the response of demand to housing prices is. However, its importance at the planning stage seems to be limited to the individual developer. It will play a major role in the final phase of the project and will determine the number of housing units that are currently being constructed.

If housing prices are stable, growing costs mean that profit margins are lower and, consequently, the expected future profits decline and the virtual supply curve goes up. This results in the suspension of new investments, slowing construction of the existing real estate investments, or even abandonment of the current projects. The virtual and the actual supply curve is shown in the left-hand panel of Figure 5. Rising demand for housing, as shown in the right-hand panel of Figure 4, as a shift in the demand curve to the right (from D to D '), will urge real estate developers to increase housing production. As a result of rising factor prices and the negative scale effects (average costs of production factors begin to grow), the real cost of production of such a large number of dwellings is higher (see curve F) and exceeds the price that consumers are ready to pay. This, in turn, creates a surplus in the housing market.

4 Aggregate demand and supply, model calibration and shock analysis

Taking into account the previously described model of individual demand for housing space H_t, we proceed to the aggregate demand D_t. Each household reports demand for a certain number of square meters of housing, which in the aggregate translates into a growing number of desired housing units. The aggregate demand can be described by the following equation[91], where the parameter a captures the constant demand, and the parameter b shows how strongly demand responds to price increases:

$$D_t = a - bp_t$$

The aggregate supply side can be described in a similar way, whereas housing production started in a particular period will be available with delay. The supply responds to the price of the previous period, as described with parameter d, whereas the parameter c means autonomous supply[92], independent of the price level.

$$S_t = c + dp_{t-1}$$

To determine the equilibrium of such a system (equilibrium price P* and the number of sold housing units ($q^* = S_t = D_t$) we combine these two equations and get the following result:

$$p^* = \frac{a - c}{b + d}$$

$$q^* = \frac{ad - bc}{b + d}$$

To describe real phenomena in the market, the following two conditions concerning the parameters *a, b, c* and *d* must be met. First, we want to avoid negative prices in equilibrium, thus *a > c*. Moreover, the system has to be stable, and to converge towards the equilibrium, which is possible only if *d <b.*

Changes in home prices are driven by differences in the levels of supply D_t and demand S_t (see Tse Ho and Ganesan, 1999), and the price adjustment can be described by the following equation:

$$\Delta P_t = \rho(D_t - S_t)$$

The parameter ρ is responsible for the speed of price adjustment. On the basis of empirical observations we conclude that the response of real estate developers is asymmetric, which means that prices are flexible upwards and not flexible downwards. Price of housing is fixed by the developer and the buyer can negotiate it, yet has a small amount of information and little bargaining power[93]. Typically, developers have price expectations and are ready to wait for a client who is willing to pay their price[94]. When

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[91] This is a simplification of the previously described demand function, where the parameter *a* accounts for the autonomous demand, which is independent of income, demographics and housing preferences. The parameter *b* determines, how strong the demand reacts to price changes.

[92] Given high fixed costs, the developer produces a certain amount of housing, irrespective of the current prices and construction costs. We call this production autonomous (see also Augustyniak et al. 2012).

[93] There is a strong asymmetry of information, the developer can put a smaller number of housing units on the market to create the appearance that housing is a rare good. The housing developer has also marketing tools to convince the client that housing is worth as much as expected by the developer.

[94] Compare the offers presented in Figure 4 in NBP (2013).

demand exceeds supply, the developer may demand a higher price. However, in the case of oversupply, the developer lowers his price expectations slowly, hoping to find a buyer who would be willing to pay the price. This has been observed in the Polish real estate market in the recent years. It may change when a developer uses high financial leverage and has to raise funds quickly. Then he is forced to cut prices in order to sell housing as soon as possible. However, when his construction is financed with a loan, the loan agreement may prevent him from lowering prices below a certain threshold.

4.1 Model calibration to the Warsaw property market

To calibrate the model, we use the aggregate housing demand. We assume that it is equal to the product of the average size of housing (58 square meters) and the average number of households that buy an apartment every year. According to our data, during the analyzed period, the average number of transactions in the Warsaw housing market amounted to approx. 13 000 housing units, while during the period of stabilization (2002-2004) this number reached approx. 12 600 units. Let us assume that such an aggregate demand determines the equilibrium point. Starting from this point, demand has increased significantly due to the increased supply of credit. This has led to higher prices, as described in Chapter 2.4. As a result, real estate developers embarked on new investment projects that supplied the market with approx. 1-2 years of delay. Until 2007, we observed price rises and increased production of new housing, yet, due to the global economic crisis, demand for housing fell. The result was a reduced number of new constructions and minor price changes. This example reflects the greater price elasticity in the case of price rises and the lower price elasticity in the case of price declines.

The market was in equilibrium in the period 2002-2004, in which the price was approx. PLN 4 200 per square meter (in constant prices of 2004), and approx. 12 600 housing units were sold each year.

$$p^* = 4{,}2, \qquad q^* = 12{,}6$$

We look for such parameters as a, b, c and d, which will make it possible to reconstruct the market cycle. For simplicity, we neglect the autonomous production of housing, so we set $c = 0$. By dividing the price equation by the equation of the number of sold housing units, we get the following equation:

$$\frac{4{,}2}{12{,}6} = \frac{a - c}{ad - bc}$$

Since we assumed that $c = 0$, we get the parameter $d = 3$. Then, from the price equation we get the equation describing the parameter a depending on the selected parameter b and d:

$$a = p(b + d)$$

Taking into account the previously discussed requirements concerning the parameters (*a> c, d <b*), we chose the following set of parameters[95]: *a* = 29,4, *b* = 4, *c* = 0, *d* = 3. We also see that real estate developers are more likely to raise prices than to lower them, which we reflect in the model by setting the parameter $\rho = 0,05$ if $D_t > S_t$ and $\rho = 0,02$ if $D_t < S_t$. The calibrated model reflects the observed market behavior. In the next section, we apply shocks to the model economy.

4.2 Analysis of the impact of shocks

In this section we analyze the impact of a demand shock amidst symmetric and asymmetric upward and downward price elasticity of real estate developers. For simplicity, we assume that the economy is close to the equilibrium point when price changes are small and supply and demand vary only slightly (2002-2004). The shock is the variation in demand by the size determined on the basis of the actual deviations calculated on the basis of empirical data (2004 year is the base year). Due to a large supply of loans denominated in foreign currency and rising incomes, the availability of credit has increased. In consequence, the demand for housing increased rapidly, but real estate developers supplied a greater number of new housing units with a certain delay. When current demand exceeds supply, home prices rise, encouraging developers to build more housing in the future. The home purchase decision is limited by credit supply, which depends on interest rates. At some point, the economy was in a situation when households wanted to buy less housing, but real estate developers continued to bring new offers to the market. This led to a reduction in prices, and developers should have cut down production in the medium term, moving to a new equilibrium point. However, developers were too slow in reducing their prices and production levels. As a result, the number of unsold housing rose considerably.

In order to close the model, we assume, according to market observations, that there is a stock of unsold developer housing, with which the developer can satisfy a portion of short-term demand. This stock ($\widehat{S_t}$) was selected as 50% of the average volume of sales transactions (6 500). This is an important simplification, as otherwise in the case of large shocks, demand would not be satisfied to a large extent, and price shocks would be even larger. On the other hand, real estate developers would have to sell the entire production at the time of demand decline and therefore prices would fall drastically. This stock consists of overproduction from the current and the previous periods and can be described as $\widehat{S_t} = \widehat{S_{t-1}} - (D_t - S_t))$.

A single, fading demand shock driven by the actual growth in demand at the turn of 2004/2005, presented in Chapter 2 is analysed in the first place. Demand for housing increased in this period by approx. 15 % only as compared with the average demand. We assume that in the next period, demand returns to its long-term average. As a result of demand exceeding supply, real estate developers increase prices, and in the subsequent

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[95] The exists an infinite number of combinations of *a* and *b*, however we want to use a simple notation of demand. Our choice of parameters allows us to generate quite realistic cycles.

period put more housing onto the market. The excessive demand is partly satisfied with the stock of unsold units. In period t +1 the demand returns to the average demand value recorded before the shock and real estate developers gradually reduce the price. Households buy as many housing units as before the shock, and developers, misled by excessively high prices, produce too many housing units. As a result, the surplus of unsold homes rises (left-hand panel of Figure 6). If, however, real estate developers cut prices as quickly as they raised them, they would not generate oversupply of housing for too long, and the market would quickly return to the long-term equilibrium (right-hand panel of Figure 6).

Figure 6 Analysis of single demand shock (left-hand panel- the price elasticity of real estate developers is higher upward than downward, right-hand panel – the price elasticity of real estate developers is symmetrical)
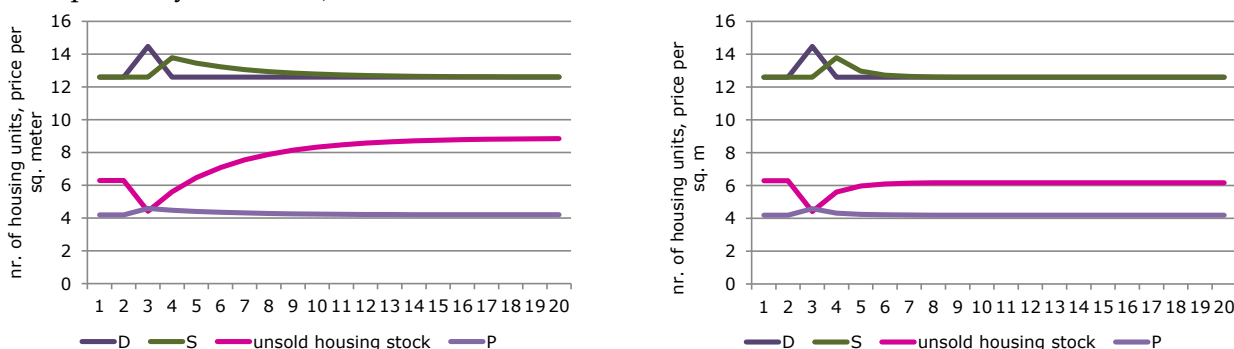
Source: Own calculations.

Figure 7 Analysis of the long-term demand shock (left-hand panel- the price elasticity of real estate developers is higher upward than downward, right-hand panel – the price elasticity of real estate developers is symmetrical)
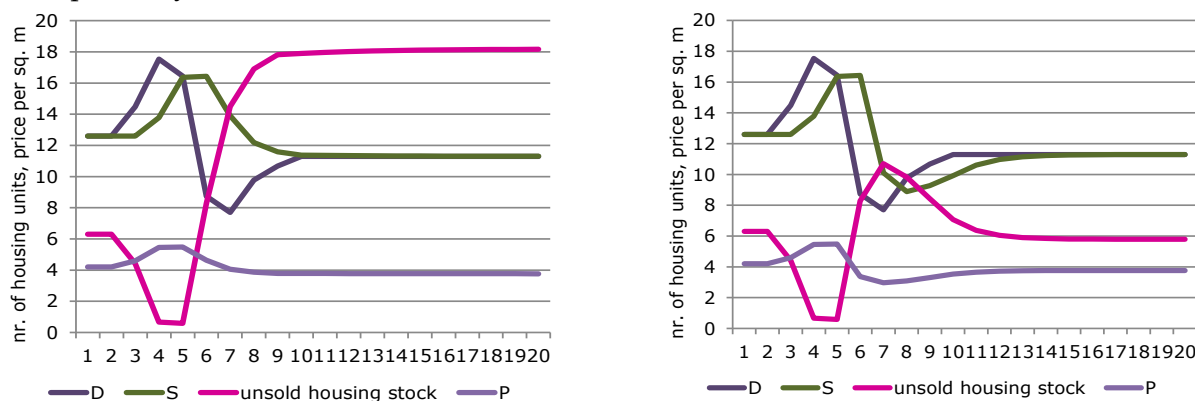
Source: Own calculations.

The same analysis is performed for a longer lasting shock. Demand grows from period to period, in accordance with the empirical growth in demand (see Chart 4). In this case, as previously, real estate developers observing excessive demand, raise prices and produce more housing with a delay. This behavior is repeated as long as demand grows, yet, real estate developers cut down production of housing too late. If they lowered prices

more rapidly in response to falling demand, they would produce less housing, and the market would quickly return to equilibrium (see Figure 7). The stock of unsold housing, which increased considerably with asymmetric price changes, decreases relatively fast and almost returns to its equilibrium level.

Based on the foregoing considerations, we may conclude that regardless whether the demand shock is a one-time or long-term one, if real estate developers had adjusted prices to excessive demand to a larger extent, the market would reach equilibrium faster.

To sum up, the model helps to explain the price dynamics and the volume of real estate transactions, which lead to significant fluctuations. The model suggests that the only way to achieve an market equilibrium and ensure small fluctuations around this point, is to stabilize and control demand, among others by slowing down the credit boom. Such a strong demand boom would probably not be possible, should only zloty denominated loans be granted. Moreover, the regulations related to the existence of the government-subsidized housing scheme sustained the demand (see: NBP, 2013). If, however, a programme aimed to support the rental housing market was introduced, the demand shock caused by rising incomes and low interest rates could be limited.

5. Summary

We have presented a relatively simple model that helps to understand the cyclical nature of the housing market. After calibrating the model to the Warsaw market, we showed how changes in interest rates affect the demand. Then, we demonstrated that a very slow price reduction by real estate developers amidst oversupply, caused that imbalance persisted for a considerable time. If real estate developers had adjusted prices downwards quickly, the market would return to the equilibrium level faster, and the unsold housing stock would be sold relatively fast. Moreover, the model shows that demand shocks, especially those repeated, substantially interfere with prices and housing production. It may be concluded that only the reduction in demand, for example, by prudential regulations limiting the availability of loan-financed housing can help to smooth out the housing market cycle.

An important assumption of the discussed current model is, in accordance with empirical approach, the fact that the market is in constant disequilibrium. Delayed adjustments of supply to the continuously changing demand lead to permanent cycles. We wish to emphasize that the assumed equilibrium, on which most of the known housing models are based, gives erroneous results and misleading indications to decision makers. We believe that our model is useful for policy makers, central banks and regulators for analyzing the impact of various factors on the housing market.

Literature

Augustyniak, H., K. Gajewski, J. Łaszek and G. Żochowski (2012), *Real estate development enterprises in the Polish market and issues related to its analysis*, MPRA Paper 43347.

Augustyniak, H., J. Łaszek, K. Olszewski and J. Waszczuk (2013), *Modelling of cycles in the residential real estate markets – interactions between the primary and the secondary market and multiplier effects*, National Bank of Poland Working Paper 143.

Aoki, K., J. Proudman and G. Vlieghe (2002), *House prices, consumption, and monetary policy: a financial accelerator approach*, Bank of England Working Paper no. 169.

Bajari, P., P. Chan, D. Krueger and D. Miller (2013), *A dynamic model of housing demand: estimation and policy implications*, International Economic Review 54, 409–442.

Bernanke, B., M. Gertler and S. Gilchrist (1999), *The financial accelerator in a quantitative business cycle framework*, Handbook of macroeconomics (North Holland).

Bracke, P. (2011), *How Long Do Housing Cycles Last? A Duration Analysis for 19 OECD Countries.*, IMF Working Paper WP/11/231.

Burnham, J. B. (1972), *Private Financial Institutions and the Residential Mortgage Cycle, with Particular Reference to the Savings and Loan Industry*, In: Board of Governors of the Federal Reserve System, Ways To Moderate Fluctuations in Housing Construction.

Chang, C.-O. and C.W.R. Ward (1993), *Forward pricing and the housing market: the pre-sales housing system in Taiwan*, Journal of Property Research V 10, 217-227.

DiPasquale, D. and W. C. Wheaton (1992), *The markets for Real Estate Assets and Space: A Conceptual Framework*, Journal of the American Real Estate and Urban Economics Association, Vol. 20, 181-197.

DiPasquale, D. (1999), *Why Don't We Know More About Housing Supply?*, The Journal of Real Estate Finance and Economics, Vol. 18, 9-23.

Dunsky, R.M. and J.R. Follain (1997), *The demand for mortgage debt and the income tax*, Journal of Housing Research, Vol. 8, 155-199.

Epple, D., B. Gordon and H. Sieg (2010), *A New Approach to Estimating the Production Function for Housing*, The American Economic Review, Vol. *100*(3), 905-924.

Fair, R. C. (1972), *Disequilibrium in housing models*, The Journal of Finance, 27(2), 207-221.

Hanau, A. (1928), *Die prognose der Schweinepreise (Forecasting the price of pork)*, Vierteljahreshefte zur Konjunkturforschung Sonderheft 7.

Henderson, J.V. and Y.M. Ioannides (1983), *A Model of Housing Tenure Choice.*, The American Economic Review, Vol. 73(1), 98-113.

Lambertini, L., C. Mendicino and M. T. Punzi (2012), *Expectations-Driven Cycles in the Housing Market*, Bank of Finland Research Discussion Paper 2-2012.

Levin, E. J. and G. Pryce (2009), *What Determines the Responsiveness of Housing Supply? The Role of Real Interest Rates and Cyclical Asymmetries.*, Centre for Public Policy for Regions Discussion Paper no. 20.

Lin, C. and S. Lin (1999), *An Estimation of Elasticities of Consumption Demand and Investment Demand for Owner-Occupied Housing in Taiwan: A Two-Period Model*, International Real Estate Review, Vol. 2, 110-125.

Łaszek, J. (2013), *Housing and consumer theory*, In: Report on the situation in the Polish residential and commercial real estate market in 2012, NBP.

Muth, R. (1960), *The demand for non-farm housing*, in A.C. Harberger, *The demand for durable goods*, The University of Chicago Press.

NBP (2011), *Report on the situation in the Polish residential real estate market in 2010 r*.

NBP (2012a), *Report on the situation in the Polish residential real estate market in 2011 r*.

NBP (2012b), *Information on home prices and the situation in the residential and commercial real estate market in Poland in 2012 (Q1 and Q2)*.

NBP (2013), *Information on home prices and the situation in the residential and commercial real estate market in Poland in 2013 Q1.*

NBP (2013), *Report on the situation in the Polish residential real estate market in 2012 r.*

Ortola-Magne, F. and S. Rady (2006), *Housing Market Dynamics: On the Contribution of Income Shocks and Credit Constraints,* Review of Economic Studies, Vol. 73, 459-485.

Phang, S. Y., K. H. Kim and S. Wachter (2010), *Supply Elasticity of Housing,* In: International Encyclopedia of Housing and Home, Elsevier and Science Direct.

Rubaszek, M. (2012), *Mortgage down-payment and welfare in a life-cycle model,* Bank and Credit, Vol. 43(4), 5-28.

Sanchez, A. C. and A. Johansson (2011), *The Price Responsiveness of Housing Supply in OECD Countries,* OECD Economics Department Working Papers, No. 837.

Shone, R. (2002), *Economic Dynamics: Phase diagrams and their economic application,* Cambridge University Press.

Sommervoll, D. E., T.-A. Borgensen and T. Wennemo (2010), *Endogenous housing market cycles,* Journal of Banking & Finance, Vol. 34, 557-567.

Stein, J. (1995), *Prices and trading volume in the housing market: a model with downpayment constraints,* Quarterly Journal of Economics, 110(2), 379-406.

Stover, M. E. (1986), *The price elasticity of the supply of single-family detached urban housing, Journal of Urban Economics,* 20(3), 331-340.

Steiner, E. (2010), *Estimating a stock-flow model for the Swiss housing market,* Swiss National Bank Working Papers 2010-08.

Topel, R. and S. Rosen (1988), *Housing Investment in the United States,* Journal of Political Economy, Vol. 96, 718-740.

Tse, R.Y.C., C.W. Ho and S. Ganesan (1999), *Matching housing supply and demand: an empirical study of Hong Kong's market,* Construction Managment and Economicss Vol. 17, 625-633.

Waldron, M. and F. Zampolli (2010), *Household debt, house prices and consumption in the United Kingdom: a quantitative theoretical analysis,* Bank of England Working Paper No. 379.

Wheaton, W. C. (1999), *Real Estate "Cycles": Some Fundamentals,* Real Estate Economics, Vol. 27,2, 209-230.

Part III. Analysis of regional cities – only in Polish