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Real Estate Market Analysis
for Market Value Assessment

1. Introduction

Market analysis is typically carried out in two stages, consisting of: gathering data, selection and use of an appropriate algorithm based on the optimal model. The basic problem of the real estate market analysis in Poland, as repeatedly indicated in the specialist literature and bank reports, is the lack of reliable data.

In bank reports for 2007 published on websites, the following wordings can be read:

> "Entities having access to information often distort it for the sake of their own interests."
>
> "Average price levels published in 2004–2005 are several times understated in relation to the widely available offering prices, and furthermore, they do not include promissory agreements, which are the proper price indicator in the primary market in the current circumstances."

Reports by banking sector analysts very unambiguously undermine the credibility of transaction prices indicated in notarial deeds. It is a well-known fact that where parties strive to minimise charges due to a transaction, this results in understating the price, whereas for credit purposes, prices are regularly overstated in promissory agreements. Analyses of promissory agreements for both the primary and the secondary market reveal that prices in final agreements are often 10–20% lower than those in the promissory agreement. This is caused by the intention to receive a credit equal in amount to 100% of the real estate value. Transactional data are only gathered by the GUS [Central Statistical Office] in a very limited range. A positive phenomenon might be the AMRON system run by the Polish Bank Association [Związek Banków Polskich]. It is very likely that in the future

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the AMRON will fill the information gap and be the basic source of information for the banking sector. Even the best algorithms will not bring sufficiently credible results if the data that are subjected to statistical processing are falsified on the very input. It is proposed that the provisions of the Real Estate Management Act be extended with more options of taking into account data gained from promissory agreements and offers (considering research results that suggest that these are circa 7–10% higher than the transaction prices) in the primary market in the process of assessing real property.

Market analysis can be performed using the classic approach, as well as methods described as artificial intelligence, which include neuron networks, decision trees and the *k*-nearest neighbour algorithm. Market research should provide answers to some key questions – what is the trend of price fluctuation in time in the local market and how long will it last, and what changers will follow afterwards? Promising results, as far as price forecasting is concerned, are provided by the so-called System Dynamics. This is a concept derived from the systems theory and assumes studying the market in a complex manner. Markets are treated as dynamic systems in which the supply and demand relations are constantly changing under the influence of decisions made by the market participants, in an ever-changing environment. In specialist literature, market analysis is more and more often treated as study of the supply and demand relation in the changing, broadly understood market environment: economic, spatial, social-economic, demographic, political and other. An essential thing in the adopted algorithms is defining and examining all possible interactions and their results that may be brought about by a change of a given element in the model.

In the late 1950s, at the Sloan School of Management, Massachusetts Institute of Technology, Forrester developed an approach currently known under the name System Dynamics. Initially, System Dynamics was utilised for studying the industry and then it was applied to studying social processes. According to Kwaśnicki [14], work carried out under System Dynamics led to the creation of the Dynamic model of the global economy. Results of these studies were broadly commented by Domański [20] and Bajerowski [19], from whose works it followed that the basic barriers for the development of mankind are the limited number of raw materials, environmental contamination and demography. Research conducted by Michnowski [13] and Kuciński [10] show that in the perspective of several dozen years, the problems of environmental protection and natural resources will be key issues to the mankind. System Dynamics is used in many fields of life as a good research instrument. Its basic advantage is that numerical data can be linked with expert opinions and evaluations. When transposing methods used for market analysis in the industry to assessing market value it should be remembered that the real es-

tate market significantly differs from other goods markets. Uncritically transferring algorithms successfully used in other markets to the real estate market can lead to big errors. Almost all of the currently used approaches of market analysis speak of analysis as broadly understood. Relations of supply and demand with the price are examined in the context of market environment in the local and global scale [23].

Legal regulations for property experts determine the rules and conditions for using the comparative approach referred to in article 153 section 1 of the Act of 21 August 1997 on Real Estate Management (Dz. U. [Journal of Laws] of 2000, No. 46, item 543) and in the Ordinance of the Council of Ministers of 21 September 2004. In paragraph 1.2 of the Ordinance it is said that similar estates may be taken into account "only then if" their prices and features, as well as the transaction conditions, are known. In extension, in paragraph 2.2 subparagraph "d", it is stated that the expert should present a market analysis and characteristics consisting in examining the supply and demand relation, the investment potential of the given market, the unemployment rate as well as other economic factors that the expert finds relevant.

One of the market analysis methods that accounts for the broadly understood environment is an algorithm consisting in utilising a reciprocal correlation matrix for transaction prices and macroeconomic parameters.

2. Elements and Factors of Real Estate Market Analysis

Observing the relationship between transaction prices and transaction times over a period of many years, we can notionally distinguish five key components of the examined function.

2.1. Development Tendency

Development tendencies (T – trend: can be diminishing, growing or horizontal) are presented by means of trend analyses. Most often, the "smoothing" of the function is performed using the moving average or by adapting the function with the least squares method. Market analysis consisting in examining transaction prices in time can be presented in the form of a set: $\{(t, C_T); t = t_1, t_2, t_3, ...t_n; C_T = C_1, C_2, C_3, ... C_n\}$. In a similar manner, we can present local and global features by collating time on the X axis and the variable examined on the Y axis. The number of moving average elements is selected in such a manner as to eliminate seasonal and casual fluctuations. This means that if for calculating the moving average we

take as many elements as there are in the season cycle, then this way we eliminate the seasonal fluctuations. Depending on the number of elements utilised for calculating the moving average, whether even or odd, we deal with straight or aligned average respectively. In practice, despite many positive aspects and its calculation simplicity, the moving mean is seldom used by real estate experts. Most commonly, for determining the price fluctuation trend in time, experts take advantage of the trend line determined with the method of least squares.

One can distinguish three basic kinds of trend lines, approximated with the least squares method: straight lines, monotonic curves and polynominals. Straight line, most commonly used in the analysis of the additive models, has a number of merits, the most important of which is its simplicity and ease of practical usage. Curves (logarithmic, exponent, exponential, etc.) are usually used in the multiplicative model. A curve with "radius" approaching infinity can with sufficient accurateness be treated as a straight line and utilised for the additive and the multiplicative models. In transitory periods, when we have a distinct change of trend, several trend lines should be used, adjusted simultaneously using the least squares method.

2.2. Seasonal Fluctuations

Seasonal fluctuations (S – the seasonal cycle is regular and lasts no loner than one year, and can be observed if one has quarterly, monthly or daily data, etc.) are relatively easy to diagnose. It is assumed that the seasonality of the phenomenon being studied cannot last longer than a year; hence if we take annual data for the analysis, we eliminate the seasonal character of the phenomenon. For several years, due to immense technological progress and climate warming, the phenomenon of seasonality has been practically negligible in real estate market analysis for assessing real estate value. The gradual elimination of tax reliefs resulted in decreased number of transactions as at the end of the accounting period.

2.3. Business-cycle Fluctuations

Business-cycle fluctuations (K – we can observe a business cycle if we have data from many years) are a very essential factor in the real estate market analysis. Business cycle periods are: recession, depression, recovery and prosperity. Grabski [1] states that the fundamental characteristic of the economic life is the variability of conditions in which it proceeds. Burns and Mitchell [2] define business cycles as: "(...) a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises; a cycle consists of expansions

occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle." For Haberler [3], a business cycle is a wave type movement comprising the economic system, as an entirety, manifested above all in production and employment fluctuations. The awareness of the cycle phase is particularly important on account of its capital-intensive and time-consuming nature. Failure to recognise the cycle phase by an investor may expose him to severe material losses. By investing in the real estate market after having correctly recognised the cycle phase, we considerably increase the likelihood of achieving an economic success.

According to some researchers, cycles in the real estate market can be considered in the macro- and microeconomic scale, as well as on the national and local market level [15]. Business cycles occur in all real estate markets: office, warehouse, housing and other [25]. It ahs been ascertained that cycles in the real estate market do not always follow the cycles for the entire economy. A higher congruity with the economic cycle has been found for the housing estate market than for the commercial estate market [6–7], and [12]. Research conducted by Jongejan [9] resulted in providing the basic elements that trigger off business cycle fluctuations, among which the researcher included: phase movements occurring in the entire economy, human behaviours and specificity of the construction industry itself (structural features of the buildings, arrangements, permits and the construction process). Observing economies of various countries, and the business cycle phases, one may say that formerly it was mainly economic crises that affected the real estate market. The late 20th century saw an increase in the number of economic crises initiated by crises in the real estate markets. This is chiefly caused by the dependence of the banks' financial condition on the market value of the property constituting mortgage for the credits taken out. Wherever the wave movement of the real estate market is the reason of a bank crisis, there a crisis in the entire economy is bound to follow in the second phase. Hübner [11] thinks that thanks to the business cycle barometers, econometric models, expert opinions and business cycle tests, one can obtain analyses and forecasts for the business cycle phase. Indicator methods, which include business cycle barometers (quantitative data) and business cycle tests (qualitative data), belong to the main methods of business cycle phase analysis. Zarnowitz and Boschan [5] state that the variables utilised for describing business cycles should refer to essential features of the business cycle and should be representative. Business cycle in the real estate market can be described with multiple variables, for example: the number of sales transactions being concluded, the price of 1 m² of dwelling area, number of construction permits being issued, vacancy rates, number of people employed in the construction in-

dustry, number of construction companies or the number of new dwellings completed [25]. Particularly worth noticing is the varying vacancy rate with regard to commercial premises, which is a good indicator of the business cycle provided that we examine it parallel to the increase of new commercial spaces intended for lease. If dwellings not yet built are being sold in the market and this is a common phenomenon, then this may herald the peak of prosperity and subsequent market breakdown. Similarly, increasing real estate prices at declining buying power of citizens in a given country. While analysing the market, one must closely follow changes in the VAT rates, tax reliefs and other factors that may significantly influence prosperity enhancement or weakening.

Dwight R. Lee of Georgia University describes in his article *Inflation and inflationary demand for housings* a big boom in housing construction in the USA in the 1970s. A high level of personal incomes connected with inflation and available tax deductions caused that Americans, contrary to experts' forecasts invested their incomes in real estates. In connection with the drop of the number of people in households from 3.4 persons in 1974 to 2.76 persons in 1980, forecasts explicitly indicated a decrease in the area of newly built houses. In practice, however, the impact of the above mentioned factors caused an actual increase in the area of newly built houses by 17%.

For business cycle studies, Gdakowicz [25] suggests using an indicator calculated as the geometric root of the indices calculated for the variables:

I_{KMt} – business cycle indicator for the dwelling market,

I_{Mt} – number of new dwellings index,

I_{Zt} – average employment in the construction industry index

$$I_{KMt} = \sqrt{I_{Mt} \cdot I_{Zt}} \tag{2.1}$$

The proposed business cycle indicator for the dwelling market is a medium of information on the real estate market. When using it, one should bear in mind that dwelling construction can be carried out by external companies or it can be carried out by the owners themselves. The number of new dwellings may not reflect the actual state, due to the commonly known fact that new dwellings are often registered with delay for the avoidance of local charges.

2.4. Critical Component

Critical component (SKR) – a variable occurring in the period of price bubble formation and vanishing after exhaustion of the negative effects of the crisis on the real estate market. SKR happens once in a generation and has a destructive impact on the entire economy, and is usually preceded by a phenomenon described as

price bubble. Many researchers very clearly distinguish the phenomenon of crisis in the real estate market (including price bulb) from the business cycle phase, as coinciding phenomena, yet of fundamentally different significance. A crisis in the real estate market is closely related to the economy and was typically preceded by the phenomenon of price bulb. Price bulb, usually preceding a crisis in the real estate market, is a violent increase of asset prices beyond the level of their fundamental value that ends with a violent price adjustment.

Many researchers discern unparalleled price increase due to fundamental reasons, consumer optimism and speculative activities (speculation).

Definitions of speculation:
– economic activity undertaken with the view of exorbitant profit; consists in buying and gathering goods and reselling the same in the situation when the demand for them exceeds the supply [4].
– a risky trading transaction intended to yield (high) profit from expected changes in prices, market supply, manufacturing methods, etc. [16].

The levels reached by real estate prices in the last years resulted from a coincidence of multiple events.

Reasons for price increase in the real estate market:
– fundamental: long-term increase of the GDP, unemployment drop, increased income within the society;
– political: Poland's accession to the EU, permits for dwelling purchases by foreigners, complete absence of state control over the processes occurring, politicisation of decisions aimed at supporting the construction industry, lack of a pro-family policy, lack of dwelling investments financed from the state budget, long-standing negligence in the housing policy;
– banking: interest rate decrease, liberalisation of credit policy by the banks;
– speculative: (speculative) investment demand increase, consumer optimism, absence of arbitration control;
– demographic: mass economic emigration, baby boomers from the 1980s joining the consumer group;
– supply-demand: dwelling purchases by investment funds, general lack of spatial development plans, considerable demand surplus over supply, mass export of construction services;
– educational: errors in the system of education (liquidation of vocational schools);
– information: lack of a proper and reliable database, delays in transferring information, frequent cases of intentionally misrepresented prices in notarial deeds, unparalleled susceptibility and uncritical acceptance of information from media coverage.

Fundamental reasons, including permits for dwelling purchases by foreign investors and investment funds, along with the increase of economic emigration are the basic reason for the increase of real estate prices in Poland as far as demand is concerned. A significant price increase caused liberalisation of the credit policies by banks, producing a feedback reaction. However, according to independent research carried out in 2007, easy access to credits in Poland accounted for not more than 7–10% of the real estate price increase.

After a period of demand inflation related to a huge surplus of demand over supply, Poland witnessed cost inflation related to increased prices of materials and services as a result of a drastic increase of the prices of final products. The effect of such a course of inflation events is an irreversible increase of real estate prices by the cost inflation rate. A price adjustment that is bound to follow will happen at the expanse of developers' margin. At the same time, one cannot rule out a coincidence of several negative factors affecting the real estate market, e.g.: dwelling clearance selling by investment funds, sale of dwellings (belonging to people who fail to pay the rent) by banks, panic on the speculative market and pertaining hasty sale of dwellings, increase of the economic emigration, birth rate drop, crisis on the social insurance market, loss of Euro 2012 organisation rights by Poland, bankruptcies of banks, increase of the economic crisis in the USA, crisis on the capital market, etc. According to Malpezzi and Wachter [21], the delay on the supply part to the market stimuli fosters an abrupt price increase of speculative character. Arbitration activity on the real estate market is almost non-existent, contrary to the capital markets where it contributes to the improvement of their functioning [18]. The phenomenon of price bubble is driven by "gregarious" actions of the investors. Some researchers went amazingly far in their statements: "those who follow the herd of investors are unable to use their own knowledge" [8]. Żelazowski [26] provides some ways of identifying price bubbles, including the relationships: price per 1 m^2/profit per 1 m^2, price per 1 m^2/rent per 1 m^2, volume of households' income/price of 1 m^2 dwelling, etc. Indicators should have definite boundary values, and where they change over time, they should be provided with a forecast resulting from the trend and the changes thereof. When using indicators, one should bear in mind that they may have different values for different phases of the business cycle.

2.5. Casual Fluctuations

Using the moving average or algorithms using the least squares method, we can effectively eliminate the impact of casual fluctuations (P – irregular deviations of the phenomenon from the expected level).

3. Conceptual Models of Market Analysis

Transaction prices of real estates C_T can be described conceptually by means of the function

$$C_T = T + S + K + P + SKR \qquad (3.1)$$

where:

T – development tendency,
S – seasonal fluctuations,
K – business cycle fluctuations,
P – casual fluctuations,
SKR – critical component.

Isolation of all of the elements of the transaction price function is called **decomposition of the transaction price**.

Two "models" of market analysis can be distinguished [22].

1) The additive model (seasonal and casual fluctuations are constant and sum up with the trend); the idea can be presented with the formula

$$C_T = T + S + P \qquad (3.2)$$

Examples of the additive model variables represented on the time axis can be average remuneration, number of employees in the construction industry, interest rates, etc.

2) The multiplicative model (fluctuations are proportional to the phenomenon and overlap the trend in a multiplier manner); the idea can be presented with the formula

$$C_T = T \cdot S \cdot P \qquad (3.3)$$

Examples of the multiplicative model variables are: inflation, GDP, business cycle indicators, foreign exchange rates, etc.

4. Final remarks

– Owing to the development of the real estate market and its growing resemblance to other markets, the methods of consumer goods market analysis, which examine a phenomenon or the dynamics of its changes, will be more and more frequently used for the real estate market analysis.

- A common part for the vast majority of methods is examining the supply and demand relation in the dynamically changing broadly understood environment. The market environment is understood as the local and global environment. On account of a close affinity between the housing estate market cycle and the economic cycle, the strongest correlation between prices and macroeconomic parameters should be obtained on the housing estate market.

- A proof of the rightness of each method used for market analysis is the reliability of the forecast. Employing a given model for market analysis is only desirable when replacing the old model involves an increase in forecast reliability.

- Simple models provide the possibility of making quick analyses to accept or reject the assumptions and hypotheses being formulated, and serve for making short-term forecasts. Complex models, on the other hand, provide the possibility to take into account a far greater number of variables, and are used for long-term forecasts.

- Each market, thus also the real estate market, has its limitations and so--called boundary conditions. If the certain parameters of a given model exceed the boundary value, then the model becomes useless.

- The main difficulties that an expert faces while making a market analysis is the lack of a sufficient number of reliable and complete data.

- Fitting several different trend lines, using the least squares method, in consecutive time intervals but into the same data set may result in increased reliability of the time-adjustment of prices, due to the elimination of many of the function components. In practice, the process of adjusting prices due to time lapse is reduced to the analysis of several trend lines. The weakness of this method is limited forecasting. The merit is the optimal consideration of the trend line variability.

- Each algorithm that increases the reliability of the forecast, takes into account similarity weights, local and global attributes, and provides the possibility to perform variance analysis, should be deemed good.

- Long-term forecast should be used to determine the banking and mortgage value as well as for investment purposes with special consideration of the macroeconomic parameters, expert forecasts, behavioural research, etc.

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