

## The Real-time Problem in Real Estate Market Research

Justyna Brzezicka<sup>1</sup>

<sup>1</sup> *University of Warmia and Mazury in Olsztyn, Poland,*  
 ORCID: <https://orcid.org/0000-0001-9500-1054>, [justyna.brzezicka@uwm.edu.pl](mailto:justyna.brzezicka@uwm.edu.pl)

### ABSTRACT

Purpose – The research goals were to analyze the problems in real estate market research; prepare a map of the problems associated with information supply on the real estate market and describe in detail the problem of real time in real estate market research.

Design/methodology/approach – In the theoretical part, the method of detailed literature review was used. In the research part, the case study method was used. On the example of the city of Olsztyn was examined delays in entering and accessing data in the Register of Real Estate Prices and Values in Olsztyn.

Findings – On the Olsztyn market, the length of the information lag between the date on which an application was submitted and the date on which the requested information was provided was approximately 30 days. The average difference between the date on which the requested information was received and the date of the most recent transaction in the register was 40 days. The average lag between transaction date and registration date was 85 days.

Research limitations – The main research limitation is the analysis of only one local market, the market of the city of Olsztyn. For this reason, the results should not be generalized, and the problem requires deeper research.

Research implications – The problems relating to insufficient market data, delayed access to data, information asymmetry and real-time data need to be resolved to improve the research process and facilitate the operations of market service providers, such as property appraisers, consultants and brokers.

<b>Keywords:</b>	information, research problems, information supply
<b>JEL codes:</b>	D80; D82; R00; R20; R21;
<b>Article type:</b>	research article
<b>DOI:</b>	10.14659/WOREJ.2021.106.05

## **INTRODUCTION**

The real estate market is a difficult subject of research. These difficulties undoubtedly stem from the specific nature of the real estate market and the characteristic attributes of real estate. The real estate market is imperfect, and every real estate is unique. The heterogeneity of real estate, such as apartments, considerably impairs the process of selecting a homogeneous research sample. These are only some of the problems associated with real estate market research. Other difficulties include insufficient supply of information on the real estate market, structure and availability of data, selection of the optimal research methods, data quality and data cleaning methods. The problem of real time in real estate market research plays an important role in this context.

This article is a part of a series of papers dedicated to information supply on the real estate market. It explores problems that arise in real estate market research, with particular emphasis on the real-time problem in market research. These problems have been identified and considered on the example of the Polish real estate market. The research goals were to: 1) analyze the problems in real estate market research, 2) prepare a map of the problems associated with information supply on the real estate market, 3) describe in detail the problem of real time in real estate market research. A map of problems was developed, and the problems identified on the housing market were grouped into several categories. The research methods involved a review of the literature and a case study. The article contributes new knowledge about market imperfections that generate research problems.

## **LITERATURE REVIEW**

The imperfect nature of the real estate market and the unique attributes of real estate have been extensively researched. Numerous problems in real estate market research can be identified by analyzing the existing body of knowledge. According to Ludwiczak (2017, p. 358), the real estate market is highly imperfect and, therefore, poses a considerable challenge for researchers. The problems associated with real estate market research, analyses of market data and interpretation of the results are encountered in all stages of market research, beginning from data collection, analyses of the structure, availability and quality of market data, and ending in the selection of research methods. These problems can adversely impact the results of research and, consequently, undermine the reliability of the conclusions about market performance. In this sense, the study of the real estate market

---

is not a research problem that should be defined and resolved with the use of scientific methods, by formulating research questions and attempting to find the answers.

This chapter focuses on the supply of information on the real estate market as the key factor that generates numerous research problems. This problem was broken down into several researchable parts, and their consequences were identified. The presented list of problems is not exhaustive, and it was developed in an attempt to systematize the existing issues and offer a synthetic description of the discussed problem.

The supply of information on the real estate market is a highly complex issue. Information deficiency is regarded as an immanent feature of the real estate market, and it is associated with the imperfect nature of the real estate market and its unique attributes (Kucharska-Stasiak, 2006, p. 44; 2016, p. 58). Information deficiency is a widespread problem that stems from low market transparency and low informational efficiency of the real estate market (Wisniewski, 2007). At the same time, information plays a key role on the market; it is a category that describes the unique attributes of market actors and real estate, and characterizes the relations between these entities, thus juxtaposing various factors that influence systemic processes (Wiśniewski, 2007, p. 11). Information is an essential element of the market that conditions effective market performance. The effectiveness of the market is compromised when information is not available: anomalies occur and the system's structure is disrupted. Due to the integrating function of information, the effects of information deficiency can be observed at many levels and in many market processes. These effects can be delayed, especially since the real estate market is dynamic and burdened with considerable uncertainty (Brzezicka, Wisniewski 2014, p. 108).

Various subcategories of problems associated with information supply on the real estate market are discussed below.

The **scarcity of information** on the market has been widely investigated (Konowalczyk & Ramian, 2012; Brzezicka & Wisniewski, 2014; Brzezicka, 2014; Ludwiczak, 2017; Rącka, 2017; Polczyk & Konowalczyk, 2018; Renigier-Biłożor, Janowski & d'Amato, 2019; Tomal, 2021a). In many cases, the existing body of information is insufficient, information is fragmentary, or deficiencies are reported in specific market segments. The scarcity of publicly available information on commercial real estate or the absence of a central database containing information about property titles in housing cooperatives (such information is not entered into the Register of Real Estate Prices and Values) are examples of the above. The information provided in notarial deeds is often insufficient (Widłak et al., 2013, p. 137), it

---

is difficult to access and is not standardized (Kokot, 2015). According to Żróbek et al. (2020), the opposite also applies because property assessments that are based on a very large number of attributes generate surplus information, which is particularly true of agricultural real estate.

**Insufficient availability of data** on the market is yet another problem. Ludwiczak (2017, p. 355) analyzed the fragmentation and asymmetry of market data, which leads to variation in the availability of data on different sub-markets and compromises the usefulness of information available on parallel markets. The lack of access to specific types of information, such as data accumulated in banking systems, was discussed by Widłak, Augustyniak, Łaszek and Olszewski (2013, p. 138). Asymmetry in information access is also an important issue. Low market transparency combined with high market heterogeneity (Tomal, 2021b) contribute to information asymmetry. Other problems associated with information availability include access to secondary data; low availability of information about specific market transactions and the abundance of aggregate (averaged) market data that are difficult to compare; the costs associated with data access (Konowalczyk & Ramian, 2012), and subjective management of data (data owners often distort information for personal gain) (Dąbrowski, 2010, p. 57)).

The **quality and reliability of data**, noise, and distortion of information in the media are also important considerations. Widłak, Augustyniak, Łaszek and Olszewski (2013, pp. 136-137) and Dąbrowski (2010, p. 57) have observed that property values and prices may be underestimated for tax reasons, which affects the reliability of the collected data. Registers of real estate prices and values are also replete with errors: transaction prices are entered incorrectly or the same property attributes are described in different ways (such as floor number or appurtenances).

Another category of problems is associated with the **development of databases and the methods** used to calculate various parameters. Numerous methodologies for calculating aggregate values, indices and other statistical data, such as the data generated by *Statistics Poland*, have been proposed for long time series. Data are sampled at various intervals, and they are obtained from diverse sources (Widłak et al., 2013, pp. 136-137). According to Widłak, Augustyniak, Łaszek and Olszewski (2013, p. 136), the applicability of different methods for measuring the rate of price changes is determined by data availability. For example, the development of price indices with the use of hedonic methods (which are regarded as the optimal methods for measuring price trends) requires access to databases that contain extensive information. In addition to property prices, information about the physical attributes of real estate, its location and neighborhood is also needed. Data

---

availability affects the choice of research methods. When access to market data is limited, researchers may be forced to work with shorter time series, or they may be unable to formulate logical conclusions, which undermines the reliability of research findings.

**Information delay** is yet another category of problems related to the supply of information on the real estate market. These problems include delays in data collection (Widłak et al., 2013, pp. 136-137), delayed access to the accumulated data, and delays in discounting information that is already available. Real estate prices respond relatively slowly to new market information (Ludwiczak, 2017, p. 357). Market signals respond slowly to transaction prices, and prices respond slowly to changes in market signals (Kucharska-Stasiak, 2016, p. 58). As a result, real estate attributes are not completely reflected in market prices (Kucharska-Stasiak, 2010, p. 8; Kucharska-Stasiak, Załęcza & Żelazowski, 2012, p. 23). Information delays are associated with the real-time problem in real estate market research. The real-time problem has not been thoroughly analyzed, and it is poorly understood. Therefore, this problem is discussed in a separate subsection. The problems addressed in this article are summarized in Figure 1.

### **THE REAL-TIME PROBLEM**

At first glance, the real-time problem appears to be linked with the group of information delay problems. However, a deeper analysis suggests that the real-time problem partially overlaps with all categories of problems, despite the fact that it is most closely associated with delays in information flow. Due to the low of availability of current data, the real-time problem belongs to the group of information deficits and accessibility problems. These deficits directly affect the quality of research and the applied or potential research methods. The real-time problem belongs to the group of problems associated with information delays because data ultimately become available, but after a certain period of time.

---

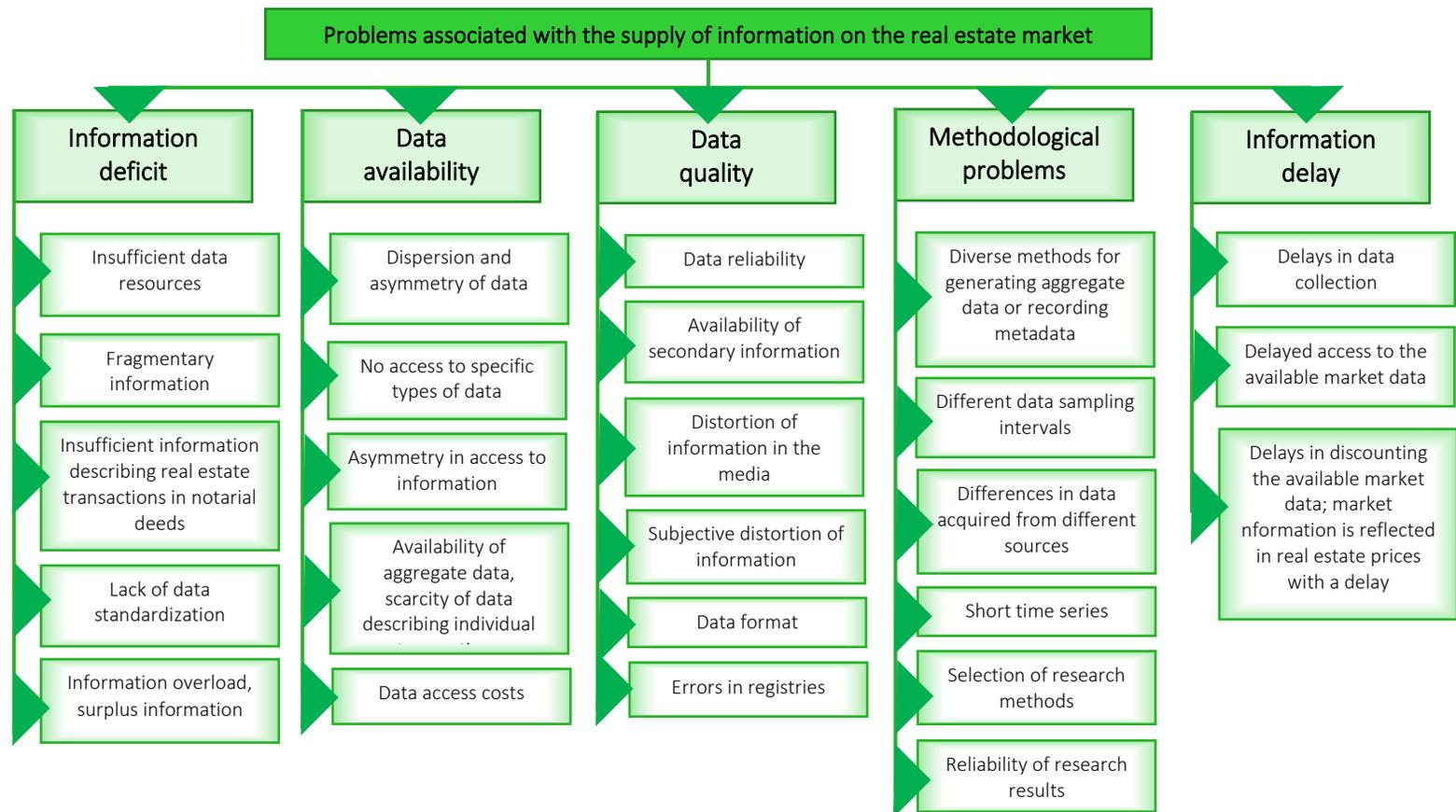


Figure 1. Problems associated with the supply of information on the real estate market

Source: own elaboration based on a review of the literature

According to Olender-Skorek and Wydro (2007, p. 1), the value of information is determined by the moment in which that information is used. This observation accurately defines the essence of the real-time problem in real estate research. The real-time problem remains insufficiently investigated in the literature dedicated to the Polish real estate market. The concept of "real time" is generally not encountered in market analyses, in particular in analyses of time series. The few references to the real time concept should be considered in a broader context. Dąbrowski (2011) relied on the real time concept to analyze lagged variables in linear regression models with an autocorrelation factor. In the work of Hycner and Mika (2002), this concept was used to design real-time systems for the real estate cadaster. The real time concept can also refer to selected functionalities, technologies and applications that operate in real time. A reference to the real time concept was made in the Act of 6 September 2001 on access to public information (Article 8, point 6) which states that the information published in the Public Information Bulletin should be time-stamped to guarantee that the real time at which that information was made available to the public can be identified.

Despite the above, the problem of real time in real estate research has not been explicitly identified or addressed in the literature. To date, this problem has not been defined in the above context. The time horizon applicable to the real time of the available data and the acceptable duration of information lags have never been defined. The question whether the terms "valid data" and "real-time data" are interchangeable and can be used synonymously also remains open.

The time horizon applicable to real estate prices has been discussed in greater detail by Kokot (2015, p. 47) who observed that notarial deeds that are submitted by notaries to centers of geodetic and cartographic documentation are registered in the system, including the Register of Real Estate Prices and Values, with a considerable delay. Due to the long waiting period, these notarial deeds formally "do not exist", and they cannot be accessed by members of the public who have an interest in transaction prices. In many cases, notarial deeds are registered with a delay of several months or even more than six months. As a result, market analysts and property appraisers are unable to access information about recent transactions. These delays compromise the validity of real estate market analyses (Kokot, 2015, p. 47).

In view of the fact that the problem of real time has not been clearly defined in the literature dedicated to the Polish real estate market, the aim

---

of this study was to determine the validity of data available on a local real estate market.

### CASE STUDY

Two data access requests were submitted to the Olsztyn City Office to determine the time lag between the date on which a notarial deed was concluded and the date on which it was entered into the Register of Real Estate Prices and Values in Olsztyn, and to assess the validity of the registered data. The requests concerned access to the Register of Real Estate Prices and Values, covering the period from 1 January 2021 to the last registered transaction. For the needs of the study, the datasets received in response to the first and second request were labeled as R1 and R2, respectively. The dates on which the requests were prepared and submitted, and the dates on which the requested information was received by the authors are presented in Table 1. The information delay was expressed by the number of days between the date on which the request was submitted and the date on which the requested information was received, and between the date on which the requested information was received and the date of the most recent transaction (Tab. 1).

**Table 1. Delays in accessing data in the Register of Real Estate Prices and Values in Olsztyn**

Category	R1	R2
Date on which the request for information from the Register of Real Estate Prices and Values was prepared	30 April 2021	31 May 2021
Date on the which the request was sent from the Faculty of Geoengineering of the University of Warmia and Mazury in Olsztyn	4-5 May 2021	7 June 2021
Date on which the requested information was received	24 May 2021	12 July 2021
Date of the most recent transaction in the register	30 March 2021	27 May 2021
Number of days between the date on which the request was sent and the date on which the requested information was received	20 days	42 days
Number of days between the date on which the requested information was received and the date of the most recent transaction in the register	55 days	46 days

Source: own elaboration.

In the next step, the quantity and quality of the information provided in response to each request was evaluated. The obtained data were used to develop a consistent and homogeneous database of apartment transactions. Information about property ownership and co-ownership was included in the database. All transactions were conducted on the private market, regardless of the formal status of the involved parties (public/private). The analyzed properties were apartments with an area of 40 m<sup>2</sup> to 60 m<sup>2</sup>, traded on the primary and the secondary market. The time horizon of the analysis was 1 January 2021 to the last transaction reported in the register. Ten observations classified as non-private transactions (transaction prices below PLN 500/m<sup>2</sup>) were eliminated from the database that was developed based on R2 data. The average prices and the number of transactions are presented in Table 2 and Figures 2 and 3. The number of days between the date of the transaction/valuation and the date on which the transaction was registered was calculated. These results and the calculated descriptive statistics are presented in a histogram in Figure 4.

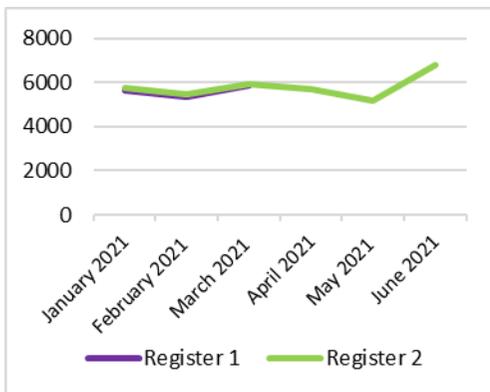
**Table 2. Average prices and the number of transactions in databases developed based on R1 and R2 data**

Data	Average price				Number of transactions			
	R1	R2	difference [PLN]*	difference [%]**	R1	R2	difference [No.]*	difference [%]**
January 2021	5661	5729	67	1.2	27	46	19	70
February 2021	5362	5474	112	2.1	26	40	14	54
March 2021	5870	5928	58	1.0	8	25	17	213
April 2021		5706				19	19	
May 2021		5174				9	9	
June 2021		6788				2	2	

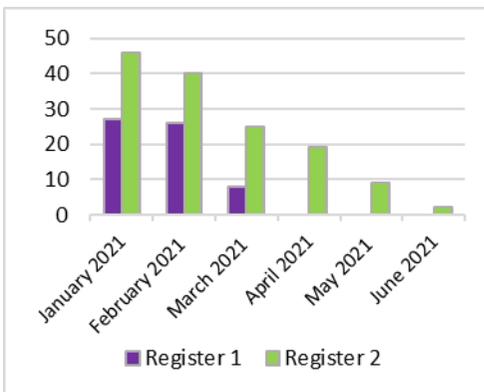
\* differences are expressed in terms of absolute values

\*\* differences in average prices/number of transactions relative to R1 data

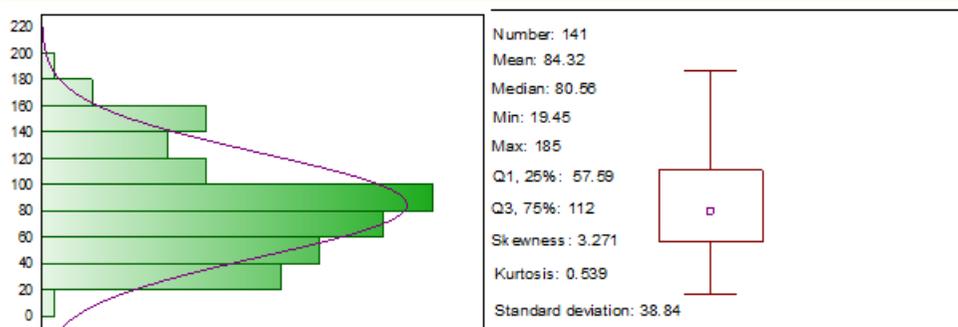
Source: own elaboration



**Figure 2. Average prices**  
Source: own elaboration.



**Figure 3. Number of transactions**  
Source: own elaboration.



**Figure 4: Time lag between the date of the transaction and the date on which the transaction was registered**  
Source: own study.

The time lag between the date on which the request was submitted and the date on which the requested information was received was determined at 20 days for R1 and 42 days for R2. The time lag between the date on which the requested information was received and the date of the most recent transaction in the register was determined at 55 days for R1 and 46 days for R2. The average transaction prices calculated for each month of the analyzed period based on R1 and R2 data were similar (maximum difference – PLN 112, i.e. 2% of transaction prices in register R1). The analyzed datasets differed significantly in the number of concluded transactions, which can be attributed to the fact that the requests were submitted on different dates; therefore, the received datasets differed in the date of the last registered transaction. The number of transactions was 50-200% higher in dataset R2 than in dataset R1. The dates on which the requests were prepared differed by one month, whereas transaction dates in

each dataset differed by three months (R1 covered only the first three months of the year, whereas R2 covered the first six months of the year). The average time lag between the date on which the transaction was concluded and the date on which it was registered was determined at 84 days, with a median of 81 days, maximum value of 185 days (around 6 months), and a minimum value of 19 days. The analysis covered all days of the week, and no distinction was made between workdays and holidays.

### CONCLUSION

When analyzed in the broader context of problems relating to information supply on the real estate market, the real-time problem appears to be ubiquitous, but also elusive. Due to its universal character, the real-time problem affects all parties dealing with real estate market analyses, including researchers and practitioners. The real-time problem is elusive because it has not been accurately defined, and because the time horizon and the duration of the information lag that would be acceptable and would render an analysis valid have not been described.

In this study, the length of the information lag between the date on which an application was submitted and the date on which the requested information was provided was approximately 30 days. The average difference between the date on which the requested information was received and the date of the most recent transaction in the register was 40 days. On the Olsztyn market, the average lag between transaction date and registration date was 85 days. The time horizon during which other types of market data are published and made available to the public is similar. For example, the housing index developed by *Statistics Poland* is published in the Official Gazette of the Republic of Poland (announcement of the President of *Statistics Poland*) within 4 months after the end of each quarter. The housing index for Q1 2021 was published on 30 September 2021, which indicates that market data were published with a delay of 6 months. However, this time horizon is legally regulated; therefore, it denotes a time shift, rather than a delay. The database of housing prices is published by the National Bank of Poland with a delay of around 3 months, whereas quarterly reports are published within 3-6 months after the end of each quarter. These examples support a preliminary and cautious conclusion that data which are considered valid have been generated in the last 3-6 months, whereas real-time data have been generated in the last several weeks. The real-time boundary is difficult to define arbitrarily, and further in-depth research is needed to explore this problem.

---

The delays or time shifts in the process of entering market data into the registers of real estate prices and values differ across Polish cities. In the analyzed case, data were registered with a time lag of 3-40 days. However, not all market transactions are registered within the above period, and in some cases, data are registered up to 6 months after a transaction had been concluded. In turn, the volume of data accumulated in the register impacts the quality and reliability of market analyses. An analysis of dataset R2 (received on 12 July 2021) demonstrated that only 4.25% of real estate transactions were entered into the register within 30 days, 30% transactions were entered within 60 days, and 65% of transactions were entered within the analyzed period (1 January 2021 to 27 May 2021). However, the share of the above figures in the total number of transactions that were entered into the register in the analyzed period remains unknown.

The problems relating to insufficient market data, delayed access to data, information asymmetry and real-time data need to be resolved to improve the research process and facilitate the operations of market service providers, such as property appraisers, consultants and brokers. The availability of up-to-date information is also crucial for public administration bodies at the central and local level. The real-time problem should be resolved to generate benefits for members of the public, improve the efficiency of housing policies, and enhance the reliability and timeliness of research. This problem can be addressed by creating a central register of real estate transactions. The register would be accessible to the public, and the reporting process would be mandatory. The scope of the submitted data and reporting procedures would differ depending on the purpose of the report, the type of data and the reporting party.

On the one hand, the problems associated with the supply of information on the real estate market, information delays and the real-time problem appear to be immanent features of the real estate market, and on the other hand, the availability of up-to-date information plays a crucial role in research because it affects the reliability of research results. A review of the literature and the presented case study indicate that to date, information deficiencies on the real estate market have been analyzed in highly generalized manner and that the offered insights represent only the tip of the iceberg. The general scarcity of up-to-date information and problems with accessing valid data pose significant challenges in real estate market research.

---

## ACKNOWLEDGEMENTS AND FINANCIAL DISCLOSURE

The publication was written as a result of the author's internship at the Cracow University of Economics, co-financed by the European Union under the European Social Fund (Operational Program Knowledge Education Development), carried out in the project Development Program at the University of Warmia and Mazury in Olsztyn (POWR.03.05. 00-00-Z310/17)

## REFERENCES

- Brzezicka, J. (2014). Zjawisko kaskady informacyjnej na rynku nieruchomości. *Ekonomia. Rynek, Gospodarka, Społeczeństwo*, (39), 7-27.
- Brzezicka J., & Wiśniewski R. (2014). Wybrane postawy uczestników rynku wobec braków informacyjnych na rynku nieruchomości. *Ekonomia XXI wieku*, 2(2), 106-121.
- Dąbrowski, J. (2010). *Zastosowanie wybranych metod statystycznych do analizy rynku nieruchomości*. Statsoft Polska, Online, Retrieved on 07/09/2021, from: [http://www.statsoft.pl/Portals/0/Downloads/Zast\\_met\\_stat\\_analizy\\_rynku\\_nieruchomosci.pdf](http://www.statsoft.pl/Portals/0/Downloads/Zast_met_stat_analizy_rynku_nieruchomosci.pdf)
- Dąbrowski, J. (2011). Modele regresji liniowej z czynnikiem autokorelacji w analizie rynku nieruchomości. *Studia i Materiały Towarzystwa Naukowego Nieruchomości*, 19(1), 119-129.
- Hycner, R., & Mika, M. (2002). Systemy czasu rzeczywistego a możliwości ich zastosowania do tworzenia katastru nieruchomości. *Geodezja/Akademia Górniczo-Hutnicza im. Stanisława Staszica w Krakowie*, 8(2), 331-335.
- Kokot, S. G. (2015). Jakość danych o cenach transakcyjnych na rynku nieruchomości. *Acta Scientiarum Polonorum Administratio Locorum*, 14(1), 43-49.
- Konowalczuk, J., & Ramian, T. (2012). Potrzeby i bariery informacyjne rynku nieruchomości z perspektywy wyceny nieruchomości w Polsce. *Studia i Materiały Towarzystwa Naukowego Nieruchomosci*, 20(2), 105-118.
- Kucharska-Stasiak, E. (2006). *Nieruchomość w gospodarce rynkowej*. Warszawa: PWN.
- Kucharska-Stasiak, E. (2010). Odzworowanie cech nieruchomości w cenach i skutki dla procesu wyceny. *Studia i Materiały Towarzystwa Naukowego Nieruchomości*, 18(3), 7-16.
- Kucharska-Stasiak E., Schneider B., & Załączna M. (2009). *Methodology For Local and Regional real estate market*. Łódź: Wydawnictwo Uniwersytetu Łódzkiego.
-

- Kucharska-Stasiak, E. (2016). *Ekonomiczny wymiar nieruchomości*. Warszawa: PWN.
- Ludwiczak, A. (2017). Jaki nie jest rynek nieruchomości–problemy dla badaczy. *Finanse, Rynki Finansowe, Ubezpieczenia*, (85), 351-361.
- Olender-Skorek, M., & Wydro, K. B. (2007). Wartość informacji. *Telekomunikacja i techniki informacyjne*, 1-2, 72-84.
- Polczyk, M., & Konowalczyk, J. (2018). Potrzeby informacyjne inwestorów na rynku nieruchomości przedsiębiorstw. *Finanse, Rynki Finansowe, Ubezpieczenia*, 91, 177-190.
- Rącka, I. (2017). Jakość informacji na rynku nieruchomości w Polsce. *Problemy Jakości*, 49(4), 19-25.
- Renigier-Biłozor, M., Janowski, A., & d'Amato, M. (2019). Automated valuation model based on fuzzy and rough set theory for real estate market with insufficient source data. *Land Use Policy*, 87, 104021. <https://doi.org/10.1016/j.landusepol.2019.104021>.
- Tomal, M. (2021a). Testing for overall and cluster convergence of housing rents using robust methodology: evidence from Polish provincial capitals. *Empirical Economics*, 1-33. <https://doi.org/10.1007/s00181-021-02080-w>.
- Tomal, M. (2021b). Housing market heterogeneity and cluster formation: evidence from Poland. *International Journal of Housing Markets and Analysis*. <https://doi.org/10.1108/IJHMA-09-2020-0114>.
- Act of 6 September 2001 on access to public information* (Journal of Laws 2001 No. 112 item 1198 as amended).
- Widłak, M., Augustyniak, H., Łaszek, J., & Olszewski, K. (2013). Analiza sektora nieruchomości w Polsce-monitoring cen. *Bezpieczny Bank*, 4(53), 124-203.
- Wiśniewski R. (2007). Efficient real estate market. *Studia i Materiały Towarzystwa Naukowego Nieruchomości*, 1-2, 103-113.
- Zrobek, S., Kovalyshyn, O., Renigier-Biłozor, M., Kovalyshyn, S., & Kovalyshyn, O. (2020). Fuzzy logic method of valuation supporting sustainable development of the agricultural land market. *Sustainable Development*, 28(5), 1094-1105. <https://doi.org/10.1002/sd.2061>.
-