REAL ESTATE MARKETS IN POLAND
– ANALYSIS OF SUBSYSTEM STRUCTURE

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The real estate market
is one of the most rapidly developing commodity markets that attract massive investments, but as an object of research, it poses numerous problems.

This study attempts to prove the hypothesis that the <u>efficiency of real estate markets is identifiable and measurable</u>.

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The source of uncertainty in market evaluations :

a) market effectiveness;
b) market structure, namely the configuration of market institutions and organizations;
c) market functions;
d) market environment.

    The level of knowledge about the market and its participants is a factor that determines the efficiency of the RE market, but is often disregarded in market analyses. Knowledge gaps may originate with active market participants who have limited information about the system and its constituent elements.

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Any discussion concerning the **efficiency of real estate market participants** would be incomplete without a reference to the classical approach to market effectiveness (in particular capital markets). In line with the assumptions made by this study, efficiency determines effectiveness.

Wider conclusions in the article.

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According to the authors, the **inefficiency of real estate markets** results from a **small number of transactions** and the **unavailability of vital information about the transaction** and its **parties**.

Such information is difficult to accumulate without database systems. It is also difficult to interpret without extensive analyses of functional dependencies between various attributes of real estate. The determination of the effect that real estate attributes have on a selected decision (e.g. price) may also prove problematic.

From a different perspective, the **ineffectiveness of the Polish real estate market** has a number of positive outcomes, including **above average profits and rates of return on real estate investments**.

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Fig. 1. Efficiency of market participants and the effectiveness of the real estate market. *Source*: own study.

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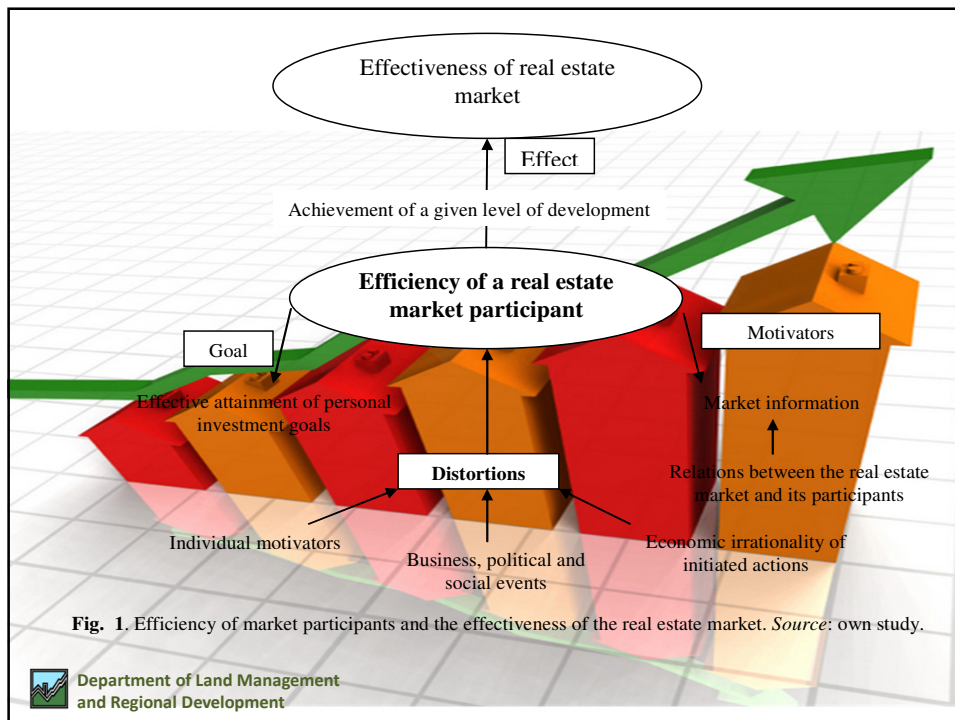
ANALYSIS OF THE EFFICIENCY OF SELECTED RE MARKETS IN POLAND

The data which have been used to analyze real estate market efficiency was:
population,
employment rate,
average gross monthly wages,
area in square kilometers,
number of real estate transactions separately for land plots and apartments,
and the average price per sq. m. of apartment area.

Two indicators were computed based on the assumption that the acquired data are credible:
1. **PO/RET** – population per 1 real estate transaction,
2. **HA/GW** – housing area in square meters that can be purchased with an average gross monthly wage.

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Efficiency of real estate markets in Poland

No.	City	Population	Unemployment rate	Gross monthly wage in PLN	Area in km²	No. of transactions		Average price PLN/m2	Population / No. of transactions [PO/RET]	Average wage / Average price per m2 [HA/GW]
						Land plots	Apartments			
1	Olsztyn	176457	4.5	2830	88.33	224	717	4765	188	0.59
2	Słupsk	97331	9.2	2667	43.15	91	816	3783	107	0.70
3	Suwałki	69448	13.4	3645	66.00	270	124	4433	176	0.82
4	Ciechanów	45270	5.7	2994	32.51	131	182	2503	145	1.20
5	Wrocław	632162	5.0	3415	292.82	159	2661	6740	224	0.51
6	Działdowo	21644	6.6	2546	11.47	17	60	2401	281	1.06
7	Inowrocław	76137	20.4	2789	30.42	11	25	3443	2115	0.81
8	Gdańsk	456591	5.1	4053	261.68	26	1728	6215	260	0.65
9	Cracow	755000	4.6	3424	326.00	127	2298	7260	311	0.47
10	Koszalin	106987	4.7	2912	98.33	258	805	4112	101	0.71
11	Kętrzyn	27942	27.5	2423	10.35	9	31	2345	698	1.03
12	Toruń	193115	8.3	3175	115.75	49	252	4666	642	0.68
13	Gołdap	13514	5.7	2361	17.20	4	5	2432	1501	0.97
14	Poznań	554221	3.3	3669	261.85	83	1292	5800	403	0.63
15	Łódź	742387	9.5	3159	293.25	251	2165	4666	307	0.68
16	Bydgoszcz	357650	7.3	2830	175.98	61	1235	4125	276	0.69
17	Zielona Góra	117503	7.5	3060	58.00	12	615	3446	91	0.89
18	Ełk	57579	12.2	2584	21.00	72	252	2990	178	0.86
19	Elbląg	127954	16.5	2521	38.94	87	821	3894	141	0.65
20	Białystok	294685	11.6	3145	102.00	74	324	4660	740	0.67

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Market efficiency in terms of population size per one RE transaction

No.	Real estate market	Population / No. of transactions [PO/RET]
1	Zielona Góra	91
2	Koszalin	101
3	Słupsk	107
4	Elbląg	141
5	Ciechanów	145
6	Suwałki	176
7	Ełk	178
8	Olsztyn	188
9	Wrocław	224
10	Gdańsk	260
11	Bydgoszcz	276
12	Działdowo	281
13	Łódź	307
14	Cracow	311
15	Poznań	403
16	Toruń	642
17	Kętrzyn	699
18	Białystok	740
19	Gołdap	1502
20	Inowrocław	2115
	Source: Own research	

Market efficiency in terms of real estate affordability – the number of square meters that can be purchased with average monthly wages

No.	Real estate market	Average wage / Average price per m² of housing area [HA/GW]
1	Ciechanów	1.20
2	Działdowo	1.06
3	Kętrzyn	1.03
4	Gołdap	0.97
5	Zielona Góra	0.89
6	Ełk	0.86
7	Suwałki	0.82
8	Inowrocław	0.81
9	Koszalin	0.71
10	Słupsk	0.71
11	Bydgoszcz	0.69
12	Toruń	0.68
13	Łódź	0.68
14	Białystok	0.67
15	Gdańsk	0.65
16	Elbląg	0.65
17	Poznań	0.63
18	Olsztyn	0.59
19	Wrocław	0.51
20	Cracow	0.47
	Source: Own research	

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THE USE OF THE ROUGH SET THEORY IN ANALYSES OF REAL ESTATE MARKET EFFICIENCY

This study addresses a common problem encountered during advanced analyses of real estates, namely the choice and use of analytical and research methods that account for the specific nature of real estate data.

As suggested in the preceding parts of this paper, the following factors contribute to the inefficiency and ineffectiveness of real estate markets:

a) significant variations in the quantity of available information, subject to the type of the analyzed market (region),
b) complex methods of data description (differences in the scale of attribute description)
c) the same attribute can be described in a variety of ways using different evaluation scales,
d) significant differences between real estates (no two real estates are identical),
e) various criteria for using real estate
f) lack of comprehensive information
g) inaccurate and "fuzzy" character of real estate data
h) absence of homogenous functional dependencies between real estate attributes,
i) decision-making strategies represented by the value, function and method of real estate management.

According to the authors, popular analytical methods (mostly statistical) are relatively ineffective in weak-form efficient real estate markets. The preferred methods and procedures should account for the following defects in real estate data: absence of data, small number of transactions, significant variations in attribute coding, non-linear correlations between the analyzed data and the type of the underlying market. The applied methods should support market analysis at the potential (theoretical) and actual (applied) level.

THE USE OF THE ROUGH SET THEORY IN ANALYSES OF REAL ESTATE MARKET EFFICIENCY

The use of the rough set theory (RST) for improving real estate market efficiency

RST-based methods for analyzing the real estate market		
General problem	Detailed problem	Solution
Selection of methods for managing and using buildings and apartments (RENIGIER, 2006)	Analysis of the real estate market using various methods for registering real estate attributes without data loss (RENIGIER, 2008)	Option of analyzing data sets without the risk of data loss when quantitative attributes are replaced with qualitative attributes
Real estate appraisal on markets characterized by limited resource availability (RENIGIER, 2008)	Real estate appraisal involving limited data sets (RENIGIER, 2008)	Real estate appraisal based on expert data sets, with high confidence in results
Selection of functions assigned to land on ineffective real estate markets (RENIGIER-BIŁOZOR, BIŁOZOR 2009 a, b, c)	Determining the significance of real estate attributes without the use of statistical methods (RENIGIER-BIŁOZOR, BIŁOZOR 2009a, 2009b)	Reliable verification of the significance of attributes adopted based on a limited data set
	Determining weighing factors for real estate prices (RENIGIER-BIŁOZOR, BIŁOZOR 2009c)	Determining the significance of attributes without the use of statistical tests
Real estate appraisal based on limited market data (RENIGIER-BIŁOZOR, 2010)	Supplementing the missing real estate attributes (RENIGIER-BIŁOZOR, 2010)	Determining the value of the missing real estate attributes based on the analyzed data set

Source: own research

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CONCLUSIONS

❑ The efficiency of real estate markets is a problem that escapes an easy definition and a crucial factor that determines the selection of appropriate procedures and methods for market analysis.

❑ The venture point for every analysis of real market efficiency is the selection of adequate research methods that account for the market's specific attributes and produce results applicable to other local markets. Owing to their individual character, local markets require suitable analytical tools, such as the proposed method based the rough set theory.

❑ The rough set theory was chosen for the analysis of real estate markets since it accounts for the specific nature of real estate data which are highly specific, fuzzy, inaccurate and diverse, both quantitatively and qualitatively. The results of the study support the verification of the potential and actual efficiency of the analyzed real estate markets.

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