

ANALYZING RENTAL TIME AND PRICING TRENDS BEFORE, DURING, AND AFTER THE COVID-19 PANDEMIC

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Abstract. This study examines the dynamics of rental time on market (TOM) for residential properties in Szczecin, Poland, from 2016 to 2023. Using data from the regional MLS system administered by the West Pomeranian Association of Realtors (ZSPON), the analysis spans four distinct periods: pre-pandemic (2016–2019), pandemic onset (2020), transitional recovery (2021), and post-pandemic normalization (2022–2023). The study investigates two primary hypotheses: (H1) TOM differs significantly across pandemic phases; and (H2) TOM is correlated with rental price levels. Employing Kaplan-Meier survival analysis and General Linear Modeling (GLM), the results confirm both hypotheses. TOM increased sharply during early pandemic phases and decreased in subsequent years, though not returning to pre-pandemic levels. Additionally, listings with mid-range prices consistently showed the shortest TOM, while overpriced and underpriced listings were associated with longer market exposure. The findings contribute to the understanding of how external shocks, such as the COVID-19 pandemic, induce both temporary and persistent changes in rental market behavior. The study also offers practical implications for real estate professionals, suggesting that TOM-based modeling can enhance pricing and listing strategies, particularly during periods of uncertainty or recovery.

Keywords: residential real estate, time on market (TOM), duration analysis, rental market, COVID-19.

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1. Introduction

The year 2020 marked the beginning of an unprecedented global disruption. On March 11, the World Health Organization (WHO) officially declared COVID-19 a pandemic, following weeks of reports about the spread of a novel coronavirus (SARS-CoV-2) from Wuhan, China. In the following months, countries around the world implemented wide-ranging restrictions: mass event bans, lockdowns, school and workplace closures, and severe mobility limitations. These interventions, though necessary for public health, caused ripple effects across virtually all areas of life – from education and labor markets to culture, industry, and mental health (Baek et al., 2020; Nicola et al., 2020; Ratten, 2020; Sharma & Borah, 2022).

The real estate sector was no exception. Numerous studies have documented how the pandemic disrupted traditional market mechanisms, including property pricing, listing exposure time, and transaction volume. Residential property prices increased in some markets (Bas, 2022; Wang, 2021; Zhao, 2020), while areas with high infection rates and population density saw price declines (D’Lima et al., 2022; Hu et al., 2021; Liu & Tang, 2021; Qian et al., 2021). Transaction activity fell, often due to reduced property viewings stemming from contagion concerns (Bas,

2022; Cohen et al., 2022; Del Giudice et al., 2020), while real estate agents responded with virtual tours and digital presentation tools (Marona & Tomal, 2020; Nicola et al., 2020).

In the rental segment, the pandemic’s impact bifurcated along short- and long-term lines. Short-term rentals, closely tied to tourism, were quickly devastated by travel restrictions (Hromada, 2021; Yeon et al., 2020), while long-term rentals proved more resilient, yet still experienced notable structural adjustments. Researchers reported changes in rental prices across international cities—including Kraków, Warsaw, Lisbon, and New York (Batalha et al., 2022; Evans et al., 2020; Kadi et al., 2020; Li et al., 2022) – as well as shifts in tenant expectations, such as increased demand for flexible leasing and better housing standards (Nanda et al., 2021; Tomal & Helbich, 2022). Supply-side responses included landlords converting short-term units into long-term leases (Batalha et al., 2022; Marona & Tomal, 2020), while simultaneously facing challenges such as increased rent arrears (de la Campa & Reina, 2023) and tenant turnover (Gbadegegin, 2024).

While the immediate crisis of 2020 and the transitional phase of 2021 have been widely studied, far less is known about the post-pandemic rental market. The question

remains whether the changes observed in 2020–2021 were temporary or whether they ushered in new, lasting behavioral patterns. This question is particularly salient in Central and Eastern Europe, where housing systems differ from Western models, and pandemic responses varied in both timing and scope.

This study addresses this gap by investigating time on market (TOM) for rental listings in Szczecin, Poland, based on data from the West Pomeranian Association of Realtors (ZSPON), which manages the regional MLS system. The longitudinal dataset spans 2016 to 2023 and enables an evaluation of TOM dynamics over four distinct periods:

1. Pre-pandemic baseline (2016–2019),
2. Pandemic shock phase (2020),
3. Transitional adjustment period (2021),
4. Post-pandemic normalization (2022–2023).

Poland's pandemic trajectory offers a structured framework for such analysis. The first confirmed COVID-19 case in Poland was recorded on March 4, 2020 (Ministerstwo Zdrowia, 2020). Within days, sweeping restrictions were enacted, ranging from mobility bans to remote education and retail closures (Związek Przedsiębiorców i Pracodawców, 2021). These measures can be grouped into four phases (Związek Przedsiębiorców i Pracodawców, 2021), with Phase I (March–May 2020) and Phase III (October 2020–June 2021) exerting the strongest constraints on daily life and market activity.

By including both pandemic and post-pandemic periods, this study enables a comprehensive analysis of whether TOM patterns have returned to their pre-2020 state, or whether new, persistent dynamics have emerged. This is especially relevant given that the years 2022–2023, though nominally “post-pandemic”, continue to exhibit the residual effects of systemic disruption and behavioral adaptation.

Accordingly, the following hypotheses were formulated:

H1: There is a significant difference in rental TOM before, during and after the COVID-19 pandemic.

H2: There is a significant correlation between rental price level and TOM.

Through survival analysis and generalized linear modeling, we aim to assess both the magnitude and nature of TOM variation, contextualizing our findings within the evolving landscape of the Polish rental market.

2. Literature review: Rental market in a pandemic period

Theoretical considerations of what changes the COVID-19 pandemic will bring to the rental housing market led the team of Nanda et al. (2021) to the conclusion that the distance of the apartment from the workplace will lose importance due to working and learning remotely and the prohibition of moving, so the rental rate of apartments located in central and suburban locations should be expected to even out. The apartment size and adaptability to a new role – home office, school, and relaxation

zone – will be important. The following aspects will gain importance: additional space to be developed or adapted for the new role, a fast internet connection, a recreational area (garden, terrace, balcony), and building security (e.g., by installing an alarm).

The COVID-19 pandemic significantly disrupted rental housing markets across the globe, leading to substantial changes in supply and demand dynamics, rental price trajectories, and both tenant and landlord behavior. Although the scale and direction of these changes varied by country, city, and local context, several recurring patterns have emerged from the literature.

One of the most notable shifts was the redirection of housing stock from the short-term tourist rental segment to the long-term rental market. This transition was evident in Lisbon, where, as Batalha et al. (2022) found, property owners withdrew units from the tourism-oriented Airbnb market and offered them for longer-term leases, resulting in increased rental supply and a slowdown in rent price growth. A similar trend was observed in the Austrian rental market, where Kadi et al. (2020) reported a growing number of fully furnished apartments offered for rent. Interestingly, despite this growing supply, rents remained stable in Vienna and even slightly increased in cities such as Graz and Salzburg. In the Czech Republic, Hromada (2021) confirmed that restrictions on tourism led to a surge in long-term rental supply, accompanied by declining rents.

In Turkey, the rental market experienced upward pressure on prices during the pandemic. Subaşı and Baycan (2022) documented a continuous increase in rents between March 2020 and December 2021, attributing it to factors such as inflation and limited market regulation. At the same time, other studies indicated that tenants' housing preferences evolved in response to lockdowns and increased time spent at home. According to Nanda et al. (2021) and Tomal and Helbich (2022), features such as balconies, gardens, and better indoor quality gained importance in rental decisions, reflecting a broader revaluation of housing needs under pandemic conditions.

The Australian rental market responded differently, as demand decreased significantly. Evans et al. (2020) observed a reduction in rental demand alongside a rise in supply, largely due to the collapse of short-term tourism-related rentals. The consequence was a decline in rents, and projections indicate continued stagnation in rental growth in subsequent years.

In the United States, Kuk et al. (2021) analyzed the 49 largest metropolitan areas and observed a strong spatial differentiation in rental price dynamics. From mid-March to early June 2020, average and median rents declined significantly in Black and Latino neighborhoods, while in predominantly white neighborhoods, rents increased. These findings highlight the uneven social and spatial impact of the pandemic on the rental housing sector.

The pandemic also exacerbated problems with rent arrears and housing insecurity. According to Airgood-Obrycki et al. (2021), by December 2020, nearly 20% of tenant

households in the U.S. were behind on rent. de la Campa and Reina (2023) confirmed these findings and noted that landlords faced delayed maintenance and financial instability due to diminished rental income. Similar difficulties were documented in Nigeria by Gbadegesin (2024), where late payments were widespread, especially among lower-income tenants.

In China, the rental market was highly sensitive to pandemic-related movement restrictions. Li et al. (2022) noted that strict lockdowns led to increased vacancy rates and even the bankruptcy of rental agencies. The number of COVID-19 cases in each area was negatively correlated with the number of active leases, emphasizing the link between public health and market liquidity.

In Poland, several regional studies revealed the varied effects of the pandemic on local rental markets. In Kraków, Marona and Tomal (2020) reported a shift of landlords from short-term to long-term rental strategies, accompanied by tenant expectations for lower prices and higher housing standards. Tomal and Marona (2021) documented a 6–7% decrease in rental prices during the first wave of the pandemic and estimated that brokers expected a reduction of up to 13%. The same study also showed a drop in the number of rental transactions. Tomal and Helbich (2022) found that the determining factors for rental prices had changed significantly, with apartments in large multi-family buildings experiencing notable price reductions. One important factor was the departure of university students from urban centers due to the transition to remote learning. This phenomenon was particularly visible in cities such as Olsztyn, where Żróbek-Róžańska (2022a, 2022b) observed a mass withdrawal of student tenants from the market. Students, aware of the situation, negotiated lower rents and displayed little willingness to pay for reserving accommodations.

In the capital city of Warsaw, the decline in rental prices was also significant. Trojanek et al. (2021) noted a 7.7% reduction in long-term rental prices between March and December 2020. The most pronounced drops occurred in central districts, where former short-term rental apartments were redirected to the long-term market, increasing supply. In contrast, in the city of Szczecin, the pandemic had a limited impact. Bas (2022) reported no major change in either the number of rental transactions or rental prices, suggesting a degree of resilience in markets with less exposure to tourism and international student flows.

The literature shows that the COVID-19 pandemic altered both the structure and functioning of rental housing markets. Although the specific effects were highly context-dependent, several common tendencies can be observed. These include a reconfiguration of supply between rental submarkets, growing segmentation based on tenant preferences and socio-economic status, and the exposure of market vulnerabilities related to affordability, payment discipline, and financial stability. While the short-term effects are well documented, further research is needed to assess the long-term transformations resulting from the pandemic-induced disruption.

3. The rental market and time on market residential property

The residential rental market plays a significant role in the economy of every country. Good housing rental arrangements make tenants more mobile in their search for work, which is what employers expect (Scanlon & Kochan, 2011). In Poland in 2020, as much as 85.6% of apartments were owner-occupied, and only 14.4% were rented (Eurostat, 2021). In addition, the latter group includes apartments (11.1%) owned by municipal legal entities (e.g., they are a resource of a municipality or a Social Housing Association – TBS). The lease of apartments is linked to preferential fees and apartments provided by private investors (3.3%), to which a free-market rent is linked, not subject to top-down regulations, and created only based on the owner's expectations and the tenant's possibilities. Such a low proportion of renter-occupied housing is characteristic of post-socialist countries with relatively low GDP (Łaszek et al., 2021).

The free residential rental market does not fall under specific regulations, often constituting a grey market (Kucharska-Stasiak, 2016). When renting an apartment, a property owner must report this fact to the relevant Tax Office and pay the appropriate taxes, but this often fails to happen. The willingness to rent an apartment can be advertised on the market without the involvement of any professionals. It is enough to offer a rental on dedicated Internet portals such as otodom.pl or olx.pl. Such a source of information works well in the absence of reliable transaction data (Lyons, 2019). From the point of view of market analysis, it is desirable when there is a top-down regulation mandating that information about a market transaction is placed on the relevant register. As the real estate market develops and the participants are educated and aware of the market, there is a growing interest in the services of real estate agents. An intermediary, by assisting in the process of selling or renting a property, enables to save time, can advise on formal and legal issues, offers a wide choice of offers and even increases the security of the transaction (Ostrowska, 2014). In addition, the intermediary uses listing exchange systems (MLS) to inform most people about the property proposed for sale or lease. At the moment, it can be assumed that the databases available to real estate agents are the most complete and reliable databases on the rental market. Of course, these databases have their limitations, as Gdakowicz et al. (2023) explain in detail. An additional advantage of the MLS is the recording in the system of the date of signing of a contract for the sale or rental of a property, which makes it possible to estimate the time a property remains on the market (TOM). In this paper, the time on market (TOM) is conceptualized as the interval from the date of listing activation to its deactivation, which may result from lease finalization, listing withdrawal, or temporary suspension by an intermediary for various reasons: the signing of a lease agreement, withdrawal of the offer by the owner or its blocking by an agent for a potential client.

Due to the difficulty in accessing reliable data, the timing of residential tenancies has been the subject of a few studies, all of which are concerned with the pre-pandemic period. Allen et al. (2009) stated that the TOM depended on the amount of asking rent (the lower the rent, the shorter the TOM would be, but also the higher the initial asking rent was, and then the subsequent reduction in it resulted in a longer TOM and often a lower rental price). They also noted that properties offered for rent in the second half of the year waited longer for a tenant. Factors that influenced TOM were the property size, age, amenities (like a fireplace, security system, and fencing), and the possibility of living with pets (the research was conducted in Dallas). In studies of the German rental market, exposure time depended on: the energy efficiency of the building – dwellings with relatively low-energy efficiency stayed on the market longer (Cajias et al., 2016, 2019), the asking rent and apartment area (negative impact), and the age of the building, number of rooms and distance from the city center (positive impact) (Cajias et al., 2020; Cajias & Freudenreich, 2018). Also, research conducted in Switzerland confirmed the dependence of TOM on distance from the center – the closer to the center, the lower the TOM (Ruf, 2017). In the English rental market, the importance of the timing of a property's application for lease was observed – the TOM was lower in summer, and the proximity to academic centers – properties located close to academic centers, before the start of the academic year, rented faster (Yilmaz et al., 2022). Research conducted for the Polish rental market indicates that the timing of offering properties varied depending on the year the offer entered the system (Gdakowicz et al., 2023).

4. Methodology of research

The research methodology employed two complementary analytical approaches: duration analysis and General Linear Modeling (GLM). Duration analysis was used to account for censored data and to estimate the expected time a rental listing remains on the market, which is particularly important when not all transactions are completed within the observation window. In turn, the GLM approach allowed for testing the statistical significance of key explanatory variables (namely, the year the property was listed and its asking rent level) on the time on market (TOM), providing a deeper understanding of how market conditions and pricing influence rental dynamics over time.

4.1. Duration analysis

The time a property is offered on the market, from the moment it is declared for rental until it is rented, is a random variable T . The analysis of such a random variable is made possible by duration analysis methods. These are methods from the group of statistical methods that have found application in many fields of science. They were initially used in actuarial statistics and demography. Then they were applied in medicine, technical sciences, and

in the study of socio-economic phenomena: unemployment and business duration (Bieszk-Stolorz & Markowicz, 2019), economic activity of the population (Landmesser, 2013), poverty dynamics in urban and rural households (Sączewska-Piotrowska, 2016), credit risk (Matuszyk, 2015), duration of real estate offerings for sale (BuHamdan et al., 2021; Cirman et al., 2015; Gdakowicz & Putek-Szeląg, 2022; Gwiazda, 2006) or rent (Allen et al., 2009; Cajias & Freudenreich, 2018; Gdakowicz et al., 2023; Ruf, 2017; Yilmaz et al., 2022). The main concept is the duration function, which is expressed by the Equation (1):

$$S(t) = P(t < T) = 1 - F(t), \quad (1)$$

where: T – the duration of the phenomenon; $F(t)$ – the distribution of the random variable T .

The above function determines the probability that the duration (time of the offer) for a given unit (property) will be longer than t . The distribution of the random variable T – the distribution of the time a property is offered on the market – is usually unknown, so an appropriate estimator must be used to evaluate the duration function (Elandt-Johnson & Johnson, 2014). Estimators often require some assumptions about the distributions of variables and duration information for all units under study. However, duration analysis methods have the advantage of including all observed units in the study, including those that were still active when the observation ended. To make this possible, observations still in progress are treated as truncated or censored observations – a term first used by Hald (1949). This method accounts for censored observations and enables robust modeling of incomplete rental durations (Kaplan & Meier, 1958), expressed by the Equation (2):

$$\hat{S}(t) = \prod_{j:t \leq t_j} \left(1 - \frac{d_j}{n_j} \right), \quad (2)$$

where: d_j – number of final events at the time of t_j ; n_j – number of units at risk in the period t_j .

The survival function estimates the likelihood that a property remains on the market beyond time t , while the cumulative distribution function identifies the probability of rental occurring by time t . What is the probability of the property being rented (deleting from the database). In a survey, d_j is the number of deletions of a property from the database for a given reason at the time t_j (letting of the property or a change of the owner's decision regarding the rental of the property).

The probability of leasing a residential property was analyzed within groups defined by asking rent levels. The boundaries of these groups were determined based on quartile values calculated separately for each year in which the property was listed in the system. By categorizing the variable independently for each year, the comparability of the defined groups across years was ensured. Properties in group G1 represent the 25% of listings with the lowest asking rents in a given year. Four price groups were determined – Table 1.

Table 1. Interval series for the asking rents feature (source: own study)

Intervals	Group symbol
$x_i < Q1$	G1
$Q1 \leq x_i < M$	G2
$M \leq x_i < Q3$	G3
$Q3 \leq x_i$	G4

Note: Q1, Q3 – the first and third quartile of the collective respectively, M – the median value.

The significance of the differences between the duration curves determined for groups of residential property listings used the log-rank test (Mantel, 1966). This test is designed to compare two or more groups for censored data when the distribution for the duration curves is unknown. The null hypothesis is that there are no differences in duration curves for groups $H_0: S_1(t) = S_2(t)$ against the alternative hypothesis of significant differences in the duration functions of the different groups $H_1: S_1(t) \neq S_2(t)$. The test statistic is the χ^2 statistic:

$$\chi^2 = \sum_{k=1}^r \frac{\left(\sum_{l=1}^s (O_{kl} - E_{kl}) \right)^2}{\sum_{l=1}^s E_{kl}}, \quad (3)$$

where: $O_{kl} = \sum_{i=1}^d d_{lki}$ – observed number of events in the layer l , group k ; $E_{kl} = \sum_{i=1}^d e_{lki}$ – expected number of events in layer l , group k .

Statistics (3) is characterized by a chi-square distribution with $r-1$ degrees of freedom.

4.2. General linear modeling analysis

The rental duration of a residential property is influenced by a range of factors. Among the key explanatory variables are the timing of market entry (i.e., the date the listing was introduced, which reflects prevailing macroeconomic conditions), the level of asking rents, as well as various property-specific attributes, such as the number of rooms, floor area, floor level, and overall standard of the unit. In addition, location-based factors (including access to public transportation, immediate surroundings, and neighborhood safety) also play an important role. The rental time on the market (TOM) can thus be expressed as a function of these variables:

$$TOM = f(K, P, S, N, A), \quad (4)$$

where: TOM – dwelling's time on market; K – macroeconomic conditions; P – level of asking rents (prices); S – structural dwelling's characteristics; N – neighborhood characteristics; A – accessibility characteristics.

The factorial analysis of variance using the General Linear Model (GLM) framework is a statistical method used to assess the influence of two or more categorical

or continuous independent variables (factors) on a continuous dependent variable (McCullagh & Nelder, 1989; Stanis, 2007). In this case, the dependent variable is the time on market (TOM), representing the number of weeks a residential property remains listed before being rented. The explanatory variables include asking rent category and year of listing, which allows the model to examine both the main effects of each factor and their interaction effect on TOM.

5. Data collection and sample description

Time estimation of residential rental property offers was carried out on unit offer data obtained from the West Pomeranian Association of Real Estate Agents (ZSPON), which is the only association of real estate agents in Szczecin. Membership of ZSPON is declared by the majority of brokers operating in the city. The association is the administrator of the West Pomeranian Offer Exchange System (ZSWO), a local format of MLS. The research utilized data collected through the West Pomeranian MLS (ZSWO) platform, documenting rental listing activity in Szczecin from January 2016 to December 2023. The advantage of using such a source of information is the accessibility of the closing date for offering the property on the market and signing the lease agreement.

In the analyzed period 2016–2023, there were 8,564 flats reported for rent, more than half of which were withdrawn (Table 2). The reasons for removing a listing from the MLS can range from a change in the landlord's decision regarding the willingness to rent up to the landlord (or another real estate agency) renting independently. Brokerage agreements for rental properties are usually concluded as open-ended agreements – the owner has the right to submit a given listing to multiple brokerage offices and, at the same time, attempt to rent the property independently without incurring additional fees or penalties (Mulawa, 2014). The effect of an open-ended contract is often that there is no information about the completion of the transaction (letting of the property), as the property owner can (but does not have to) inform the brokerage office(s) of the withdrawal of the offer, without giving any reason. Thus, among the 4,100 listings withdrawn from the system, some certainly ended up with a contract, but this took place without the brokers placing the entry in the MLS.

Table 2. The structure of residential rental property offers in Szczecin reported in the MLS in the period from 1.01.2016 to 31.12.2023 (source: own study)

Current offer status	Number of offers
Current	741
Suspended	2,309
Withdrawn	4,100
Closed	1,414
Total	8,564

Table 3. Structural parameters of asking rents (PLN/1 m²) of flats offered in Szczecin in the years 2016–2023 (source: own study)

Year	Minimum	Maximum	Average	Median	Q1	Q3	Standard deviation	Asymmetry
2016	13.03	70.00	33.85	33.95	26.32	40.29	9.88	0.30
2017	11.32	86.67	34.90	34.38	27.69	40.82	9.56	0.68
2018	14.06	89.29	36.78	35.52	28.57	43.42	10.98	0.65
2019	13.64	90.91	39.46	38.33	31.71	46.30	11.75	0.79
2020	5.00	110.00	40.04	37.91	31.25	47.15	12.56	0.96
2021	8.22	138.89	41.88	40.00	33.59	48.36	12.18	1.51
2022	12.51	350.00	53.61	50.16	42.05	61.29	20.03	5.41
2023	8.24	147.54	54.27	51.51	42.31	62.50	17.61	1.21

During the period under review, 1,414 properties were rented (approximately 31.7%), 741 were still current (on December 31, 2023), and 2,309 were suspended, which means that for various reasons, the real estate agent blocked the listing, e.g., reserving it for a potential tenant. Among the reasons for suspended listings, there is also the habit of brokers not to record successful, meaning rented, listings in the MLS. An apartment that has been leased continues to appear in the MLS as for rent, and when the letting ends, the listing is reinstated without requiring all the data to be re-entered into the system. Finally, further analysis was conducted based on current, suspended, and closed offers, namely 4,464 listings.

The number of residential offers submitted for rent to the MLS in Szczecin during the period of 2016–2023 ranged from 433 offers (2019) to 776 offers (2023). The number of completed transactions ranged from 148 in 2016 to 229 in 2022. The Szczecin residential rental market is characterized by limited transparency and incomplete market participation. Only a fraction of residential rental listings is advertised on the market with the assistance of real estate agents (or at least only a fraction are placed in the MLS). Rental properties are submitted to brokers either by landlords who treat rentals quite sporadically or by landlords whose properties are, for some reason, difficult to rent. During 2017–2019, the rental housing market grew – the number of listings on the MLS decreased, while the number of transactions was about the same, indicating an increase in property agents' efficiency, with 38.6% of reported apartments being rented in 2019. In 2020, the first year of the COVID-19 pandemic, the number of apartments offered for rent on the MLS increased. It can therefore be concluded that for safety reasons (exposure to another person), but also due to a decrease in demand for rental properties, landlords were more inclined to use professionals. A similar pattern was observed in the subsequent year, 2021. The number of rental listings in the MLS system increased, which may be attributed to two main factors: growing trust among property owners in real estate agents, or persistent difficulties in renting out properties independently due to limited demand – hence the increased reliance on professional brokerage services. In the post-pandemic period, a year-on-year increase in

the volume of rental listings submitted to the MLS system was recorded.

While 2021 saw a decline in the number of rental agreements concluded – likely influenced by ongoing restrictions and the continued prevalence of remote learning and working arrangements – the number of transactions began to rise from 2022 onward.

Table 3 summarizes the descriptive statistics of asking rents per 1 square meter of apartments offered for rent in Szczecin during 2016–2023. Landlords' rental price expectations were higher yearly, by nearly 24% in 2021 compared to 2016. A sharp increase in landlords' rental price expectations was observed in 2022 – the average asking rent per square meter rose by 28% compared to 2021. The data presented in Table 4 refer to all properties listed for rent in the MLS system; therefore, asking rents may be higher than the actual rental rates at which lease agreements were concluded. In the years under study, the asymmetry of the distribution of the offer price of 1 m² of apartments deepened, with cheaper apartments dominating each year, with a price below the arithmetic mean. The right-sided asymmetry of the distribution indicates a demand-driven market – more cheaper than more expensive apartments were available – but price expectations were formulated at an increasingly high level.

The diversity of distributions and the occurrence of outliers provides a rationale for using positional measures in the further part of the study. In addition, a detailed analysis of the distributions of asking rent 1 m² of apartments indicates the necessity to separate price groups each year independently, according to the equations presented in Table 1. Thanks to such a solution, group G1 (and, respectively, the remaining groups) will include all flats for which in each year the price was lower than the value of quartile one (and, respectively, the next quartiles), even though the value of Q1 in each year was higher.

Properties for which no tenants had been found by 31.12.2023, and the owners still declared that the offer was valid are called incomplete, censored observations (Watt et al., 1996). These are cases for which no duration of the phenomenon can be determined because they lack information on one or both start and end dates of the duration. Such observations are called censored left, right, or both,

respectively. To examining rental duration, each property is assigned a duration value of $t = 0$ when it is reported. Random censoring occurs when individual units enter the field of observation at different calendar times and the observation ends on a specific date (31.12.2023 in our case).

6. Market response and behavioral patterns time on market rented dwellings

6.1. Duration analysis of rented dwellings

The duration of the rental housing offer was studied in three periods: before the COVID-19 pandemic (2016–

2019), in the first year of the pandemic (2020), and the first year of restoration of ‘normality’ in 2021. There are censored observations in each phase, and the number of observations increased from period to period (Table 4).

Using Equations (1) and (2), duration curves were estimated for residential rental properties reported to the MLS by separate price groups (according to Table 1) over the entire analysis period (Figure 1) and in separate periods (Figures 2–5). The analysis of the duration curves in the separated periods was supplemented with a nonparametric test examining the significance of differences between the distributions of the duration curves, calculated based on Equation (3). The results are summarized in Table 5.

Table 4. Apartments reported, rented, and observations censored during 2016–2023 (source: own study)

Year	Apartments reported	Apartments rented	Observations censored		
			Current offers	Offers suspended	Share (%)
2016–2019	1,751	628	122	1,001	64.1
2020	521	163	29	329	68.7
2021	562	165	102	295	70.6
2022–2023	1,630	458	488	684	71.9
Total	4,464	1,414	741	2,309	68.3

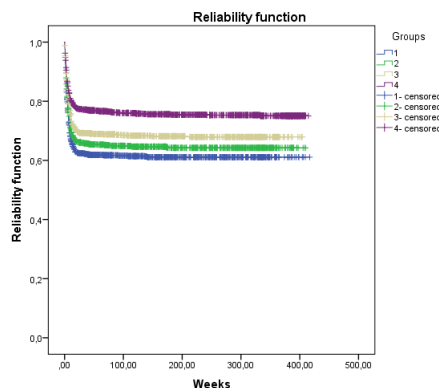


Figure 1. Duration curves of dwellings reported for rent in MLS by price groups in Szczecin in 2016–2023 (source: own study)

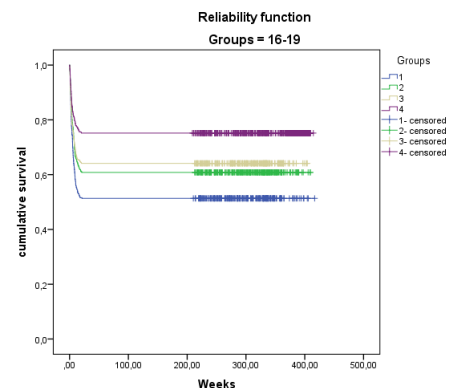


Figure 2. Duration curves of dwellings reported for rent in MLS by price groups in Szczecin in 2016–2019 (source: own study)

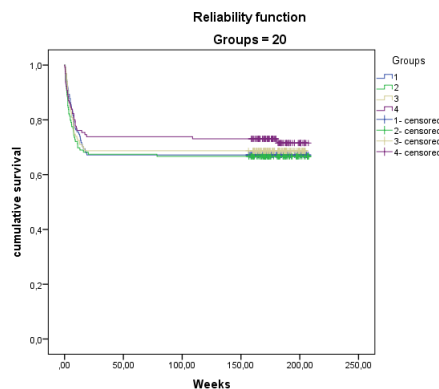


Figure 3. Duration curves of dwellings reported for rent in MLS by price groups in Szczecin in 2020 (source: own study)

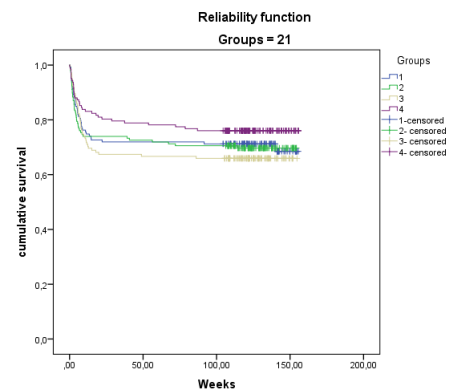


Figure 4. Duration curves of dwellings reported for rent in the MLS by price groups in Szczecin in 2021 (source: own study)

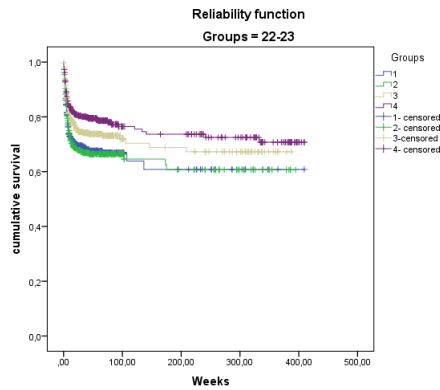


Figure 5. Duration curves of dwellings reported for rent in MLS by price groups in Szczecin in 2022–2023 (source: own study)

Throughout the analysis period, the cheapest flats (G1) were rented out the fastest (Figure 1) and the first 25% of properties in approximately six weeks. For the more expensive flats, from the G2 group, the time on market was below eight weeks for the first 25% of rented apartments. The most expensive apartments (G3) waited for a tenant the longest – ten weeks. In addition, it should be noted that up to seven weeks after a property was offered on the market, there was a sharp decrease in the likelihood of the offer remaining in the system, meaning that the owner had rented the apartment. If a property had not been rented within four months of coming on the market, such an offer could be considered ‘overdue’, as the probability of it being rented was at a similar level to that of a property still on the market.

The pre-pandemic period between 2016 and 2019 was characterized by the same rental time patterns for properties in the different price groups as for the entire analysis period (Figure 2). Indeed, the cheapest apartments found a tenant faster (4 weeks), and apartments in the G2 and G3 price groups found a tenant in around six and a half weeks. The duration curves differed significantly (Table 6).

In the first year of the pandemic (2020), the rental time of apartments in Szczecin increased irrespective of the asking rents (Figure 3). The time on market for the cheapest properties rose sharply – by more than threefold – reaching 12 weeks. The rental time for properties in groups G2 and G3 increased relatively modestly, by only one or two weeks, reaching approximately eight weeks. The most expensive units remained on the market for over four months. However, the differences in the development of the duration curves were not statistically significant (Table 5).

In 2021 – a transitional year from the pandemic, although still marked by periodically reinstated restrictions – the rental time for properties in groups G2 and G3 remained at a similar level to the previous year, averaging around eight weeks (Figure 4). The rental time for the cheapest apartments was shortened by one week, to a level of eleven weeks. As in the previous year, the differ-

Table 5. The distributions equality test of the duration of properties offered for rent in the price groups in Szczecin in the different periods of analysis (source: own study)

Period	Test	χ^2	df	p-value
2016–2023	Log Rank (Mantel-Cox)	20.015	1	0.000
2016–2019	Log Rank (Mantel-Cox)	60.374	3	0.000
2020	Log Rank (Mantel-Cox)	1.112	3	0.774
2021	Log Rank (Mantel-Cox)	3.326	3	0.344
2022–2023	Log Rank (Mantel-Cox)	19.582	3	0.000

ences in the development of the duration curves were not statistically significant (Table 5). In both pandemic years (2020 and 2021), an overall lengthening of the time on market was observed across all price groups. Additionally, the cheapest units waited longer for a tenant than those in the second and third price categories.

In the final stage of the analysis (2022–2023), the relationship between rental speed and price groups returned to the pattern observed in the pre-pandemic period: the cheapest units were rented the fastest, followed sequentially by those in groups G2, G3, and G4 (Figure 5). The rental time for the lowest-priced apartments decreased to 8 weeks, although it still did not return to pre-pandemic levels. The differences in the duration curves during this period were statistically significant (Table 5).

In addition, based on a duration analysis, it is possible to determine the time after which an offer will be ‘overdue’, which means that it has zero probability of being rented. One consistent pattern can be observed in the Szczecin residential property market: between 2016 and 2019, as well as in 2020, 2021, and 2022–2023, the threshold after which an offer was considered overdue remained relatively stable, ranging from 18 to 20 weeks.

6.2. Analysis of variance of rented dwellings

Although survival analysis (e.g., the Kaplan–Meier estimator) allows for the estimation of the probability of an event over time under conditions of censoring, it does not test mean differences across groups in a multivariate framework. Therefore, to complement the duration analysis and examine whether the average time on market (TOM) varies significantly across price categories and time periods, we employed a General Linear Model (GLM) analysis of variance. This approach enables a direct comparison of mean TOM values across predefined groups (e.g., price segments, years), facilitating a clearer interpretation of group-level effects and interaction patterns. The GLM results serve as a robustness check, offering additional insight into temporal and structural variation in rental market dynamics.

Subsequently, in order to identify the most relevant factors affecting time on market, a main-effects General Linear Model was estimated, incorporating the following independent variables: number of rooms, floor level of the dwelling, total number of floors in the building, year of listing introduction, presence of an elevator (binary

Table 6. Results of the general linear model (GLM) analysis of variance (source: own study)

	Level	Parameters	Standard error	Statistics <i>T</i>	<i>p</i>
Free term		141.461	1.576	89.780	0.000
Year	2016	109.693	4.667	23.506	0.000
Year	2017	94.353	4.062	23.225	0.000
Year	2018	57.548	4.322	13.314	0.000
Year	2019	7.125	4.559	1.563	0.118
Year	2020	−14.508	4.195	−3.458	0.001
Year	2021	−47.905	4.093	−11.703	0.000
Year	2022	−89.183	3.787	−23.548	0.000
Groups	G1	−18.364	2.717	−6.759	0.000
Groups	G2	−5.612	2.728	−2.057	0.040
Groups	G3	0.801	2.760	0.290	0.772

variable), and asking rent, categorized into four price segments. Among the models tested, the best fit, measured by the coefficient of determination, was achieved by the specification including two predictors: the year of listing introduction and the asking rent segment. This model demonstrated statistical significance for both main effects and explained 39.93% of the variance in the dependent variable, i.e., the time required to rent the property.

The results of the estimated General Linear Model (GLM) presented in Table 6 indicate that both the year the property was introduced to the market and the asking rent level (price group) had a statistically significant effect on the time on market (TOM) for residential rentals. The parameter estimates refer to the reference year – 2023 – during which the average TOM was approximately 24 weeks. For comparison, in 2016, rental listings remained on the market for more than 15 weeks longer, as reflected by the parameter value (109.693), indicating an average TOM approximately 31.8 weeks longer than in 2023. The years 2016–2018 were characterized by notably longer rental periods, while the following years showed a gradual reduction in TOM, suggesting an increase in rental market dynamism.

The analysis of the price variable revealed that listings in the lowest price category (G1) rented significantly faster – on average, 18.4 weeks sooner – than those in the reference group (G4), which consisted of the highest-priced properties. Properties in group G2 also exhibited shorter rental times (a difference of −5.6 weeks), though to a lesser extent. No statistically significant difference was found for group G3 compared to G4, suggesting that mid-priced and high-priced units remained on the market for a similar duration.

Tenants demonstrated stronger interest in lower-priced units, resulting in faster rental turnover for this segment. This confirms the high price elasticity of demand in the lower rental segment and the increasing competitiveness of more affordable housing. The findings also show that rental periods shortened significantly in the post-pandemic years 2022–2023, which may reflect market recovery.

7. Discussion

The results presented in this study provide clear empirical support for the stated research hypotheses. Hypothesis H1, which posited that rental time on market (TOM) differs significantly before, during, and after the COVID-19 pandemic, is strongly confirmed. TOM increased sharply during the first quarters of 2020, corresponding with mobility restrictions and tenant uncertainty. However, in the post-pandemic period (2022–2023), rental activity accelerated, but did not fully return to pre-pandemic exposure times. This suggests a structural change in tenant decision-making or listing practices, similar to the phenomena described by Cajias and Freudenreich (2018) in other European cities.

Hypothesis H2, concerning the relationship between price level and TOM, is also supported. The data showed a statistically significant correlation between these variables, though the relationship was not strictly linear. Properties priced well above or below the market median experienced longer exposure periods. This is in line with findings by Allen et al. (2009), who demonstrated that market mispricing – whether overpricing or underpricing – tends to reduce listing effectiveness. Listings within the mid-price range achieved the shortest TOM, suggesting an equilibrium zone of tenant price acceptance.

Our use of survival analysis with the Kaplan-Meier estimator provided robust insight into TOM distribution across price segments and time periods. This approach enabled precise estimation of listing durations even in the presence of right-censored data. The addition of GLM-based modeling enriched the analysis by capturing interactions between time, price range, and market phase.

While this study is grounded in the specific case of Szczecin, several characteristics of the Polish rental housing market suggest that the findings may be cautiously generalized to other urban areas in Poland and, more broadly, to cities across the Central and Eastern European (CEE) region. Similar to other post-socialist countries, Poland's rental market remains relatively underdeveloped, with a

dominant owner-occupied housing structure, limited institutional rental supply, and a substantial share of informal market activity (Łaszek et al., 2021; Kucharska-Stasiak, 2016). These systemic characteristics are shared by many urban markets in CEE, including cities in the Czech Republic, Austria, and Turkey (Hromada, 2021; Kadi et al., 2020; Subaşı & Baycan, 2022), which enhances the potential for broader applicability of the observed dynamics.

Furthermore, the COVID-19 pandemic triggered comparable disruptions across the region, including lockdowns, declines in short-term rental demand, and tenant preference shifts toward affordability and housing quality (Tomal & Helbich, 2022; Batalha et al., 2022). Studies from cities such as Kraków, Warsaw, and Olsztyn (Tomal & Marona, 2021; Trojanek et al., 2021; Żróbek-Różańska, 2022b) reveal trends similar to those observed in Szczecin, including lengthened TOM during early pandemic phases and post-pandemic reactivation of demand.

Nonetheless, certain features of Szczecin's rental market – such as lower exposure to tourism and international student migration – may moderate the pandemic's effects compared to more globally connected cities. The impact of COVID-19 on rental prices and transaction volumes in Szczecin was more muted relative to other Polish cities. Therefore, while key behavioral patterns, such as price sensitivity and temporal segmentation of TOM, may hold in other contexts, the magnitude and timing of such effects could vary depending on local economic structure and market composition. To verify the robustness of these findings, future research could adopt a comparative framework across multiple cities within the region.

8. Conclusions

The empirical analysis presented in this paper provides evidence-based confirmation of the two research hypotheses. Firstly, it has been demonstrated that the time on market (TOM) for rental listings varied significantly across different pandemic phases – before, during, and after COVID-19. The disruption caused by the pandemic initially lengthened TOM due to delayed rental decisions by tenants and lockdown-related constraints. In subsequent periods, TOM declined as demand rebounded; however, it did not fully return to pre-pandemic levels, suggesting a long-term behavioral shift in both tenant decision-making and listing strategies.

Secondly, a statistically significant relationship was observed between the price level and TOM. Properties listed within a mid-range pricing bracket were rented more quickly, while those priced either significantly above or below this range experienced longer listing durations. These findings confirm the sensitivity of TOM to pricing strategy, reinforcing existing literature while offering new insight based on post-pandemic market conditions.

This study contributes to the understanding of rental market dynamics in Poland by applying robust methods, including survival analysis and GLM estimation, to a rich,

longitudinal dataset. The combination of descriptive statistics, time-series segmentation, and price stratification allows for a nuanced view of market behavior, especially in a transitional economic context.

From a practical standpoint, these insights can aid real estate professionals in optimizing pricing strategies and forecasting listing duration. MLS platforms may also benefit by integrating TOM-based indicators into property valuation dashboards, thus supporting more informed decision-making for both agents and landlords.

Future research could expand the model to include additional explanatory variables such as spatial location, accessibility, property amenities, or landlord characteristics. Moreover, integrating behavioral economics frameworks (e.g., reference pricing or loss aversion) may offer deeper explanations for listing inertia. Lastly, there is scope to apply machine learning methods to automate TOM prediction and assess the real-time impact of external shocks on listing dynamics.

References

- Airgood-Obrycki, W., Demers, B., Greene, S., Herbert, C., Hermann, A., Luberoff, D., & Wedeen, S. (2021). *Renters' responses to financial stress during the pandemic*. https://www.jchs.harvard.edu/sites/default/files/research/files/harvard_jchs_renter_responses_covid_airgood-obrycki_et_al_2021.pdf
- Allen, M. T., Rutherford, R. C., & Thomson, T. A. (2009). Residential asking rents and time on the market. *Journal of Real Estate Finance and Economics*, 38(4), 351–365. <https://doi.org/10.1007/S11146-007-9092-0>
- Baek, S., Mohanty, S. K., & Glambsky, M. (2020). COVID-19 and stock market volatility: An industry level analysis. *Finance Research Letters*, 37, Article 101748. <https://doi.org/10.1016/J.FRL.2020.101748>
- Bas, M. (2022). The impact of the COVID-19 pandemic on the residential real estate market on the example of Szczecin, Poland. *Procedia Computer Science*, 207, 2048–2058. <https://doi.org/10.1016/J.PROCS.2022.09.264>
- Batalha, M., Gonçalves, D., Peralta, S., & Pereira dos Santos, J. (2022). The virus that devastated tourism: The impact of Covid-19 on the housing market. *Regional Science and Urban Economics*, 95, Article 103774. <https://doi.org/10.1016/j.regsciurbeco.2022.103774>
- Bieszk-Stolorz, B., & Markowicz, I. (2019). *Analiza trwania w badaniach ekonomicznych* [Duration analysis in economic research]. CeDeWu Sp. z o.o.
- BuHamdan, S., Alwisy, A., & Bouferguene, A. (2021). Drivers of housing purchasing decisions: A data-driven analysis. *International Journal of Housing Markets and Analysis*, 14(1), 97–123. <https://doi.org/10.1108/IJHMA-02-2020-0018>
- Cajias, M., & Freudenreich, P. (2018). Exploring the determinants of liquidity with big data – market heterogeneity in German markets. *Journal of Property Investment and Finance*, 36(1), 3–18. <https://doi.org/10.1108/JPIF-01-2017-0006>
- Cajias, M., Freudenreich, P., & Freudenreich, A. (2020). Exploring the determinants of real estate liquidity from an alternative perspective: Censored quantile regression in real estate research. *Journal of Business Economics*, 90(7), 1057–1086. <https://doi.org/10.1007/S11573-020-00988-w>

- Cajias, M., Fuerst, F., & Bienert, S. (2016). *Are energy efficiency ratings ignored in the German housing market? – Evidence from a large-sample hedonic study*. SSRN. <https://doi.org/10.2139/SSRN.2799206>
- Cajias, M., Fuerst, F., & Bienert, S. (2019). Tearing down the information barrier: The price impacts of energy efficiency ratings for buildings in the German rental market. *Energy Research and Social Science*, 47, 177–191. <https://doi.org/10.1016/j.erss.2018.08.014>
- Cirman, A., Pahor, M., & Verbic, M. (2015). Determinants of time on the market in a thin real estate market. *Engineering Economics*, 26(1), 4–11. <https://doi.org/10.5755/j01.ee.26.1.3905>
- Cohen, J. P., Friedt, F. L., & Lautier, J. P. (2022). The impact of the Coronavirus pandemic on New York City real estate: First evidence. *Journal of Regional Science*, 62(3), 858–888. <https://doi.org/10.1111/jors.12591>
- de la Campa, E. A., & Reina, V. J. (2023). Landlords' rental businesses before and after the COVID-19 pandemic: Evidence from a National Cross-Site Survey. *Journal of Housing Economics*, 59, Article 101904. <https://doi.org/10.1016/j.jhe.2022.101904>
- Del Giudice, V., De Paola, P., & Del Giudice, F. P. (2020). COVID-19 infects real estate markets: Short and mid-run effects on housing prices in Campania region (Italy). *Social Sciences*, 9(7), Article 114. <https://doi.org/10.3390/socsci9070114>
- D'Lima, W., Lopez, L. A., & Pradhan, A. (2022). COVID-19 and housing market effects: Evidence from U.S. shutdown orders. *Real Estate Economics*, 50(2), 303–339. <https://doi.org/10.1111/1540-6229.12368>
- Elandt-Johnson, R. C., & Johnson, N. L. (2014). *Survival models and data analysis*. Wiley-Interscience. <https://www.perlego.com/book/1006446/survival-models-and-data-analysis-pdf>
- Evans, R., Rosewall, T., & Wong, A. (2020, September 17). The rental market and COVID-19. *Australian Economy*. <https://www.rba.gov.au/publications/bulletin/2020/sep/the-rental-market-and-covid-19.html>
- Gbadegesin, J. T. (2024). Does the COVID-19 affect tenants' adherence to lease obligations in rental market? Property managers' perspective. *Journal of Facilities Management*, 22, 402–415. <https://doi.org/10.1108/JFM-12-2021-0165>
- Gdakowicz, A., & Putek-Szeląg, E. (2022). Attributes affecting the exposure time of a residential property. In K. Jajuga, G. Dehnel, & M. Walesiak (Eds.), *Modern classification and data analysis. SKAD 2021. Studies in classification, data analysis, and knowledge organization* (pp. 93–118). Springer. https://doi.org/10.1007/978-3-031-10190-8_8
- Gdakowicz, A., Putek-Szeląg, E., & Bas, M. (2023). Duration of the rental offer for residential property. *Real Estate Management and Valuation*, 31(2), 82–91. <https://doi.org/10.2478/remav-2023-0015>
- Gwiazda, J. (2006). Modelowanie szybkości zawierania transakcji na warszawskim rynku mieszkaniowym [Modeling the speed of transactions in the Warsaw housing market]. In A. Orłowski (Ed.), *Metody ilościowe w badaniach ekonomicznych VI* (pp. 209–220). Wydawnictwo SGGW.
- Hald, A. (1949). Maximum likelihood estimation of the parameters of a normal distribution which is truncated at a known point. *Scandinavian Actuarial Journal*, 1949(1), 119–134. <https://doi.org/10.1080/03461238.1949.10419767>
- Eurostat. (2021). *Housing in Europe — 2021 interactive edition*. <https://ec.europa.eu/eurostat/web/products-interactive-publications/-/ks-09-21-479>
- Hromada, E. (2021). Impacts of COVID-19 on the real estate market in the Czech Republic. *SHS Web of Conferences*, 91, Article 01028. <https://doi.org/10.1051/shsconf/20219101028>
- Hu, M. R., Lee, A. D., & Zou, D. (2021). COVID-19 and housing prices: Australian evidence with daily hedonic returns. *Finance Research Letters*, 43, Article 101960. <https://doi.org/10.1016/j.frl.2021.101960>
- Kadi, J., Schneider, A., & Seidl, R. (2020). Short-term rentals, housing markets and COVID-19: Theoretical considerations and empirical evidence from four Austrian cities. *Critical Housing Analysis*, 7(2), 47–57. <https://doi.org/10.13060/23362839.2020.7.2.514>
- Kaplan, E. L., & Meier, P. (1958). Nonparametric estimation from incomplete observations. *Journal of the American Statistical Association*, 53(282), Article 457. <https://doi.org/10.2307/2281868>
- Kucharska-Stasiak, E. (2016). Grey zone in the real estate market. *Real Estate Management and Valuation*, 24(3), 83–92. <https://doi.org/10.1515/remav-2016-0023>
- Kuk, J., Schachter, A., Faber, J. W., & Besbris, M. (2021). The COVID-19 pandemic and the rental market: Evidence from Craigslist. *American Behavioral Scientist*, 65(12), 1623–1648. <https://doi.org/10.1177/00027642211003149>
- Landmesser, J. (2013). *Wykorzystanie metod analizy czasu trwania do badania aktywności ekonomicznej ludności w Polsce* [Use of duration analysis methods to study the economic activity of the population in Poland]. Wydawnictwo SGGW.
- Łaszek, J., Augustyniak, H., & Olszewski, K. (2021). The development of the rental market in Poland. In J. Łaszek, K. Olszewski, & R. Sobiecki (Eds.), *Real estate at exposure: New challenges, old problems* (pp. 263–274). SGH Publishing House.
- Li, T., Jing, X., Wei, O., Yinlong, L., Jinxuan, L., Yongfu, L., Li, W., Ying, J., Weipan, X., Yaotian, M., & Yifan, D. (2022). Mobility restrictions and their implications on the rental housing market during the COVID-19 pandemic in China's large cities. *Cities*, 126, Article 103712. <https://doi.org/10.1016/j.cities.2022.103712>
- Liu, Y., & Tang, Y. (2021). Epidemic shocks and housing price responses: Evidence from China's urban residential communities. *Regional Science and Urban Economics*, 89, Article 103695. <https://doi.org/10.1016/j.regsciurbeco.2021.103695>
- Lyons, R. C. (2019). Can list prices accurately capture housing price trends? Insights from extreme markets conditions. *Finance Research Letters*, 30, 228–232. <https://doi.org/10.1016/j.frl.2018.10.004>
- Mantel, N. (1966). Evaluation of survival data and two new rank order statistics arising in its consideration. *Cancer Chemotherapy Reports*, 50(3), 163–170. <https://pubmed.ncbi.nlm.nih.gov/5910392/>
- Marona, B., & Tomal, M. (2020). The COVID-19 pandemic impact upon housing brokers' workflow and their clients' attitude: Real estate market in Krakow. *Entrepreneurial Business and Economics Review*, 8(4), 221–232. <https://doi.org/10.15678/EBER.2020.080412>
- Matuszyk, A. (2015). *Zastosowanie analizy przetrwania w ocenie ryzyka kredytowego klientów indywidualnych* [Application of survival analysis in assessing the individual customers credit risk]. CeDeWu.pl. <https://cedewu.pl/Zastosowanie-analizy-przetrwania-w-ocenie-ryzyka-kredytowego-klientow-indywidualnych-p1199>
- McCullagh, P., & Nelder, J. A. (1989). *Generalized linear models*. Routledge.
- Ministerstwo Zdrowia. (2020). *Pierwszy przypadek koronawirusa w Polsce*. <https://www.gov.pl/web/zdrowie/pierwszy-przypadek-koronawirusa-w-polsce>
- Mulawa, K. T. (2014). Podwójny problem agencji na przykładzie odpowiedzialności zawodowej pośrednika w obrocie nieruchomości w Polsce [Double agency problem on the example of

- professional liability of a real estate agent in Poland]. *Ekonomia XXI Wieku Economics of the 21st Century*, 1(1), 42–57.
<https://doi.org/10.15611/e21.2014.1.03>
- Nanda, A., Thanos, S., Valtanen, E., Xu, Y., & Zandieh, R. (2021). Forced homeward: The COVID-19 implications for housing. *Town Planning Review*, 92(1), 25–31.
<https://doi.org/10.3828/tpr.2020.79>
- Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, M., & Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery*, 78, Article 185.
<https://doi.org/10.1016/j.ijssu.2020.04.018>
- Ostrowska, I. (2014). Analiza zalet i wad korzystania z usług pośrednictwa w obrocie nieruchomości na podstawie opinii konsumentów [The analysis of advantages and disadvantages of using services of real estate agencies based on consumer opinion]. *Problemy Zarządzania, Finansów i Marketingu*, 34, 161–171. http://serwisy.gazetaprawna.pl/nieruchomosci/artykuly/692369,zapasc_na_
- Qian, X., Qiu, S., & Zhang, G. (2021). The impact of COVID-19 on housing price: Evidence from China. *Finance Research Letters*, 43, Article 101944. <https://doi.org/10.1016/j.frl.2021.101944>
- Ratten, V. (2020). Coronavirus (Covid-19) and entrepreneurship: Changing life and work landscape. *Journal of Small Business & Entrepreneurship*, 32(5), 503–516.
<https://doi.org/10.1080/08276331.2020.1790167>
- Ruf, D. (2017). Agglomeration effects and liquidity gradients in local rental housing markets (Working Papers on Finance No. 2017/02). <https://doi.org/10.2139/ssrn.2823708>
- Sączewska-Piotrowska, A. (2016). Dynamika ubóstwa w miejskich i wiejskich gospodarstwach domowych [Poverty dynamics in urban and rural households]. *Wiadomości Statystyczne. The Polish Statistician*, 7, 39–59.
<https://doi.org/10.5604/01.3001.0014.1038>
- Scanlon, K., & Kochan, B. (Eds.). (2011). *Towards a sustainable private rented sector: The lessons from other countries*. London School of Economics and Political Science. http://eprints.lse.ac.uk/56070/1/Towards_a_sustainable_private_rented_sector.pdf
- Sharma, A., & Borah, S. B. (2022). Covid-19 and domestic violence: An indirect path to social and economic crisis. *Journal of Family Violence*, 37(5), 759–765.
<https://doi.org/10.1007/S10896-020-00188-8>
- Stanisz, A. (2007). *Przystępny kurs statystyki z zastosowaniem STATISTICA PL na przykładach z medycyny. Tom 2. Modele liniowe i nieliniowe* [An accessible course in statistics using STATISTICA PL with medical examples: Vol. 2. Linear and nonlinear models]. StatSoft Polska Sp. z o.o.
- Subaşı, S. Ö., & Baycan, T. (2022). Impacts of the COVID-19 pandemic on private rental housing prices in Turkey. *Asia-Pacific Journal of Regional Science*, 6(3), 1177–1193.
<https://doi.org/10.1007/S41685-022-00262-7>
- Tomal, M., & Helbich, M. (2022). The private rental housing market before and during the COVID-19 pandemic: A submarket analysis in Cracow, Poland. *Environment and Planning B: Urban Analytics and City Science*, 49(6), 1646–1662.
<https://doi.org/10.1177/23998083211062907>
- Tomal, M., & Marona, B. (2021). The impact of the COVID-19 pandemic on the private rental housing market in Poland: What do experts say and what do actual data show? *Critical Housing Analysis*, 8(1), 24–35.
<https://doi.org/10.13060/23362839.2021.8.1.520>
- Trojanek, R., Gluszek, M., Hebdzinski, M., & Tanas, J. (2021). The COVID-19 pandemic, Airbnb and housing market dynamics in Warsaw. *Critical Housing Analysis*, 8(1), 72–84.
<https://doi.org/10.13060/23362839.2021.8.1.524>
- Wang, B. (2021). How does COVID-19 affect house prices? A cross-city analysis. *Journal of Risk and Financial Management*, 14(2), Article 47. <https://doi.org/10.3390/JRFM14020047>
- Watt, D. C., Aitchison, T. C., MacKie, R. M., & Sirel, J. M. (1996). Survival analysis: The importance of censored observations. *Melanoma Research*, 6(5), 379–385.
<https://doi.org/10.1097/00008390-199610000-00005>
- Yeon, J., Song, H. J., & Lee, S. (2020). Impact of short-term rental regulation on hotel industry: A difference-in-differences approach. *Annals of Tourism Research*, 83, Article 102939.
<https://doi.org/10.1016/J.ANNALS.2020.102939>
- Yilmaz, O., Talavera, O., & Jia, J. Y. (2022). Rental market liquidity, seasonality, and distance to universities. *International Journal of the Economics of Business*, 29(2), 223–239.
<https://doi.org/10.1080/13571516.2022.2033078>
- Zhao, Y. (2020). *US housing market during COVID-19: Aggregate and distributional evidence* (IMF Working Papers No. 212). <https://doi.org/10.5089/9781513557816.001>
- Żróbek-Różańska, A. (2022a). Stay or leave the city? Students and rented accommodation during COVID-19 pandemic. *Cities*, 128, Article 103788. <https://doi.org/10.1016/j.cities.2022.103788>
- Żróbek-Różańska, A. (2022b). Students and the city: Student rental behaviour during COVID-19 in the example university town. *Real Estate Management and Valuation*, 30(3), 98–111.
<https://doi.org/10.2478/remav-2022-0024>
- Związek Przedsiębiorców i Pracodawców. (2021). *Podsumowanie lockdown-u w Polsce* [A summary of the lockdown in Poland]. <https://zpp.net.pl/wp-content/uploads/2021/01/25.01.2021-Business-Paper-Podsumowanie-lockdownu-w-Polsce.pdf>