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DISCOVERING THE DETERMINANTS OF HOUSE PRICES DYNAMICS IN POLAND USING BAYESIAN MODEL AVERAGING

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ABSTRACT. We examine the price drivers in 18 capital housing markets in Poland from 2004 to 2021. Using the Bayesian Model Averaging method, we discovered that some financial elements explain house price changes more consistently than conventional economic and demographic variables. The dynamics of house prices in most cities were defined explicitly by financial factors – mortgage market activity, mortgage interest rate, and terms and conditions of granting mortgages. Additionally, the stock market played a vital role in house price movement in selected cities. Economic (regional GDP, salaries, unemployment) and demographic (migration) factors were significant predictors of housing price dynamics only for particular cities. Our study closes the knowledge gap on factors influencing home price dynamics in Poland and other developing nations that have gone through systemic change. In the case of Eastern European countries, we have limited knowledge of those linkages.

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

Introduction

Recent economic, pandemic and geopolitical turbulences reignited the debate about demand and supply drivers contributing to house price dynamics. At least since the 1970s, economists have tried to capture several demographic, socioeconomic, institutional, and financial factors' roles in explaining housing price movements on a regional level. Those empirical affords were accompanied by significant theoretical contributions regarding the linkages between various mechanisms of the housing market. The housing markets have also evolved, thanks to lifestyle and cultural changes, the maturing mortgage industry and institutional shifts in many countries. The well-established relations found in classic papers do not seem to fit the current state of the housing market economy.

Moreover, the economic evidence is geographically unbalanced. The housing markets in developing countries or emerging economies have been under-researched compared to their mature markets in Western Europe and the United States. In many cases, the empirical evidence concerning the house price dynamics is relatively limited, primarily due to data availability issues. For example, in the case of Poland (or other countries that have transformed from socialist to market economies in Central and Eastern Europe, for that matter), the housing market had not fully operated before 1990, and only in the late 1990s and early 2000s the market-related data allowed for empirical investigation concerning house price dynamics and its drivers.

The paper aims to identify and evaluate the impact of selected supply and demand drivers on house price dynamics in Poland. Additionally, we compare the importance of house price predictors in 18 regional housing markets to find common and idiosyncratic factors that explain house price movements in given cities.

Our research narrows the gap in the body of knowledge on determinants of house prices in Poland and other emerging economies that have undergone system transformation. The paper contributes to the ongoing debate on determinants of house price dynamics using the Bayesian Model Averaging atheoretical approach (Koop, 2003). It allows us to account for uncertainty and accommodate a broad range of possible econometric model specifications, as discussed in Steel (2020). The empirical investigation is based on the novel database that contains over three million apartment offers in 18 Polish regional housing markets from 2004 to 2021. This allows us to cover a more extended period than studies that used standard house price information from the National Bank of Poland.

The rest of the paper is organised straightforwardly. Section 2 highlights the economic literature investigating the drivers of house prices. This synthetic overview aims to identify explanatory variables and discover potential research gaps. We focus primarily on the recent empirical studies that used a similar methodology. Section 3 discusses the novel house price dataset used in the practical part of the paper and the Bayesian Model Averaging Approach applied. Section 4 presents econometric results and compares them with the relevant literature. Last but not least, we summarise the findings and pinpoint their limitations in the Conclusion part of the paper.

1. Literature review

The economic literature on factors affecting house prices distinguishes between two categories of drivers. The first category comprises various structural, locational, and environmental factors that capitalise on house prices and are helpful when explaining the values of properties within the local housing market. Within this category, we find property characteristics, neighbourhood effects and locational accessibility. The second category

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

encompasses a broad selection of fundamentals that explain house price dynamics on the national and regional levels. Various economic, demographic and financial variables and exogenous institutional and regulatory changes are within this category. The empirical research on house prices typically focuses on either of two types and rarely overlaps.

The economic fundamentals of house price dynamics have been carefully investigated in empirical research. The list of factors considered in previous papers is immense. Based on prior literature, house prices are positively related to household incomes, industrial production, economic activity, and GDP and are negatively linked to unemployment. The economic drivers of house price house dynamics include disposable incomes (Abelson et al., 2005; Hamid et al., 2022; Mikhed & Zemčík, 2009; Oikarinen et al., 2018), gross domestic product (Alpha Kabine, 2022; Jarociński & Smets, 2008; Nyakabawo et al., 2015) or industrial production (Bork & Møller, 2015; Rapach & Strauss, 2009). Furthermore, according to various economic research, the unemployment rate negatively affects house prices (Engerstam, 2021; Mikhed & Zemčík, 2009; Mohan et al., 2019a; Plakandaras et al., 2015). In general, the evidence from developed economies reveals that house prices rise in expansion and fall in recessions (Hirata et al., 2013). Previous research in Poland has reported the links between economic growth and house prices (Bełej & Cellmer, 2014; Tomal, 2019; Trojanek, 2010).

Economic literature recognises housing as an asset class, similar to stocks or bonds (Jordà et al., 2019). Therefore, from an investment perspective, the housing market is an alternative to the stock market. To reflect this fact, many empirical papers seek to understand the house price dynamics by considering the stock indices (Bagliano & Morana, 2012; Hirata et al., 2013; Mikhed & Zemčík, 2009; Zhang et al., 2012).

Extensive empirical evidence shows that inflation is vital in explaining house price movements. Housing has long been considered a hedge against expectable and unexpected inflation. The literature addressed the role of consumer price inflation when predicting house price fluctuations (Alpha Kabine, 2022; Bagliano & Morana, 2012; Melnychenko et al., 2022; Mohan et al., 2019b; Plakandaras et al., 2015).

The literature addressed the role of a wide range of socio-demographic fundamentals. For example, labour force and population growth have been used to predict house price dynamics (Borowiecki, 2009; Capozza et al., 2002; Plakandaras et al., 2015). In addition, some paper has addressed more subtle demographic facets, such as the role of migration (Han et al., 2018; Laurinavičius et al., 2022; Taltavull de la Paz & White, 2012).

The geographic constraints are instrumental to house price elasticity (Oikarinen et al., 2018). Land supply influenced by physical and regulatory conditions is essential to house prices (Saiz, 2010). Land supply (Glaeser et al., 2008; Han et al., 2018). Empirical studies on housing supply also focused on construction costs and their short-term and long-run relations with house prices (Capozza et al., 2002; Oikarinen, 2010). The recent papers addressed the impact of effective exchange rates on house prices. The former may be linked to housing dynamics due to currency depreciation and inflationary effects on construction materials. The effect is positively related to the dependency of a particular economy on necessary construction materials (Bahmani-Oskooee & Wu, 2018). Prior studies in Poland addressed the linkages between construction costs and house prices (Brzezicka et al., 2018).

The house is a significant asset of a typical household and often requires extensive external financing (Campbell & Cocco, 2003; Rouwendal, 2009). Therefore, financial factors were always considered a key to understanding house price dynamics. The interest in investigating complex economic and housing market relations has only increased since the Financial Crisis 2008. Borrowing constraints are essential to comprehend housing investment on a household level but are also instrumental for housing market dynamics (Khan & Rouillard, 2018). In general, dependence on mortgage financing makes housing investments very sensitive

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

to interest rates and terms and conditions of credit lending. There is a strong relationship between the effective cost of mortgage and house price dynamics (Bork & Møller, 2015; Cuestas, 2017; Jarociński & Smets, 2008; Lin & Tsai, 2021; Mian & Sufi, 2011; Mikhed & Zemčík, 2009; Mukayev et al., 2022; Oikarinen, 2009; Tsatsaronis & Zhu, 2004). The prior research focused on the role of credit supply (Gimeno & Martínez-Carrascal, 2010). Still, it was also concerned with the impact of mortgage industry practices, subprime lending, extensive securitisation, and fraudulent mortgage origination that helped understand the housing crisis of 2008 (Griffin et al., 2021). The Spanish evidence suggests a strong link between foreign capital flows, credit supply and house prices (Cuestas, 2017).

Although fundamental factors tend to explain house price dynamics, there is substantial evidence that in the case of some local housing markets, the connection is relatively weaker (Rapach & Strauss, 2009). It is worth noting that although the selection of variables was often similar, the choice depended on the level of analysis (national vs regional) and data availability (country-specific).

Aside from many instrumental factors determining house prices, they are not driven by market forces alone. The housing market is highly regulated and subject to various policy instruments that generate exogenous demand and supply shocks. The impact of different housing policy tools on house price dynamics has been addressed empirically (Liu et al., 2020).

As predictable as it may seem, the housing market dynamics are not entirely driven by traditional economic, financial and socio-demographic variables that explain the supply and demand side of the market. Aside from those fundamentals, the housing market is likely driven by human sentiments, beliefs and expectations about future prices (Griffin et al., 2021). At least since the seminal work of Shiller, there has been consensus about the role of speculation in house price formation, especially in the booming market (Glaeser & Nathanson, 2017; Shiller, 2014).

In recent years, much research has investigated the impact of the COVID-19 pandemic on house prices (Qian et al., 2021; Trojanek et al., 2021), but that also applies to a larger category of epidemic events that had exogenously affected the housing market - Spanish Flu and Cholera Outbreaks being the most prominent examples (Meen et al., 2016). Last but not least, the economic literature explored the role of exogenous shocks caused by natural catastrophes like earthquakes, cyclones, tsunamis, volcano eruptions (Gluszak, 2018) and anthropogenic ones like industrial accidents (Fink & Stratmann, 2015) or wars (Trojanek & Gluszak, 2022) – mostly on local housing markets.

To date, few studies have attempted to explain the role of latent factors in house price dynamics using the Bayesian Model Averaging framework. The mainstream economic evidence comes from various geographical locations.

The Pan-European BMA study explored the role of macroeconomic, monetary, and demographic house price fundamentals (Risse & Kern, 2016). In particular, they studied the role of household incomes, GDP, industrial production, stock market dynamics, interest rates, exchange rates, money supply, inflation, labour force and unemployment rate. The study revealed that no single variable was a fundamental driver of house prices in all countries during a study period. Macroeconomic variables explained house prices better in Belgium, France, Germany, and Italy, whereas financial fundamentals were more strongly linked to housing price dynamics in the Netherlands and Spain.

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

Table 1. Recent BMA studies on factors that affect house prices

Study	Geographic scope	Time	Sample	Variables
(Risse & Kern, 2016)	European Monetary Union	1975-2015	Six countries	12 macroeconomic, monetary, and demographic
(Wei & Cao, 2017)	China	2007-2015	30 municipalities	12 economic, financial and behavioural variables
(Stadelmann, 2010)	Switzerland (Zurich metropolitan area)	1998-2004	169 municipalities	33 Location-specific, fiscal, economic, socio-demographic
(Ouyang et al., 2022)	China	2012-2016	14191 housing units	24 structural and location-specific variables

Source: *own compilation*

Another BMA used Chinese data to evaluate the forecasting performance of several indicators when predicting house price dynamics (Wei & Cao, 2017). The study used national and city-level economic and financial variables and focused on the market's behavioural side. The results revealed that internet searches are beneficial when predicting house price dynamics. Moreover, the results suggest that they outperformed several macroeconomic variables traditionally used to understand housing market fluctuations.

Swiss BMA study investigated the factors influencing house prices in 169 communities from 1998 to 2004 in the Zurich metropolitan area (Stadelmann, 2010). The study examined the impact of 33 location-specific, fiscal, economic, and socio-demographic variables. The study revealed that apart from several location-specific variables (distance to the urban centre, proximity to shops and schools and air pollution), property prices are positively related to expenditure for culture, health and social well-being and negatively associated with municipal debts. Furthermore, the results suggest that important drivers of house prices are also population incomes and the share of elderly, foreigners and commuters in the population.

Most of the prior studies focused on house price dynamics and performed the analysis at the aggregate level – municipal or national. Alas, successful attempts have been made to narrow the gap in knowledge and bridge the gap between macro and micro determinants of house prices. For example, the Chinese hedonic BMA study, based on individual property data, used individual and aggregate data to investigate variations in property prices. The results show that the availability of education and recreational facilities positively and significantly affects house prices and rents. Additionally, house prices are influenced by the availability of healthcare facilities (Ouyang et al., 2022).

2. Methodological approach

The BMA framework considers the model uncertainty and can be treated as an atheoretical approach (Koop, 2003). A comprehensive and exhaustive presentation of the application of BMA can be found in Steel (2020). At a glance, the idea of the BMA is as follows. This approach deals with the whole space of possible specifications (including and excluding variables from a model). Assuming that we have k likely regressors (determinants) that can explain the dependent variable, i.e., housing price, we have 2^k possible models. In this study, we were concerned with 41 variables (including lagged variables). It gives us the total number of possible models equal 2^{41}=2 199 023 255 552 for each of the 18 cities. We are considering the following linear model: $y = X_j\beta_j + \epsilon$, where y is the vector of observations, X_j is the matrix

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

of explanatory variables, β_j is the vector of parameters, while ϵ is the error term with a normal distribution (Hoeting et al., 1999).

The averaging technique employs the Bayes theorem, where the posterior odds ratio for model M_l over M_n $\frac{P(M_l|y)}{P(M_n|y)}$ gives the rule for choosing models $\frac{P(M_l|y)}{P(M_n|y)} = \frac{P(M_l)}{P(M_n)}\frac{p(y|M_l)}{p(y|M_n)}$, where $\frac{P(M_l)}{P(M_n)}$ is the prior odds ratio and $\frac{p(y|M_l)}{p(y|M_n)}$ is the Bayes factor (Zellner, 1971). The model M_l is supported by data over model M_n when the posterior odds ratio is greater than 1. As the model prior, we use the binominal prior with parameter 0.5, which indicates the uniform prior distribution, and in other words, all the variables are equally probable (Fernandez et al., 2001). Further considerations follow us to the posterior probability of the model M_i which is given by the formula:

$P(M_l|y) = \frac{P(M_l)p(y|M_l)}{\sum P(M_r)p(y|M_r)}$. The posterior density of vector parameters β is equal: $p(\beta|y) = \sum P(M_r|y)E(\beta_r|y, M_r)$, which is the average of posterior densities $p(\beta_r|y, M_r)$. The conditional mean is as follows: $E(\beta|y) = \sum P(M_r|y)E(\beta_r|y, M_r)$ and the conditional variance is:

$$var(\beta|y) = \sum P(M_r|y)var(\beta_r|y, M_r) + \sum P(M_r|y)\big(E(\beta_r|y, M_r) - E(\beta|y)\big)^2,$$

where $E(\beta_r|y, M_r)$ and $var(\beta_r|y, M_r)$ are the mean and variance of β_r conditional on model M_r, respectively. The additional and beneficial measure is the posterior inclusion probability (PIP), which can be treated as the importance of the variable in explaining the modelled phenomena. The PIP for variable x_i is in the range between 0 and 1 (as a probability) and obtained as a sum of posterior probabilities of models, which includes x_i. In this research, we use the value of PIP to determine the explanatory significance and assume that if PIP>0.66, then the variable is highly probable, 0.33<PIP<0.66 then is medium probable, while for PIP<0.33, we say that variable is lowly probable (Błażejowski et al., 2020).

The results of the BMA procedure have been calculated in Gretl software using the BMA package. The total number of iterations for each city was 3,000,000, with 10% of burn-in draws. The specification of the prior variance matrix was based on the benchmark prior, which is recommended by Fernández et al. (Fernandez et al., 2001), and the prior average model size is equal to 20.5, which is half of the number of explanatory variables and gives an equal probability for each variable. The total time of estimation and averaging of the models was between 1199 sec and 2007 sec for each city, depending on the town. The whole calculation time was 24468 sec. (using a machine with four real processors and four virtual processors). The Results of PIP values with means, variances, conditional means, and conditional variances obtained in the BMA approach for all investigated cities are in Tables A1 - A18.

This research also uses the widely known procedure X-13ARIMA-SEATS for seasonal adjustment (Gómez & Maravall, 2001). In addition, we exploit the ADF test to evaluate the unit root in the studied time series (Said & Dickey, 1984). The results of the ADF test are presented in Table 2 in the Results and Discussion section.

3. Data

3.1. Housing prices

This study used house price indices built on a unique database of over 3 million housing offers in 18 Polish provincial capital cities from 2004 to 2021 (Trojanek, 2021). Previous research on regional house price dynamics relied on data from the National Bank of Poland (NBP) or the Central Statistical Office (CSO). Since 2013, the NBP house price indices have

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

been part of the Public Statistics Statistical Research Program. They are likely Poland's most established source of information on residential price dynamics, published quarterly since 2010 (data from 3rd quarter 2006).

Nonetheless, we discovered that NBP data did not meet the study's objectives for two reasons. Firstly, there are differences in recorded transaction volume and average house prices between NBP data and complete housing transaction information in the beginning period of the indexes (Gluszak et al., 2018; Hill & Trojanek, 2022; Konawalczuk, 2014). Secondly, the NBP dataset does not include the early 2000s, which we believe is an especially interesting period to investigate. The alternative CSO dataset on house prices was unsuitable for our research owing to its short time series. It covers the dynamics of residential house prices in regional areas since 2015. Furthermore, it only contains data on ownership. Despite the relatively high share of market transactions, sales of cooperative ownership rights to housing units are excluded.

This study used house price indices based on asking about house price dynamics and considering some NBP and CSO information limitations. The idea of asking prices as a source of information for computing housing price indexes is not new (Pollakowski, 1995). There are not many research articles that compare asking and transaction price indexes. One reason for this lack of studies is that such research requires two different datasets, which various institutions often gather; hence, scientific researchers often do not have access to both. A few studies, however, indicate that the offer data are a good reflection of the changes taking place in the property market and offers, which may be an adequate substitute when transaction data are not available (Anenberg & Laufer, 2017; Kolbe et al., 2021; Lyons, 2019; Shimizu et al., 2016).

This study employed house price indices (PRICE) built on a unique database of over 3 million apartment listings in 18 Polish provincial cities from 2004 to 2021. The list of cities included Bialystok (BIA), Bydgoszcz (BYD), Gdansk (GDA), Gorzow Wielkopolski (GOW), Katowice (KAT), Kielce (KIE), Krakow (KRA), Lublin (LUB), Łodz (LOD), Olsztyn (OLS), Opole (OPO), Poznan (POZ), Rzeszow (RZE), Szczecin (SZC), Torun (TOR), Warsaw (WAR), Wroclaw (WRO), Zielona Gora (ZGO). Trojanek (2021; 2022) provides a detailed description of dataset formation.
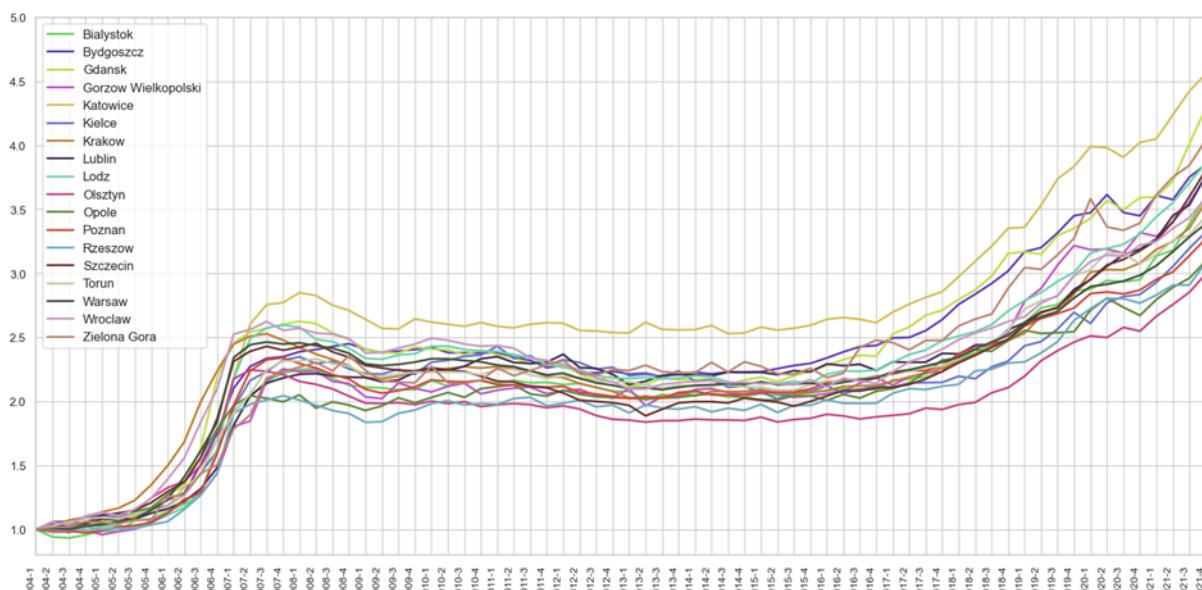

Figure 1. Nominal House Price Indices for provincial capital cities in Poland for Q1 2004 - Q4 2021 (Q1 2004 = 1)
Source: (Trojanek, 2021).

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

Explanatory variables used in the research were selected based on the literature and availability in the Polish context. Variables available for the entire analysis period were adopted for further analysis, and there was no change in the methodology for their determination. We incorporated three groups of variables. Economic variables potentially affecting housing demand and supply were Gross Domestic Product (GDP), unemployment rate (UNEMPL), gross salaries (SAL), new housing construction (NSUPPLY), and construction costs (CONSTR). Financial predictors were mortgage interest rate (MTR), number of active mortgages (A_MORTGAGE), terms and conditions related to issuing of mortgages (MORTGAGE), the margin of mortgage rate (MARG), and stock exchange index (WIG). Finally, we also accounted for demographic variables: migration rate (MIG) and birthrate (BIRTH). In principle, we tried to collect data on the city level, but the variables were sometimes aggregated on a country level. Data sources and detailed descriptions are presented in Table 2.

Table 2. Variables definitions and data sources

Variable	Definition	Frequency	Level	Data source
PRICE	House Price Indices	Quarterly	City	(Trojanek, 2021)
GDP	Gross Domestic Product	Quarterly	Country	Statistical Office
UNEMPL	Unemployed persons as a proportion of the total labour force	Quarterly	City	Statistical Office
SAL	average gross salary in enterprises	Quarterly	City	Statistical Office
NSUPPLY	New houses built	Quarterly	City	Statistical Office
CONSTR	Cost of construction of a multifamily building	Quarterly	City	Bistyp - Catalogue of unit prices for renovation works and buildings
MTR	The interest rate for mortgage borrowing	Quarterly	Country	National Bank of Poland
A_MORTGAGE	Number of active mortgages	Quarterly	Country	National Bank of Poland
MORTGAGE	Terms and conditions of mortgages	Quarterly	Country	National Bank of Poland
MARG	Difference between mortgage rate and Lombard rate	Quarterly	Country	National Bank of Poland
WIG	Warsaw Stocks Exchange index	Quarterly	Country	Warsaw Stock Exchange
MIG	Internal and international net migration for permanent residence	Quarterly	City	Statistical Office
BIRTH	difference between the number of live births and the number of deaths	Quarterly	City	Statistical Office

Source: *own compilation*

4. Results and discussion

The first step of the research was seasonally adjusting the used time series with the X-13-ARIMA procedure. Next, we checked the unit root for all variables and cities using the ADF test. If the null was not rejected, what meant that the data containing the unit root, or in other words, are integrated, the time series have been differentiated. The p-values and the integration level are presented in Tables 3 and 4.

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table 3. The p-values and integration level for explanatory variables based on the ADF test for all cities

CITY	PRICE	SAL	UNEMPL	BIRTH	MIG	CONSTR	NSUPPLY
BIA	pval=0,0544 I(1)	pval=0,6402 I(1)	pval=0,4125 I(1)	pval=0,9875 I(1)	pval=0,8565 I(1)	pval=0,9054 I(1)	pval=0,0000 I(0)
BYD	pval=0,3089 I(1)	pval=0,8894 I(1)	pval=0,7102 I(1)	pval=0,9999 I(1)	pval=0,9896 I(1)	pval=0,6780 I(1)	pval=0,0000 I(0)
GDA	pval=0,3499 I(1)	pval=0,5293 I(1)	pval=0,0865 I(1)	pval=0,6687 I(1)	pval=0,0268 I(0)	pval=0,2056 I(1)	pval=0,0000 I(0)
GOW	pval=0,0677 I(1)	pval=0,8166 I(1)	pval=0,2963 I(1)	pval=0,7900 I(1)	pval=0,2834 I(1)	pval=0,2437 I(1)	pval=0,0001 I(0)
KAT	pval=0,0711 I(1)	pval=0,5013 I(1)	pval=0,5186 I(1)	pval=0,9925 I(1)	pval=0,5368 I(1)	pval=0,6030 I(1)	pval=0,4304 I(1)
KIE	pval=0,1200 I(1)	pval=0,3823 I(1)	pval=0,3102 I(1)	pval=0,9859 I(1)	pval=0,0005 I(0)	pval=0,8789 I(1)	pval=0,0000 I(0)
KRA	pval=0,0500 I(1)	pval=0,8930 I(1)	pval=0,2520 I(1)	pval=0,9636 I(1)	pval=0,1485 I(1)	pval=0,3637 I(1)	pval=0,0057 I(0)
LUB	pval=0,4509 I(1)	pval=0,1321 I(1)	pval=0,4099 I(1)	pval=0,9995 I(1)	pval=0,2684 I(1)	pval=0,6914 I(1)	pval=0,0000 I(0)
LOD	pval=0,4590 I(1)	pval=0,6367 I(1)	pval=0,1619 I(1)	pval=0,7998 I(1)	pval=0,1256 I(1)	pval=0,5659 I(1)	pval=0,0969 I(1)
OLS	pval=0,3354 I(1)	pval=0,5923 I(1)	pval=0,3858 I(1)	pval=0,9919 I(1)	pval=0,6022 I(1)	pval=0,9460 I(1)	pval=0,0000 I(0)
OPO	Pval=0,0527 I(1)	pval=0,0900 I(1)	pval=0,1279 I(1)	pval=0,6421 I(1)	pval=0,0561 I(1)	pval=0,8469 I(1)	pval=0,3265 I(1)
POZ	pval=0,1038 I(1)	pval=0,7294 I(1)	pval=0,0257 I(0)	pval=0,8073 I(1)	pval=0,3085 I(1)	pval=0,3441 I(1)	pval=0,8486 I(1)
RZE	pval=0,4266 I(1)	pval=0,7748 I(1)	pval=0,4106 I(1)	pval=0,9917 I(1)	pval=0,0261 I(0)	pval=0,6062 I(1)	pval=0,0000 I(0)
SZC	pval=0,2495 I(1)	pval=0,8166 I(1)	pval=0,1473 I(1)	pval=0,9904 I(1)	pval=0,7918 I(1)	pval=0,6302 I(1)	pval=0,0001 I(0)
TOR	pval=0,2725 I(1)	pval=0,7805 I(1)	pval=0,4198 I(1)	pval=0,9994 I(1)	pval=0,1266 I(1)	pval=0,6780 I(1)	pval=0,1460 I(1)
WAR	pval=0,0655 I(1)	pval=0,1743 I(1)	pval=0,1252 I(1)	pval=0,9797 I(1)	pval=0,5770 I(1)	pval=0,3759 I(1)	pval=0,0026 I(0)
WRO	pval=0,5941 I(1)	pval=0,2437 I(1)	pval=0,0765 I(1)	pval=0,9401 I(1)	pval=0,1383 I(1)	pval=0,4704 I(1)	pval=0,0000 I(0)
ZGO	pval=0,1164 I(1)	pval=0,9159 I(1)	pval=0,5183 I(1)	pval=0,9936 I(1)	pval=0,0897 I(1)	pval=0,2437 I(1)	pval=0,0000 I(0)

Source: *own compilation*

Table 4. The p-values and integration level based on the ADF test (with trend included) for explanatory variables common for all cities (at national aggregation).

	MTR	A_MORTGAGE	MARG	MORTGAGE	GDP	WIG
POLAND	pval=0.0179 I(0)	pval=0.000 I(0)	pval=0.0105 I(0)	pval=0.0001 I(0)	pval=0.2953 I(1)	pval=0.6688 I(1)

Source: *own compilation*

The results of the unit root evaluation provide the following remarks. First, all cities' dependent variables (square meter prices) have a unit root and must be differentiated, meaning they are interpreted as growth rates. A similar finding is for salaries, birthrate, and cost of building for all cities, while 17 of 18 cities (except Poznan) have unit roots for unemployment.

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Almost all cities are also integrated in the first order for migration. For new houses, only five cities needed differentiation. We obtained unit roots for GDP and WIG for variables at national levels. The ADF test did not indicate the significant unit root for credit interest rate, credit margin, mortgage, and active mortgage. Variables, which are integrated, were differentiated and are noted with the prefix "d_". All variables were transformed using a logarithm. The model for each city has a unique specification, which includes the set of explanatory variables related to this city (in levels or first differences according to Table 2) and a set of variables that are on a national level and are common for all specifications (the differentiation according to Table 3). All variables are included with their lags up to the fourth order.

In Bialystok, a medium-large city in the east part of Poland, we obtained two highly probable variables: salary and mortgage. The medium possible variables are the stock exchange index and an active mortgage. For Bydgoszcz, the highly probable variable is a mortgage (which is a lagged variable and is also medium probable), while birthrate, unemployment, and interest rate are medium probable. Close to Bydgoszcz is Torun, where a highly possible determinant is a mortgage. For this city, medium probable variables are related to the cost of the credit: interest rate and margin. In Gdansk, the city at the seaside, mortgages and active mortgages are highly possible determinants of explaining the price of houses. The stock index is medium probable in Gorzow Wielkopolski, where we obtained no highly possible variables. Similar to Torun, the cost of credit-related variables is medium probable. We have a similar situation for Zielona Gora, which is close to Gorzow Wielkopolski and of comparable size. The margin of credit is a highly possible variable, and the interest rate is medium probable in explaining the house prices. Katowice is a very industrial city in Poland. The mortgage is highly probable in this city, while the interest rate is medium probable. There are no highly probable variables in Kielce, but we have five medium probable determinants: margin, stock exchange index, cost of building, mortgage, and interest rate. The remaining variables are lowly probable. In the second largest city in Poland - Krakow - high probable are active mortgage and cost of building. In contrast, medium probable are new houses and other lags of the active mortgage and interest rate. Lublin is a city with only one variable - the highly probable mortgage. The variable with a medium PIP value is also mortgage (with another lag). There are no highly probable variables in the third largest city in Poland - Łodz in the centre of Poland. Mortgage, interest rate, and margin are medium probable determinants. The prices of houses in Olsztyn depend on the active mortgage, stock exchange index, and mortgage (highly probable). We do not obtain medium probable variables in this city. In Opole, the most probable determinant is the stock exchange index, while active mortgages with different lags are medium probable explanatory variables. The house prices in Poznan, a city above half a million inhabitants, can be modelled by the variable mortgage, which is a highly probable variable, and a lagged mortgage is medium probable. Rzeszow is a city in the southeast part of Poland. The only highly possible variable is a mortgage, with no medium probable variables. The mortgage is a highly probable variable in Szczecin, a northwest city close to the German border and seaside, but not at the seaside. The new houses, birthrate, interest rate, and active mortgage are medium probable variables. In Warsaw, the capital of Poland, the largest and wealthiest city in Poland, the highly probable variables are birthrate, mortgage, new houses, migration, and interest rate. The medium probable determinants are margin, cost of building, GDP, and unemployment rate. We obtained large posterior model sizes for this city. Similar posterior model sizes are for Wroclaw, a fast-developing city in Poland. We received many high and medium probable variables. The active mortgage, new houses, migration, unemployment, and the stock exchange index are highly probable determinants of house prices. Medium possible variables are mortgage, birthrate, cost of building, interest rate, and GDP. Please notice that the variables mentioned above appear with different lags.

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

The value of particular variables as valid predictors of house price dynamics differed significantly in the study period. Figures 2 to 5 present the posterior inclusion probability values for considered variables. For each city, the highest value of PIP of all lags is shown.
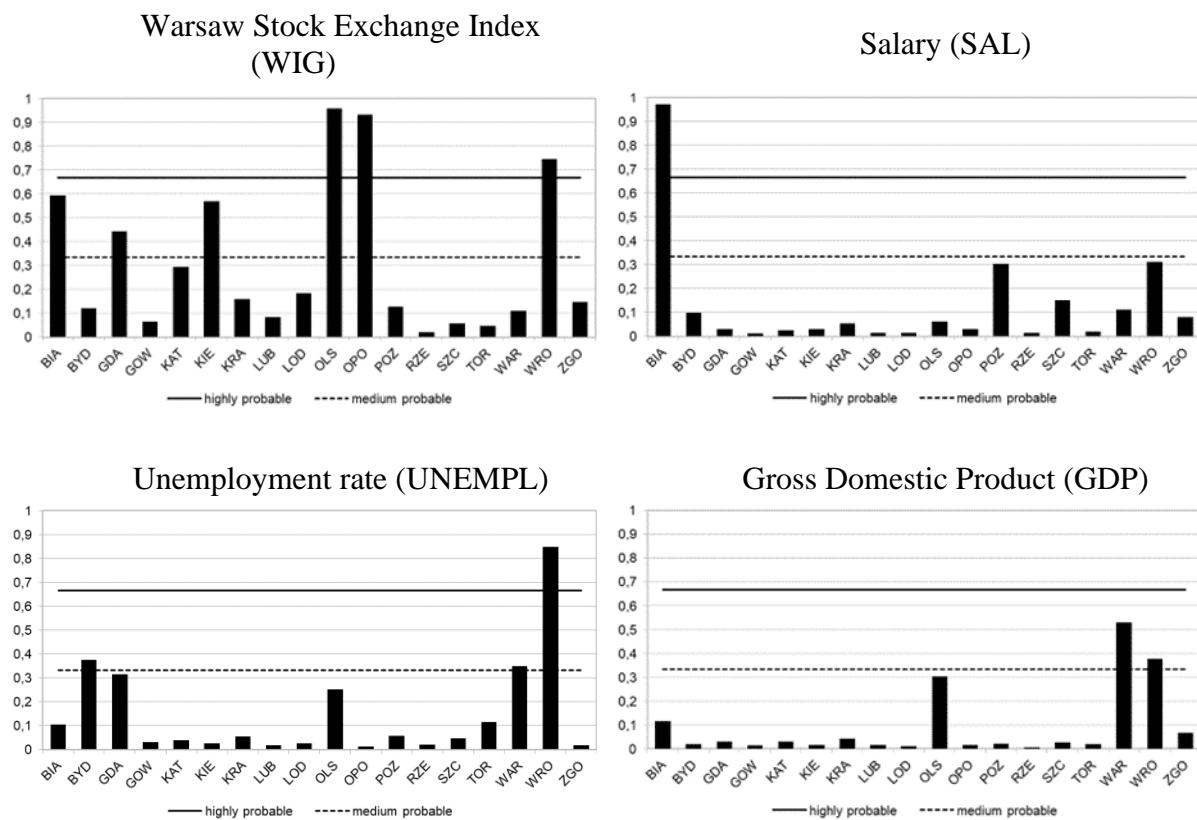
Figure 2. Posterior inclusion probability (PIP) for macroeconomic variables - Warsaw stock exchange index (WIG), salary (SAL), unemployment rate (UNEMPL) and gross domestic product (GDP)Source: *own compilation*

Generally, economic variables affect house price dynamics only in selected cities. For example, the Gross Domestic Product, measured on the national level aggregate, was a medium probable predictor of house price dynamics only in Warsaw and Wroclaw. On the other hand, aggregate GDP did not seem to impact house prices in different cities strongly. Variable salary (SAL) is very high probable for Bialystok, and for the remaining towns, this variable is not likely to be a house price determinant. Another economic variable - the employment rate (UNEMPL) – is a highly probable house price predictor in Wroclaw and a medium probable in Bydgoszcz and Warsaw. However, it does not seem to impact house price dynamics in other cities. The stock exchange index (WIG) is classified as a highly probable variable for three cities (Olsztyn, Opole, and Wroclaw). This determinant is medium probable for the following three cities, while the other twelve are lowly probable explanatory. Compared to macroeconomic factors, financial determinants seemed to have a more universal and generally stronger effect on house prices in the study period (Figure 3).

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT
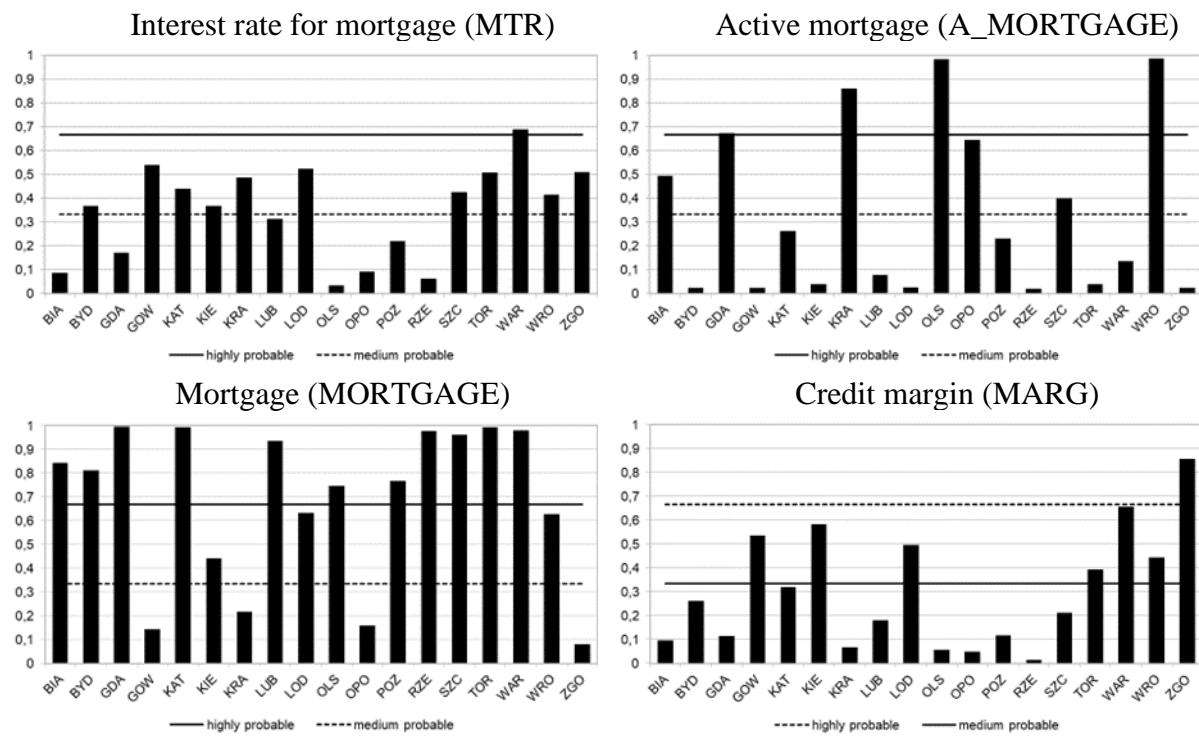
Figure 3. Posterior inclusion probability (PIP) for credit-related variables - interest rate (MTR), active mortgage (A_MORTGAGE), mortgage (MORTGAGE) and credit margin (MARG)
Source: *own compilation*

The cost of granting credit is an essential determinant of tenure choice and strongly impacts house prices. Considering the interest rate and credit margin, we obtained a high inclusion probability for Warsaw (interest rate) and Zielona Gora (margin). The medium probable values are for most of the cities. The detailed values of PIPs for mortgage interest rate (MTR) and credit margin (MARG) are presented in Figure 3. Our findings suggest that the most important explanatory variables are the conditions of granting mortgages - MORTGAGE and the number of active mortgages – A_MORTGAGE. The MORTGAGE determinant is classified as highly probable or medium probable for fourteen of eighteen cities. It is a low probability for only four cities (Gorzow, Krakow, Opole, and Zielona Gora). On the other hand, the number of active mortgages was essential for Gdansk, Krakow, Olsztyn, and Wroclaw. Considering those variables jointly, we conduct the mortgage and active mortgage as the most probable determinants in describing house prices.

The cost of building new houses (CONSTR), measured per square meter, is a highly possible determinant in Krakow, medium possible in Kielce, Warszawa, and Wroclaw. However, for all remaining cities, the cost of building is not a likely house price determinant. In Warszawa and Wroclaw, the number of new houses built (NSUPPLY) is a high probable determinant, and for Krakow and Szczecin, it is close to a high probable threshold. However, for other cities, this variable is an unlikely explanatory variable of house prices (Figure 4).

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT
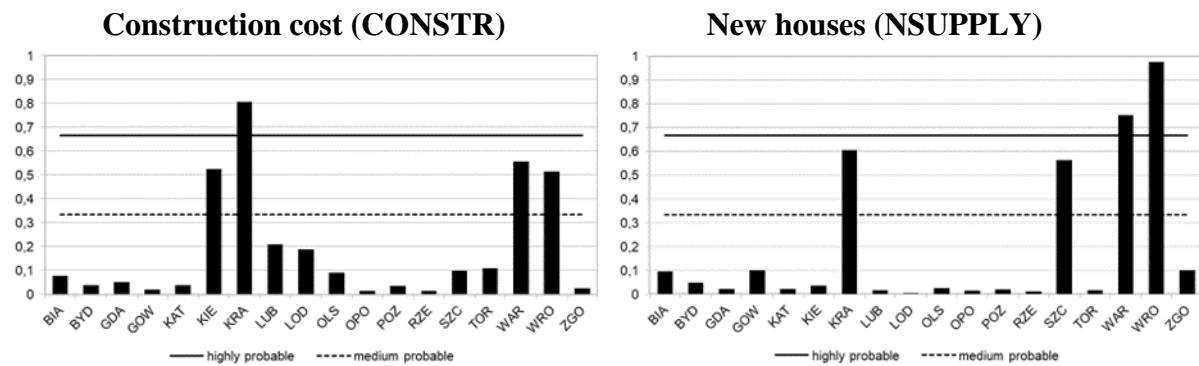
Figure 4. Posterior inclusion probability (PIP) for supply variables - construction cost (CONSTR) and new houses (NSUPPLY)
Source: *own compilation*

In the paper, we evaluated the role of demographic factors, and the results generally suggest that their importance as house price determinants is minor (Figure 5).
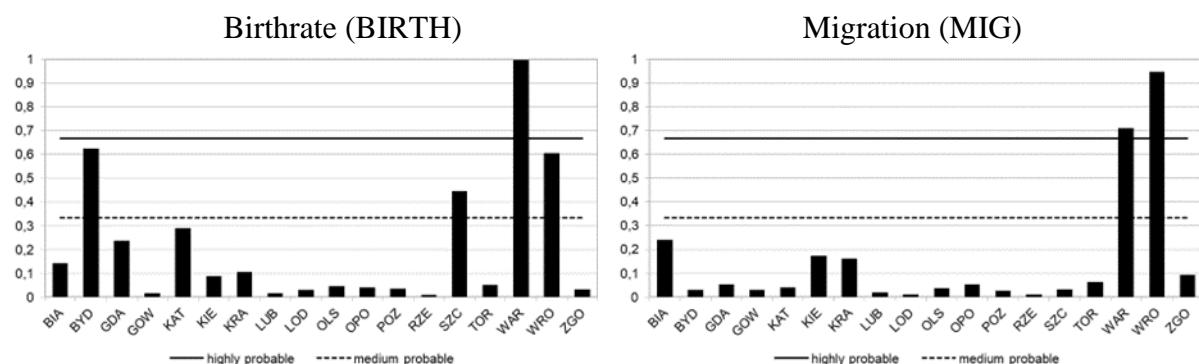
Figure 5. Posterior inclusion probability (PIP) for demographic variables - birthrate (BIRTH) and migration (MIG)
Source: *own compilation*

The birthrate (BIRTH) variable is an important determinant for house price dynamics only in Warsaw. In Wroclaw and Bydgoszcz, the birthrate PIP is a medium inclusion probability. A similar variable type is migration, which is highly probable for Warszawa and Wroclaw. These two cities are the fastest developing and increasing in Poland. Therefore, from the model averaging point of view, these cities have the highest average model sizes (more variables are included).

The empirical findings shed new light on the dynamics of house prices in regional markets in Poland. The changes in Polish cities were linked to several factors. However, only some seem to have a more general effect in most markets investigated. Additionally, no single variable was a fundamental driver of house prices in all cities. This finding is in line with Risse and Kern (2016). The summary of the importance of selected predictors of city-level house price dynamics in Poland is presented in Table 4.

Generally, financial variables outperformed fundamental economic and demographic variables when predicting house price movements). Similar evidence was found in multiple papers (Bork & Møller, 2015; Cuestas, 2017; Mian & Sufi, 2011). As expected, we found solid evidence of the linkage between the mortgage cost (interest rate - MTR and mortgage margin - MARG) and city-level house prices in the study period (probable predictor in 11 and 7 cities, respectively). Moreover, costs and terms and conditions of granting mortgages (MORTGAGE)

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

were important predictors of house price dynamics in eleven cities. We also found that active mortgages (A_MORTGAGE) were vital in predicting house price movements in seven out of eighteen cities examined. We also found that the stock exchange index (WIG) was the strong determinant of house price dynamics in several regional housing markets in Poland (6 cities).

Economic factors also helped to understand house price movement, but the effect varied and was observed only in selected cities. Nevertheless, the results suggest that GDP, gross salaries (SAL), and unemployment rate (UNEMPL) in some cities affect house prices. The relatively weaker explanatory role of traditional fundamental factors in predicting house price dynamics was recently observed by Wei & Cao (Wei & Cao, 2017) and Rapach and Strauss (Rapach & Strauss, 2009). The findings extend the understanding of the relationship between macroeconomic variables and house price dynamics found in other Polish studies (Bełej & Cellmer, 2014; Tomal, 2019). The supply side was also instrumental in predicting house price movements in some of the regional markets in the sample, which is in line with prior economic research (Capozza et al., 2002; Oikarinen, 2010). We found that the supply of new housing units (NSUPPLY) and construction costs (CONSTR) affect house price dynamics in at least four cities.

Demographic factors seem to play a minor role, which may contrast with prior literature (Han et al., 2018; Plakandaras et al., 2015). Furthermore, only in two cities (Warsaw and Wroclaw), which experienced a significant migration, did MIG impact house price dynamics strongly in the study period. On the other hand, the birthrate (BIRTH) helped to explain the house price movements in four out of eighteen cities examined.

Table 5. The relative importance of selected house price dynamics predictors

CITY	BIA	BYD	GDA	GOW	KAT	KIE	KRA	LUB	LOD	OLS	OPO	POZ	RZE	SZC	TOR	WAR	WRO	ZGO	Total
GDP																Med	Med		2
SAL	High																		1
UNEMPL		Med														Med	High		3
CONSTR				Med	High											Med	Med		4
NSUPPLY						Med								Med		High	High		4
MTR		Med	Med	Med	Med	Med	Med							Med	Med	High	Med	Med	11
A_MORTGAGE	Med		High		High		High	Med				Med					High		7
MARG					Med	Med			Med						Med	Med	Med	High	7
MORTGAGE	High	High	High		High	Med		High	Med	High	High	High	High	High		High	Med		14
WIG		Med	Med	Med					High	High							High		6
BIRTH		Med												Med		High	Med		4
MIG																High	High		2

Note: The table summarises the posterior inclusion probability values for particular variables for each city (High, Med). The last column reports the number of cities where the variable had at least medium posterior inclusion probability.

Conclusions

The research narrows the gap in the knowledge of fundamental drivers of house price dynamics, especially when emerging markets are concerned. Moreover, the findings extend the understanding of the determinants of house price dynamics found in other Polish studies (Bełej & Cellmer, 2014; Tomal, 2019). Nonetheless, it is the first systematic attempt to address the supply and demand factors affecting house prices in Poland. It also adds to the relatively limited number of papers using the Bayesian Model Averaging approach to investigate house price dynamics.

The paper investigated house price dynamics in 18 regional housing markets in Poland from 2004 to 2021. Using the Bayesian Model Averaging approach, we found that selected

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

financial factors are more critical in explaining house price dynamics than traditional economic and demographic variables. In particular, the mortgage interest rates and terms and conditions of granting mortgages helped predict the house price movements in most cities. On the other hand, economic factors (GDP, salaries, unemployment, construction cost and construction activity) and demographic factors (migrations, birthrate) were instrumental predictors of house price dynamics only for selected cities.

The study has some limitations. Due to data availability, we could not track several interesting predictors of house price movements in the literature. Future research could focus on market search behaviour (using Google search indices) for future house price developments. Recently, more empirical attention has been focused on the role of exogenous factors in house price dynamics. Using recent data could help to understand the impact of pandemics and war on house prices. Most certainly, adding the data from other cities in Central and Eastern European countries would add more generality to the research.

Acknowledgement

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Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

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Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

Appendix

Table A1. PIPs, means, variances, conditional means and conditional variances for Białystok.

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,4989	0,5072	-0,4989	0,5072
d_l_BIA_salary_SA	0,9727	1,5269	0,5046	1,5697	0,4410
l_POL_mortgage2_SA	0,8432	0,1076	0,0595	0,1276	0,0405
d_l_POL_WIG_SA	0,5941	0,0635	0,0598	0,1069	0,0372
l_POL_active_mortgage_SA_2	0,4946	-0,6778	0,8161	-1,3704	0,6305
l_POL_active_mortgage_SA_1	0,4459	0,6205	1,0454	1,3915	1,1739
d_l_BIA_migration_SA_1	0,2405	-0,3864	0,7756	-1,6064	0,7357
l_POL_active_mortgage_SA	0,1608	0,0889	0,4358	0,5524	0,9617
d_l_BIA_birthrate_SA_2	0,1427	-0,2850	0,7666	-1,9970	0,8363
d_l_POL_GDP_SA_1	0,1169	0,0552	0,1790	0,4726	0,2775
d_l_POL_GDP_SA_2	0,1127	0,0589	0,1839	0,5224	0,2407
d_l_BIA_unepl_SA_1	0,1040	-0,0150	0,0536	-0,1444	0,0944
l_POL_IR_SA_2	0,1021	-0,0038	0,0142	-0,0370	0,0272
d_l_POL_WIG_SA_1	0,0972	0,0058	0,0212	0,0599	0,0370
l_BIA_new_houses_SA	0,0957	-0,0019	0,0068	-0,0195	0,0119
l_POL_margin_SA	0,0956	-0,0046	0,0179	-0,0482	0,0354
d_l_BIA_migration_SA	0,0934	-0,1367	0,5095	-1,4630	0,9151
l_POL_mortgage2_SA_1	0,0924	0,0066	0,0247	0,0715	0,0446
l_POL_IR_SA_1	0,0855	-0,0031	0,0136	-0,0361	0,0310
d_l_BIA_unepl_SA	0,0843	-0,0106	0,0430	-0,1263	0,0857
d_l_BIA_cost_m2_SA_2	0,0774	-0,0290	0,1136	-0,3751	0,1917
l_BIA_new_houses_SA_2	0,0734	-0,0013	0,0056	-0,0173	0,0122
d_l_POL_GDP_SA	0,0562	0,0165	0,0879	0,2933	0,2376
l_POL_IR_SA	0,0555	-0,0012	0,0095	-0,0224	0,0339
l_POL_margin_SA_2	0,0542	-0,0014	0,0104	-0,0258	0,0371
l_POL_margin_SA_1	0,0538	-0,0014	0,0112	-0,0255	0,0413
l_POL_mortgage2_SA_2	0,0470	0,0020	0,0126	0,0429	0,0402
l_BIA_new_houses_SA_1	0,0295	-0,0001	0,0027	-0,0036	0,0153
d_l_BIA_migration_SA_2	0,0289	0,0321	0,2380	1,1098	0,8744
d_l_BIA_salary_SA_1	0,0285	0,0032	0,0919	0,1117	0,5332
d_l_BIA_birthrate_SA	0,0279	-0,0124	0,1686	-0,4445	0,9091
d_l_BIA_cost_m2_SA	0,0265	-0,0018	0,0272	-0,0698	0,1525
d_l_BIA_cost_m2_SA_1	0,0251	-0,0002	0,0343	-0,0089	0,2163
d_l_BIA_birthrate_SA_1	0,0243	0,0005	0,1367	0,0188	0,8767
d_l_BIA_salary_SA_2	0,0226	0,0115	0,1055	0,5113	0,4877
d_l_BIA_unepl_SA_2	0,0150	0,0000	0,0150	-0,0007	0,1220
d_l_POL_WIG_SA_2	0,0135	0,0001	0,0049	0,0106	0,0413
l_BIA_new_houses_SA_3	0,0120	0,0000	0,0014	0,0009	0,0127
d_l_BIA_birthrate_SA_3	0,0057	-0,0081	0,1260	-1,4238	0,8721
d_l_BIA_unepl_SA_3	0,0029	0,0003	0,0087	0,1133	0,1151
d_l_BIA_migration_SA_3	0,0022	0,0016	0,0506	0,7205	0,8186
d_l_BIA_cost_m2_SA_3	0,0018	-0,0003	0,0104	-0,1479	0,1921
d_l_BIA_birthrate_SA_4	0,0007	-0,0010	0,0462	-1,4854	0,9218
d_l_BIA_cost_m2_SA_4	0,0002	0,0000	0,0031	0,0377	0,2188
d_l_BIA_migration_SA_4	0,0001	0,0000	0,0112	-0,0278	0,9806

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A2. PIPs, means, variances, conditional means and conditional variances for Bydgoszcz.

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,2494	0,2568	-0,2494	0,2568
l_POL_mortgage2_SA	0,8100	0,1131	0,0657	0,1397	0,0403
d_l_BYD_birthrate_SA	0,6232	1,6152	1,3944	2,5918	0,7672
d_l_BYD_unepl_SA_1	0,3751	-0,0930	0,1293	-0,2479	0,0785
l_POL_IR_SA	0,3671	-0,0224	0,0320	-0,0611	0,0206
l_POL_mortgage2_SA_1	0,3589	0,0456	0,0683	0,1270	0,0514
l_POL_margin_SA	0,2626	-0,0194	0,0355	-0,0737	0,0282
l_POL_margin_SA_2	0,1672	-0,0127	0,0315	-0,0758	0,0340
l_POL_margin_SA_1	0,1553	-0,0092	0,0280	-0,0590	0,0459
l_POL_IR_SA_1	0,1476	-0,0071	0,0225	-0,0479	0,0382
d_l_POL_WIG_SA	0,1208	0,0109	0,0334	0,0904	0,0452
d_l_BYD_salary_SA	0,1000	0,0516	0,1774	0,5159	0,2739
l_POL_IR_SA_2	0,0848	-0,0047	0,0179	-0,0554	0,0309
d_l_BYD_salary_SA_2	0,0677	0,0482	0,1927	0,7115	0,2761
l_BYD_new_houses_SA	0,0470	0,0005	0,0030	0,0114	0,0081
d_l_BYD_cost_m2_SA_2	0,0390	-0,0209	0,1140	-0,5344	0,2415
d_l_BYD_migration_SA	0,0304	-0,0212	0,1844	-0,6952	0,8057
d_l_BYD_cost_m2_SA	0,0298	0,0063	0,0559	0,2126	0,2473
l_POL_active_mortgage_SA_1	0,0244	0,0019	0,0697	0,0792	0,4393
d_l_BYD_unepl_SA	0,0230	0,0004	0,0143	0,0156	0,0930
l_POL_active_mortgage_SA	0,0229	0,0008	0,0433	0,0338	0,2840
l_BYD_new_houses_SA_1	0,0222	0,0001	0,0015	0,0054	0,0086
d_l_POL_WIG_SA_2	0,0208	0,0015	0,0115	0,0705	0,0387
d_l_POL_GDP_SA	0,0182	0,0007	0,0379	0,0367	0,2783
l_POL_active_mortgage_SA_2	0,0160	-0,0027	0,0574	-0,1660	0,4236
d_l_POL_WIG_SA_1	0,0160	0,0006	0,0067	0,0358	0,0398
d_l_BYD_birthrate_SA_1	0,0158	0,0097	0,1197	0,6136	0,7315
d_l_BYD_cost_m2_SA_1	0,0152	0,0019	0,0389	0,1258	0,2895
d_l_BYD_migration_SA_1	0,0148	-0,0087	0,1109	-0,5853	0,7013
l_BYD_new_houses_SA_2	0,0144	-0,0001	0,0012	-0,0047	0,0089
l_POL_mortgage2_SA_2	0,0132	0,0001	0,0058	0,0066	0,0505
d_l_BYD_salary_SA_1	0,0113	0,0005	0,0305	0,0470	0,2823
d_l_BYD_migration_SA_2	0,0111	0,0108	0,1286	0,9741	0,7397
d_l_POL_GDP_SA_1	0,0111	0,0010	0,0283	0,0870	0,2538
d_l_BYD_unepl_SA_2	0,0055	-0,0003	0,0084	-0,0580	0,0981
d_l_POL_GDP_SA_2	0,0052	0,0008	0,0205	0,1564	0,2395
l_BYD_new_houses_SA_3	0,0044	0,0000	0,0006	0,0012	0,0095
d_l_BYD_birthrate_SA_2	0,0041	0,0003	0,0478	0,0687	0,7446
d_l_BYD_migration_SA_3	0,0006	-0,0001	0,0181	-0,1958	0,7169
d_l_BYD_cost_m2_SA_3	0,0005	-0,0001	0,0057	-0,1042	0,2212
d_l_BYD_birthrate_SA_3	0,0005	-0,0002	0,0177	-0,3457	0,7133
d_l_BYD_unepl_SA_3	0,0004	0,0000	0,0016	0,0199	0,0750
d_l_BYD_migration_SA_4	0,0001	-0,0001	0,0122	-0,9630	0,7920
d_l_BYD_birthrate_SA_4	0,0001	-0,0001	0,0110	-1,0844	0,7985
d_l_BYD_cost_m2_SA_4	0,0000	0,0000	0,0012	0,0139	0,2022

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A3. PIPs, means, variances, conditional means and conditional variances for Gdańsk

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,9997	0,9611	-0,9997	0,9611
l_POL_mortgage2_SA	0,9943	0,1963	0,0507	0,1975	0,0487
l_POL_active_mortgage_SA_2	0,6730	-1,2702	1,0736	-1,8874	0,7401
l_POL_active_mortgage_SA_1	0,5293	1,0565	1,3368	1,9960	1,2252
d_l_POL_WIG_SA	0,4440	0,0576	0,0714	0,1297	0,0462
d_l_GDA_unepl_SA_1	0,3162	-0,0500	0,0809	-0,1580	0,0603
l_POL_active_mortgage_SA	0,2392	0,2810	0,5967	1,1750	0,6621
d_l_GDA_birthrate_SA	0,2381	0,5208	1,0418	2,1873	0,9557
l_POL_IR_SA	0,1702	-0,0110	0,0274	-0,0644	0,0310
l_POL_IR_SA_1	0,1203	-0,0064	0,0231	-0,0528	0,0447
l_POL_margin_SA	0,1146	-0,0024	0,0274	-0,0213	0,0784
l_POL_IR_SA_2	0,1121	-0,0075	0,0258	-0,0668	0,0443
l_POL_margin_SA_1	0,0958	0,0004	0,0302	0,0038	0,0974
l_GDA_migration_SA	0,0530	-0,0292	0,1639	-0,5498	0,4695
d_l_GDA_cost_m2_SA	0,0506	-0,0084	0,0469	-0,1668	0,1307
l_POL_margin_SA_2	0,0460	-0,0028	0,0200	-0,0613	0,0717
d_l_POL_WIG_SA_1	0,0390	0,0022	0,0137	0,0551	0,0436
d_l_GDA_unepl_SA	0,0375	-0,0025	0,0193	-0,0668	0,0754
d_l_GDA_salary_SA	0,0303	0,0095	0,0786	0,3125	0,3308
d_l_POL_GDP_SA_1	0,0287	0,0080	0,0701	0,2776	0,3100
d_l_GDA_salary_SA_1	0,0279	0,0097	0,0815	0,3479	0,3465
l_GDA_migration_SA_1	0,0276	-0,0024	0,1183	-0,0881	0,7068
l_GDA_migration_SA_2	0,0250	0,0094	0,1103	0,3766	0,5892
d_l_GDA_cost_m2_SA_1	0,0243	-0,0024	0,0235	-0,0985	0,1147
l_GDA_new_houses_SA_1	0,0224	-0,0002	0,0024	-0,0067	0,0148
l_POL_mortgage2_SA_2	0,0223	-0,0008	0,0089	-0,0345	0,0487
d_l_POL_GDP_SA	0,0218	0,0007	0,0452	0,0299	0,3044
l_GDA_new_houses_SA	0,0209	-0,0001	0,0022	-0,0063	0,0138
d_l_GDA_birthrate_SA_1	0,0203	0,0122	0,1615	0,5972	0,9653
l_POL_mortgage2_SA_1	0,0193	0,0002	0,0070	0,0082	0,0494
d_l_GDA_birthrate_SA_2	0,0173	-0,0298	0,2627	-1,7215	1,0377
l_GDA_new_houses_SA_2	0,0171	-0,0001	0,0018	-0,0032	0,0138
d_l_GDA_unepl_SA_2	0,0139	-0,0015	0,0159	-0,1111	0,0785
d_l_GDA_unepl_SA_3	0,0118	-0,0006	0,0082	-0,0514	0,0561
l_GDA_migration_SA_4	0,0107	0,0028	0,0654	0,2617	0,5751
d_l_GDA_cost_m2_SA_2	0,0105	-0,0015	0,0191	-0,1452	0,1179
d_l_POL_WIG_SA_2	0,0088	0,0005	0,0066	0,0535	0,0466
l_GDA_migration_SA_3	0,0082	0,0036	0,0631	0,4389	0,5426
d_l_POL_GDP_SA_2	0,0074	0,0021	0,0346	0,2793	0,2889
d_l_GDA_salary_SA_2	0,0072	-0,0023	0,0385	-0,3224	0,3196
d_l_GDA_birthrate_SA_3	0,0070	0,0005	0,0798	0,0716	0,9492
d_l_GDA_cost_m2_SA_3	0,0060	0,0001	0,0081	0,0096	0,1043
l_GDA_new_houses_SA_3	0,0050	0,0000	0,0011	0,0057	0,0146
d_l_GDA_cost_m2_SA_4	0,0015	-0,0001	0,0048	-0,0718	0,1010
d_l_GDA_birthrate_SA_4	0,0012	-0,0006	0,0374	-0,4737	0,9746

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A4. PIPs, means, variances, conditional means and conditional variances for Gorzów Wielkopolski

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,5506	0,2661	-0,5506	0,2661
1_POL_IR_SA_1	0,5375	-0,0422	0,0428	-0,0786	0,0235
1_POL_margin_SA	0,5345	-0,0600	0,0595	-0,1122	0,0275
1_POL_IR_SA_2	0,3182	-0,0242	0,0377	-0,0762	0,0227
1_POL_margin_SA_1	0,3105	-0,0333	0,0530	-0,1073	0,0333
1_POL_mortgage2_SA_1	0,1446	0,0166	0,0447	0,1149	0,0504
1_GOW_new_houses_SA	0,1017	-0,0018	0,0061	-0,0180	0,0084
1_POL_mortgage2_SA	0,0856	0,0083	0,0307	0,0971	0,0488
1_POL_IR_SA	0,0780	-0,0036	0,0200	-0,0459	0,0564
1_POL_margin_SA_2	0,0718	-0,0058	0,0247	-0,0810	0,0492
d_1_POL_WIG_SA_1	0,0648	0,0059	0,0254	0,0915	0,0457
1_POL_mortgage2_SA_2	0,0584	0,0067	0,0308	0,1144	0,0621
d_1_POL_WIG_SA	0,0448	0,0033	0,0182	0,0746	0,0455
d_1_GOW_unepl_SA	0,0323	-0,0029	0,0200	-0,0900	0,0679
d_1_GOW_migration_SA_1	0,0286	0,0212	0,1491	0,7406	0,4942
d_1_GOW_migration_SA	0,0232	-0,0140	0,1203	-0,6017	0,5191
1_POL_active_mortgage_SA_1	0,0225	-0,0006	0,1169	-0,0272	0,7780
1_POL_active_mortgage_SA_2	0,0225	-0,0053	0,0844	-0,2380	0,5117
1_POL_active_mortgage_SA	0,0211	0,0054	0,0970	0,2534	0,6185
d_1_GOW_cost_m2_SA	0,0204	0,0055	0,0550	0,2688	0,2777
d_1_POL_WIG_SA_2	0,0173	0,0018	0,0151	0,1062	0,0466
d_1_GOW_birthrate_SA_1	0,0153	0,0072	0,0814	0,4677	0,4669
d_1_POL_GDP_SA_1	0,0145	0,0041	0,0482	0,2833	0,2844
1_GOW_new_houses_SA_2	0,0141	-0,0001	0,0014	-0,0079	0,0088
1_GOW_new_houses_SA_1	0,0129	-0,0001	0,0011	-0,0039	0,0091
d_1_GOW_salary_SA	0,0127	0,0038	0,0673	0,2969	0,5194
d_1_GOW_cost_m2_SA_1	0,0124	0,0024	0,0392	0,1898	0,2974
d_1_GOW_birthrate_SA	0,0122	-0,0020	0,0565	-0,1678	0,4843
d_1_POL_GDP_SA	0,0112	0,0009	0,0315	0,0764	0,2881
d_1_GOW_unepl_SA_1	0,0111	0,0001	0,0061	0,0127	0,0566
d_1_GOW_salary_SA_1	0,0093	0,0019	0,0548	0,2079	0,5291
d_1_GOW_birthrate_SA_2	0,0041	0,0028	0,0543	0,6986	0,4896
d_1_GOW_cost_m2_SA_2	0,0039	-0,0012	0,0246	-0,3103	0,2457
d_1_GOW_unepl_SA_3	0,0016	-0,0002	0,0048	-0,1050	0,0543
d_1_GOW_unepl_SA_2	0,0015	0,0000	0,0025	-0,0312	0,0545
d_1_GOW_migration_SA_2	0,0015	-0,0003	0,0236	-0,2261	0,5607
d_1_POL_GDP_SA_2	0,0014	0,0000	0,0107	0,0077	0,2888
d_1_GOW_salary_SA_2	0,0013	-0,0001	0,0209	-0,0653	0,5683
1_GOW_new_houses_SA_3	0,0013	0,0000	0,0003	-0,0022	0,0087
d_1_GOW_birthrate_SA_4	0,0006	0,0006	0,0299	1,1406	0,5196
d_1_GOW_birthrate_SA_3	0,0005	-0,0003	0,0194	-0,6978	0,5301
d_1_GOW_migration_SA_3	0,0004	-0,0002	0,0131	-0,4597	0,5110
d_1_GOW_cost_m2_SA_3	0,0003	0,0000	0,0050	-0,1594	0,2518
d_1_GOW_migration_SA_4	0,0001	0,0000	0,0041	0,1282	0,5356
d_1_GOW_cost_m2_SA_4	0,0000	0,0000	0,0015	-0,1087	0,2202

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A5. PIPs, means, variances, conditional means and conditional variances for Katowice

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,6562	0,4043	-0,6562	0,4043
1_POL_mortgage2_SA_1	0,9923	0,2005	0,0497	0,2021	0,0466
1_POL_IR_SA_2	0,4390	-0,0310	0,0385	-0,0707	0,0239
1_POL_margin_SA	0,3185	-0,0276	0,0438	-0,0868	0,0300
d_1_POL_WIG_SA_1	0,2933	0,0289	0,0501	0,0985	0,0413
d_1_KAT_birthrate_SA_1	0,2903	0,5575	0,9699	1,9206	0,7890
1_POL_mortgage2_SA	0,2754	0,0276	0,0498	0,1001	0,0418
1_POL_margin_SA_2	0,2684	-0,0207	0,0373	-0,0770	0,0292
1_POL_active_mortgage_SA_2	0,2628	-0,5025	0,9799	-1,9125	0,9787
1_POL_active_mortgage_SA_1	0,2485	0,5979	1,3482	2,4055	1,7220
1_POL_IR_SA_1	0,2455	-0,0170	0,0339	-0,0693	0,0327
d_1_KAT_birthrate_SA	0,2254	0,4116	0,8495	1,8264	0,7861
1_POL_margin_SA_1	0,1711	-0,0128	0,0321	-0,0748	0,0373
1_POL_IR_SA	0,1181	-0,0073	0,0230	-0,0616	0,0335
1_POL_active_mortgage_SA	0,0769	-0,0765	0,4922	-0,9946	1,4959
d_1_KAT_birthrate_SA_2	0,0575	0,0948	0,4291	1,6487	0,8014
d_1_POL_WIG_SA	0,0503	0,0030	0,0165	0,0598	0,0449
d_1_KAT_unepl_SA_1	0,0386	-0,0019	0,0150	-0,0494	0,0590
d_1_KAT_migration_SA	0,0385	-0,0388	0,2695	-1,0075	0,9544
d_1_KAT_cost_m2_SA_1	0,0374	-0,0073	0,0548	-0,1946	0,2095
d_1_KAT_unepl_SA	0,0360	-0,0019	0,0148	-0,0532	0,0579
d_1_KAT_cost_m2_SA	0,0351	0,0073	0,0528	0,2067	0,1955
1_POL_mortgage2_SA_2	0,0332	0,0016	0,0132	0,0479	0,0548
d_1_POL_GDP_SA_1	0,0308	0,0063	0,0591	0,2055	0,2690
d_1_KAT_migration_SA_1	0,0285	-0,0171	0,1865	-0,5997	0,9337
d_1_KAT_cost_m2_SA_2	0,0258	-0,0075	0,0548	-0,2889	0,1875
d_1_KAT_salary_SA_1	0,0257	-0,0038	0,0479	-0,1461	0,2612
d_1_KAT_salary_SA	0,0252	-0,0047	0,0497	-0,1848	0,2545
d_1_POL_WIG_SA_2	0,0234	0,0015	0,0118	0,0643	0,0436
d_1_KAT_new_houses_SA_1	0,0227	0,0000	0,0009	-0,0021	0,0059
d_1_KAT_new_houses_SA	0,0194	0,0000	0,0008	-0,0020	0,0053
d_1_POL_GDP_SA	0,0193	0,0002	0,0365	0,0083	0,2626
d_1_KAT_salary_SA_2	0,0181	0,0059	0,0554	0,3234	0,2575
d_1_POL_GDP_SA_2	0,0150	0,0044	0,0482	0,2940	0,2650
d_1_KAT_unepl_SA_2	0,0122	-0,0005	0,0082	-0,0422	0,0610
d_1_KAT_new_houses_SA_2	0,0090	0,0000	0,0006	0,0030	0,0058
d_1_KAT_migration_SA_2	0,0082	-0,0001	0,0846	-0,0138	0,9363
d_1_KAT_cost_m2_SA_3	0,0050	-0,0017	0,0272	-0,3377	0,1861
d_1_KAT_migration_SA_3	0,0026	-0,0030	0,0738	-1,1497	0,8892
d_1_KAT_birthrate_SA_3	0,0018	0,0017	0,0538	0,9253	0,8453
d_1_KAT_unepl_SA_3	0,0012	0,0000	0,0023	0,0040	0,0644
d_1_KAT_new_houses_SA_3	0,0010	0,0000	0,0002	-0,0001	0,0058
d_1_KAT_migration_SA_4	0,0006	-0,0007	0,0396	-1,2468	1,0498
d_1_KAT_birthrate_SA_4	0,0004	-0,0003	0,0252	-0,7508	0,9781
d_1_KAT_cost_m2_SA_4	0,0003	0,0000	0,0033	-0,0683	0,1856

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A6. PIPs, means, variances, conditional means and conditional variances for Kielce.

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	1,3053	2,7950	1,31	2,8
1_POL_margin_SA	0,5836	-0,0493	0,0475	-0,08	0,03
d_1_POL_WIG_SA	0,5680	0,0714	0,0703	0,13	0,04
d_1_KIE_cost_m2_SA	0,5238	0,3632	0,3862	0,6934	0,24
1_POL_mortgage2_SA	0,4395	0,0476	0,0599	0,11	0,04
1_POL_IR_SA	0,3690	-0,0214	0,0312	-0,06	0,02
1_POL_IR_SA_1	0,3076	-0,0169	0,0299	-0,05	0,03
1_KIE_migration_SA	0,1735	-0,1885	0,4623	-1,09	0,51
1_KIE_migration_SA_1	0,1637	-0,1789	0,4574	-1,09	0,53
1_POL_mortgage2_SA_1	0,1577	0,0141	0,0366	0,09	0,04
1_POL_IR_SA_2	0,1316	-0,0091	0,0256	-0,07	0,03
1_POL_margin_SA_1	0,1255	-0,0068	0,0269	-0,0538	0,06
d_1_KIE_birthrate_SA	0,0867	0,1337	0,5022	1,54	0,86
1_POL_margin_SA_2	0,0813	-0,0060	0,0222	-0,07	0,03
1_POL_active_mortgage_SA_1	0,0393	0,0108	0,1697	0,2750	0,81
1_KIE_new_houses_SA_1	0,0347	-0,0002	0,0018	-0,01	0,01
1_POL_active_mortgage_SA	0,0322	0,0049	0,0829	0,15	0,44
d_1_KIE_salary_SA	0,0303	0,0095	0,0760	0,31	0,31
d_1_KIE_salary_SA_1	0,0277	-0,0146	0,0992	-0,53	0,29
d_1_KIE_unepl_SA	0,0257	-0,0024	0,0274	-0,09	0,14
1_POL_mortgage2_SA_2	0,0235	0,0017	0,0128	0,07	0,04
1_POL_active_mortgage_SA_2	0,0219	-0,0153	0,1454	-0,7010	0,7
1_KIE_new_houses_SA	0,0178	-0,0001	0,0009	0	0,01
d_1_POL_GDP_SA	0,0176	0,0004	0,0320	0,02	0,24
d_1_KIE_unepl_SA_1	0,0111	-0,0014	0,0201	-0,13	0,14
d_1_KIE_salary_SA_2	0,0107	0,0046	0,0539	0,43	0,29
d_1_KIE_cost_m2_SA_1	0,0090	0,0018	0,0326	0,2	0,28
1_KIE_migration_SA_2	0,0085	0,0027	0,0645	0,32	0,62
d_1_POL_GDP_SA_1	0,0075	0,0013	0,0263	0,17	0,25
d_1_POL_WIG_SA_1	0,0070	0,0002	0,0039	0,03	0,04
d_1_POL_GDP_SA_2	0,0066	0,0016	0,0261	0,24	0,22
1_KIE_new_houses_SA_2	0,0062	0,0000	0,0005	0	0,01
d_1_KIE_birthrate_SA_1	0,0059	-0,0012	0,0650	-0,2	0,83
1_KIE_new_houses_SA_3	0,0047	0,0000	0,0005	0	0,01
d_1_KIE_unepl_SA_2	0,0042	0,0001	0,0097	0,02	0,15
d_1_POL_WIG_SA_2	0,0042	0,0001	0,0028	0,01	0,04
d_1_KIE_birthrate_SA_2	0,0038	0,0006	0,0641	0,17	1,02
d_1_KIE_cost_m2_SA_2	0,0038	0,0001	0,0138	0,02	0,22
1_KIE_migration_SA_3	0,0036	-0,0003	0,0288	-0,09	0,47
1_KIE_migration_SA_4	0,0024	-0,0012	0,0328	-0,5	0,45
d_1_KIE_birthrate_SA_3	0,0017	0,0014	0,0486	0,84	0,84
d_1_KIE_unepl_SA_3	0,0015	-0,0002	0,0066	-0,11	0,13
d_1_KIE_cost_m2_SA_3	0,0013	0,0000	0,0082	0,03	0,22
d_1_KIE_birthrate_SA_4	0,0001	0,0001	0,0114	0,45	0,9
d_1_KIE_cost_m2_SA_4	0,0001	0,0000	0,0026	0,1	0,22

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A7. PIPs, means, variances, conditional means and conditional variances for Kraków.

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,4256	0,5746	-0,4256	0,5746
l_POL_active_mortgage_SA_2	0,8601	-1,1485	0,7224	-1,3353	0,5978
d_l_KRA_cost_m2_SA_1	0,8070	-0,2636	0,1567	-0,3267	0,0992
l_KRA_new_houses_SA_2	0,6058	0,0151	0,0140	0,0250	0,0087
l_POL_active_mortgage_SA_1	0,5716	0,6329	1,1589	1,1072	1,3507
l_POL_active_mortgage_SA	0,4940	0,5212	0,6357	1,0552	0,5048
l_POL_IR_SA_1	0,4852	-0,0345	0,0409	-0,0712	0,0289
l_POL_IR_SA_2	0,3492	-0,0231	0,0360	-0,0661	0,0295
d_l_KRA_cost_m2_SA	0,2257	-0,0466	0,0983	-0,2065	0,0988
l_POL_mortgage2_SA	0,2164	0,0136	0,0293	0,0627	0,0297
d_l_KRA_cost_m2_SA_2	0,1720	-0,0411	0,0989	-0,2387	0,0985
d_l_KRA_migration_SA_3	0,1594	0,2210	0,5396	1,3861	0,4601
d_l_POL_WIG_SA_1	0,1587	0,0111	0,0299	0,0698	0,0390
l_POL_IR_SA	0,1523	-0,0083	0,0252	-0,0547	0,0404
l_KRA_new_houses_SA_3	0,1135	0,0021	0,0066	0,0186	0,0089
d_l_KRA_birthrate_SA_2	0,1057	0,1800	0,5925	1,7027	0,8530
d_l_POL_WIG_SA	0,1021	0,0058	0,0210	0,0570	0,0374
d_l_KRA_birthrate_SA_1	0,0965	0,1209	0,4448	1,2534	0,7947
l_POL_mortgage2_SA_2	0,0898	-0,0048	0,0185	-0,0535	0,0345
l_POL_margin_SA_1	0,0672	0,0024	0,0157	0,0357	0,0499
l_POL_margin_SA	0,0671	-0,0019	0,0184	-0,0288	0,0652
d_l_KRA_salary_SA	0,0556	0,0271	0,1554	0,4869	0,4582
d_l_KRA_unepl_SA	0,0544	-0,0035	0,0207	-0,0640	0,0634
d_l_KRA_unepl_SA_1	0,0438	-0,0023	0,0166	-0,0519	0,0608
l_POL_margin_SA_2	0,0431	0,0002	0,0091	0,0049	0,0434
d_l_POL_GDP_SA_1	0,0422	0,0067	0,0640	0,1583	0,2701
d_l_POL_GDP_SA	0,0403	0,0068	0,0519	0,1693	0,1984
l_KRA_new_houses_SA	0,0363	-0,0002	0,0024	-0,0052	0,0112
d_l_KRA_salary_SA_1	0,0326	-0,0044	0,0907	-0,1353	0,4844
l_KRA_new_houses_SA_1	0,0312	0,0001	0,0019	0,0025	0,0103
d_l_KRA_migration_SA_1	0,0305	-0,0031	0,0958	-0,1000	0,5394
l_POL_mortgage2_SA_1	0,0300	0,0000	0,0063	0,0005	0,0362
d_l_POL_WIG_SA_2	0,0293	0,0010	0,0090	0,0334	0,0410
d_l_KRA_migration_SA	0,0288	-0,0022	0,0827	-0,0767	0,4815
d_l_POL_GDP_SA_2	0,0268	-0,0008	0,0500	-0,0301	0,3039
d_l_KRA_birthrate_SA	0,0264	-0,0019	0,1241	-0,0706	0,7610
d_l_KRA_salary_SA_2	0,0262	-0,0112	0,0968	-0,4278	0,4227
d_l_KRA_migration_SA_2	0,0187	0,0048	0,0836	0,2549	0,5569
d_l_KRA_unepl_SA_2	0,0158	0,0002	0,0080	0,0112	0,0624
d_l_KRA_cost_m2_SA_3	0,0149	-0,0017	0,0186	-0,1160	0,0999
d_l_KRA_migration_SA_4	0,0134	0,0150	0,1389	1,1130	0,4629
d_l_KRA_birthrate_SA_3	0,0126	0,0100	0,1247	0,7933	0,7814
d_l_KRA_unepl_SA_3	0,0100	0,0004	0,0071	0,0375	0,0605
d_l_KRA_birthrate_SA_4	0,0016	0,0004	0,0386	0,2429	0,9386
d_l_KRA_cost_m2_SA_4	0,0010	0,0000	0,0033	-0,0046	0,1022

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A8. PIPs, means, variances, conditional means and conditional variances for Lublin

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,3054	0,3291	-0,3054	0,3291
l_POL_mortgage2_SA_1	0,9351	0,1877	0,0732	0,2008	0,0558
l_POL_mortgage2_SA	0,5952	0,0889	0,0829	0,1494	0,0500
l_POL_IR_SA_1	0,3116	-0,0199	0,0331	-0,0639	0,0265
l_POL_IR_SA_2	0,2243	-0,0143	0,0292	-0,0636	0,0257
d_l_LUB_cost_m2_SA	0,2101	0,1365	0,2932	0,6495	0,2756
l_POL_IR_SA	0,1934	-0,0114	0,0263	-0,0588	0,0282
l_POL_margin_SA_2	0,1801	-0,0129	0,0303	-0,0716	0,0301
l_POL_margin_SA_1	0,1666	-0,0117	0,0300	-0,0702	0,0358
l_POL_margin_SA	0,1383	-0,0099	0,0286	-0,0715	0,0389
d_l_POL_WIG_SA	0,0835	0,0080	0,0306	0,0961	0,0526
l_POL_active_mortgage_SA_1	0,0785	0,2204	1,1829	2,8089	3,2497
l_POL_active_mortgage_SA_2	0,0654	-0,1329	0,6563	-2,0316	1,6521
l_POL_active_mortgage_SA	0,0630	-0,0838	0,5491	-1,3301	1,7691
d_l_POL_WIG_SA_1	0,0362	0,0026	0,0162	0,0721	0,0471
d_l_LUB_cost_m2_SA_1	0,0305	-0,0136	0,1000	-0,4465	0,3666
l_POL_mortgage2_SA_2	0,0204	0,0013	0,0128	0,0627	0,0652
d_l_LUB_migration_SA	0,0187	0,0083	0,1064	0,4442	0,6416
d_l_LUB_unepl_SA	0,0178	-0,0008	0,0239	-0,0447	0,1739
l_LUB_new_houses_SA_1	0,0170	0,0000	0,0018	-0,0017	0,0138
d_l_LUB_migration_SA_1	0,0166	-0,0097	0,1096	-0,5831	0,6247
d_l_LUB_birthrate_SA	0,0161	-0,0057	0,1655	-0,3525	1,2587
d_l_POL_GDP_SA	0,0157	0,0019	0,0401	0,1222	0,2962
l_LUB_new_houses_SA	0,0155	0,0000	0,0017	-0,0006	0,0133
d_l_LUB_salary_SA	0,0148	0,0011	0,0218	0,0711	0,1648
d_l_POL_GDP_SA_1	0,0139	0,0029	0,0411	0,2089	0,2805
d_l_LUB_unepl_SA_1	0,0135	-0,0006	0,0191	-0,0431	0,1591
l_LUB_new_houses_SA_2	0,0127	0,0000	0,0016	0,0007	0,0143
d_l_LUB_salary_SA_1	0,0121	0,0010	0,0199	0,0793	0,1626
d_l_LUB_birthrate_SA_1	0,0116	-0,0010	0,1355	-0,0824	1,2576
d_l_LUB_cost_m2_SA_2	0,0087	-0,0041	0,0513	-0,4751	0,2818
d_l_POL_WIG_SA_2	0,0067	0,0005	0,0075	0,0771	0,0508
d_l_LUB_cost_m2_SA_3	0,0057	-0,0025	0,0380	-0,4326	0,2615
d_l_LUB_migration_SA_2	0,0040	-0,0030	0,0626	-0,7517	0,6389
d_l_POL_GDP_SA_2	0,0031	0,0008	0,0212	0,2634	0,2741
d_l_LUB_birthrate_SA_2	0,0029	0,0031	0,0908	1,0459	1,3186
l_LUB_new_houses_SA_3	0,0023	0,0000	0,0007	0,0072	0,0136
d_l_LUB_unepl_SA_2	0,0023	-0,0002	0,0083	-0,0812	0,1537
d_l_LUB_birthrate_SA_3	0,0022	0,0026	0,0836	1,1863	1,3487
d_l_LUB_salary_SA_2	0,0017	0,0000	0,0069	0,0273	0,1676
d_l_LUB_unepl_SA_3	0,0014	-0,0001	0,0060	-0,0701	0,1447
d_l_LUB_migration_SA_3	0,0014	-0,0002	0,0232	-0,1204	0,6128
d_l_LUB_birthrate_SA_4	0,0011	0,0000	0,0542	0,0352	1,6482
d_l_LUB_migration_SA_4	0,0009	-0,0004	0,0219	-0,3851	0,6054
d_l_LUB_cost_m2_SA_4	0,0009	-0,0001	0,0080	-0,1027	0,2501

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A9. PIPs, means, variances, conditional means and conditional variances for Łódź

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,3205	0,2491	-0,3205	0,2491
l_POL_mortgage2_SA_1	0,6327	0,0778	0,0674	0,1230	0,0402
l_POL_IR_SA_1	0,5236	-0,0300	0,0311	-0,0573	0,0167
l_POL_margin_SA	0,4960	-0,0415	0,0455	-0,0836	0,0255
l_POL_IR_SA	0,1950	-0,0100	0,0226	-0,0515	0,0221
d_l_LOD_cost_m2_SA	0,1895	0,0854	0,1930	0,4506	0,1792
l_POL_margin_SA_1	0,1857	-0,0124	0,0292	-0,0670	0,0303
d_l_POL_WIG_SA	0,1819	0,0158	0,0371	0,0871	0,0371
l_POL_mortgage2_SA	0,1369	0,0115	0,0320	0,0838	0,0379
l_POL_margin_SA_2	0,0468	-0,0031	0,0148	-0,0654	0,0245
l_POL_IR_SA_2	0,0467	-0,0024	0,0120	-0,0524	0,0222
d_l_LOD_birthrate_SA	0,0290	0,0221	0,1669	0,7643	0,6282
l_POL_mortgage2_SA_2	0,0287	0,0028	0,0181	0,0980	0,0454
l_POL_active_mortgage_SA_1	0,0260	0,0055	0,1350	0,2099	0,8108
l_LOD_unepl_SA	0,0254	-0,0005	0,0057	-0,0206	0,0293
d_l_LOD_new_houses_SA	0,0250	-0,0002	0,0013	-0,0063	0,0053
l_POL_active_mortgage_SA	0,0232	-0,0013	0,0612	-0,0569	0,3976
l_LOD_unepl_SA_1	0,0230	-0,0004	0,0073	-0,0180	0,0450
d_l_LOD_salary_SA	0,0156	0,0047	0,0706	0,2994	0,4799
d_l_LOD_salary_SA_1	0,0153	0,0133	0,1214	0,8649	0,4733
d_l_LOD_birthrate_SA_1	0,0127	0,0132	0,1352	1,0417	0,6068
d_l_POL_GDP_SA	0,0122	0,0005	0,0251	0,0382	0,2244
d_l_LOD_migration_SA	0,0120	0,0008	0,1299	0,0676	1,1828
d_l_POL_WIG_SA_1	0,0089	0,0005	0,0067	0,0588	0,0400
l_POL_active_mortgage_SA_2	0,0088	-0,0048	0,0891	-0,5464	0,7773
l_LOD_unepl_SA_2	0,0046	0,0001	0,0054	0,0161	0,0772
d_l_LOD_cost_m2_SA_1	0,0042	0,0006	0,0175	0,1413	0,2313
d_l_POL_GDP_SA_1	0,0037	0,0006	0,0168	0,1617	0,2261
d_l_LOD_new_houses_SA_1	0,0033	0,0000	0,0004	0,0021	0,0058
d_l_LOD_migration_SA_1	0,0032	-0,0026	0,0816	-0,8118	1,1860
d_l_LOD_cost_m2_SA_2	0,0016	-0,0005	0,0155	-0,3015	0,2426
d_l_LOD_birthrate_SA_2	0,0007	0,0003	0,0210	0,3604	0,6957
l_LOD_unepl_SA_3	0,0007	0,0000	0,0021	0,0351	0,0702
d_l_LOD_migration_SA_2	0,0007	-0,0004	0,0370	-0,6102	1,2572
d_l_LOD_salary_SA_2	0,0007	0,0002	0,0136	0,2327	0,4800
d_l_POL_GDP_SA_2	0,0006	0,0001	0,0057	0,0931	0,2148
d_l_LOD_new_houses_SA_2	0,0006	0,0000	0,0002	0,0028	0,0062
d_l_POL_WIG_SA_2	0,0005	0,0000	0,0010	0,0253	0,0371
d_l_LOD_migration_SA_3	0,0003	-0,0004	0,0339	-1,7084	1,2115
d_l_LOD_cost_m2_SA_3	0,0002	-0,0001	0,0049	-0,2279	0,2320
d_l_LOD_new_houses_SA_3	0,0001	0,0000	0,0001	0,0059	0,0073
d_l_LOD_birthrate_SA_3	0,0001	0,0000	0,0069	0,1387	0,6639
d_l_LOD_birthrate_SA_4	0,0000	0,0000	0,0054	-1,3358	0,7250
d_l_LOD_cost_m2_SA_4	0,0000	0,0000	0,0003	0,1017	0,1607
d_l_LOD_migration_SA_4	0,0000	0,0000	0,0000	0,0000	0,0000

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A10. PIPs, means, variances, conditional means and conditional variances for Olsztyn

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-1,1091	0,3392	-1,1091	0,3392
1_POL_active_mortgage_SA_2	0,9820	-2,0211	0,6152	-2,0581	0,5560
1_POL_active_mortgage_SA_1	0,9588	2,2405	1,0763	2,3367	0,9916
d_1_POL_WIG_SA	0,9578	0,1200	0,0418	0,1253	0,0341
1_POL_mortgage2_SA_1	0,7444	0,0742	0,0519	0,0997	0,0329
d_1_POL_GDP_SA	0,3039	0,1400	0,2364	0,4607	0,1902
d_1_OLS_unepl_SA_1	0,2508	-0,0278	0,0539	-0,1109	0,0488
1_POL_mortgage2_SA	0,2368	0,0170	0,0347	0,0720	0,0334
d_1_OLS_unepl_SA	0,2130	-0,0220	0,0478	-0,1033	0,0483
d_1_POL_WIG_SA_1	0,1904	0,0125	0,0293	0,0657	0,0317
1_POL_active_mortgage_SA	0,1516	-0,1446	0,5599	-0,9540	1,1383
d_1_OLS_cost_m2_SA_1	0,0910	-0,0269	0,1013	-0,2958	0,1821
1_POL_IR_SA_1	0,0887	-0,0037	0,0157	-0,0422	0,0341
d_1_OLS_cost_m2_SA	0,0800	0,0204	0,0835	0,2548	0,1658
d_1_OLS_salary_SA	0,0613	0,0206	0,1037	0,3358	0,2641
1_POL_margin_SA	0,0572	0,0012	0,0133	0,0217	0,0513
1_POL_IR_SA_2	0,0483	-0,0009	0,0084	-0,0179	0,0337
d_1_OLS_birthrate_SA_1	0,0458	0,0290	0,1777	0,6329	0,5544
d_1_OLS_salary_SA_1	0,0429	0,0108	0,0722	0,2518	0,2466
1_POL_margin_SA_1	0,0424	0,0009	0,0092	0,0208	0,0396
d_1_POL_GDP_SA_1	0,0408	-0,0084	0,0624	-0,2050	0,2344
d_1_OLS_migration_SA_1	0,0380	-0,0122	0,0915	-0,3197	0,3491
1_POL_IR_SA	0,0351	-0,0002	0,0073	-0,0053	0,0389
1_POL_margin_SA_2	0,0328	0,0006	0,0062	0,0169	0,0301
1_POL_mortgage2_SA_2	0,0287	-0,0001	0,0073	-0,0020	0,0431
1_OLS_new_houses_SA_1	0,0251	0,0000	0,0008	-0,0013	0,0049
1_OLS_new_houses_SA	0,0247	0,0000	0,0008	-0,0017	0,0049
d_1_OLS_birthrate_SA	0,0244	0,0035	0,0958	0,1424	0,5967
d_1_OLS_migration_SA	0,0236	-0,0013	0,0525	-0,0559	0,3372
1_OLS_new_houses_SA_2	0,0228	0,0000	0,0007	0,0000	0,0047
1_OLS_new_houses_SA_3	0,0101	-0,0001	0,0008	-0,0067	0,0045
d_1_POL_GDP_SA_2	0,0074	0,0017	0,0259	0,2339	0,1907
d_1_OLS_unepl_SA_2	0,0073	-0,0005	0,0076	-0,0696	0,0555
d_1_OLS_cost_m2_SA_2	0,0067	-0,0014	0,0234	-0,2099	0,1945
d_1_OLS_birthrate_SA_2	0,0046	0,0023	0,0576	0,4896	0,6923
d_1_OLS_salary_SA_2	0,0041	0,0007	0,0185	0,1605	0,2390
d_1_OLS_migration_SA_2	0,0039	-0,0008	0,0241	-0,1930	0,3319
d_1_POL_WIG_SA_2	0,0037	0,0000	0,0022	0,0120	0,0332
d_1_OLS_birthrate_SA_3	0,0007	-0,0006	0,0300	-0,8513	0,7339
d_1_OLS_migration_SA_3	0,0004	-0,0001	0,0084	-0,2049	0,3485
d_1_OLS_cost_m2_SA_3	0,0004	-0,0001	0,0044	-0,1297	0,1667
d_1_OLS_unepl_SA_3	0,0003	0,0000	0,0011	0,0255	0,0575
d_1_OLS_migration_SA_4	0,0003	0,0002	0,0123	0,6263	0,3450
d_1_OLS_birthrate_SA_4	0,0001	0,0000	0,0065	0,3567	0,7631
d_1_OLS_cost_m2_SA_4	0,0000	0,0000	0,0010	0,0086	0,1610

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A11. PIPs, means, variances, conditional means and conditional variances for Opole

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,6666	0,4141	-0,6666	0,4141
d_1_POL_WIG_SA	0,9332	0,1239	0,0451	0,1328	0,0317
l_POL_active_mortgage_SA_1	0,6442	-0,2327	1,2381	-0,3613	1,5274
l_POL_active_mortgage_SA	0,6307	0,8125	0,7341	1,2883	0,4915
l_POL_active_mortgage_SA_2	0,4556	-0,5368	0,6779	-1,1781	0,5030
l_POL_mortgage2_SA	0,1597	0,0136	0,0352	0,0849	0,0414
l_POL_IR_SA	0,0913	-0,0043	0,0156	-0,0468	0,0263
d_1_OPO_migration_SA_1	0,0519	0,0399	0,1921	0,7679	0,3894
l_POL_margin_SA	0,0488	-0,0012	0,0124	-0,0255	0,0501
l_POL_IR_SA_1	0,0478	-0,0015	0,0090	-0,0318	0,0274
l_POL_margin_SA_1	0,0448	-0,0016	0,0116	-0,0356	0,0423
d_1_OPO_birthrate_SA	0,0405	0,0326	0,1963	0,8051	0,5738
d_1_OPO_salary_SA	0,0307	0,0091	0,0654	0,2958	0,2331
l_POL_IR_SA_2	0,0304	-0,0010	0,0073	-0,0342	0,0246
d_1_OPO_migration_SA	0,0300	-0,0158	0,1183	-0,5275	0,4432
d_1_OPO_birthrate_SA_1	0,0209	0,0155	0,1316	0,7441	0,5368
l_POL_mortgage2_SA_1	0,0205	0,0007	0,0073	0,0321	0,0402
d_1_POL_GDP_SA	0,0161	-0,0020	0,0303	-0,1222	0,2062
d_1_OPO_cost_m2_SA	0,0142	0,0008	0,0193	0,0593	0,1511
d_1_OPO_new_houses_SA	0,0140	0,0000	0,0005	0,0015	0,0037
d_1_OPO_unepl_SA	0,0133	0,0000	0,0069	0,0018	0,0597
d_1_OPO_unepl_SA_1	0,0129	0,0008	0,0096	0,0583	0,0616
l_POL_margin_SA_2	0,0122	0,0001	0,0042	0,0069	0,0372
d_1_OPO_cost_m2_SA_1	0,0117	-0,0019	0,0252	-0,1628	0,1677
d_1_OPO_salary_SA_1	0,0088	0,0007	0,0244	0,0840	0,2467
d_1_POL_WIG_SA_1	0,0082	0,0001	0,0033	0,0167	0,0324
l_POL_mortgage2_SA_2	0,0078	0,0000	0,0032	-0,0054	0,0362
d_1_OPO_new_houses_SA_1	0,0078	0,0000	0,0003	-0,0010	0,0038
d_1_POL_GDP_SA_1	0,0076	0,0000	0,0178	0,0003	0,2040
d_1_OPO_cost_m2_SA_2	0,0038	-0,0011	0,0212	-0,2935	0,1768
d_1_POL_WIG_SA_2	0,0027	0,0001	0,0030	0,0475	0,0329
d_1_POL_GDP_SA_2	0,0024	0,0006	0,0158	0,2587	0,1910
d_1_OPO_new_houses_SA_2	0,0011	0,0000	0,0001	0,0012	0,0039
d_1_OPO_unepl_SA_2	0,0011	0,0000	0,0024	0,0223	0,0695
d_1_OPO_migration_SA_2	0,0010	0,0002	0,0146	0,1689	0,4241
d_1_OPO_salary_SA_2	0,0010	0,0001	0,0089	0,1332	0,2515
d_1_OPO_birthrate_SA_2	0,0008	-0,0001	0,0157	-0,1570	0,5244
d_1_OPO_new_houses_SA_3	0,0007	0,0000	0,0002	0,0063	0,0038
d_1_OPO_migration_SA_3	0,0003	0,0001	0,0084	0,2750	0,4186
d_1_OPO_unepl_SA_3	0,0003	0,0000	0,0013	-0,0469	0,0700
d_1_OPO_cost_m2_SA_3	0,0002	0,0000	0,0028	-0,0874	0,1668
d_1_OPO_birthrate_SA_3	0,0002	0,0000	0,0081	0,2612	0,5696
d_1_OPO_migration_SA_4	0,0000	0,0000	0,0027	0,2593	0,4135
d_1_OPO_cost_m2_SA_4	0,0000	0,0000	0,0011	-0,1989	0,1657
d_1_OPO_birthrate_SA_4	0,0000	0,0000	0,0023	-0,3678	0,6450

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A12. PIPs, means, variances, conditional means and conditional variances for Poznań

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,3064	0,4525	-0,3064	0,4525
l_POL_mortgage2_SA	0,7672	0,1062	0,0698	0,1385	0,0435
l_POL_mortgage2_SA_1	0,5934	0,0823	0,0771	0,1386	0,0469
d_l_POZ_salary_SA	0,3050	0,3178	0,5284	1,0420	0,4012
l_POL_active_mortgage_SA_2	0,2316	-0,3493	0,7467	-1,5078	0,8126
l_POL_active_mortgage_SA_1	0,2281	0,3909	1,0218	1,7137	1,5200
l_POL_IR_SA_1	0,2215	-0,0104	0,0222	-0,0469	0,0225
l_POL_IR_SA	0,1861	-0,0086	0,0204	-0,0462	0,0226
l_POL_IR_SA_2	0,1540	-0,0072	0,0191	-0,0469	0,0226
d_l_POL_WIG_SA	0,1289	0,0107	0,0313	0,0833	0,0397
l_POL_margin_SA	0,1168	-0,0063	0,0218	-0,0538	0,0387
l_POL_active_mortgage_SA	0,0790	-0,0274	0,3938	-0,3468	1,3611
d_l_POL_WIG_SA_1	0,0781	0,0060	0,0232	0,0763	0,0390
l_POZ_unepl_SA	0,0575	0,0010	0,0055	0,0178	0,0151
l_POL_margin_SA_1	0,0555	-0,0015	0,0135	-0,0278	0,0505
l_POZ_unepl_SA_1	0,0546	0,0009	0,0053	0,0156	0,0170
l_POZ_unepl_SA_2	0,0471	0,0008	0,0047	0,0167	0,0142
l_POL_margin_SA_2	0,0450	-0,0018	0,0112	-0,0409	0,0345
d_l_POZ_cost_m2_SA	0,0362	-0,0054	0,0363	-0,1493	0,1224
d_l_POZ_birthrate_SA	0,0344	0,0386	0,2655	1,1224	0,9121
d_l_POZ_migration_SA	0,0269	0,0230	0,1967	0,8568	0,8520
d_l_POZ_cost_m2_SA_1	0,0261	-0,0038	0,0318	-0,1451	0,1349
d_l_POL_GDP_SA_1	0,0221	0,0058	0,0520	0,2608	0,2360
d_l_POZ_birthrate_SA_1	0,0204	0,0189	0,1856	0,9268	0,9184
l_POL_mortgage2_SA_2	0,0195	0,0007	0,0088	0,0353	0,0527
d_l_POZ_new_houses_SA	0,0185	0,0001	0,0017	0,0060	0,0108
d_l_POZ_cost_m2_SA_2	0,0156	-0,0035	0,0326	-0,2268	0,1309
d_l_POL_GDP_SA	0,0151	0,0006	0,0306	0,0385	0,2458
d_l_POZ_new_houses_SA_1	0,0149	-0,0001	0,0014	-0,0064	0,0099
d_l_POZ_salary_SA_1	0,0143	0,0033	0,0535	0,2283	0,3850
l_POZ_unepl_SA_3	0,0142	0,0002	0,0025	0,0171	0,0129
d_l_POZ_new_houses_SA_2	0,0142	0,0002	0,0022	0,0162	0,0095
d_l_POL_WIG_SA_2	0,0131	0,0009	0,0090	0,0666	0,0420
d_l_POZ_migration_SA_1	0,0129	0,0049	0,1000	0,3833	0,7940
d_l_POZ_salary_SA_2	0,0042	0,0010	0,0312	0,2425	0,4144
d_l_POZ_birthrate_SA_2	0,0040	0,0023	0,0687	0,5814	0,9274
d_l_POL_GDP_SA_2	0,0039	0,0005	0,0163	0,1220	0,2299
d_l_POZ_migration_SA_3	0,0036	-0,0041	0,0826	-1,1609	0,7592
d_l_POZ_migration_SA_2	0,0035	-0,0002	0,0494	-0,0479	0,8277
d_l_POZ_cost_m2_SA_3	0,0017	-0,0002	0,0062	-0,0987	0,1149
d_l_POZ_new_houses_SA_3	0,0014	0,0000	0,0004	-0,0068	0,0097
d_l_POZ_birthrate_SA_3	0,0012	-0,0007	0,0383	-0,5307	0,9478
d_l_POZ_birthrate_SA_4	0,0006	-0,0009	0,0431	-1,3958	0,9958
d_l_POZ_migration_SA_4	0,0002	-0,0002	0,0156	-0,6732	0,7839
d_l_POZ_cost_m2_SA_4	0,0002	0,0000	0,0017	0,0214	0,1202

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A13. PIPs, means, variances, conditional means and conditional variances for Rzeszów

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,0122	0,1797	-0,0122	0,1797
l_POL_mortgage2_SA_1	0,9767	0,1872	0,0498	0,1917	0,0411
l_POL_mortgage2_SA	0,2071	0,0240	0,0514	0,1158	0,0463
l_POL_IR_SA_1	0,0638	-0,0022	0,0099	-0,0341	0,0208
l_POL_IR_SA	0,0461	-0,0014	0,0076	-0,0299	0,0197
d_l_RZE_unepl_SA	0,0211	-0,0035	0,0288	-0,1645	0,1135
l_POL_active_mortgage_SA_1	0,0206	0,0053	0,1154	0,2566	0,7627
d_l_POL_WIG_SA	0,0202	0,0012	0,0099	0,0574	0,0408
l_POL_active_mortgage_SA	0,0190	0,0013	0,0463	0,0668	0,3298
l_RZE_salary_SA_1	0,0164	-0,0025	0,0504	-0,1550	0,3623
l_RZE_salary_SA	0,0153	0,0023	0,0495	0,1533	0,3706
d_l_RZE_cost_m2_SA	0,0146	0,0033	0,0359	0,2272	0,1933
l_POL_margin_SA_1	0,0132	-0,0004	0,0047	-0,0265	0,0309
l_POL_margin_SA	0,0125	-0,0003	0,0046	-0,0249	0,0326
l_RZE_migration_SA	0,0112	-0,0001	0,0233	-0,0063	0,2204
l_RZE_new_houses_SA	0,0102	-0,0001	0,0010	-0,0052	0,0088
l_RZE_migration_SA_1	0,0101	-0,0001	0,0211	-0,0071	0,2101
l_RZE_new_houses_SA_1	0,0093	0,0000	0,0008	-0,0022	0,0082
d_l_RZE_birthrate_SA	0,0077	0,0013	0,0724	0,1722	0,8074
l_POL_IR_SA_2	0,0070	-0,0003	0,0037	-0,0362	0,0251
d_l_POL_GDP_SA	0,0070	-0,0002	0,0210	-0,0295	0,2487
l_POL_active_mortgage_SA_2	0,0061	-0,0056	0,0933	-0,9170	0,7729
d_l_RZE_birthrate_SA_1	0,0028	0,0034	0,0781	1,2145	0,8301
l_RZE_new_houses_SA_3	0,0026	0,0000	0,0011	0,0189	0,0087
l_RZE_salary_SA_2	0,0025	-0,0004	0,0147	-0,1543	0,2514
l_POL_margin_SA_2	0,0025	-0,0001	0,0027	-0,0404	0,0376
l_POL_mortgage2_SA_2	0,0021	-0,0001	0,0035	-0,0583	0,0492
l_RZE_new_houses_SA_2	0,0016	0,0000	0,0004	0,0051	0,0073
d_l_RZE_unepl_SA_1	0,0016	-0,0002	0,0063	-0,1035	0,1157
l_RZE_migration_SA_2	0,0015	0,0001	0,0083	0,0503	0,2043
d_l_RZE_cost_m2_SA_2	0,0011	-0,0005	0,0173	-0,4479	0,2666
d_l_POL_GDP_SA_1	0,0011	0,0001	0,0086	0,0809	0,2471
d_l_RZE_cost_m2_SA_1	0,0011	0,0000	0,0077	-0,0283	0,2347
d_l_POL_WIG_SA_1	0,0010	0,0000	0,0014	0,0156	0,0420
d_l_RZE_unepl_SA_2	0,0006	-0,0001	0,0052	-0,1770	0,1161
d_l_POL_GDP_SA_2	0,0004	0,0001	0,0060	0,2046	0,2395
d_l_POL_WIG_SA_2	0,0004	0,0000	0,0011	0,0407	0,0404
l_RZE_migration_SA_3	0,0003	0,0000	0,0047	-0,1167	0,2462
d_l_RZE_birthrate_SA_2	0,0002	0,0000	0,0116	-0,2514	0,8213
d_l_RZE_birthrate_SA_3	0,0001	0,0000	0,0089	0,0124	0,8214
d_l_RZE_unepl_SA_3	0,0001	0,0000	0,0013	-0,0608	0,1147
d_l_RZE_birthrate_SA_4	0,0001	-0,0001	0,0147	-1,1703	0,9206
d_l_RZE_cost_m2_SA_3	0,0001	0,0000	0,0025	0,0540	0,2452
l_RZE_migration_SA_4	0,0001	0,0000	0,0023	-0,0902	0,2198
d_l_RZE_cost_m2_SA_4	0,0000	0,0000	0,0012	-0,0008	0,1955

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A14. PIPs, means, variances, conditional means and conditional variances for Szczecin

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,4214	0,3237	-0,4214	0,3237
l_POL_mortgage2_SA	0,9608	0,1279	0,0442	0,1331	0,0366
l_SZC_new_houses_SA_1	0,5643	-0,0132	0,0131	-0,0234	0,0082
d_l_SZC_birthrate_SA	0,4436	0,9476	1,1998	2,1362	0,8401
l_POL_IR_SA_2	0,4254	-0,0357	0,0446	-0,0838	0,0252
l_POL_active_mortgage_SA_2	0,3986	-0,4378	0,6367	-1,0983	0,5401
l_POL_IR_SA_1	0,3478	-0,0290	0,0440	-0,0834	0,0321
l_POL_active_mortgage_SA_1	0,3449	0,3711	0,7312	1,0761	0,8898
l_POL_IR_SA	0,2721	-0,0226	0,0398	-0,0831	0,0279
l_SZC_new_houses_SA_2	0,2172	-0,0043	0,0090	-0,0196	0,0082
l_POL_margin_SA_2	0,2107	-0,0183	0,0385	-0,0867	0,0330
l_POL_margin_SA_1	0,2106	-0,0158	0,0342	-0,0749	0,0336
l_POL_margin_SA	0,2069	-0,0154	0,0338	-0,0745	0,0335
d_l_SZC_salary_SA_1	0,1516	-0,0832	0,2212	-0,5488	0,2595
l_POL_active_mortgage_SA	0,1471	0,0730	0,2943	0,4961	0,6156
d_l_SZC_birthrate_SA_1	0,1455	0,2461	0,6705	1,6918	0,8029
d_l_SZC_cost_m2_SA	0,0999	-0,0324	0,1168	-0,3243	0,2046
l_POL_mortgage2_SA_1	0,0883	0,0053	0,0202	0,0595	0,0375
d_l_POL_WIG_SA_1	0,0578	0,0029	0,0145	0,0510	0,0345
d_l_SZC_unepl_SA	0,0456	0,0024	0,0158	0,0531	0,0525
d_l_POL_WIG_SA	0,0453	0,0018	0,0113	0,0399	0,0361
l_SZC_new_houses_SA	0,0395	-0,0003	0,0024	-0,0077	0,0096
d_l_SZC_migration_SA	0,0330	-0,0182	0,1505	-0,5521	0,6253
d_l_SZC_unepl_SA_1	0,0320	0,0014	0,0119	0,0431	0,0513
d_l_POL_GDP_SA	0,0261	0,0008	0,0383	0,0313	0,2348
d_l_SZC_salary_SA	0,0260	-0,0033	0,0452	-0,1289	0,2502
d_l_POL_GDP_SA_1	0,0225	0,0028	0,0385	0,1251	0,2250
l_POL_mortgage2_SA_2	0,0222	-0,0002	0,0070	-0,0099	0,0461
d_l_SZC_cost_m2_SA_1	0,0201	0,0013	0,0257	0,0633	0,1699
d_l_SZC_migration_SA_1	0,0185	0,0025	0,0930	0,1362	0,6708
d_l_SZC_salary_SA_2	0,0081	-0,0027	0,0387	-0,3296	0,2770
d_l_SZC_cost_m2_SA_2	0,0051	-0,0005	0,0149	-0,1046	0,1797
d_l_POL_WIG_SA_2	0,0050	0,0001	0,0031	0,0206	0,0380
l_SZC_new_houses_SA_3	0,0046	0,0000	0,0007	0,0062	0,0086
d_l_POL_GDP_SA_2	0,0040	0,0004	0,0148	0,1065	0,2079
d_l_SZC_unepl_SA_2	0,0040	0,0001	0,0032	0,0144	0,0490
d_l_SZC_migration_SA_2	0,0035	-0,0001	0,0386	-0,0383	0,6513
d_l_SZC_birthrate_SA_2	0,0032	0,0001	0,0433	0,0274	0,7598
d_l_SZC_migration_SA_3	0,0021	0,0024	0,0604	1,1560	0,6467
d_l_SZC_cost_m2_SA_3	0,0006	0,0000	0,0040	0,0395	0,1651
d_l_SZC_birthrate_SA_4	0,0004	-0,0007	0,0376	-1,6335	0,7610
d_l_SZC_unepl_SA_3	0,0004	0,0000	0,0011	0,0063	0,0522
d_l_SZC_birthrate_SA_3	0,0003	0,0000	0,0138	0,0531	0,7518
d_l_SZC_migration_SA_4	0,0001	0,0001	0,0082	0,5745	0,6628
d_l_SZC_cost_m2_SA_4	0,0001	0,0000	0,0015	0,0995	0,1792

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

Table A15. PIPs, means, variances, conditional means and conditional variances for Toruń

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,4058	0,1880	-0,4058	0,1880
l_POL_mortgage2_SA	0,9928	0,1398	0,0339	0,1408	0,0318
l_POL_IR_SA_1	0,5073	-0,0272	0,0295	-0,0536	0,0173
l_POL_margin_SA	0,3920	-0,0295	0,0390	-0,0752	0,0213
l_POL_IR_SA_2	0,2971	-0,0172	0,0279	-0,0579	0,0160
l_POL_margin_SA_1	0,2633	-0,0184	0,0335	-0,0698	0,0258
l_POL_margin_SA_2	0,2544	-0,0187	0,0335	-0,0733	0,0201
d_l_TOR_unepl_SA_1	0,1147	-0,0195	0,0597	-0,1698	0,0742
d_l_TOR_cost_m2_SA	0,1105	0,0442	0,1423	0,3998	0,2026
l_POL_IR_SA	0,0913	-0,0032	0,0141	-0,0356	0,0321
d_l_TOR_migration_SA_1	0,0621	-0,0587	0,2565	-0,9451	0,4702
d_l_TOR_birthrate_SA	0,0509	0,0449	0,2309	0,8837	0,5544
d_l_POL_WIG_SA	0,0468	0,0027	0,0147	0,0567	0,0392
d_l_TOR_unepl_SA	0,0464	-0,0052	0,0291	-0,1127	0,0784
l_POL_active_mortgage_SA_1	0,0395	0,0209	0,2000	0,5301	0,8620
l_POL_active_mortgage_SA_2	0,0323	-0,0251	0,1804	-0,7793	0,6486
l_POL_active_mortgage_SA	0,0284	0,0060	0,0837	0,2104	0,4512
l_POL_mortgage2_SA_1	0,0284	0,0012	0,0092	0,0408	0,0372
d_l_TOR_salary_SA	0,0204	0,0039	0,0445	0,1921	0,2470
d_l_POL_GDP_SA	0,0193	0,0030	0,0364	0,1566	0,2110
d_l_TOR_migration_SA	0,0163	0,0033	0,0620	0,2024	0,4424
d_l_TOR_new_houses_SA	0,0155	0,0001	0,0010	0,0037	0,0068
d_l_POL_WIG_SA_1	0,0151	0,0005	0,0059	0,0364	0,0322
d_l_POL_WIG_SA_2	0,0136	0,0008	0,0077	0,0589	0,0299
d_l_TOR_cost_m2_SA_1	0,0133	0,0027	0,0333	0,2024	0,2074
l_POL_mortgage2_SA_2	0,0125	0,0004	0,0060	0,0348	0,0404
d_l_TOR_birthrate_SA_1	0,0096	0,0039	0,0692	0,4016	0,5812
d_l_TOR_salary_SA_1	0,0091	-0,0010	0,0256	-0,1096	0,2450
d_l_POL_GDP_SA_1	0,0086	0,0004	0,0199	0,0485	0,2090
d_l_TOR_new_houses_SA_1	0,0083	0,0000	0,0007	0,0030	0,0068
d_l_TOR_cost_m2_SA_2	0,0048	-0,0010	0,0190	-0,2122	0,1739
d_l_POL_GDP_SA_2	0,0043	0,0010	0,0194	0,2308	0,1832
d_l_TOR_birthrate_SA_2	0,0034	0,0018	0,0458	0,5349	0,5756
d_l_TOR_migration_SA_3	0,0031	-0,0028	0,0566	-0,9252	0,4312
d_l_TOR_new_houses_SA_2	0,0026	0,0000	0,0004	-0,0044	0,0066
d_l_TOR_migration_SA_2	0,0024	-0,0007	0,0264	-0,2997	0,4501
d_l_TOR_salary_SA_2	0,0024	-0,0003	0,0123	-0,1139	0,2257
d_l_TOR_unepl_SA_2	0,0023	-0,0001	0,0036	-0,0241	0,0696
d_l_TOR_cost_m2_SA_3	0,0010	-0,0002	0,0089	-0,2178	0,1720
d_l_TOR_unepl_SA_3	0,0006	0,0000	0,0023	0,0710	0,0661
d_l_TOR_birthrate_SA_3	0,0004	0,0002	0,0158	0,3914	0,6427
d_l_TOR_new_houses_SA_3	0,0003	0,0000	0,0001	-0,0008	0,0064
d_l_TOR_migration_SA_4	0,0001	-0,0001	0,0092	-0,7012	0,4183
d_l_TOR_birthrate_SA_4	0,0000	0,0000	0,0064	-0,9019	0,6532
d_l_TOR_cost_m2_SA_4	0,0000	0,0000	0,0009	-0,1148	0,1655

Radoslaw Trojanek, Michal Gluszak,
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RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A16. PIPs, means, variances, conditional means and conditional variances for Warszawa

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-1,0977	0,2698	-1,0977	0,2698
d_1_WAR_birthrate_SA_1	0,9980	2,9154	0,6317	2,9212	0,6189
d_1_WAR_birthrate_SA_2	0,9871	2,6612	0,8028	2,6959	0,7479
1_POL_mortgage2_SA_1	0,9796	0,1030	0,0333	0,1052	0,0301
d_1_WAR_birthrate_SA	0,9299	2,3210	1,0732	2,4961	0,8953
1_WAR_new_houses_SA_2	0,7524	0,0227	0,0170	0,0302	0,0126
d_1_WAR_migration_SA_2	0,7103	1,5792	1,2628	2,2234	0,9016
1_POL_mortgage2_SA	0,6917	0,0473	0,0391	0,0684	0,0278
1_POL_IR_SA_1	0,6897	-0,0720	0,0544	-0,1043	0,0303
1_POL_margin_SA	0,6557	-0,0840	0,0698	-0,1282	0,0420
1_WAR_new_houses_SA_3	0,5638	0,0141	0,0149	0,0249	0,0110
d_1_WAR_cost_m2_SA_2	0,5574	-0,1112	0,1196	-0,1995	0,0897
d_1_POL_GDP_SA	0,5302	0,2254	0,2550	0,4252	0,1943
d_1_WAR_unepl_SA_1	0,5029	0,0808	0,0957	0,1606	0,0733
d_1_WAR_cost_m2_SA	0,4930	-0,0982	0,1165	-0,1992	0,0860
1_POL_margin_SA_2	0,4315	-0,0527	0,0685	-0,1221	0,0492
d_1_WAR_unepl_SA	0,4173	0,0659	0,0940	0,1578	0,0817
d_1_WAR_birthrate_SA_3	0,3960	0,6930	0,9383	1,7501	0,6112
1_POL_IR_SA_2	0,3757	-0,0412	0,0606	-0,1097	0,0478
d_1_WAR_cost_m2_SA_1	0,3676	-0,0544	0,0875	-0,1479	0,0836
d_1_WAR_unepl_SA_3	0,3503	0,0607	0,0911	0,1734	0,0645
1_POL_mortgage2_SA_2	0,1539	-0,0056	0,0204	-0,0361	0,0399
1_POL_active_mortgage_SA_2	0,1359	-0,0250	0,1857	-0,1838	0,4740
1_POL_active_mortgage_SA_1	0,1325	0,0221	0,2547	0,1670	0,6820
d_1_WAR_cost_m2_SA_3	0,1289	-0,0157	0,0509	-0,1215	0,0850
1_POL_active_mortgage_SA	0,1228	-0,0019	0,1108	-0,0155	0,3158
1_POL_margin_SA_1	0,1185	-0,0061	0,0301	-0,0516	0,0728
d_1_POL_GDP_SA_2	0,1169	-0,0108	0,0829	-0,0923	0,2263
d_1_WAR_salary_SA	0,1119	-0,0312	0,1516	-0,2789	0,3691
d_1_WAR_unepl_SA_2	0,1110	0,0029	0,0373	0,0263	0,1092
d_1_POL_WIG_SA_1	0,1105	0,0030	0,0140	0,0270	0,0334
d_1_WAR_migration_SA_1	0,1103	0,0640	0,3079	0,5801	0,7485
d_1_WAR_salary_SA_2	0,1073	-0,0215	0,1450	-0,1999	0,4002
1_WAR_new_houses_SA_1	0,1027	0,0009	0,0046	0,0085	0,0119
1_POL_IR_SA	0,0999	-0,0007	0,0161	-0,0074	0,0504
d_1_WAR_migration_SA	0,0960	-0,0370	0,2603	-0,3850	0,7562
d_1_POL_WIG_SA_2	0,0900	0,0004	0,0114	0,0049	0,0377
1_WAR_new_houses_SA	0,0859	-0,0005	0,0041	-0,0055	0,0129
d_1_POL_GDP_SA_1	0,0847	-0,0007	0,0627	-0,0078	0,2152
d_1_POL_WIG_SA	0,0818	0,0010	0,0104	0,0117	0,0347
d_1_WAR_salary_SA_1	0,0817	0,0087	0,1072	0,1065	0,3607
d_1_WAR_migration_SA_3	0,0454	0,0057	0,1654	0,1265	0,7665
d_1_WAR_cost_m2_SA_4	0,0093	0,0010	0,0135	0,1035	0,0945
d_1_WAR_migration_SA_4	0,0091	0,0086	0,1216	0,9475	0,8569
d_1_WAR_birthrate_SA_4	0,0074	0,0050	0,0885	0,6697	0,7804

Radoslaw Trojanek, Michal Gluszak,
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RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A17. PIPs, means, variances, conditional means and conditional variances for Wrocław

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,7347	0,7133	-0,7347	0,7133
1_POL_active_mortgage_SA_2	0,9851	-2,5742	1,0260	-2,6130	0,9834
1_WRO_new_houses_SA_1	0,9750	0,0301	0,0092	0,0309	0,0079
1_WRO_new_houses_SA_3	0,9673	0,0261	0,0091	0,0270	0,0078
d_1_WRO_migration_SA	0,9478	-2,0576	0,8239	-2,1708	0,6858
1_POL_active_mortgage_SA_1	0,9122	2,6428	1,4573	2,8972	1,2614
d_1_WRO_migration_SA_1	0,8643	-1,6542	0,9301	-1,9139	0,7099
d_1_WRO_unepl_SA_1	0,8493	-0,1587	0,0950	-0,1869	0,0732
d_1_WRO_migration_SA_3	0,7522	-0,9975	0,7477	-1,3261	0,5544
d_1_POL_WIG_SA_2	0,7460	0,0804	0,0603	0,1077	0,0440
1_WRO_new_houses_SA_2	0,6956	0,0132	0,0116	0,0190	0,0092
d_1_POL_WIG_SA	0,6730	0,0835	0,0721	0,1240	0,0519
1_POL_mortgage2_SA_1	0,6266	0,0500	0,0499	0,0797	0,0401
d_1_WRO_birthrate_SA_1	0,6063	0,7170	0,7291	1,1825	0,5712
d_1_WRO_cost_m2_SA_2	0,5153	-0,1609	0,2002	-0,3122	0,1748
d_1_WRO_cost_m2_SA_3	0,4685	-0,1356	0,1846	-0,2895	0,1680
1_POL_margin_SA	0,4444	0,0356	0,0511	0,0802	0,0479
1_POL_IR_SA_2	0,4159	0,0366	0,0667	0,0880	0,0785
1_POL_mortgage2_SA_2	0,3885	-0,0236	0,0379	-0,0607	0,0381
d_1_POL_GDP_SA	0,3769	0,1494	0,2413	0,3964	0,2380
1_WRO_new_houses_SA	0,3499	-0,0050	0,0093	-0,0142	0,0107
d_1_WRO_birthrate_SA_4	0,3488	-0,3814	0,6431	-1,0935	0,6380
d_1_WRO_salary_SA_2	0,3117	0,1943	0,3792	0,6234	0,4402
d_1_WRO_cost_m2_SA	0,3117	-0,0727	0,1418	-0,2332	0,1645
d_1_WRO_salary_SA_1	0,3080	0,1702	0,3349	0,5527	0,3908
d_1_WRO_salary_SA	0,2797	0,1474	0,3139	0,5270	0,3900
1_POL_mortgage2_SA	0,2618	0,0107	0,0242	0,0410	0,0317
1_POL_active_mortgage_SA	0,2429	-0,0366	0,5735	-0,1508	1,1562
1_POL_IR_SA_1	0,2244	-0,0079	0,0408	-0,0352	0,0803
1_POL_IR_SA	0,2147	0,0058	0,0240	0,0268	0,0459
d_1_POL_GDP_SA_2	0,1987	-0,0403	0,1262	-0,2028	0,2174
d_1_WRO_cost_m2_SA_4	0,1883	-0,0284	0,0928	-0,1511	0,1649
1_POL_margin_SA_1	0,1839	0,0047	0,0263	0,0257	0,0567
1_POL_margin_SA_2	0,1681	-0,0010	0,0213	-0,0058	0,0518
d_1_WRO_birthrate_SA_2	0,1608	0,0617	0,2250	0,3835	0,4374
d_1_WRO_migration_SA_2	0,1590	-0,0698	0,3086	-0,4392	0,6609
d_1_WRO_cost_m2_SA_1	0,1574	-0,0183	0,0746	-0,1160	0,1548
d_1_WRO_unepl_SA	0,1535	-0,0071	0,0298	-0,0464	0,0630
d_1_WRO_birthrate_SA	0,1519	0,0623	0,2515	0,4105	0,5230
d_1_WRO_birthrate_SA_3	0,1456	-0,0332	0,2242	-0,2282	0,5485
d_1_POL_GDP_SA_1	0,1394	0,0110	0,1067	0,0787	0,2763
d_1_WRO_unepl_SA_3	0,1327	0,0015	0,0218	0,0110	0,0591
d_1_POL_WIG_SA_1	0,1140	-0,0001	0,0138	-0,0011	0,0410
d_1_WRO_unepl_SA_2	0,1110	-0,0011	0,0199	-0,0102	0,0590
d_1_WRO_migration_SA_4	0,1056	-0,0064	0,2074	-0,0608	0,6358

Radoslaw Trojanek, Michal Gluszak,
Pawel Kufel, Maria Trojanek

RECENT ISSUES IN ECONOMIC DEVELOPMENT

Table A18. PIPs, means, variances, conditional means and conditional variances for Zielona Góra

	PIP	Mean	Std.Dev.	Cond.Mean	Cond.Std.Dev
const	1,0000	-0,5449	0,2058	-0,5449	0,2058
l_POL_margin_SA	0,8566	-0,0938	0,0465	-0,1095	0,0284
l_POL_IR_SA_1	0,5104	-0,0322	0,0343	-0,0630	0,0190
l_POL_IR_SA	0,1788	-0,0099	0,0238	-0,0555	0,0254
l_POL_IR_SA_2	0,1732	-0,0108	0,0252	-0,0626	0,0204
d_l_POL_WIG_SA_2	0,1466	0,0169	0,0438	0,1153	0,0418
l_ZGO_new_houses_SA_1	0,1016	0,0016	0,0053	0,0157	0,0075
l_POL_margin_SA_1	0,0954	-0,0055	0,0303	-0,0579	0,0813
d_l_ZGO_migration_SA	0,0918	-0,0606	0,2146	-0,6602	0,3253
d_l_ZGO_migration_SA_1	0,0884	0,0697	0,2437	0,7886	0,3240
d_l_ZGO_salary_SA	0,0815	0,0372	0,1411	0,4561	0,2308
l_POL_mortgage2_SA_1	0,0800	0,0075	0,0291	0,0937	0,0499
d_l_POL_GDP_SA	0,0659	0,0307	0,1328	0,4663	0,2537
d_l_ZGO_birthrate_SA_2	0,0330	0,0485	0,2960	1,4671	0,7549
l_POL_margin_SA_2	0,0279	-0,0017	0,0138	-0,0606	0,0569
d_l_ZGO_cost_m2_SA	0,0253	0,0072	0,0598	0,2833	0,2519
l_POL_active_mortgage_SA	0,0238	0,0060	0,0967	0,2522	0,5748
l_POL_active_mortgage_SA_1	0,0227	-0,0029	0,0984	-0,1260	0,6403
d_l_ZGO_birthrate_SA	0,0204	0,0154	0,1615	0,7532	0,8510
d_l_ZGO_unepl_SA	0,0178	-0,0009	0,0128	-0,0528	0,0805
l_POL_mortgage2_SA	0,0175	0,0007	0,0078	0,0380	0,0452
d_l_ZGO_salary_SA_2	0,0172	0,0056	0,0508	0,3248	0,2139
l_ZGO_new_houses_SA	0,0162	-0,0001	0,0012	-0,0054	0,0075
d_l_ZGO_unepl_SA_1	0,0147	-0,0013	0,0135	-0,0885	0,0691
l_POL_mortgage2_SA_2	0,0134	0,0009	0,0105	0,0694	0,0592
d_l_POL_WIG_SA	0,0131	0,0002	0,0054	0,0180	0,0439
l_POL_active_mortgage_SA_2	0,0112	-0,0023	0,0562	-0,2053	0,4898
d_l_ZGO_cost_m2_SA_1	0,0098	0,0020	0,0306	0,2024	0,2343
d_l_POL_WIG_SA_1	0,0091	0,0004	0,0058	0,0407	0,0459
l_ZGO_new_houses_SA_3	0,0090	0,0001	0,0010	0,0072	0,0077
d_l_ZGO_salary_SA_1	0,0085	0,0014	0,0274	0,1660	0,2475
d_l_ZGO_unepl_SA_2	0,0081	-0,0005	0,0081	-0,0581	0,0692
l_ZGO_new_houses_SA_2	0,0068	0,0000	0,0006	0,0002	0,0076
d_l_ZGO_cost_m2_SA_2	0,0067	-0,0005	0,0205	-0,0670	0,2409
d_l_POL_GDP_SA_1	0,0063	0,0006	0,0240	0,0987	0,2870
d_l_ZGO_birthrate_SA_1	0,0062	-0,0009	0,0634	-0,1447	0,7921
d_l_ZGO_migration_SA_2	0,0060	-0,0006	0,0295	-0,1028	0,3658
d_l_POL_GDP_SA_2	0,0058	0,0002	0,0199	0,0414	0,2577
d_l_ZGO_migration_SA_3	0,0046	0,0029	0,0470	0,6247	0,3101
d_l_ZGO_cost_m2_SA_3	0,0024	-0,0008	0,0199	-0,3431	0,2260
d_l_ZGO_birthrate_SA_3	0,0014	-0,0014	0,0475	-0,9844	0,8018
d_l_ZGO_unepl_SA_3	0,0008	0,0000	0,0022	-0,0336	0,0695
d_l_ZGO_birthrate_SA_4	0,0004	0,0005	0,0302	1,2434	0,8003
d_l_ZGO_cost_m2_SA_4	0,0002	0,0000	0,0041	0,2299	0,2095
d_l_ZGO_migration_SA_4	0,0001	0,0000	0,0035	0,0566	0,3544