Public and Private Data Sources and its Potential for Real Estate Transparency in Germany

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Key words: committee of valuation experts, purchase price database, standard land values, foerecasting, corona

SUMMARY

On the basis of the German Building Code, all land purchase contracts in Germany are evaluated by independent local bodies of real estate experts (purchase price collection). Real estate market data obtained from this can be purchased anonymously by anyone. In addition, private institutions such as banks and service companies maintain databases for real estate purchase prices and rents, in some cases as part of a network. These data are either free of charge, subject to a fee or only accessible to the network partners.

Since around 1960, the expert committees in Germany have determined standard land benchmarks for the purpose of market transparency. The land benchmarks indicate average land values for almost all properties in Germany. The standard land values are used in both private and official appraisals and are the basis of many investment decisions, but are also of great importance in the area of taxation. In the lecture - using the example of the city of Munich - it will be shown what standard land values are, how they are determined, what they can do and where their limits are.

Public administration collects data with different organizations. The main data collecting organization for real estate valuation is the committee of valuation experts. All prices for real estate transactions on the German market are recorded in a database. Besides these data-sources many data-sources of the public administration are unused for market observation e.g., data from tax authorities (collecting the rentals for every real estate in Germany), building authority (Building years and years of significant renewal of real estates), or planning offices. Until now these data-sources are not used because the infrastructure for data-interchange is missing. This work focuses on potential to connect databases and discuss possible interchanges.

As an application for the German data analysis in the context of Corona pandemic are shown. When the Corona pandemic became known in March 2020, the question arose whether a crisis would stop the real estate boom. Just a few experts expected prices to continue increasing. Unfortunately, there were very few data-driven findings and it has become clear how important the correct and data-based analysis of the real estate market is. The aim here is to show how data can be used to identify or exclude corona effects and what the pitfalls can be.

As a further application a future-oriented view with regard to the price development is shown on the German data. The forecast of purchase price developments is gaining in importance for many market players. Scientifically based forecasting methods, such as the “Autoregressive-

Integrated-Moving-Average-Method" or the "Vector-Autoregressive-Method", offer the possibility to predict such developments. The aim of this application example is to test the applicability of these two methods on the real estate market with regard to price development. Real past prices are compared with forecast prices for the same period, using the city of Düsseldorf as a case study area.

KURZZUSAMMENFASSUNG

Auf der Grundlage des Baugesetzbuches werden in Deutschland alle Grundstückskaufverträge durch unabhängige örtliche Gremien von Immobiliensachverständigen in der Kaufpreissammlung registriert. Die daraus gewonnenen Immobilienmarktdaten können von jedermann anonymisiert erworben werden. Darüber hinaus unterhalten private Institutionen wie Banken und Dienstleistungsunternehmen Datenbanken für Immobilienkaufpreise und -mieten, zum Teil im Verbund. Diese Daten sind entweder kostenlos, kostenpflichtig oder nur für die Netzwerkpartner zugänglich.

Seit etwa 1960 haben die Gutachterausschüsse in Deutschland einheitliche Bodenrichtwerte zur Markttransparenz ermittelt. Die Bodenrichtwerte geben durchschnittliche Bodenwerte für fast alle Grundstücke in Deutschland an. Die Bodenrichtwerte werden sowohl in der privaten als auch in der amtlichen Wertermittlung verwendet und sind Grundlage vieler Investitionsentscheidungen, aber auch im Bereich der Besteuerung von großer Bedeutung. Im Beitrag wird - am Beispiel der Stadt München - gezeigt, was Bodenrichtwerte sind, wie sie ermittelt werden, was sie leisten können und wo ihre Grenzen liegen.

Die öffentliche Verwaltung sammelt neben den Kaufpreisen weitere Daten durch verschiedene Behörden. Neben der Kaufpreissammlung sind viele immobilienmarktrelevante Datenquellen der öffentlichen Verwaltung für die Marktbeobachtung ungenutzt, z.B. Daten der Finanzämter (Erhebung der Mieten für jede Immobilie in Deutschland), des Bauamtes (Baujahre und Jahre wesentlicher Erneuerungen von Immobilien) oder der Stadtplanung. Bislang werden diese Datenquellen nicht genutzt, da die Infrastruktur für den Datenaustausch fehlt. Im Rahmen dieses Beitrags wird das Potential eines Austauschs dieser Behörden dargestellt um Auswertungen zu verbessern.

Beispielhaft wird zudem die Auswertung von Daten im Kontext Corona-Pandemie dargestellt. Nur wenige Experten erwarteten, dass die Preise weiter steigen würden. Leider gab es nur sehr wenige datengestützte Erkenntnisse und es ist deutlich geworden, wie wichtig die richtige und datengestützte Analyse des Immobilienmarktes ist. Hier wird gezeigt, wie Daten genutzt werden können, um Corona-Effekte zu erkennen oder auszuschließen und wo die Fallstricke liegen können.

Als weiteres Beispiel wird eine Untersuchung zu zukunftsorientierter Betrachtung hinsichtlich der Preisentwicklung vorgestellt. Die Prognose von Kaufpreisentwicklungen gewinnt für viele Marktteilnehmer zunehmend an Bedeutung. Wissenschaftlich fundierte Prognosemethoden, wie die "Autoregressive-Integrated-Moving-Average-Methode" oder die "Vektor-Autoregressive-Methode", bieten die Möglichkeit, solche Entwicklungen vorherzusagen. Ziel dieses Anwendungsbeispiels ist es, die Anwendbarkeit dieser beiden Methoden auf den Immobilienmarkt im Hinblick auf die Preisentwicklung zu testen. Dabei werden die realen Preise der Vergangenheit mit den prognostizierten Preisen für den gleichen Zeitraum beispielhaft in der Stadt Düsseldorf verglichen.

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1. INTRODUCTION

In Germany, there are about 1 million real estate transactions each year. Share deals and the sale of companies that own real estate are not included here. The public and private bodies in Germany concerned with the transparency of the property markets are endeavouring to obtain the property market data. However, the potential associated with this data is far from exhausted. This contribution consists of five parts. It is to explain the situation of real estate market data in Germany (Section 2 and 3) and describes its possible potential (Section 4) und its current (Section 5) and future practical application (Section 6).

2. COMMITTEE OF VALUATION EXPERTS AND REAL ESTATE PURCHASE PRICE-DATA BASIS

There are various occasions and groups of people for whom the accessibility of real estate market data is of interest and importance - be it absolute purchase prices, purchase prices per unit of area, the number of sales in a certain district or area, developments of this data, etc. While the search for such data can nowadays be carried out in some countries without any difficulty, online, free of charge, house number specific, up-to-date and transparent, there are certain hurdles in Germany. Data protection is a fundamental right in Germany, the so-called right to informational self-determination. It relates to the collection, processing and use of personal data. In principle, the person concerned decides for himself to whom he discloses which personal information. A generally accessible platform with real estate market data does not exist in Germany. There is another, very special platform (in the geodesy world often called the data treasure), which is in the hands of the so-called expert committees.

Committees of Valuation Experts

For more than 60 years now, Committees of Valuation Experts have had to be formed on the basis of the German Building Code to determine real estate values and other valuations. Committees of Valuation Experts are independent collegiate bodies of real estate experts from various professional groups, such as civil engineers, architects, bank and insurance employees, brokers and farmers. The structuring of these expert committees is the responsibility of the 16 federal states. In some federal states, an expert committee is formed for the area of a surveying and cadastral authority; in other federal states, hundreds of expert committees are formed at the municipal level; in still others, there is only one expert committee in the federal state. The main task of the expert committees is to ensure the transparency of the real estate market. To this end, they have to maintain a collection of purchase prices - the data treasure.

Real Estate Purchase Price-Data Basis

For the purpose of compiling the Real Estate Purchase Price-Data Basis, a copy of every contract by which a person undertakes to transfer ownership of a plot of land in return for payment or to create a heritable building right is to be sent to the expert committee by the notarizing body. The purchase agreements are to be evaluated and from them standard land values (see Section 3) and data required for the valuation are to be derived, e.g., capitalization interest rates, factors for adjusting the tangible values to the respective situation on the land market (tangible value factors) and comparison factors for developed land.

In order to be able to achieve corresponding analyses of high quality, the appraisal committee generally requires additional information on the acquired real estate, which is not usually provided by the purchase contracts. For this purpose, the expert committee sends questionnaires to the owners. Based on the example of a condominium, the following information is to be obtained, among other things

- Seller group
- Residential location
- Year of construction
- Degree of modernization
- Apartment equipment
- Residential/usable area
- property group (first sale/resale/conversion)
- number of apartments in the building/complex
- Location of the apartment in the building
- Occupancy situation

The data obtained form the basis for evaluations, some of which are very comprehensive. With the help of statistical methods, the regression analyses, dependencies of the purchase prices on individual properties such as the living space, the year of construction or the rental situation can be revealed. In this way, it is possible not only to determine average purchase prices, but also to attribute a significant value influence to individual property characteristics and to derive corresponding correction factors.

Depending on the scope and number of purchase contracts, more or less accurate market data is derived for more or less property types. The Valuation Committee fulfills its task of ensuring transparency on the real estate market by, among other things, publishing property market reports once or twice a year. The property market data is published anonymously in the property market reports.

Figure 1: Price development of new apartments and multi-story residential land by indices in Munich (green: multi-story residential land; blue: new apartments)
Source: Munich Property Market Report 2020

It is also possible to request specific extracts from the collection of purchase prices, e.g. for a certain period of time, a defined location quality and a certain group of property types with limited characteristics. In this way, it is possible to research comparative prices, some of which are applicable to one's own valuation case.

Particularly in times like the present, when the German real estate market is on the one hand looking back on legendary developments with in some cases historic price increases (see Fig. 1) and on the other hand is experiencing great uncertainty due to the Corona pandemic (see Section 5), one thing is particularly painful: the time lag of the sales contract evaluations and their publication in the form of property market reports and standard land values. As useful and high-quality as the evaluations of the sales contracts can be in principle, outdated, obsolete market data are of little help on a current valuation date. Potential for improvement lies in the timeliness and availability of the data.

Other real estate market data providers

Independent of a legal mandate for transparency of the real estate market, many companies, brokers, banks and associations make it their business to publish their respective market expertise in market reports. Banks and service companies often have their own research departments for this purpose. Within the scope of their activities, the aforementioned professional groups gain insight into rental agreements, purchase contracts and comprehensive information on real estate and also carry out property inspections. The frequency of market data publication is partly quarterly, partly semi-annual, partly annual or irregular.

One example is vdpResearch, a real estate market research company of the Association of German Covered Bond Banks, which deals with the analysis, valuation and forecasting of real estate prices from a lending perspective (www.vdpresearch.de). A large amount of purchase and rental contract data from many German Covered Bond Banks flows together here, and these

banks are in turn beneficiaries of the analyses. Among other things, it is possible to research an online query at the zip code level for residential prices of owner-occupied homes, condominiums and rents, which is based on highly up-to-date data.

3. SYSTEM OF GOVERNMENTAL STANDARD LAND VALUES

An important product of the expert committees, which builds on the purchase price collection, are the standard land values. They are created nationwide for all of Germany. Standard land values are average location values for undeveloped land. They indicate the price of a typical piece of land for a demarcated area. The standard land value is made up of several parts which together contain the important price information. These are essentially the standard land value number, the structural density and the type of development. An example to illustrate this: A standard land value is: 2400 / 0.7 / W (Figure 2). This means that one m² of floor costs 2400 euros if you can build 70 m² of floor space on 100 m² of ground space in the form of residential buildings. It should be noted that the standard land values also relate to the undeveloped land value.

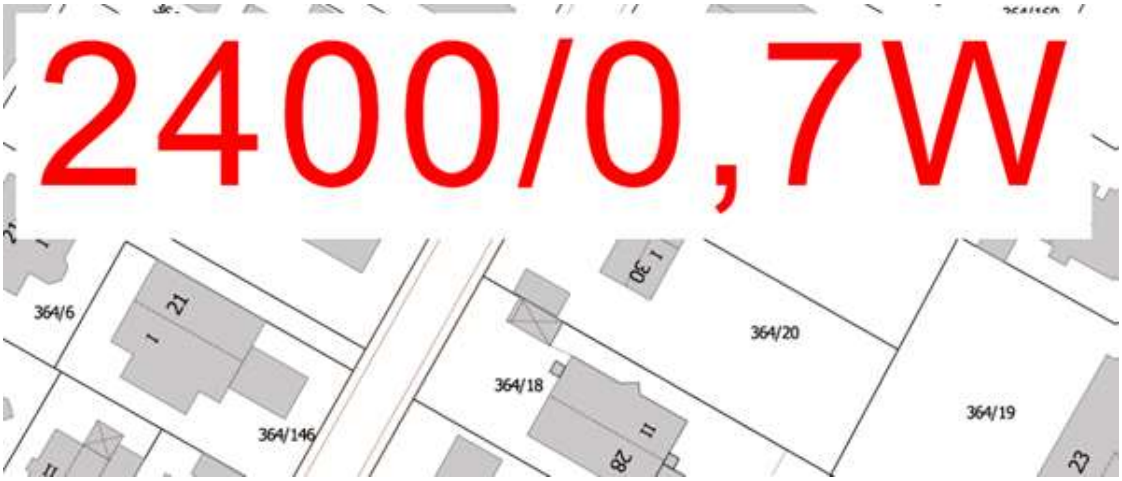

Figure 2: Exemplary representation of a standard land value for the city of Munich. Source: https://bodenrichtwerte-muenchen.de (last access: 25.03.2021)

The standard land values are usually drawn up every two years by the expert committees in a complex process. This procedure differs a little from expert committee to expert committee depending on real estate market developments and data. The procedure will be shown briefly using the example of the state capital Munich. First of all, an administrative unit of the expert committee works on the basis of the purchase cases of the past two years and with the inclusion of additional data such as index series, development plans, noise maps or contaminated sites maps. These suggestions are then discussed by the experts in approx. 10 to 12 preparatory benchmark meetings and modified if necessary. The guide values are then decided by all experts in a final meeting. They are then published and can then be queried by anyone at the office of the expert committee. There are currently around 2300 reference values and around 3000 reference value zones in Munich (Figure 3).

Figure 3: Exemplary representation of standard land value zones for the city of Munich
Source: https://bodenrichtwerte-muenchen.de (last access: 25.03.2021)

Since the expert committee is independent, free of instructions and neutral, the benchmarks represent the real estate market neutrally on the respective reference date. Because of this neutrality, the standard land values enjoy a high level of trust among all real estate market participants. They serve for transparency on the real estate market. It is important to emphasize that the expert committee uses the guide values to map the market and shows which prices are being paid. But he does not set any prices. An important finding that not everyone is aware of. In politics, in particular, there is often a desire that problems such as "too high prices for real estate" can be resolved by setting the committee of experts. The standard land values form the basis of many reports and valuations. This makes them the basis for many real estate transactions and investments. On this basis, one can make comparisons of different areas of a municipality, create time series and quickly get an overview of the market situation.
Furthermore, the standard land values form the basis for various taxes and state fee bills. The most important types of tax are inheritance and gift tax, real estate transfer tax and property tax. Despite all the diversity and functionality, it should not be overlooked that there are also limits to the possible uses. So one can theoretically compare the standard land values from Munich or Berlin with the values from small communities in central Germany. However, this comparison alone does not say much because, for example, questions of marketing duration or sustainability are not reflected in the standard land value. Return expectations cannot be read either. But even within a guideline value zone, the guideline value cannot always be applied unchanged to all affected properties. For example, the plots on the edge of the guideline zone, e.g., on a noisy street, may be worth a little less than the rest of the plots in the guideline zone.
It should also be noted that, with all due care, it is not always possible for the expert committees to take into account all the special features. The following applies: The standard land value is an average value that applies to the typical properties in the zone. If you know these special features and pay attention to them when working with the guide values, the guide values are an invaluable state source of information for the real estate market, which in this form should be unique worldwide.

4. AVAILABILITY OF REAL ESTATE META DATA AND THE POTENTIAL OF INTERLINKING

In Germany the information about every transaction is collected in the purchases price database (section 1). The database has the ability to collect the prices, metainformation about the transaction itself (buyer, seller, type of contract, etc.) as well as information about the real estate. While the information about the purchase price and the transaction itself can easily be found in the contract, the information about the real-estates itself are rarely available publicly. This metainformation is needed for statistical analysis.
Soot (2021, p. 51) investigated the appearance of data-gaps in the purchase price collection of lower saxony and validated the structure of missingness nationwide. Data-gaps up to 80 % can be found in important influencing parameters that are used for statistical market investigations. In this section we outline the problem with the data collection process in general and suggest new collaborations and approaches for analysis of available data sources.

4.1. Data source for meta-data

In the following section several data sources are discussed with the purpose of usage together with the purchase price database of the committee of valuation experts.
By law the authority of the committee of valuation experts is very wide. In § 197 BauGB (German building code) the committee gets the permission to get written or oral statements from all people who can make a statement about a real estate. Also, they can demand documents that are connected to a real estate or transaction. It also permits the local inspection of a real estate lot and with the permission of the owner even internal inspection. Beside this collaboration with the owner the committee is allowed to ask for administrative assistance to other authorities but with the limitation of disproportional effort. However, because of limitations in privacy concerns and lack of staff data can't be obtained.
In general, the authorities have useful information for valuation purpose in their archives that should be used more intense.
Notaries: Notaries have direct access to the seller and buyer (present in signing process) and could obtain information from both parties. Also a direct link could increase the time between transaction and evaluation of this transaction. With the Project eNova (Destatis 2019) first steps toward direct data transfer from notaries to the committees of valuation experts are planned. This information includes meta-information about the real estate.
Building authorities: For every building that was created after a specific date (depending on federal state) exists a record of the building application. In this building application information about the building year as well as the living space and the gross floor area exists. If real estates are significantly changed an approval by the building authorities is necessary. The record of this approval can be found in the building construction file.
Some committees of valuation experts already have access to the digital building construction file.
Problems: Informal or illegal changes are not in the record. In general, it can be assumed that new real estates are still in the same condition while it is more likely that older real estates are not matching the official building application.

Taxation office: Taxation offices have the knowledge of all payments in the real estate background. Contracts of transactions as well as rental contracts and investments are recorded by the tax authorities. Because of privacy issues this data can't be used. Future work should concentrate on aggregating the information from the tax authorities, especially the rental situation, in context of the income method for valuation.
Aerial Images and 3D Models: Aerial Images, oblique aerial images and 3D-Models become more and more available. These images and 3D-Models can be used to extract information about the size (floors, surrounding) as well as information about the quality and age (typical style) without having an on-side visit. First investigations show that information can be extracted automatically (Zeppelzauer 2018). More work is necessary on this potential.

5. DATA-DRIVEN INSIGHTS INTO THE CURRENT EFFECTS OF THE CORONA PANDEMIC

In order to get an impression of the trend of the entire real estate market, it is useful to look at residential and commercial real estate. In Germany, the share of cash turnover from sales of residential real estate is around 67% of total turnover. The share of sales of commercial real estate is about 28 %. In addition, good data on the performance of residential property prices is now available in Europe.
A good source is the European House Price Index from the statistical office of the European Union, "eurostat" (www.eurostat.eu). Eurostat analyses and publishes the price trend of, among others, single-family houses in the European member states since 2007 (Figure 4).

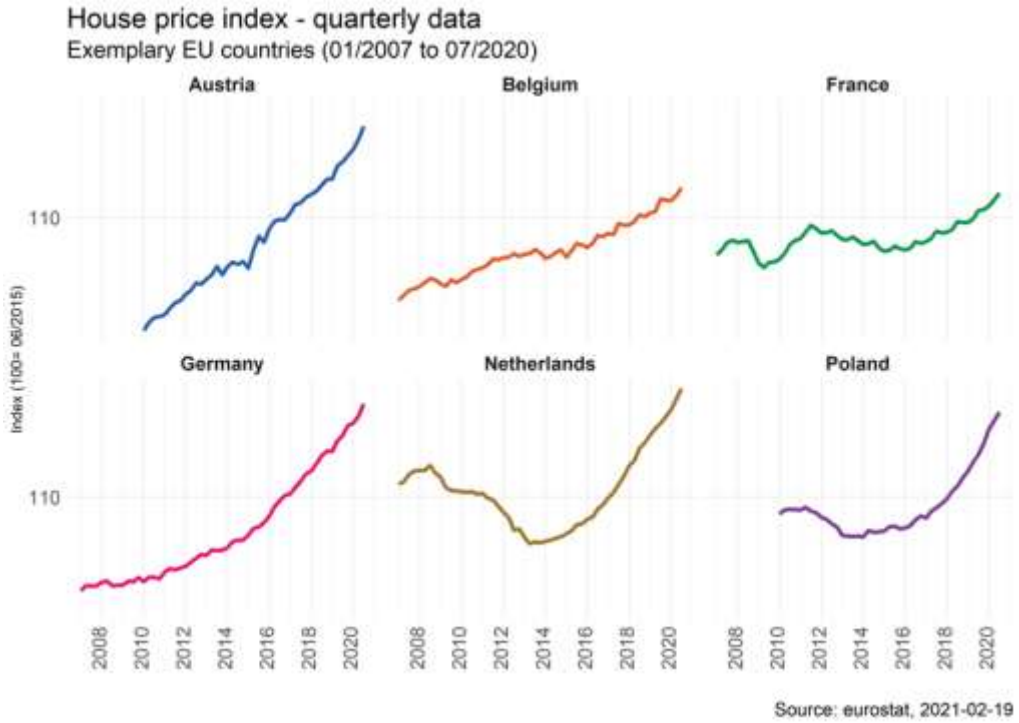

Figure 4: European House Price Index for selected countries.
Source: https://ec.europa.eu/eurostat/databrowser/view/tipsho40/default/line (last access 19.02.2021)

As one can see, house prices in Germany's neighbouring countries have risen sharply in recent years (at least since 2016). Even the Corona pandemic has obviously not changed anything in 2020.
In the case of commercially used real estate, the focus is less on the price and more on the performance of the return. A downward trend has been evident here in Lower Saxony for several years. This trend is evident not only in Lower Saxony but throughout Germany.
For some time now, purchasers of income-producing properties have been willing to pay higher prices for the property, even if the achievable rent does not rise sharply. It can be assumed that the real estate is classified as a very safe investment compared to other investment goods.
For example, we can show the gross initial yield on office- and retail- real estates in the federal state of Lower Saxony in the north part of Germany (Figure 5).

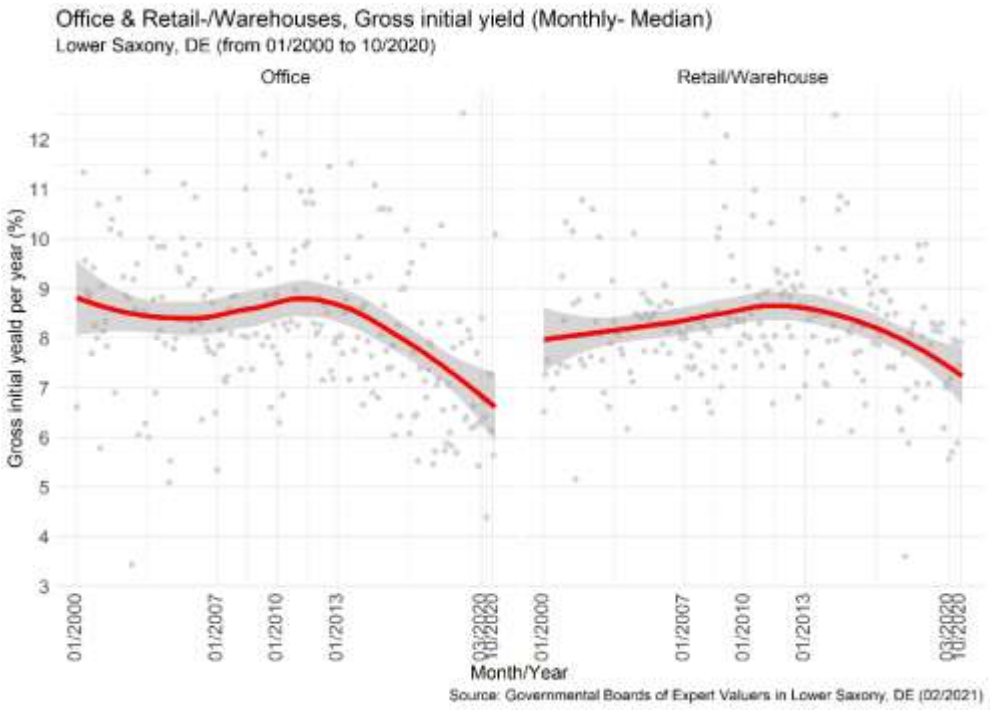

Figure 5: Development of gross initial yields for office and retail market in Lower Saxony (Germany).

There is a significant trend on decreasing initial yields since 2010 for offices and from 2012 for retail/warehouses real estate. The gross initial yield has declined as the price of real estate has increased while the rent has remained the same. Investors were willing to pay correspondingly higher prices for the properties despite the decreasing yield. This is related to the expected high and long-term security of the investment.
To what extent this security will still be attributed to such properties in the future is still unclear. Currently, the real estate market report for Germany is being prepared by the state expert committees. The approximately 300-page report is expected to be published in December 2021.

This report will provide the first comprehensive insights into the effects of the pandemic in 2020 (www. immoblienmarktbericht-deutschland.info).

6. FUTURE FORECASTS ON REAL ESTATE DATA

Regional purchase price records capture all property market transactions concluded in the past. With the help of these price records, valuation-relevant data are derived that are used for property valuation at the current time. A future-oriented view with regard to the price development is not considered here. The forecast of purchase price developments is gaining in importance for many market players. In doing so, they primarily ask themselves the question of how long the price increase on the real estate market will last and which influencing factors have an impact on it. In Germany, real estate prices increased by 61,5% between 2010 and 2020 (STATISTA 2021). Scientific forecasting methods offer a possible prediction of the development. Forecasts deal with the description of events in the future, which can be predicted on the basis of observations from the past and with the help of scientific methods.

This examination deals in particular with the forecast of purchase prices per m² of living space for used condominiums in the German city of Düsseldorf. Only time series are considered in this study. The development of the purchase prices between 2000 and 2020 is determined on the basis of the purchase price collection of the expert committee for property values in the state capital Düsseldorf. The almost 40.000 purchase cases are combined into annual time intervals for this purpose. The median shows the value of the respective intervals. Compared to calculated mean values (e.g. arithmetic mean), this is less precise, but considerably less sensitive to outliers. Outliers, both downwards and, especially for residential properties in central locations, upwards, are not uncommon for purchase prices. Possible influencing indicators, such as unemployment trends, can be called up or requested from the statistical office of the respective city.

With time series forecasting methods, depending on the number of time series taken into account, a distinction can be made between univariate and multivariate methods. A univariate procedure considers a single dependent variable. Multivariate methods consider two or more dependent variables at the same time. Multivariate methods can therefore describe relationships between two or more different variables.

A univariate forecasting method is the Autoregressive-Integrated-Moving-Average-Model (ARIMA-Method). Here, the forecast of the purchase price development is made solely by the past purchase price development. The autoregressive process attributes observations at the current point in time only to past observations, and in the moving-average process values of a time series are presented as a function of the estimation errors of past time periods. Thus, the ARIMA method makes use not only of past observations of the time series, but also of information from errors in the forecast. The periods of 2005-2007, 2010-2012 and 2016-2018 are forecast. These forecast purchase prices are compared with the actual purchase prices

(median) within the accuracy estimate. The root mean square error (RMSE) is used here. This is the root of the mean square error and a measure for assessing the quality of the forecast and thus indicates how well a forecast time series is adjusted to the available data (Figure 6).

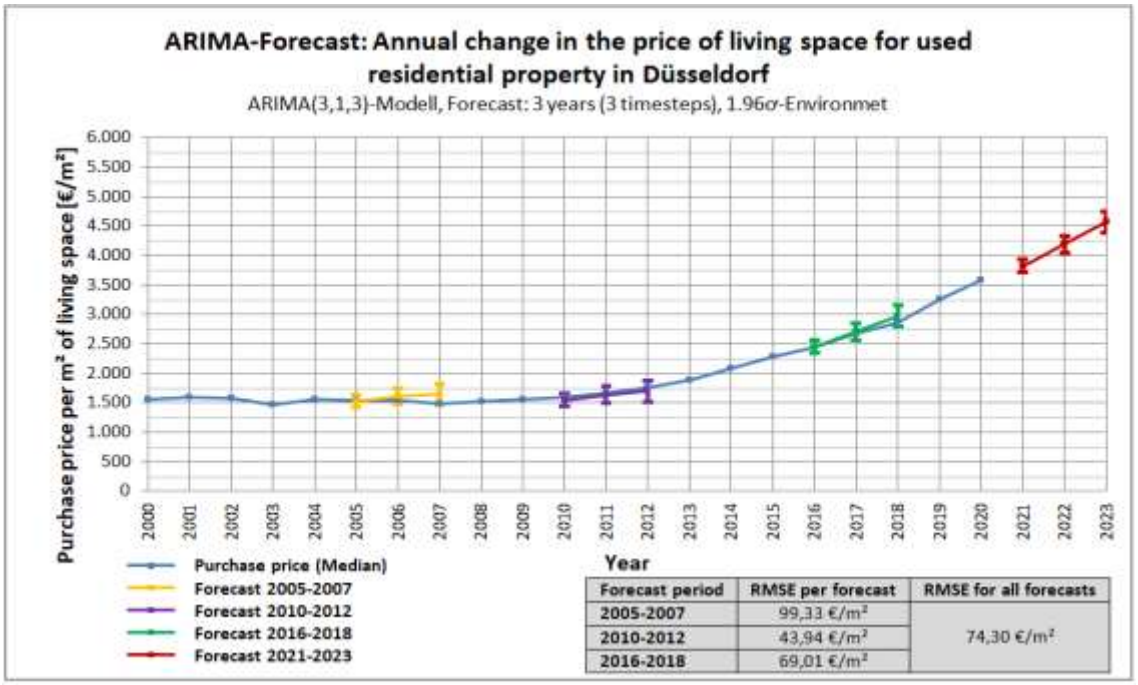

Figure 6: Arima-Forecast for the city of Düsseldorf.
Source: Own illustration

The RMSE for all forecasts is 74.30 €/m². If the deviation is assessed based on the current price situation and current market development, it is very small. The RMSE is just 2% of the current purchase prices per m² of living space.

With the help of multivariate methods, it is possible to both forecast the purchase price per m² of living space and determine possible influencing indicators. In the study, for example, unemployment and population trends in the city of Düsseldorf are considered in addition to purchase price trends. The vector autoregressive model (VAR model) represents a multivariate forecasting method. Several dependent variables are described both by their own past values and by the past values of the other time series (Figure 7).

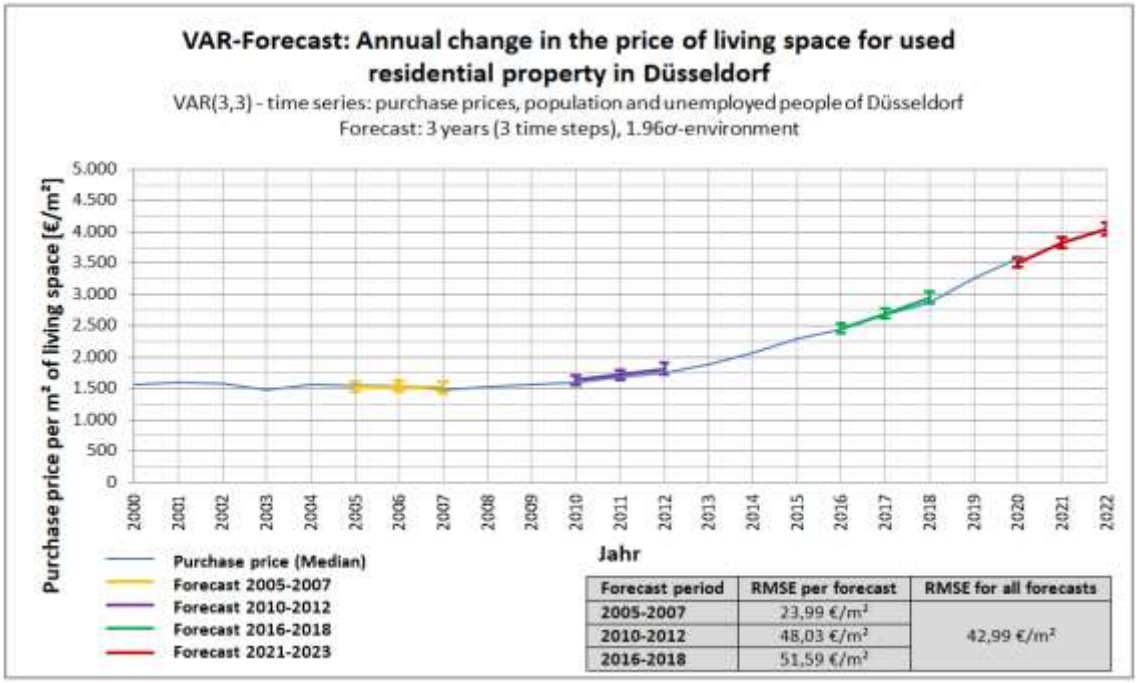

Figure 7: VAR-Forecast for the city of Düsseldorf.
Source: Own illustration

Compared to the RMSE of the ARIMA model the RMSE for the VAR model is lower and amounts to 42.99 €/m². Here, too, the relatively small size of the error in relation to the current purchase prices is striking.

Since both the ARIMA forecast model and the VAR forecast models show very small deviations in the modeling, a statement about the development of the purchase prices per m² of living space is made using both methods. The forecast price range for the next two years is:

- 2021: 3.714 €/m² - 4.223 €/m²
- 2022: 3.952 €/m² - 4.785 €/m²

However, the prognoses must be scrutinized. It is not possible to make a precise statement about the shocks that occur, since the test data with which the models are created, do not show these. Therefore, an estimate of the impact of shocks on influencing variables, e.g. such as the corona pandemic, is not possible with statistical forecasting methods.

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BIOGRAPHICAL NOTES

Peter Ache studied Geodesy at the Jade University in Oldenburg in Lower Saxony. He is managing director of the upper expert committee in lower saxony in Germany and managing director for the working group of the upper expert committees in the federal republic of germany. In his job he is editorial manager for the real estate market report Germany and head of the working group "Real Estate Valuation" of the DVW-Society for Geodesy, Geoinformation and Landmanagement.

Albert Fittkau studied law at the Ludwig Maximilians University in Munich. He has been working for the city of Munich since 1999. After having worked in the cultural department and the department for work and economics, he has been in the real estate appraisal office since 2006. He is managing director of the expert committee of the township of munich.

Antje Haase graduated in geodesy from the Leibniz University of Hannover in 2004. After her training as a technical administrator, she worked as a real estate appraiser for a real estate service provider in Frankfurt am Main from 2006-2008. From 2008-2019 she worked as an appraiser in the field of market and mortgage lending value appraisal for NORD/LB. Since 2020 she has been employed by the valuation company JKT Immobilien GmbH.

Matthias Soot received his Master of Science (M.Sc.) in Geodesy in 2014 and a Bachelor of Science in 2012 at the Technical University of Dresden. From 2010-2015 he worked as a valuation expert in free economy. Since March 2015, he is working at the Geodetic Institute of the Technical University of Dresden at Chair of Land Management. His research focus is on statistical analysis of market information and development of purchasing price databases.

Caroline Stockhausen completed her Bachelor's and Master's degrees in geodesy and geoinformation at the University of Bonn from 2014 to 2021. Together with Sebastian Krieger, the topic of forecasting developments on the real estate market was covered in their master's thesis. Since April 2021, she has been on a kind of trainee program in the district government of Detmold (North Rhine-Westphalia, DE).

Sebastian Krieger received his Master of Science (M.Sc.) in Geodesy in 2021 and his Bachelor of Science in 2018 at the University of Bonn. Together with Caroline Stockhausen, he wrote his Master's thesis on forecasting developments in the real estate market. Since April 2021, he

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