

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

Department of Economics



Urban Economics: Comparison of Urban development in two chosen areas

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

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BACHELOR THESIS ASSIGNMENT

Pešice Ondřej

Economics and Management

Thesis title

Urban Economics: Comparison of Urban Development in Two Chosen Areas

Objectives of thesis

Give general overview of urban economics by comparison of 2 different cities. To evaluate development in particular urban areas and provide explanation of differences between urban and suburban space.

Methodology

On collection data and literature various methods will be used. Mainly analysis, deduction, comparison and methods of comparative analysis should help to achieve goals of the thesis.

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Keywords

urbanization, property, futures, city, economic development, fundamental analysis

Recommended information sources

Economics of Cities and Suburbs
Author: William Thomas Bogart
Publisher: Prentice Hall, 1997. ISBN10: 0135699711

Modern Urban and Regional Economics
Author: Philip McCann
Publisher: OUP Oxford, 2012. ISBN10: 0199582009

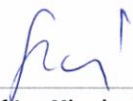
Fundamentals of Urban Economics
Author: John F. McDonald
Publisher: Prentice Hall, 1996. ISBN10: 0023788526

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November 2012



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Prague October 3. 2013

Declaration

I declare that I have worked on my bachelor thesis “Urban Economics: Urban development in two chosen areas” by myself and I have used only the sources mentioned at the end of thesis. As the author, I declare that the thesis does not break copyrights of any third person.

In Prague.....

.....

Ondřej Pešice

Acknowledgement

Firstly I would like to show my gratitude to Ing. Petr Procházka, MSc. Ph.D. for his patient help and supervision during the process of writing my bachelor thesis. Then I would like to mention my dear friends Ondřej Novák and Zdeněk Pilař for their encouragement and valuable advices. Last but not least, I have to thank my family for supporting me all my life!

Urban Economics: Comparison of Urban Development in Two Chosen Areas

Ekonomika vývoje městských oblastí: srovnání dvou vybraných regionů

Souhrn

Tato bakalářská práce se zaměřuje na vývoj městských oblastí, konkrétně měst Praha a Berlín. Na základě vývoje na trhu s nemovitostmi se autor snaží zdokumentovat hlavní faktory ovlivňující cenu nemovitostí na trhu. Teoretická část je věnována analýze literatury související s tématem a definice klíčových výrazů vyskytujících se nadále v celé bakalářské práci jako například *městská* či *předměstská* část města. Dále se v ní nachází použité metodologie a vytyčení hlavních cílů praktické části práce. A v závěrečné kapitole teoretické části jsou shrnuty hlavní rozdíly obou regionů ať už z pohledu ekonomického, geografického či demografického.

V Praktické části je hlavním obsahem analýza trhu s nemovitostmi, konkrétně nabídka, poptávka a cena bytů v obou lokalitách. Pro tyto účely byly zvoleny dvě oblasti v každém z měst pro srovnání vývoje v centru města a na jeho předměstí. Analýza je prováděna nejrůznějšími metodami jako například regresní analýza či korelační matice. V další kapitole se nachází srovnání návratnosti investice do nemovitostí v obou městech. Výsledkem práce je seznámení čtenáře s vývojem a budoucími vyhlídkami na trhu s nemovitostmi v obou městech.

Klíčová slova: městský vývoj, město, předměstí, regresní analýza, korelace, urbanizace, Praha, Berlín

Summary

This bachelor thesis focuses on urban development in two chosen areas. For purposes of the research areas of Prague and Berlin were chosen. Based on real estate development, author is trying to uncover main factors and determinants influencing price on market with residential properties. Theoretical part is consisting of various definitions of often used terms such as *urban* or *suburban*. Another part includes introduction to main used methodology and aims of the thesis. Comparison of both chosen areas and overview is important for reader to understand practical part of the thesis. Introduction of main terms and factors on real estate market follows in last chapter.

Main part of Practical part is dedicated to analysis of real estate market in urban and suburban areas and their development. Various methodological tools were used such as Regression analysis or calculating Return on Investment to introduce the reader into processes of residential properties market. Data set consisting of four different areas is examined in order to provide enough results for comparison and discussion. Aim of the thesis is to provide reader general overview and recommendations concerning urban/suburban real estate market in Prague and Berlin.

Key words: urban development, city, Prague, Berlin, regression analysis, suburban, residential property, investment

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1 Introduction

This bachelor thesis is focused on urban development in two chosen areas. For this purpose I have chosen Prague and Berlin. Both of the areas are capital cities in their respective countries (Czech Republic and Germany) but at the same time urban development in them had been significantly different. There is a question what are the main reasons or factors for that, so thesis will mainly focus on real estate market and analyze it in order to find out current situation. Both of the cities recently attract great amount of people to move in for various reasons. In Prague it is basically for its economic strength and possible chance to find a well-paid job. On the other hand situation in Berlin is almost opposite, as it is one of the cheap areas in great economically developed Germany. Finally in both of the cities we can find similar prices of real estate property but it is interesting to focus on different factors affecting the price. To predict future development based on various methodological tools we need to define basic terms of real estate market.

Considering urban development thesis will not only focus on central urban areas. It will also evaluate suburban areas mainly in practical part. Prague and Berlin are constantly developing cities and creation of new suburban areas is result of this process. At the same time price-setting processes are quite different from urban areas, as new real estate property is being built. So that comparison of urban/suburban areas will be evaluated in Conclusions of the thesis. Two areas (urban and suburban) in each of the cities were chosen to provide enough data for further research of their differences. Based on Regression analysis or Correlation matrix method, relationship between different factors will be examined.

2 Goals and Methodology

2.1 Goals

The main goal of the bachelor thesis is to compare and evaluate urban development in areas of Prague and Berlin. This evaluation will be based on comparison of real estate markets focusing not only on urban but also on suburban areas providing enough background to understand processes of urban development. Different factors affecting price will be taken into an account in order to distinguish between risks of investment connected to areas of Prague and Berlin. Literature review and data analysis should provide simple recommendations for investments or prediction of future price development. Widely discussed economic crisis in year 2008 will not be forgotten and influences of this crisis will be mentioned. At the end of the thesis the reader might also be familiar with basic terms connected to urban development and real estate market.

2.2 Methodology

Literature review was concluded mainly using methods of deduction, induction, extraction and analysis. Different literature and internet sources were cited according to bachelor thesis standards and recommendations. It is very important for further understanding of terms used throughout the bachelor thesis. Processes in real estate market are vital for price-setting mechanism of real estate property so another part will be a comparison of both areas helping the reader to understand the situation in wider context. This review will be focused mainly on events which affected prices on real estate market in history or had another economical influence.

In practical part main method used is Regression Analysis of data. This helped to uncover determinants of prices to illustrate situation on the market. Another method is Correlation matrix method which was used for prediction of future increase of decrease in a price level according to main influencing factors. Quantitative analysis will be used for comparison of urban and suburban areas serving as a basis for discussion and conclusions. For analysis of real estate markets there will be used certain criteria in selection of compared property in order to obtain meaningful information suitable for comparing in both cities.

3 Theoretical Part

3.1 Urban area

We all know an urban area when we see it, but defining it is not as easy as it might seem. Areas are typically defined as “urban” and on the basis of that definition the people living there are thought of as being part of the urban population. The essential characteristic here is that urban means nonagricultural, density of people living in the area also affects this definition, but character of the area is more important. For example: a farming village of 5000 people should not be called urban, whereas a tourist spa of 2000 people may well be correctly designated as an urban area. Urban areas are now home to virtually one of every two human beings and, by the middle of the twenty-first century, nearly two out of every three people will “urban dwellers” according to United Nations Population Division from year 2008. This is truly remarkable transformation when we consider the fact, that in year 1850 only 2% of the entire population of the world lived in the cities of 100,000 or more people.¹

The definition of “urban” varies from country to country, and, with periodic reclassification, can also vary within one country over time, making direct comparisons difficult. An urban area can be defined by one or more following: administrative criteria or political boundaries (e.g., area within the jurisdiction of a municipality or town committee), a threshold population size (where the minimum for an urban settlement is typically in the region of 2,000 people, although this varies globally between 200 and 50,000), population density, economic function (e.g., where a significant majority of the population is not primarily engaged in agriculture, or where there is surplus employment) or the presence of urban characteristics (e.g., paved streets, electric lighting, sewerage) In year 2010, 3,5 billion people lived in areas classified as urban.²

¹ MILLS, Edwin S. *Handbook of Regional and Urban Economics*. Amsterdam, North-Holland, 2006 ISBN 13 978-0-444-87970-6

² Unicef - State of Worlds Children Report 2012 In: [online]. [cit. 2014-3-2]. Available from WWW: <http://www.unicef.org/sowc2012/pdfs/SOWC-2012-DEFINITIONS.pdf>

3.2 Suburban area

The places that this term denotes, often seems formless. The difficulty is that, to most people, suburbs are characterized along more than one dimension. In varying degrees in different countries, five dimensions are commonly emphasized:

1. Peripheral location in relation to a dominant urban center.
2. A partly (or entirely) residential character.
3. Low densities, often associated with decentralized patterns of settlement and high level of owner-occupation.
4. A distinctive culture, or way of life.
5. Separate community identities, often embodied in local governments.

There are obvious connections among these various elements. At the urban periphery, land is usually cheaper, encouraging lower density development and, specifically, the construction of single-family homes for owner-occupation. In the twentieth century, the development of areas at low residential densities has typically depended upon the widespread use of automobiles for summing, shopping and, increasingly, for other types of trips. Disproportionately, those who choose to move to the suburbs are likely to be in households with children, who wish to lead a family-centered life and to become involved in community organizations, notably through local schools.³

3.3 Types of Ownership

There are many types of ownership of real estate, but as this thesis is focused mainly on residential houses and flats, we can distinguish ownership into four main categories. These four main categories are stated below with detailed description and analysis of pros and cons.

Private ownership

The most common ownership would be personal or private ownership. This relates to any physical or corporate body owning a unit or a building or a building,

³ HARRIS Richard and LARKHAM Peter J., *Changing Suburbs: Foundation, form and function*. Routledge Publishing, 1999, page 8-9, ISBN-13: 978-0419220503

whether residential, commercial or industrial. In that case the buyer becomes the owner of the building or the unit (with corresponding shares in the common areas), and is recorded in the cadastre and on the property sheet as such. One of the owners many rights is to divide the building into units (if this hasn't yet happened), or rent the units/building. In the case of purchasing a unit one of the many obligations is to pay real estate tax, as well as a certain sum into the buildings own reparation fund (the last obviously doesn't apply in case the building hasn't been separated yet). Usually properties in this form of ownership have a relative highest value since they are clear of any obligations or conditions. This ownership form makes it the most liquid since the owner and the market are only players. Transaction costs are reasonable but unavoidable: 3% (of the higher of either the realized price or the value of expert opinion (real estate transfer tax applies). Nevertheless one must not forget that profit from real estate sales is subject to income tax. But there is an exemption of that obligation if the unit has been the main residence for at least two years after the acquisition date, or if the time between the purchase and the selling dates is longer than five years, then the profit made of the sale of the unit is exempt from the income tax. (Act No. 586/1992 Coll.)

Mutual ownership

This type of ownership expresses the extent to which co-owners share the obligations and rights connected to co-ownership of the property. Both co-owners have the same rights, therefore this type of ownership is not ideal solution in terms of disposal of property. Possible seller must firstly offer his share to the co-owners who can buy it before somebody else can be interested in this offer. In the Cadastre, mutual ownership is recorded as a share of total property expressed in fractions.

Cooperative ownership

Another form, that had its origin in the privatization process in the cases when the tenants couldn't afford buying their apartment and financial institutions didn't propose mortgages yet. In that case a housing association was founded, that would be granted a state-helped loan to buy the house. Tenants or in some way co-owners would then pay "rent", actually paying of their proportion of the whole

building. In most cases once the whole loan has been paid back and the tenant has paid down his part, this housing association is canceled, the building is divided into units and a transfer into private ownership to each co-owner is possible. Nevertheless, this form is way less liquid, one can sell its share in the housing association related to the unit. But the price achieved in such a sale is lower mainly for two reasons: units bound with the debt of the housing association and the sales price would be reduced by the appropriate share of no-yet repaid debt. The other factor lowering the price is the uncertainty as to when or if at all the units will ever be transferred into private ownership (all co-owners must agree). Since one buys a share of the housing association, and not a real estate unit, one cannot use a mortgage to finance the purchase. It is limiting because other types of loans are more expensive.

Rental ownership

Renting of the flat is usually based on the rent agreement that has to be signed by both sides of the contract (owner and resident of the flat). Agreement is set either for limited period or indefinitely. In second case, there is commonly 1month notice period for the resident of the flat to leave it. At the beginning of the rental contract, resident has to pay deposit of certain amount (1-2 month lease price) to prevent further inconveniences caused by his presence in the premises of the flat. Nevertheless exact conditions of the rental agreement are set by the owner of the flat, in case the flat is in his personal property. Obligations such as paying bills for water or electricity still remain on the owner of the flat.

3.4 Factors influencing Real Estate Market

As any market the price on Real Estate market is defined by the interaction between supply and demand. In following chapter factors are divided into two categories – factors influencing demand and factors influencing supply. In provides brief introduction to the practical part dealing with these factors into detail.

3.4.1 Factors influencing demand

Population

On real estate market the key factor is the population, or more precisely the growth rate of the local population. It doesn't matter if we consider birth rate or immigration. The more people come to work/live in a locality the higher the demand for housing will be.

Income

The demand will be similarly influenced by the available income of households. Naturally if the disposable income is higher than people are more able to satisfy their housing needs. Economic crisis in the area/region also has to be taken into an account.

General economic growth

Analogically in commercial units the demand for units is strongly correlated with the general growth of economy, since a rise in consumption fuels commerce and the industry which will need to expand.

Price and financial cost

The market price of the units obviously influences the demand. As most normal goods, real estate demand is negatively correlated to price. Also the conditions (interest rates etc.) on the real estate market strongly affect the buying power of the population.

3.4.2 Factors influencing supply

Construction

One of the two main sources of supply on the market is the construction of new units. One can either follow the number of constructions and their effect in the future when terminated (mostly one to three years later) or take in account the terminated constructions will affect the market directly. This is very vague since most of the developers start selling even before beginning to build. Furthermore input prices like cost of land, labor, construction materials or cost of money (interest rate, subventions...) do influence the developer's motivation to build as well as the expected selling price.

Existing residential properties

The second source of the supply on the market is the units that are being sold by the actual owners. On the other hand, these people, when selling a unit they were using they appear on the demand side (as buyer or looking for a new lease) if we omit those emigrating. Nevertheless, there is more to the motives of people moving out than pure changes in preferences or migration. Growing interest rates (making the mortgage unaffordable), rising rents or changes on employment market influencing their income.

3.5 Types of value on Real Estate market

There are several different types of value on the real estate market. For appraisal purposes, it is vital to distinguish between the different types of value, and to identify the particular type of value the appraiser is estimating. This is so critical, in fact, that appraisal reports always contain a specific definition of the value being estimated. The various types of value that may be estimated in real estate appraisals include market value, investment value, value in use, assessment value, insurable value, liquidation value, and going concern value.⁴ For the purposes of the thesis there will be mentioned only few of them.

3.5.1 Market value

This type of value is used most often in evaluation process on real estate market. It is sometimes also referred to as “exchange value” or “value in exchange”. The value is determined by the open market and it is defined according to Fannie Mae and Freddie Mac agency:

“The most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeable, and assuming the price is not affected by undue stimulus. Implicit in this definition is the consummation of a sale as of a specified date and the passing of title from seller to buyer...”

During the history, there have been different interpretations of the term “market value”. Economists, judges or legislatures gave this term various connotations applied to a certain situation. For example, state laws pertaining to condemnation –

⁴ SCHRAM, Joseph F., THOMSETT Michael C. *Real estate appraisal*. Rockwell Pub. 2006. p35
ISBN 18-870-5125-2

the taking of private property for a public purpose – and tax assessment frequently include definitions of market value. When performing an appraisal for purposes governed by state or federal law, the appraiser should use that law’s definition of market value.

3.5.2 Investment Value

The investment value of a property is based on the income it can generate during its useful life. This value is used to quickly estimate the value of an investment, but should only be used in conjunction with other methods, as it does not take into account important factors like the growth and decline of potential income. This value is obtained by dividing the net annual income of a property by its capitalization rate. Although there are different methods to calculate the capitalization rate of a property, the general idea is to divide the net annual income it generates by the property's current value. According to IVSC (International Valuation Standards Council) there is definition: “*The Value of an asset to the owner or a prospective owner for individual investment or operational objectives*”⁵

3.5.3 Net Present Value (NPV)

Part of the decision making process is comparing the estimated cash flows from the available opportunities. NPV uses the time value of money to summarize a cash flow forecast to a single value. The concept is that the value of cash far in the future is lower than the value of cash in the short term. This is expressed in the discount rate used in the calculation. The discount rate is analogous to the interest rate the investor would like for cash deposited at a secure bank.

The first step involved in the calculation of NPV is the determination of the present value of net cash inflows from a project or asset. The net cash flows may be even (i.e. equal cash inflows in different periods) or uneven (i.e. different cash flows in different periods). When they are even, present value can be easily calculated by using the present value formula of annuity. However, if they are uneven, we need to calculate the present value of each individual net cash inflow separately.

⁵ IVSC Glossary, [online], 1st Jan. 2014, Available at WWW: <http://www.ivsc.org/glossary>

In the second step we subtract the initial investment on the project from the total present value of inflows to arrive at net present value. Thus we have the following two formulas for the calculation of NPV:

When cash inflows are even:

$$\text{NPV} = \mathbf{R} \times \frac{1 - (1 + \mathbf{i})^{-\mathbf{n}}}{\mathbf{i}} - \text{Initial Investment}$$

In the above formula, **R** is the net cash inflow expected to be received each period; **i** is the required rate of return per period; **n** are the number of periods during which the project is expected to operate and generate cash inflows.

When cash inflows are uneven:

$$\text{NPV} = \left[\frac{\mathbf{R}_1}{(1 + \mathbf{i})^1} + \frac{\mathbf{R}_2}{(1 + \mathbf{i})^2} + \frac{\mathbf{R}_3}{(1 + \mathbf{i})^3} + \dots \right] - \text{Initial Investment}$$

i is the target rate of return per period;

R₁ is the net cash inflow during the first period;

R₂ is the net cash inflow during the second period;

R₃ is the net cash inflow during the third period, and so on ...⁶

3.6 Real estate property price determinants

In the real estate market price of residential properties is influenced by interactions between supply and demand, therefore we have to define respective determinants to understand the process:

- *Demographic* – age, population, size of families, fertility, mortality and divorce rate
- *Economic* – rate of unemployment, GDP/capita, purchasing parity of households, income rate
- *Political* – state housing policy, subsidy policy for housing

⁶ FABOZZI, Frank J., *Capital Budgeting – Theory and Practice*, Canada, John Wiley and Sons, 2002, s. 71, ISBN: 0471-218-332

- *Financial* – interest rates, credit risk, loan availability and conditions

There are five fundamental factors affecting supply on the real estate market. It is expressed in the following function⁷

$$S_R = f(P_R, C, P_L, W, M)$$

S_R – supply of residential properties

P_R – residential properties prices

C – cost of construction including:

P_L – price of land

W – worker's wages

M – cost of material

The real estate market is sometimes divided into two segments. Firstly it is the segment of already built properties with non-elastic supply and the price is assessed. The second segment is considering planned or already started constructions of new houses. Supply is then determined by the situation on the market, considering territorial and legislative factors, such as the locality of the building or the promotion of the housing construction. Another factor affecting the final price is the amount of invested capital in the process of construction.

In the next step we consider factors affecting demand on the real estate market. Similar to the example of supply, we can express these factors by the following function:

$$D_R = f(P_R, Y, r, W_F, D, e, X)$$

D_R – demand for residential properties

P_R – residential properties prices

Y – household income

r – interest rate on housing loans

W_F – financial wealth

D – demographic factors

⁷ ÉGERT B., MIHALJEK D., *Determinants of house prices in Central and Eastern Europe*, 2007 online journal

e – expected rate on return on housing investment

X – other factors (location, conditions of property, changes in financing)

Demand on the market with residential properties is directly affected by a disposable income of possible buyers. Considering this fact in wider context, it is indirectly influenced by unemployment rate and economic performance in the country. Demand for residential properties is also influenced by the market rent development – in case of growth of market rent, we usually record also increase in housing prices. Market rent motivates possible buyers to decide whether to buy or rent a residential property. Rise in rents increases return on investment, therefore demand of investors is getting higher.

By the following function final price of real estate might be calculated:

$$P_H = f [Y, r, W_F, D, e, X, C, (P_L, W, M)]$$

Considering previously mentioned factors to be general determinants of the price, notice, that it doesn't necessarily affect stability of the prices.

3.7 Comparison of Prague and Berlin

In this chapter of theoretical part, you can find evaluation and comparison of Prague and Berlin from various points of view. Introduction of main facts about both capital cities is important for understanding of practical part of the thesis. Processes on the real estate market are influenced by wide range of determinants not necessarily economical or possible to be captured by figures. Main historical events will be also included in this chapter.

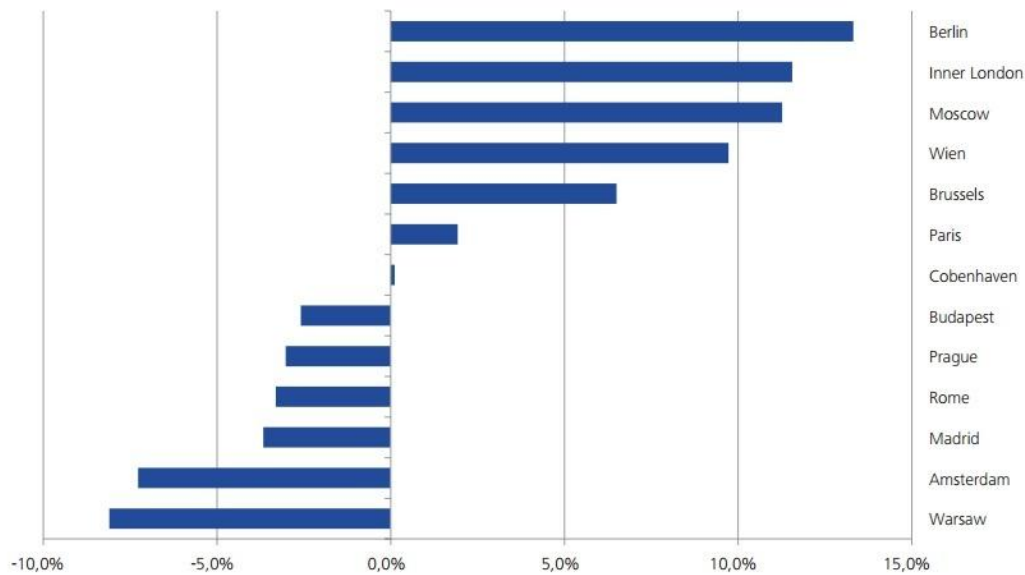
Table 1 Comparison of Prague and Berlin⁸

	Prague	Berlin
Population	1 244 375	3 401 147
Area (km²)	496	891
Density (ppl/km²)	2 509	3 800
GDP/Capita (CZK)	1 171 000	669 581
Currency	CZK	Euro (€)

As we can see in the figure above, Prague is almost three times smaller in terms of population. Even though density in Berlin is significantly higher, actual feeling from the city is very different as the whole conception of the city is different. Prague had been built around historical center which gives a character to the city. On the other hand Berlin had been affected by many historical events especially division into western and eastern part in period 1961 – 1989. Period of 2nd World War strongly influenced following urban development of Berlin. The city was bombed and destruction of the buildings brought new space for construction and building new houses in the city centre, which makes a great difference to Prague central area. Therefore in Berlin there are not so many historical buildings as compared to Czech capital city. Another interesting geographical fact is that Berlin is very flat while Prague is known for having many different hills such as Vítkov, Petřín or Vyšehrad. Nevertheless it doesn't significantly affect supply on real estate market. Obviously in Prague and Berlin there is a different currency, so for purposes of this thesis, Czech koruna (CZK) will be taken as an official currency throughout the thesis. In following graph there is illustrated annual change in transaction price for new dwelling (residential property) in Prague and Berlin.

⁸ Collection of data from Český Statistický Úřad (www.czso.cz) and German Statistical Office (www.destatis.de)

Average Transaction Price of the New Dwelling - Capitals Annual change (%), 2012



Source: Deloitte⁹

This figure shows the difference in the period 2011/2012 but the trend is still ongoing. It means that demand in Berlin is getting higher than in Prague. On the other hand, Prague's residential market is stagnating or even slightly decreasing. It can be explained by the construction potential of both capital cities. In Berlin there are many more buildings under construction recently, which brings the focus of investors. With increase in interest, also price is going up. Another important factor may be attractiveness of the city for migration, taking into account London, which is on second place.

4. Practical Part

In this chapter, reader can find calculations and results based on the theoretical part, considering development on the real estate market in Prague and Berlin. Various methods are used for evaluation of both central and suburban parts of the city. In following sub-chapters, there will be introduction of the data set for calculations and also definitions of used methods. At the end of the chapter

⁹ *Property Index Overview in European Residential Markets* [online] available from WWW: http://www.deloitte.com/assets/Dcom-CzechRepublic/Local%20Assets/Documents/Surveys/2013/EN_PropertyIndex2013A.PDF

discussion of the results and possible recommendations are stated. It is hardly possible to evaluate urban development in general, so that for purposes of the thesis flats in different locations will be evaluated. It serves as an illustration of the situation on the Real Estate market and basis for discussion and future development prediction.

4.1 Data Set

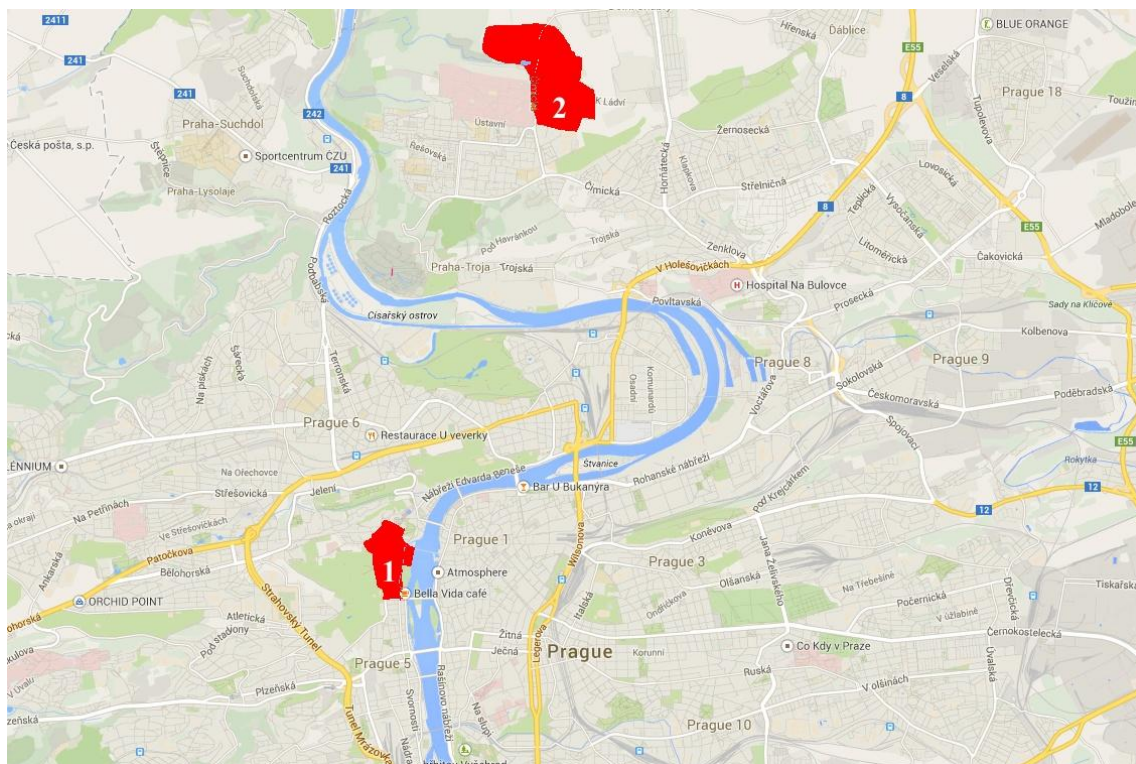
For the practical part data set was collected from 4 different locations. In each city there are chosen one urban and one suburban area. In Prague data set consists of Malá Strana (urban) and Čimice (suburban). In Berlin these areas are Mitte (urban) and Friedrichsfelde (suburban). In listed areas there are significant differences in residential property development and it provides enough information for calculations and results evaluation. In each respective area sample of 20-30 flats was chosen. Data were retrieved from websites:

www.sreality.cz (Prague)

www.hauptstadtmakler.de (Berlin)

www.immobilien.de (Berlin)

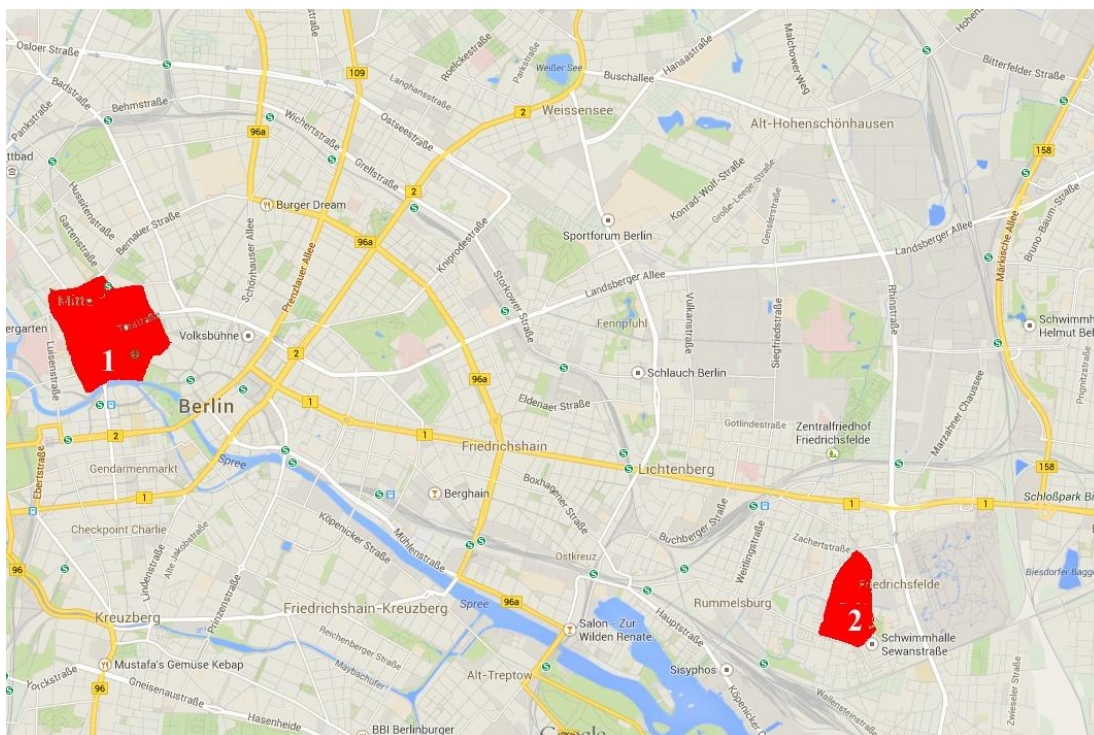
All four areas are visible in maps below.



Picture 1 1-Malá Strana, 2-Čimice¹⁰

First location is considered as one of the expensive and prominent areas in Prague. Malá Strana always has been part of the historical center and its proximity to the heart of Prague is one of the key factors affecting the price. On the other hand Čimice is area of panel houses with very cheap rents and sale prices of properties.

¹⁰ Source: own creation using google.maps.com



Picture 2 1- Mitte, 2- Friedrichsfelde¹¹

In Berlin there were chosen areas with similar characteristics, so that it can be compared and evaluated by the same measures. Selection of Friedrichsfelde area is not random, like Čimice, this area is known as one of the panel houses district in Berlin. East Berlin is relatively cheaper compared to western area, due to historical division. Mitte is a very expensive residential area surrounding city center, which is unlike Prague's quite difficult to locate exactly.

Data set consists of various factors affecting the price. Throughout practical part, aim of the thesis is to uncover and explain how and to what extend these factors really affects the price. Following factors were chosen for evaluation: Price of the flat, Rent of the flat, size in m², type of the flat (number of rooms), type of the building (bricks/panel) and type of ownership (private/cooperative). All the prices are denominated to CZK according to current exchange (EUR/CZK) rate valid on March 9th : **27,350**¹². Complete data set is inserted in Appendix, for overview.

¹¹ Source: own creation using google.maps.com

¹² *Kurzy devizového trhu ČNB*, (online) available from WWW:
http://www.cnb.cz/cs/financni_trhy/devizovy_trh/kurzy_devizoveho_trhu/denni_kurz.jsp

4.2 Correlation matrix method

As a first method for evaluation of data set Correlation matrix is chosen. It helps to uncover which of the factors are strongly connected with price-setting process on the real estate market. One of the definitions according to businessdictionary.com says:

“Degree and type of relationship between any two or more quantities (variables) in which they vary together over a period; for example, variation in the level of expenditure or savings with variation in the level of income. A positive correlation exists where the high values of one variable are associated with the high values of the other variable(s). A 'negative correlation' means association of high values of one with the low values of the other(s). Correlation can vary from +1 to -1. Values close to +1 indicate a high-degree of positive correlation, and values close to -1 indicate a high degree of negative correlation. Values close to zero indicate poor correlation of either kind, and 0 indicates no correlation at all. While correlation is useful in discovering possible connections between variables, it does not prove or disprove any cause-and-effect (causal) relationships between them.”¹³

With this method all respective areas will be analyzed in order to find out differences in strength of factors. Matrixes were calculated in Excel using Correlation function.

Table 2 Prague Malá Strana area

	Price	Rent	Size	Type	Ownership
Price	1				
Rent	0,853265	1			
Size	0,877037	0,980593	1		
Type	0,768606	0,78595	0,808664	1	
Ownership	0,093004	0,245827	0,268712	0,266679	1

¹³ *Business Dictionary – definition of Correlation*, [online] available from WWW: <http://www.businessdictionary.com/definition/correlation.html>

Table 3 Prague Čimice area

	<i>Price</i>	<i>Rent</i>	<i>Size</i>	<i>Type</i>	<i>Building</i>	<i>Ownership</i>
Price	1					
Rent	0,891692	1				
Size	0,900381	0,96326	1			
Type	0,691336	0,799037	0,82262	1		
Building	0,642217	0,587478	0,568659	0,360924	1	
Ownership	0,3037	0,231674	0,255052	0,095659	0,120096	1

Table 4 Berlin Mitte

	<i>Price</i>	<i>Rent</i>	<i>Size</i>	<i>Type</i>	<i>Ownership</i>
Price	1				
Rent	0,891181	1			
Size	0,865226	0,949121	1		
Type	0,82584	0,885733	0,882571	1	
Ownership	0,374892	0,243506	0,158468	0,117041	1

Table 5 Berlin Friedrichsfelde

	<i>Price</i>	<i>Rent</i>	<i>Size</i>	<i>Type</i>	<i>Building</i>	<i>Ownership</i>
Price	1					
Rent	0,221155611	1				
Size	0,331031723	0,922596053	1			
Type	0,3289466	0,7657484	0,8849591	1		
Building	0,6838865	0,2020577	0,1764012	0,0546933	1	
Ownership	0,3367435	-0,0956697	-0,140844	-0,203696	0,253628	1

In the Correlation matrixes it is obvious, that strongest dependence is between Rent price and size of the flat in m². If we more focus on the difference between urban and suburban area, it is visible, that correlation of rent and size of the flat is stronger in the city center. It can be explained as a result of higher demand in the center and also by lower price/m² in suburban areas. Because in the urban areas (city center) most of the houses are made of bricks, we could exclude this factor as it would be irrelevant for the result.

4.3 Comparison using users' references

On internet there are limitless resources of information. Researcher has to put a lot of effort to distinguish between reliable and useful resources and vague and insignificant data. One of great websites providing information concerning urban development and real estate market (besides other statistics) is www.numbeo.com

“Numbeo is a collection of Web pages containing numerical and other itemizable data about cities and countries, designed to enable anyone to contribute or modify content. Numbeo uses the wisdom of the crowd to obtain the most reliable information possible. Numbeo then provides you with a statistical analysis of the data collected. In addition, Numbeo provides a variety of systematic research opportunities for its readers with its compilation of worldwide information.”¹⁴

In following table there is comparison of Prague and Berlin based on users' references:

Table 6 Comparison of Prague and Berlin Numbeo¹⁵

	Prague	Berlin
Price to Income Ratio:	12.87	6.20
Mortgage as Percentage of Income:	88.94%	41.19%
Loan Affordability Index:	1.12	2.43
Price to Rent Ratio - City Centre:	29.26	22.31
Price to Rent Ratio - Outside of Centre:	20.71	18.44
Gross Rental Yield (City Centre):	3.42%	4.48%
Gross Rental Yield (Outside of Centre):	4.83%	5.42%

Information available in the table above is very interesting to examine. Last four figures are highlighted as there is similar calculation in following chapter. There is a

¹⁴ Introduction of Numbeo [online], available at WWW: www.numbeo.com/common

¹⁵ Property prices comparison between Prague and Berlin [online], available at WWW: http://www.numbeo.com/property-investment/compare_cities.jsp?country1=Czech+Republic&country2=Germany&city1=Prague&city2=Berlin

error possibly because of different number of samples in data sets. From the first and second row it is obvious that there is great difference in income in Prague and Berlin so the same it is with purchasing power of inhabitants.

Table 7 Rent per Month in Prague and Berlin

	Prague	Berlin	Difference
Apartment (1 bedroom) in City Centre	12,232.14 CZK	15,228.04 CZK	+24.49 %
Apartment (1 bedroom) Outside of Centre	8,623.27 CZK	11,083.55 CZK	+28.53 %
Apartment (3 bedrooms) in City Centre	23,500.00 CZK	31,821.19 CZK	+35.41 %
Apartment (3 bedrooms) Outside of Centre	14,950.11 CZK	22,538.09 CZK	+50.76 %

In Table 7 results show us differences in a rent/month and it is visible, that Prague center and suburbs are significantly cheaper than in Berlin (by 34,25% in average). It corresponds with results from previous table especially with Price to Income Ratio – living in a flat in Berlin is cheaper compared to average wage rate. *Average Monthly Disposable Salary (After Tax)* by data on Numbeo is estimated: 23 078 CZK in Prague and 51 069 CZK which makes a difference by 121%. That explains Price to income Ratio from the first table.

Table 8 Price/m2 to buy Apartment

	Prague	Berlin	Difference
Price/m2 to Buy Apartment in City Centre	80,466.67 CZK	79,488.99 CZK	-1.22 %
Price/m2 to Buy Apartment Outside of Centre	38,312.50 CZK	47,191.84 CZK	+23.18 %

This table greatly illustrates difference in appraisal of the flats in city centre and outside area. In Berlin the price difference is not so enormous compared to Prague. Apartments in Prague centre are even more expensive than in Berlin which might be explained by a fact that in Prague's central area there is hardly space and possibility for constructions of new building, therefore price of the existing residential

properties is increasing. The causes of the situation were explained in Comparison of Prague and Berlin as well.

4.4 Return on Investment

Another economic aspect with a significant importance in price-setting process on real estate market is Return on Investment (ROI). For purposes of the thesis, calculation is enhanced to show annual percentage of initial investment on return. Simple formula to calculate annual ROI is stated as follows:

$$\text{ROI} = (12 * \text{Rent} / \text{Investment}) * 100$$

In data set of the thesis, Rent prices are not including fees for maintenance, water and electricity, so that it is considered as a Net Profit. All values in following table are in %, as it is results from the formula.

Table 9 Return on Investment

Prague Center	Prague Suburb	Berlin Center	Berlin Suburb
1,96	5,85	3,55	14,33
2,67	5,11	4,58	5,70
2,38	4,91	1,85	6,92
1,93	3,76	3,62	5,65
1,99	5,65	2,10	11,36
1,82	4,64	4,74	7,02
2,20	4,64	4,44	3,18
3,54	5,21	4,95	3,24
3,40	5,56	5,72	2,78
2,25	4,76	4,28	3,12
1,78	4,47	3,39	2,56
1,99	4,72	2,64	2,57
4,38	5,70	2,79	3,31
3,94	4,73	2,45	3,56
2,15	5,07	3,98	2,90
2,02	4,01	4,71	2,43
2,30	4,72	3,40	3,01
1,92	3,77	4,49	1,98
3,54	5,45	1,85	2,66
2,46	3,38	3,65	2,96
2,53	4,81	3,66	4,56

In the table there is highlighted the highest average value recorded in Prague Suburb area. It might be surprising on the first glimpse, but if we focus more precisely on factors affecting ROI it makes sense. This result is caused mainly by very low investment price of residential properties in Prague suburban area. On the other hand, it is very interesting to compare Prague and Berlin concerning center area, as it illustrates decreasing real estate market demand in Prague and increasing situation on the market in Berlin. As it was recorded in chapter 3.7 on the figure, this is just an evidence of ongoing trend in Berlin urban area.

4.5 Payback Period

Another subchapter is dedicated to evaluation of Payback Period. It is intentionally following calculation of ROI, as it is basically period of 100% return on investment. Let's enhance previous formula in order to calculate number of months sufficient to cover all costs associated with acquisition of flat.

$$1. \text{ ROI} = (t * \text{Rent} / \text{Investment}) * 100$$

in following formula **t** has to be expressed from the fraction, **ROI =100**

$$2. 100/100 = t * \text{Rent} / \text{Investment}$$

$$3. t = \text{Investment} / \text{Rent}$$

Various definitions of Payback Period may be found, for better understanding of calculations in this chapter one of them is stated as follows:

*“The length of time required to recover the cost of an investment. The payback period of a given investment or project is an important determinant of whether to undertake the position or project, as longer payback periods are typically not desirable for investment positions.”*¹⁶

The table shows Payback Period in months, as the rent (net profit) is paid monthly. The result is expected to be the same as in ROI, because these two economic aspects are directly dependent.

¹⁶ *Definition of Payback Period*, [online] available at WWW:
<http://www.investopedia.com/terms/p/paybackperiod.asp>

Table 10 Payback Period

	Prague Center	Prague Suburb	Berlin Center	Berlin Suburb
ROI	2,53	4,81	3,66	4,56
ROI / month	0,211	0,401	0,305	0,380
Payback Period	474	249	327	263

What is important to notice in resulting table is length of the payback period, which is very long. ROI might attract many investors, because 3-5% interest rate sounds interesting, but we have to notice how long does it take for investment to fully return.

4.6 Regression Analysis

Regression analysis is a simple method for investigating functional relationship among variables. A real estate appraiser may wish to relate a sale price of a residential property from selected physical characteristics of the building and taxes (local, school, county) paid on the building. The relationship is expressed in a form of equation or a model connecting a *response* or *dependent* variable and one or more *explanatory* or *predictor* variables. In the real estate appraisal example, the response variable is the price of a residential property and the explanatory variables are the characteristics of the building (and the taxes paid on the building).¹⁷

Prague central urban area

Calculations were done using Excel data analyzing tools. Price of the flat is considered dependent variable and as explanatory variable following factors were chosen – Rent, Size, Type (of flat) and ownership. As buildings in Prague city center in the data set are all made of bricks, this factor was intentionally excluded as non-significant. Price of the flats was denominated to millions of CZK for more suitable results.

¹⁷ CHATTERJEE, Samprit a Ali S. HADI. *Regression analysis by example*. Fifth edition. Hoboken, New Jersey: Wiley. ISBN 04-709-0584-0.

<i>Regression Statistics</i>	
R Square	0,80599798
Adjusted R Square	0,774957657

The table above indicates that the explanatory variables explains price of the flat by 77% which showed strong relationship. On real estate market there are many more factors affecting the price, than only the ones we are examining.

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0,963246598	2,56496918	0,375539	0,710427
Rent	-0,000194457	0,000403067	-0,48244	0,633689
Size	0,149261905	0,072425228	2,06091	0,049859
Type	0,579749194	0,45656825	1,269797	0,215849
Ownership	-3,088330606	1,693355457	-1,82379	0,080161

Highlighted factors in the table above are statistically most significant, especially factor of size (as it was also presented in Correlation method chapter). This can be explained by the fact, that the size of the flat will always increase the price of the flat. If size is increased by 1m², the price will increase by 0.149 mio. CZK. By using coefficient from the calculation following equation can be concluded:

$$Y1t = 0,963246598 - 0,000194457x2t + 0,149261905x3t + 0,579749194x4t + - 3,088330606x5t$$

This formula is shown just as an example of result which is base for creating a figure to illustrate regression significance. It is only done for Prague city center, whilst it is not so important for purposes of the thesis.

Prague suburban area – Čimice

<i>Regression Statistics</i>	
R Square	0,921184031
Adjusted R Square	0,838580019

R Square coefficient is slightly higher compared to Prague city center. It might be caused by including another factor to the regression analysis (type of building) or not sufficiently numerous data set.

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-Value</i>
Intercept	0,903957957	0,404592017	2,234245657	0,035043091
Rent	0,000110354	0,000124379	0,887238927	0,383755467
Size	0,036753271	0,020004482	1,8372518	0,078586799
Type	0,063279592	0,12467135	0,507571242	0,616386965
Building	0,31631555	0,191206761	1,654311529	0,111085638
Ownership	0,213434764	0,229064711	0,931766235	0,360736538

Similar results as from the previous example from Prague were conducted. Surprisingly type of the flat doesn't have significant importance this time.

Berlin urban area – Mitte

<i>Regression statistics</i>	
R Square	0,916675807
Adjusted R Square	0,840294536

Interesting results are shown in the table above. It is completely opposite difference then in Prague. Regression statistics here are quite similar to area of Čimice.

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-Value</i>
Intercept	-5,68865261	1,475001319	3,856710184	0,001552503
Rent	0,00031464	0,000286416	1,098540732	0,289289059
Size	0,039364393	0,052994746	0,742798022	0,469078078
Type	0,59318763	0,647620603	0,915949287	0,374184649
Ownership	1,980394558	1,044824873	1,895432057	0,07747195

For the first time in the regression analysis we recorded strong effect of Rent to a price of the flat. These two factors are directly connected. Besides that we found out similar results as with other areas evaluated.

Berlin suburban area – Friedrichsfelde

In area of Berlin suburban district of Friedrichsfelde factor of building type was included, as it very important for price determination. Many houses in the locality are panel houses which has significant influence on price level.

<i>Regression Statistics</i>	
R Square	0,760626829
Adjusted R Square	0,67513641

Stated factors influence the price (dependent variable) by 76%, which is similar figure as in Prague city center. This might be also affected by number of flats in the data set, which is only 20.

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	1,0821	1,0873	0,9952	0,3365
Rent	-0,0003	0,0002	-1,4069	0,1813
Size	0,0757	0,0331	2,2882	0,0382
Type	-0,1526	0,2309	-0,6608	0,5195
Building	-1,8906	0,3769	-5,0157	0,0002
Owner	1,3644	0,8468	1,6112	0,1295

For this regression analysis was chosen 95 confidence level $\alpha = 0.05$. The critical value was 1,75. This number was compared with this result and it indicated that Size and Building are statistically significant. The table can be interpreted as follows: When size of flat increases by 1m^2 , the price of flat will increase by 0,0757 millions CZK.

5. Results and discussion

5.1 Correlation matrix method summary

Results concluded by Correlation method showed strong relationship between size and rent price of the flat. Other factors didn't prove such a significant correlation with price level, but it is mostly because only strongest relationship was considered. In suburban areas factor of type of the building was included, but it didn't prove to be an important determinant of the price. Less significant was factor of ownership, because the correlation model doesn't consider legislative issues, which makes cooperative ownership less attractive for investors.

5.2 Comparison using users' references summary

This chapter is very interesting to summarize as it verifies data concluded in other parts of research. Yield ratio (Return on Investment) results in urban and suburban areas are not so different from other parts of the research. The error might be caused by another data set used by Numbeo website. Another factors explaining situation in Prague and Berlin were Rent and Price to buy an apartment. Results proved that Prague is cheaper in terms of renting the flat, but to buy the flat in a city center investor has to pay more than in Berlin. Also average monthly disposable salary was evaluated and it is much higher in Berlin (by 121 %) which is rather great difference.

5.3 Return on Investment and Payback Period summary

Results from ROI demonstrated that investment to residential properties is a profitable decision. After calculating Payback Period it was shown that it is a very long-term investment taking 27 years in average to fully return. Nevertheless the investment especially in outside of the center can be recommended to investors. And also in the Berlin city center there is a market increase recorded, so it is ideal time to invest in residential properties as it is expected, that rent level will increase in the future.

5.4 Regression analysis summary

Last chapter of the Practical part was dedicated to Regression analysis. This method is often used evaluating Time Series of data, but it can be applied also in field of real estate market. Different factors/determinants affecting the price of residential properties were examined in order to find out which of them is the most significant.

Results show, that strongest relationship is between size and price of the apartment within all areas of data set. Analysis examined 4-5 different factors, depending on area (in center of the city building type evaluation is irrelevant) and results were quite correspondent in all of them. Also ownership type proved to be important in price setting process in most of the areas. Increase/decrease in Price was explained by 84% in average by the factors chosen for analysis. Factors affecting the rest 15% can be discussed, including for example legislation system, proximity to the city center or prominence of the area.

6. Conclusions and recommendations

In the bachelor thesis “Urban Economics: Urban development in two chosen areas” areas of Prague and Berlin were examined. Data set consisting of residential properties prices in 4 different was evaluated by various research methods to illustrate the most significant factors of development on the real estate market. Results show, that the market in Berlin is increasing, therefore it is a good time to invest on local market. Differences between urban and suburban area were more significant in Prague, as the city center is very attractive for investors and other inhabitants migrating there. In fact it the most expensive area in both cities, due to high demand and also historical development. On the other hand in Berlin center area there is more space for new constructions of buildings, which makes this market highly attractive, expecting future growth. Berlin in general proves to be more attractive for investors, as it is recorded by lower difference of urban and suburban areas in terms of price. To summarize main findings of the thesis, growth on the real estate market is expected in both areas (faster in Berlin), therefore investment is recommended, especially in suburban areas.

7. Bibliography and References

Literature

BOGART, William T., *Economics of Cities and Suburbs*, New Jersey, Prentice hall, 1997. ISBN 10: 0135-6997-11

CHATTERJEE, Samprit and Ali S. HADI. *Regression analysis by example*. Fifth edition. Hoboken, New Jersey: Wiley. ISBN 04-709-0584-0.

ÉGERT B., MIHALJEK D., *Determinants of house prices in Central and Eastern Europe*, 2007 online journal

FABOZZI, Frank J., *Capital Budgeting – Theory and Practice*, Canada, John Wiley and Sons, 2002, s. 71, ISBN: 0471-218-332

HARRIS Richard and LARKHAM Peter J., *Changing Suburbs: Foundation, form and function*. Routledge Publishing, 1999, page 8-9, ISBN-13: 978-0419220503

MCCANN, Philip. *Urban and regional economics*. 1st ed. Oxford: Oxford University Press, 2001 ISBN 10: 019-9582-009

MILLS, Edwin S. *Handbook of Regional and Urban Economics*. Amsterdam, North-Holland, 2006 ISBN 13 978-0-444-87970-6

SCHRAM, Joseph F., THOMSETT Michael C. *Real estate appraisal*. Rockwell Pub. 2006. p35 ISBN 18-870-5125-2

Online sources

Definition of Payback Period, [online] available at WWW:

<http://www.investopedia.com/terms/p/paybackperiod.asp>

Property prices comparison between Prague and Berlin [online], available at

WWW:

http://www.numbeo.com/property-investment/compare_cities.jsp?country1=Czech+Republic&country2=Germany&city1=Prague&city2=Berlin

Introduction of Numbeo [online], available at WWW: www.numbeo.com/common

Business Dictionary – definition of Correlation, [online] available from WWW:

<http://www.businessdictionary.com/definition/correlation.html>

Kurzy devizového trhu ČNB, (online) available from WWW:

http://www.cnb.cz/cs/financi_trhy/devizovy_trh/kurzy_devizoveho_trhu/denni_kurz.jsp

Property Index Overview in European Residential Markets [online] available from WWW:

http://www.deloitte.com/assets/Dcom-CzechRepublic/Local%20Assets/Documents/Surveys/2013/EN_PropertyIndex2013A.PDF

IVSC Glossary, [online], 1st Jan. 2014, Available at WWW:

<http://www.ivsc.org/glossary>

Unicef - State of Worlds Children Report 2012 In: [online]. [cit. 2014-3-2].

Available from WWW:

<http://www.unicef.org/sowc2012/pdfs/SOWC-2012-DEFINITIONS.pdf>

Sources of data

www.destatis.de

www.czso.cz

www.hauptstadtmakler.de

www.immobilien.de

www.sreality.cz