Czech University of Life Sciences Prague

Faculty of Economics and Management

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Demographic trends in the Czech Republic and selected European countries

Diploma Thesis

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DIPLOMA THESIS ASSIGNMENT

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European Agrarian Diplomacy

Thesis title

Demographic trends in the Czech Republic and selected European countries

Objectives of thesis

Diploma thesis deals with development assessment of selected demographic indicators in the Czech Republic and Europe.

Methodology

The assessment of development tendencies of selected demographic indicators will be based on statistical data analysis. For own analysis will be used classical decomposition of time series such as trend models and according to data structure also adaptive models.

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Demography, population, ČR, EU, statistical analysis, time series, trend, forecast

Recommended information sources

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Declaration

I hereby declare that I have written the diploma thesis “Demographic trends in the Czech Republic and selected European countries” independently with use of quoted resources in bibliography.

In Prague, on 2013

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Demografické trendy v České republice a vybraných státech Evropy

Souhrn:

Tato diplomová práce se zabývá demografickými trendy v České republice a vybraných evropských státech. Mezi tyto státy patří Německo, Polsko, Slovensko a Rakousko. Hlavním cílem této práce je statistická analýza demografických indikátorů, predikce jejich budoucího vývoje, a poté analýza a porovnání vztahů těchto indikátorů mezi státy.

V teoretické části jsou vysvětleny obecné informace o demografii, a dále jsou pak podrobněji popsány zkoumané demografické indikátory. Nedílnou součástí práce jsou charakteristiky jednotlivých vybraných zemí. Informace o těchto státech mají nejen obecný, ale i demografický charakter. V praktické části jsou aplikovány poznatky z teoretické části práce, zejména pak z metodologie. Metodologické postupy jsou využity během statistické analýzy časových řad každého demografického indikátoru. Tyto analýzy jsou provedeny za pomoci statistického programu IBM SPSS Statistics 20. Výsledky analýz budou vyhodnoceny a porovnány mezi státy.

Klíčová slova:

Demografie, populace, Česká Republika, EU, statistická analýza, časová řada, trend, predikce.

Demographic trends in the Czech Republic and selected European countries

Summary:

The diploma thesis deals with development assessment of selected demographic indicators in the Czech Republic and selected European countries. Those countries are Germany, Poland, Slovakia and Austria. The main aim of the thesis is to analyze the demographic indicators, to predict their future development and then to analyze and compare correlation within these indicators between the states. The priority is to evaluate the results of the Czech Republic with comparison to the other states.

The theoretical part describes general information about Demography as such and there is also a detailed description of each observed demographic indicator. The next important part of the thesis is focused on information about the states. Those data have as general, as demographic character. The information obtained in the theoretical part is applied in the practical part, mainly the information from methodology. Described methodology approaches are used within a statistical analysis of each of the indicator. Analysis of all demographic indicators is performed by using the statistical program IBM SPSS Statistics 20. The result of the analysis will be evaluate and compare within the selected states.

Keywords:

Demography, population, Czech Republic, EU, statistical analysis, time series, trend, forecast.

Content

1 Introduction

The world population exceeded 7 billion and the population of Europe reaches more than 730 million. In spite of the high number of population in the world, nowadays demographic structure has been through some radical changes which need to be observed.

There are no doubts about an importance of observation of statistical analysis such as demographic trends. Fertility, mortality, marriages, divorces and migration are closely connected to national politics of each state. The national politics includes a pension system, a social system, a population policy, a health care system, etc. Due to the fact the main task of each state is to adapt its national politics to current demographic developments of the country. It basically means that every country has to adapt and modernize its systems. Therefore especially in developed countries, the Czech Republic is no exception, there is registered an interest in the analysis of population development. This is due to its position within the overall social, economic, and social development. These problems cannot be solved without analysis of time series in demography such as forecasting etc.

Population development of today's world, the number and the age structure of the population reflects demographic trends in the past, but it is also one of the determining factors for a future development. The demographic structure of the world, especially in the last half-century has changed significantly. An extensive reproduction characterized by many children were born were replaced by an intense form, especially in European countries. Despite a relatively high diversity of demographic structures and demographic trends in the individual countries of the world, current demographic trends seem to have some universal tendencies such as significant changes in fertile behavior. The fertile is under the direct influence of modernization processes and it significantly decreased, it is still falling or it is stagnant at very low values, in particular the overall fecundity. However with the decrease in fertility it is possible to record permanently extending the average duration of human life. Better living conditions, better working conditions, social development and advances in medicine lead to the fact people are not dying prematurely in childhood or during their working lives. Significant long-term decline in the birth rate, which occurs simultaneously with the permanent extending the average length of human life are the global issues. The world population starts gradually and intensely ageing. The mentioned demographic trend is also typical for the Czech Republic and for other developed countries in Europe as well.

The rapid decline level of birth rate, which is one of the most important components of population development, observed in the Czech Republic during mid-90 years followed the trends that have occurred since the mid-60s years in the West. Observed trends in the west countries were carried out under different conditions. However in developed democratic states economy grew, so did the standard of living of the population. Therefore there have been changes in the value orientation of society, with emphasis on the individualistic lifestyle.

2 Main aim and Methodology

The diploma thesis deals with development assessment of selected demographic indicators in the Czech Republic and selected countries from Europe, in this case in Germany, Poland, the Slovak Republic and Austria. The main aim of the thesis is to analyze the demographic indicators and then to compare the results within the selected states. The priority is to evaluate the results of the Czech Republic with comparison to the other states.

The analysis part consists of analysis time series of demographic indicators which demonstrate an estate of population or a movement of population. The estate of population is characterized by the total number of inhabitants of each state. The other indicators representing the movement are fertility, mortality, marriages, divorces and migration.

The assessment development tendencies of selected demographic indicators will be based on statistical data analysis. For own data analysis will be used classical decomposition of time series such as trend models and according to data structure also adaptive models.

3 Methodology

3.1 A General Approach to Time Series Modeling

”A general objective of time series modeling is to develop models for describing the behavior of individual or multiple time series and to propose methodology for specifying, estimating and validating an appropriate model for specific data. Basic approach to analyze time series is following:

• Plot the series and examine the main features of the graph, checking in particular whether there is

a) a trend,

b) a seasonal component,

c) any apparent sharp changes in behavior,

d) any outlying observations.

• Remove the trend and seasonal components to get stationary residuals. To achieve this goal it may sometimes be necessary to apply a preliminary transformation to the data. For example, if the magnitude of the fluctuations appears to grow roughly linearly with the level of the series, then the transformed series $\{\ln X_1, . , \ln X_n\}$ will have fluctuations of more constant magnitude.

There are several ways in which trend and seasonality can be removed, some involving estimating the components and subtracting them from the data, and others depending on differencing the data, i.e., replacing the original series $\{X_t\}$ by $\{Y_t := X_t - X_{t-d}\}$ for some positive integer d. Whichever method is used, the aim is to produce a stationary series, whose values will be refer to as residuals.

• Choose a model to fit the residuals, making use of various sample statistics including the sample autocorrelation function.

• Forecasting will be achieved by forecasting the residuals and then inverting the transformations described above to arrive at forecasts of the original series $\{X_t\}$.

• An extremely useful alternative approach is to express the series in terms of its Fourier components, which are sinusoidal waves of different frequencies. This approach is especially important in engineering applications such as signal processing and structural design. It is important, for example, to ensure that the resonant frequency of a structure does not coincide with a frequency at which the loading forces on the structure have a particularly large component."[1]

3.2 Introduction to time series and forecasting

3.2.1 Time series

"A time series is a set of observations x_t, each one being recorded at a specific time *t*. A *discrete-time time series* (the type to which this book is primarily devoted) is one in which the set T_0 of times at which observations are made is a discrete set, as is the case, for example, when observations are made at fixed time intervals. *Continuous-time time series* are obtained when observations are recorded continuously over some time interval, e.g., when $T_0 = [0, 1]$. "[2]

Any given time series can be divided into four categories: trend, seasonal components, cyclical components, and random fluctuations.

$$Y_t = T_t + S_t + C_t + R_t \tag{3.1}$$

Trend represents the general tendency of a variable over an extended time period. It is usually observed a steady increase or decline in the values of a time series over a given time period. An observed trend can be characterized as linear or non-linear.

[1] BROCKWELL, Peter J., Richard A. DAVIS, Introduction to Time Series and Forecasting, Second Edition, USA: © 2002, 1996 Springer-Verlag NY, Inc., ISBN 0-387-95351-5

[2] BROCKWELL, Peter J., Richard A. DAVIS, Introduction to Time Series and Forecasting, Second Edition, USA: © 2002, 1996 Springer-Verlag NY, Inc., ISBN 0-387-95351-5

Seasonal components to a time series refer to a regular change in the data values of a time series that occurs at the same time every year.

Cyclical Components refer to periodic increases and decreases that are observed over more than a one-year period.

Random (Irregular) Components refer to irregular variations in time series that are not due to any of the three time series components. This is also known as residual or error component. This component is not predictable and is usually eliminated from the time series through data smoothing techniques.

Ordinary least squares (OLS) is a method for estimating the unknown parameters in a linear regression model. This method minimizes the sum of squared vertical distances between the observed responses in the dataset and the responses predicted by the linear approximation. Estimation for stochastic sample regression function (SPR) is following:

$$Y_i = \beta_1 + \beta_2 X_i + u_i = Y_i + u_i \qquad (3.2)$$

where Y_i is the estimated (conditional mean) value of Y_i. Then the following equation

$$u_i = Y_i + Y_i = Y_i + \beta_1 + \beta_2 X_i \qquad (3.3)$$

shows that the u_i (the residuals) are simply the differences between the actual and estimated Y values. Now given *n* pairs of observations on Y and X, we would like to determine the SRF in such a manner that it is as close as possible to the actual Y. To this end the criterion is: sum of the residuals. [1]:

$$\sum u_i = \sum (Y_i - Y_i)^2 \rightarrow \min \qquad (3.4)$$

Ordinary least square method is used within a simple linear regression by using different models. The simple models and their equation are:

- linear model: $f(t) = b_0 + b_1 t$ (3.5)
- polynomial model: $f(t) = b_0 + b_1 t + b_2 t^2 + \dots b_n t^n$ (3.6)
  a) quadratic model: $f(t) = b_0 + b_1 t + b_2 t^2$ (3.7)
  b) cubic model: $f(t) = b_0 + b_1 t + b_2 t^2 + b_3 t^3$ (3.8)
- exponential model: $f(t) = b_0 \, . \, b_1^t$ (3.9)

Where b_0 is a constant, and b_1, b_2,…b_n are estimating parameters of an observing equation.

3.2.2 Forecasting

One of the main purposes of time series modeling is a prediction of future observations. It is given $X_1 \dots X_T$, there is a wish to estimate an observed value X_{T+h}. Prediction can be a *point-wise* X_T(h) or an *interval* (predictive interval): [X_T^1 (h), X_T^2 (h)]. The prediction is connected to a selection of an appropriate model. [2]

3.2.3 Pseudo-forecasting

To assess the selecting the appropriate model and the quality of forecasts it is essential to make pseudo-forecasting. This method is done by shortening the time series of one or more of the data and the subsequent expression of forecasts. By comparing the real data *R* and the predicted data *P* a relevant error of forecasts *r* is obtained. The relevant error is characterized by:

$$r = \frac{P - R}{R} \times 100 \quad [\%] \qquad (3.10)$$

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3.2.4 Correlation of residuals

In statistics, the Pearson correlation coefficient (Pearson's *r*) is a measure of the correlation (linear dependence) between two variables x_i and y_i or their residuals e_i and e_j. The residuals are differences between the observed value and the predicted value, defined as: $e_i = x_i - \hat{x}_i$ and $e_j = y_j - \hat{y}_j$.

The Pearson correlation coefficient of residuals is defined as:

$$r = \frac{\sum_{i,j=1}^{n}(e_i - \bar{e}_i)(e_j - \bar{e}_j)}{\sqrt{\sum_{i=1}^{n}(e_i - \bar{e}_i)^2 \sum_{j=1}^{n}(e_j - \bar{e}_j)^2}} \tag{3.11}$$

The coefficient is giving a value between +1 and −1 inclusive. It is widely used as a measure of the strength of linear dependence between two variables.

In the case of a positive correlation between two values the both variables are simultaneously increasing. In the case of a negative correlation between two variables, one variable increases, the other decreases. In the absence of the linear relationship r = 0.

r = *0.0 – 0.3* weak dependence between variables

r = *0.3 – 0. 7* moderate (average) dependence between variables

r = *0.7 – 0.9* strong dependence between variables

r = *0.9 –1.0* very strong dependence between variables

Squared correlation coefficient R^2 is called the coefficient of determination, $R^2 \in (0, 1)$.

4 Methods and models in demography

4.1 Basic formal demography

4.1.1 Demography in general

Demography is a broad social science discipline. The word demography comes from the Greek word *demos,* which means population and *grafein,* which means to describe or draw.

It is a science which examines a reproduction of human populations. Population is a set of individuals at any given time *t* which satisfy the memberships criterion (for instance in the case of geographic area, the criterion is "being in the area"). Populations can be divided into a *de facto* population and a *de jure* population. [3]

The *de facto* population comprises:

- persons usually resident and present,
- persons temporarily present but usually resident elsewhere.

The *de jure* population consisting of:

- persons usually resident and present,
- persons usually resident but absent. [3]

Demography can be studied as a study of the Earth's entire population, or by specific groups such as: geographic area, age, gender, race, nationality, and a variety of other aspects. Since the main object of the study is demographic reproduction, this is the difference between geography and any other fields which also have the object of interest a human population. The reproduction in this sense is intended as a renewal of a population by nascency and dying out (extinction) of the population. Therefore changes in the population and population growth are the basic themes of demographics. Due to the fact that a population size is a process, numerical status of the population is directly affected by *vital processes* as: *fertility* (births), *mortality* (deaths) and *spatial mobility* (moving). According to that, demography examines a stage and a move of the populations. [4]

On the one hand demography seeks for general periodicities and reproduction patterns of human populations. However, on the other hand it seeks for specific manifestations within specific populations. [4]

During studying a population development demography cooperates with geography of population (which deals with migration and dislocation of the population), because the population development is not only a result of natural population renewal (nascency and extinction), but also a result of spatial mobility (migration). [4]

Demographic events (phenomena) are important events in each human life, as collective phenomena shape the course of demographic reproduction. The most significant demographic events are births and deaths, which are derived from the processes of fertility and mortality. A special type of death is abortion. Other demographic developments affect reproduction indirectly - contracting of marriage (marriages) and their interference (divorce) affects fertility, diseases (morbidity) affect mortality. Therefore in the study of reproduction is also necessary to observe these demographic events such as marriage, divorce, widowhood, illness, etc.

These events are recorded and then studied as collective phenomena, not as individual events in a life of an individual. The collective phenomena are adjusted as processes of birth, death, marriage, divorce, abortion, and then analyzed and looking to the permanent and important characteristics of their development. [4]

<u>Demographic processes</u>

Process means that each individual is experiencing a change in its state. For the individual the event means the actual transition from one state to another, or its implementation process (for example mortality - the process by which an individual passes from the state "living" to "deceased").

Demographic processes are the main indicators of a statement of population and its movement. Each of demographic processes is reflected in the demographic events:

- Fertility by birth.
- Mortality by death.
- Abortion rate by abortion.
- Contracting of marriage.
- Divorce rate by divorce.
- Migration rate by migration.

Those events can be measured by specific rates which will be explained. [4]

Generally, there are many reasons why to observe demographic trends however the basic one is an adaptation. Moreover, the adaptation to demographic developments means that every country has to adapt and modernize its systems for example a pension system, a social system etc. Sustainability of pension systems, intergeneration fiscal equity under population ageing, accounting for health care benefits for future retirees are examples of problems of each country to focus on. Those problems cannot be solved without methods used in demography such as forecasting etc.

A population structure of each country can be influenced by a social-population policy of the country. The Social-population policy is a set of intentionally designed or modified institutional arrangements or it could also be a specific program, which the government of the country influences, directly or indirectly, demographic changes.

Direct instruments influencing population structure directly through special arrangements for example in China a policy of one child.

However indirect instruments are used more often. These instruments influence population through mechanisms. The mechanisms could be a rate of maternity leave or a housing supply etc. The government performs population policy frequently with the use of normative legal acts and continuous change in rate or amount of certain social benefits, taxes or fees. These tools therefore do not cause a change directly and therefore they are not as aggressive and straightforward as direct measures.

4.1.2 Historical background to demography

”Prior to the late nineteenth century, the development of what is known as formal demography is essentially the story of the evolution of the life tables as a means of analyzing and presenting mortality data. This process was driven largely by the commercial interests of the actuarial profession. Before 1900 the topics of fertility, nuptiality, migration and age structure were rarely studied with any degree of mathematical sophistication, though one famous exception is Euler´s invention in 1760 of the concept of the Stable population. Euler´s remarkable achievement occurred some 150 years before Lotka, who is generally regarded as the father of the Stable Population Theory, published his first paper. The original paper is reproduced by Smith and Keyfitz (1977) in their invaluable collection of, and commentary on, dozens of important historical papers tracing the development of mathematical demography.”[3]

”The earliest tables which can be said to bear any resemblance to modern life tables date back to Roman times, but the first real demographic work was that John Graunt, whose analysis, in 1662, of London´s “Bills of Mortality” included the production of a life table of sorts, though the rather obscure method of calculation, discussed at length by Glass (1950). The other important development in the late seventeenth century includes that of Edmund Halley (1693), Astronomer Royal of comet fame. He calculated, for the city of Breslau (now Wroclaw in Polish Silesia), the first table based upon actual numbers of deaths by age.”[4]

”There were few important developments in the eighteenth century, but in the early nineteenth Milne (1815) is generally credited with formalizing the conventional calculation and presentation of the life table as we know it today. Thus, by 1841, when William Farr, the famous Victorian Registrar-General of England, started producing the decennial series of English life tables, which continue to the present, the life table was recognizably similar

[3]NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

[4] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

to its present form. By 1900 the distinctive notation used for life tables today had become established.”[5]

”After 1900 the major developments in formal demography are first attributable to Alfred Lotka, who in three papers totaling just thirteen pages (Lotka 1907; Lotka 1922; Sharpe and Lotka 1911), developed the mathematics of a Stable population, showing how a closed population tend, if the schedules of age-specific mortality and fertility remain constant, to develop along a predictable path to a final, fixed age-structure. Later, in 1925, Lotka, with Louis Dublin (Dublin and Lotka 1925), incorporated the concepts of ´intrinsic´ (or ´true´) rates into the theory.”[6]

”In the field of fertility analysis, the Total Fertility and Net Reproduction Rates, which had been developed by German demographers in the late nineteenth century, became widely used largely through the work of Kuczynski (1935). Cohort analysis of fertility data only really became widely used after the Second World War, especially in American fertility surveys, the classic first application there being by Whelpton (1954).”[7]

”Another post-war development is that of Hajnal´s Singulate Mean Age at Marriage (Hajnal 1953). This is noteworthy as the first of many demographic ´indirect´ techniques whereby information on one topic (here proportions single by age) is used to estimate another (here the mean age at first marriage).”[8]

”By the 1980s the main areas of advance in formal demography are in the areas of model building, much of it made possible by the ever-increasing power and sophistication of computing and related statistical and database tools. An excellent example of this is

[5] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

[6] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

[7] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

[8] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

the multi-regional demographic modeling of Rogers (1975) and others which uses accounting techniques within a framework of matrix algebra."[9]

4.1.3 Demographic measures

"Nearly all demographic data take the form of frequencies of either qualitative or discrete (i.e. counted) quantitative variables. Only rarely are continuous (i.e. measured) quantitative variables used. The statistics used to manipulate such data are *rates*, *ratios* and *proportions*. They thus constitute the most basic tools of formal demography. Essentially, they enable comparison by eliminating differences due to population size".[10]

A *ratio* is any number divided by any other number. As an example could be taken the Sex ratio:

$$Sex\ Ratio = \frac{Males}{Females} \times 100 \qquad (4.1)$$

"A *proportion* is a special type of ratio in which the numerator is included in denominator. For example, the proportion of the population that is female is the number of females (x) divided by the total number of males and females together (x + y).That is, it has the form:"[11]

$$proportion = \frac{x}{x+y} \qquad (4.2)$$

"The term *rate* is used very loosely in demography (as elsewhere) and this can cause confusion. Strictly, the numerator of a rate is a number of events, such as births or deaths,

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[9] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

[10] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

[11] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

occurring during a period of time. The denominator is the number of ´person-years of exposure to risk´ experienced by the population during the period under consideration. The crucial point is that some time period has to be specified. In demography rates are most frequently calculated for periods of one year. This means that the total number of person-years of exposure to risk can usually be approximated by the population at mid-year. To understand this, consider the calculation of an annual death rate. Each person surviving for the whole year will contribute one year to the total number of years of exposure risk, while those who dying during the year will contribute only a fraction of a year. This fraction will be, on average, half a year if people die evenly throughout the year. The total number of years of exposure to risk arrived at by adding these fractions to the total contributed by those who survived is the same as taking the average population total during the year and letting each person in that average contribute a whole year of exposure. And, since the average population can normally be approximated very closely by the population total at mid-year, the mid-year population can, under most circumstances, be used for calculating annual rates. This is why government statistical services produce annual population estimates relating to the middle of each year, rather than the beginning or end."[12]

„It should be reiterated that many measures which are commonly called ´rates´ in demography are strictly ratios, proportions or more complex indices. For example, the ´Literacy Rate´ is just the proportion of the population that is literate while the ´Crude Birth Rate´ is really a ratio since it includes in its denominator the old, children and males, none of whom are at risk of giving birth."[13]

The basic demographic equation

The one of the most fundamental relationships can be written as:

$$P_{t+1} = P_t + B - D + IN - OUT \qquad (4.3)$$

[12] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

[13] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

„In words, the population of an area at time $t + 1$ is just the population at time t plus the number of births between t and $t + 1$, less the number of deaths, plus the number of migrants entering the area, lees the number leaving. The difference between the numbers of births and deaths gives the ´natural increase´, while the difference between the numbers of migrants in and out gives the ´net migration´. Thus the equation can be written as:"[14]

Population change = Natural increase + Net migration

"The equation can also be expressed in terms of rates, by dividing each element by the mid-year population (MYP). Then the rate of population change is:"[15]

$$\frac{P_{t+1} - P_t}{MYP} = \frac{B}{MYP} - \frac{D}{MYP} + \frac{In}{MYP} - \frac{Out}{MYP} \qquad (4.4)$$

"The difference between the Birth Rate and Death Rate is the Rate of Natural Increase, and the difference between the In-and Out-Migration Rates is the Net Migration Rate so the equation can be also written as:"[16]

Growth rate = Rate of natural increase + Net migration rate

4.1.4 Types of demographic data

The materials of demography are data collected in censuses, samples, surveys, registration systems and elsewhere.

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[14] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

[15] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

[16] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

”In statistics it has become customary to contrast censuses and samples. A census is a study comprising the whole population of interest, whereas a sample involves only a part. A population census refers more specifically to a complete count of the population of an area at a given time. Censuses may be combined with samples in various ways. Some data (e.g., income) may be collected for 100% of the population and other data (e.g., income) collected from, say, every 100th unit. A census can be *de facto* or *de jure* based and typically collects such basic information as age, sex, and, perhaps on s sample basis, marital status, literacy, educational attainment, occupation, industry, place of usual residence, place of birth. Most countries of the world (including the United States, England, France, China and India) rely on censuses as the basic source of population data. In practice, censuses are carried out via mail questionnaires and door-to-door interviewing. Since population counts are often used to apportion political power, for military conscription, or for taxation, a census may not always be an innocuous operation”[17]

”In contrast to the statistics usage, in demography censuses typically are contrasted with population registers. Registers provide continuous information about all members of the (typically *de jure*) population. The Nordic countries, Japan and Russia are examples of countries with population registers. Countries with population registers do conduct censuses every five or ten years to provide occupational and educational details that are not included in the population register itself.”[18]

4.2 Fertility

”In demographic usage the tern ´fertility´ relates to the number of live births a woman has actually had. Fertile thus means roughly the opposite of childless. It means that a woman is, or was, a mother. The psychological ability to bear children, on the other hand, is known as ´fecundity´. Fecund is thus the opposite of sterile. The words ´fertile´ and ´fecund´ are therefore used by demographers the other way round from general

[17] ALHO, Juha, SPENCER, Bruce. Statistical Demography and Forecasting. NY, USA: Springer Science+ Business Media, Inc, 2005. ISBN 0-387-22538-2

[18] ALHO, Juha, SPENCER, Bruce. Statistical Demography and Forecasting. NY, USA: Springer Science+ Business Media, Inc, 2005. ISBN 0-387-22538-2

to public. It is thought that the maximum number of children an average woman can theoretically produce is about fifteen if she starts childbearing as soon as possible after menarche, which occurs around ages 12-14 (younger in developed countries than in developing ones), and continues until menopause in her middle or late forties."[19]

There are two ways of approaching the study of fertility:

- Period fertility analysis looks at fertility cross-sectional which means that it examines births occurring during a specified period, normally one year. This kind of analysis is generally simpler than the cohort one.
- Cohort fertility analysis looks at fertility longitudinally and it examines all births occurring to a specific group of women, normally all those born or married during a particular year.

4.2.1 The Child/Woman Ratio

The Ratio (C/WR) is defined as: $$C/WRatio = \frac{Children\ aged\ 0-4}{Women\ aged\ 15-44} \tag{4.5}$$

4.2.2 Crude Birth Rate

CBR is defined as: $$CBR = \frac{Births\ in\ year}{Population\ at\ mid-year} \times 1{,}000 \tag{4.6}$$

This is the simplest and most frequently used measure of fertility. The rate is always expressed per 1,000 Population. The reason why the rate is a ´crude´ rate is that it includes all ages and both sexes in the denominator.

[19] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6.

4.2.3 General Fertility Rate

The usual definition is: $$GFR = \frac{Births\ during\ year}{Women\ \ 15-44\ or\ 49\ at\ mid-year} \times 1{,}000 \qquad (4.7)$$

”This is a fertility rate rather than a birth rate because it expresses the births relative to the number of women of reproductive age. Sometimes the denominator includes women aged 45-49, sometimes it doesn´t. This is important because comparing a 15-44 GFR with a 15-49 GFR will be misleading.”[20]

4.2.4 Age-Specific Fertility Rates

The usual definition is: $$ASFR = \frac{Births\ in\ year\ to\ women\ aged\ x}{Women\ \ aged\ x\ at\ mid-year} \qquad (4.8)$$

ASFRs are often expressed per 1,000. Seven are normally calculated one for each five-year age group 15-19, 20-24….45-49. However single-year rates are also common.

4.2.5 Total Fertility Rate

This is, probably, the most widely used measure of fertility. The rate is calculated very simply just by adding up the ASFRs. However there are two problems complicating matters a bit. First problem is that each ASFR usually relates to five years. Thus, it can be thought of as the average of the rates for each of the five years. Therefore it is necessary to multiply the five-year rate by five. Second problem means that the TFR is almost always expressed per 1,000. If it is the case, then it is necessary to divide by 1,000.

The formula is: $$TFR = \frac{Sum\ \ of\ \ ASFRs \times 5}{1{,}000} \qquad (4.9)$$

[20] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6.

4.2.6 Specific Fertility Rates

”Ordinary Age-Specific Rates (ASFRs) are calculated by dividing the births occurring to women aged *x* by the total number of women aged *x*. However, it is also possible to define fertility rates that are specific to many other things, almost always in conjunction with age. The most common is by marital status.”[21]

”Consider first the General Fertility Rate (GFR). It is really just an ASFR for the age group 15-44 or 15-49. Recall that the GFR is a better measure of fertility than the CBR because it relates the births more closely to the people at risk of having those births. Now, because in most societies births occur predominantly to married women, clearly it would be useful to have a measure similar to the GFR but which used married women rather than all women in the denominator. There are in fact two in common use. One is the General Marital Fertility Rate (GMFR), defined as:

$$GMFR = \frac{All\ \ births}{Married\ \ women\ \ 15-44\ \ or\ \ 49} \times 1{,}000 \tag{4.10}$$

Then, the other is the General Legitimate Fertility Rate (GLFR):

$$GLFR = \frac{Legitimate\ \ births}{Married\ \ women\ \ 15-44\ \ or\ \ 49} \times 1{,}000 \tag{4.11}$$

For completeness, it is useful to define the General Illegitimate Fertility Rate (GIFR):

$$GIFR = \frac{Illegitimate\ \ \ births}{Single,\ widowed,\ divorced\ \ women\ \ 15-44\ \ or\ \ 49} \times 1{,}000 \tag{4.12}$$

[21] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

4.3 Mortality

”Perhaps because death is a precise, easily definable event which occurs just once to each individual, the techniques for analyzing mortality have a longer history and are more developed than those for analyzing fertility. More likely reasons, though, are the actuarial demands of insurance companies during the eighteen and nineteenth centuries. It was only in the early part of the twentieth century that fertility began to be studied to any great extent, but the history of mortality analysis goes back as far as the work of Graunt in the late seventeenth century, and even to Roman times.”[22]

4.3.1 The Crude Death rate

A formula of the Crude Death Rate (CDR) is simply expressed by the deaths in a year divided by the total population at mid-year and multiplied by 1,000.

It is defined as: $$CDR = \frac{Deaths\ in\ year}{Population\ \ at\ \ mid-year} \times 1{,}000 \qquad (4.13)$$

4.4 Marriage and divorce

”Marriage, separation, divorce widowhood and remarriage, collectively called ´nuptiality´ in demography, are not themselves of particular interest to demographers. Rather their importance arises partly from their relationship with the age at which sexual relations begin and end, and partly with the formation and dissolution of families and households.”[23]

For demographers it is quite important to distinguished first marriages from remarriages, mainly because the impact of marriage on fertility is usually determined by the age at first

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[22] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

[23] NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

marriage. However demographers search not for information about age at marriage but about the age at which sexual relation begins because since that age couples become exposed to the risk of childbearing.

Separation, divorce, these events are more culture-specific, than marriage. Each country has different culture and in many countries there is a stigma associated with those events. Therefore some people can state that they are married or single rather than they would say they are divorced or separated. Due to the fact there are problems with interpretation of collected data.

4.4.1 The measurement of marriage

A Crude Marriage Rate can be calculated as: $CMR = \frac{Marriages}{Population} \times 1{,}000$ (4.14)

The numerator is the number of marriages occurring during a year and the denominator is the population in mid-year (longer or shorter period can be used). It is important to note that the numerator means number of marriages not the number of people getting married. General Marriage Rate (GMR) is improved upon the crude rate by eliminating from the denominator groups not at risk of marriage. For example for females there is used only a number of women over legal minimum age of marriage. If it is, for instance, 15 then the GMR for females is:

$$GMR = \frac{Marriages}{Unmarried\ \ females\ \ 15+} \times 1{,}000 \qquad (4.15)$$

A similar equation of GMR can be calculated for men.

4.4.2 The measurement of remarriage and divorce

A Crude Remarriage Rate (CRR) can be measured (for females) as:

$$CRR = \frac{Females\ \ remarrying}{Divorced\ \ and\ \ widowed\ \ females} \times 1{,}000 \tag{4.16}$$

Different Age-specific Remarriage Rates (ASRR) can be calculated as:

$$ASRR = \frac{Females\ \ aged\ \ 30\ \ remarrying}{Widowed\ \ and\ \ divorced\ \ females\ aged\ \ 30} \times 1{,}000 \tag{4.17}$$

Divorce rates can be calculated in the same way as marriage rates are calculated. According to the fact that the same number of males and females, and the same number of males and females must divorce, male and female rates will always be exactly the same, unless the population is polygamous.

”It is very often the case that the focus of interest in analyses of divorce, widowhood and remarriage is not so much on the extent to which they are occurring, but on the proportions of men and women who experience these events during lifetime.“[24]

4.5 Migration

Of three demographics variables - fertility, mortality and migration - procedures for collecting and tabulating of migration data are the least developed and standardized. Thus there is a paucity of information first about population moving between countries (international migration) and within the same country (internal migration), second about movements of population between the developed and the developing world. [5]

[24]NEWELL, Colin. Methods and models in demography. Chichester, England: Wiley, 1994. ISBN 0-471-94729-6

International migration is defined as a change in habitual residence outside a defined country, the UN set a threshold limit of one year of a stay across borders. Migration between countries has important political, economic, social, demographic, psychological, and cultural impacts on an emigration and an immigration country as well. Generally, migration trends in the world are characterized by two basic directions of migration movements: North-South and East-West. Individual trends in the world of international migration are influenced by specific factors, which are generally referred to as "push" and "pull" factors. [6]

"Push" factors which force people to migrate are following:

- economic instability,
- rapid population growth,
- war,
- religious and ethnic conflicts,
- environmental degradation.

"Pull" factors attracting migrants, especially in western countries are:

- political stability,
- economic prosperity,
- high quality of life,
- freedom and the possibility of self-realization. [5]

According to the factors international migration can be divided into two main streams of migration on political and economic.

For countries which do not have population registers, data on international and internal migration are difficult to obtain. All data regarding to number, age, sex of persons leaving or entering an area of a country may be obtained from census, population register or border-control system. Migration is often measured by indirect methods and information which may cause some substantial error in estimates. However statistics of migration are important to understand the size and structure of a defined place in a defined time. [6]

5 Demographic trends in selected European countries

The demographic trends will be examined within selected European countries which are:

- *The Czech Republic.*
- *Germany.*
- *Poland.*
- *Slovakia.*
- *Austria.*

Those population trends reflect trends of each country in fertility, mortality, internal and international migration. These components underlie changes in the size of population, its geographic distribution, its age and sex composition and racial and ethnic composition. They also influence the country's housing composition of household in these countries. [7]

Government of each country has a power to influence demographic trends of the state. It can be done by using special instruments as a part of *population policy*. A definition of a population policy can be for example described as:

”Population policy may be defined as deliberately constructed or modified institutional arrangements and/or specific programs through which governments seek to influence, directly or indirectly, demographic change.“[25]

[25] DEMENY, Paul. 2003. Population policy dilemmas in Europe at the dawn of the Twenty-First Century. 2003

5.1 The Czech Republic

5.1.1 General information

Czech, officially the Czech Republic was established on 1st January 1993 after peaceful dissolution of the Czech and Slovak Federative Republic. It is a landlocked country situated in the Central Europe, sharing borders with Germany on the west, Poland on the north, Austria on the south and Slovakia on the east. The country with its area about 79,000 square kilometers belongs to middle-sized European countries comparable to size of Austria or Ireland. Czech consists of the three historical lands - Bohemia, Moravia and Silesia.

The Czech Republic is a parliamentary democratic country, with a president as its head. The capital city is Prague which is also the largest city. [8]

5.1.2 Demographic trends

”A dramatic change in fertility, family formation and living arrangements took place in the Czech Republic over the 1990s. The establishment of democracy, profound social transformation and transition to the market economy affected the values and demographic behavior of the young Czech generation. After the demise of the totalitarian regime in 1989, a complex transformation of the previous patterns of fertility, reproduction and family life has been in progress in the Czech Republic. Period fertility rates have declined sharply to one of the lowest levels in the world, accompanied by the postponement of childbearing, which proceeded at an unprecedented pace. Correspondingly, marriages have also been postponed, marriage rates have fallen rapidly and the proportion of children born outside marriage has markedly increased. Demographic changes have progressed during an era of profound societal transformation, marked by the establishment of democratic institutions and the economies, in which people's everyday lives have been radically affected."[26]

Number of inhabitants of the Czech Republic in the year 2012 is 10,516,125. Population from the year 1989 is slowly increasing however the population is getting older. Due to the change of political regime in 1989 new opportunities in social-economics (in education, employment, traveling, etc.) sphere increased. Therefore young people postpone their family lives. The high number of marriages in 1990 was influenced by the announced cancellation of loans to newly married couples. Fluctuation in the number of divorces in 1999 was caused by an amendment to the Family Act, effective from August 1st, 1998. Unfortunately from 90´s the average age of men and women getting married is getting higher and also the age of women during giving first birth is increasing. On the other hand with improving and more developing medical care the number of deaths and abortions is after the year 1989 decreasing. [9]

5.1.3 Population policy

A comprehensive and effective policy supporting families (pro-family policy) is based on the belief that the care of children and their education is not only private matter for parents, but also an important element for the successful development of the company. Assistance from the state and society to families with children must be seen as a significant social investment in the future development of the whole society, not only as a burden on the state budget.

Financial support for families takes place in two main areas:

- Indirectly families are financially supported through *tax measures*:
    1. Tax credit for a dependent child living with the taxpayer's in a household (provided in the form of tax credits, in the form of a tax bonus, or a combination of both forms).
    2. Deduction for the spouse (tax credit).

[26] SOBOTKA, Tomáš, ZEMAN, Kryštof, KANTOROVÁ, Vladimíra. Demographic Shifts in the Czech Republic after1989: A Second Demographic Transition View. European Journal of Population 19: 249–277, 2003.© 2003 Kluwer Academic Publishers. Printed in the Netherlands

- In the *social security system*:
    1. Social insurance.
    2. State social support.
    3. Assistance in material need.
    4. Social care benefits for people with disabilities.

Another activities aiming to support a family can be distinguished in three types.

- *Social services* which are designed to help and support individual family members and / or the family as a whole in a difficult social situation.
    1. Social counseling.
    2. Social care services.
    3. Social prevention services, etc.

- *Services to support of working families* which have a preventive and supportive nature. Their purpose is to facilitate and strengthen the partnership and marital cohabitation and parenthood, to support families in caring for children and the harmonization of work and family.

    I. Commercially provided services to support working families:
    1. Assistance with housekeeping.
    2. Leisure and educational activities for children, etc.

    II. Noncommercial services to support working families:
    1. Maternity centers providing leisure activities for children or for families with children (centers for family).
    2. Support in the reconciliation of professional and family roles (especially lectures and counseling).
    3. Support and education for harmonious partnership, marriage and responsible parenthood (especially lectures and courses).
    4. Other kinds of activities to support the functioning of the family.

- *Activities provided within the socio-legal protection of children* for example*:*
  1. Preventive activities in the framework of social-legal protection of children.
  2. Consulting services in the social and legal protection of children.
  3. Activities in the framework of social-legal protection of children in foster care work with children requiring increased attention in the social and legal protection of children.
  4. Providing facilities for social and legal protection of children. [10]

In the Czech Republic mothers first receive cash maternity allowance and after that they receive maternity parental allowance.

Maternity leave:

- In connection with childbirth and caring for a newborn baby, maternity leave for an employee (a mother) takes 28 weeks, in a case of giving birth to 2 or more children the maternity leave takes 37 weeks.
- Maternity leave for an employee usually starts from the beginning of sixth week before the expected birth date, but no earlier than eighth weeks before that date.
- Financial assistance is calculated from the reduction in the daily assessment base rate of 70%.
- Parental leave:
- Parental leave is provided for the child's mother after maternity leave or for the father from the birth of the child, and to the extent which they request, but no longer than l the child reaches the age of 3.
- During a period of parental leave the mother/the father is not required to get any wage compensation by her/his employer. However there is a right to get a state social assistance - parental allowance in accordance with Act No. 117/1995 Coll., On State Social Support.
- Since 2012, the parental allowance is 220 000 CZK. Parents choose the length as they receive parental allowance and according to that they will adjust the amount of parental contribution. Parents usually use the parental allowance from two to four years of age. Parental allowance must not be higher than 70% of the previous month earnings and may not exceed 11 500 CZK.

5.2 *Germany*

5.2.1 General information

The Federal Republic of Germany is located in Western and the Central Europe. It forms a bridge between maritime West of Europe and the continental East, between the warmer South and the cool North. Germany is a triad of mountain ranges, uplands and low-land plains – the Bavarian Alps in the South, the pleasant wooded mountains of the Mittelgebirge in the center of the country and the low country along the North Sea and Baltic Sea coasts in the North. The country covers an area of 357,123 square kilometers and it borders with nine countries: Belgium, the Czech Republic, Denmark, France, the Netherlands, Luxembourg, Poland, Austria and Switzerland. It comprises 16 republics and its capital is Berlin, the largest city in the country. It is one of the major political powers of the European continent and is a leader in many technological advances. The Federal Republic of Germany is a democracy. [11]

5.2.2 Demographic trends

"After the fall of the Berlin Wall in November 1989, East Germany experienced a demographic shock as the ensuing insecurity and disorientation of the population was mirrored in their demographic behavior. The situation is examined with respect to marriage, fertility and mortality. There are now signs of recovery but most people in the New Länder are still traumatized by events: nuptiality and fertility are still extremely low, while mortality is rapidly moving towards West German levels. Future demographic development will very much depend on socio-economic development and the provision of both hard and soft infrastructure conducive to stable partnerships and families since the current 'framework' has proved to be particularly unfriendly to women and children."[27]

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[27] SCHMIED, Doris. Recovery from demographic shock in the New Länder of Germany. GeoJournal 02-2000, Volume 50, © 2001 Kluwer Academic Publishers. Printed in the Netherlands

According to provisional results of the Federal Statistical Office, Germany's population increased to more than 81.8 million at the end of 2011, that is, by 92,000 (+0.1%) in 2012 and it is the most populous state and has the largest economy in the European Union.

Unfortunately demographic change in Germany is marked by low birth rates and a declining population size. Increased life expectancy, the resulting ageing of the population and the growing proportion of the population with an immigrant background affect Germany more than other industrial countries. [12]

The population of Germany has been shrinking since 2003. The reason is that the number of people dying is higher and rising faster than the number of those being born. Since 2003, positive net migration (more people moving to Germany than moving away) has not made up the difference between the death rate and the birth rate. This trend will continue in the coming years. However the trend shows a negative decline in number of population in future. [12]

”There are two reasons for population ageing: Germany has had low birth rates for many years. After reaching a peak in the mid-1960s, known as the "baby boom", average birth rates have steadily declined. Since the mid-1970s, the birth rate in Germany has remained low at an average of 1.4 children per woman. This is well below the rate of 2.1 children needed to replace the parental generation. The low birth rate is due in part to a large proportion of women remaining childless, especially highly educated women; to childbearing at later ages; and to changing notions of the family."[28]

Another important factor in demographic change is a number of people migrating to or emigrating from Germany. The number of Germans emigrating from Germany to other countries has almost tripled since the 1970s. In the year 2010, 141,000 Germans were registered as leaving the country. At the same time, 115,000 Germans moved to Germany, most of them returning home. [12]

[28] Demography report online, Federal Government Report on the Demographic Situation and Future Development of Germany.

5.2.3 Population policy

”In order to preserve government’s ability to function, the public budgets must remain sustainable. An important point of orientation is intergenerational equity. The social insurance systems and the palette of public services should be adjusted to changing conditions and needs. Starting with these four goals, the Federal Government has come up with the following fields of action for its demographic strategy:

• Enabling young people to take part in education and training regardless of their background or gender, facilitating their transition to work and teaching them the basics of a healthy lifestyle from their earliest years.

• Supporting a child- and family-friendly society, including family-friendly housing conditions, and making it easier for couples to decide to have children.

• Improving the ability to combine work and family life, so that people can take responsibility for raising their children or looking after family members in need of care, achieve their occupational potential and maintain it during family-related periods of non-employment.

• Further improving the preconditions for a long and healthy working life; redefining images of ageing; and promoting continuing education and qualification.

• Ensuring the supply of skilled labor and strengthening entrepreneurial initiative by taking advantage of domestic potential – above all by increasing the labor market participation of women and older workers, and through greater immigration of skilled foreign workers.

• Increasing innovation and supporting growing economic productivity through infrastructure and growth-promoting framework conditions.

• Activating the potential of older people, encouraging their participation in society and strengthening their civic engagement.

• Encouraging healthy and independent living as long as possible through measures ranging from age-appropriate housing to family and social networks; ensuring quality and appropriate health and long-term care.

• Setting the framework for demographic change in rural and urban areas, while taking advantage of opportunities to conserve resources and preserve the environment; ensuring the provision of vital services and need-based mobility services; keeping an eye on the equivalence of living conditions; enabling social participation and improving local integration.

• Putting public finances, including those of the social insurance systems, on a solid footing for the long term; ensuring productive and efficient public administration for all.”[29]

Germany has one of the shortest maternity leave in Europe.

Maternity leave consists of maximum 14 weeks before a baby is born.

Parental leave takes maximum 12 months. Parents are allowed to obtain a parental allowance during maximum period of 14 months. The sum of parental allowance depends on previous income and it is replaced by 65% to 100% of the monthly earnings loss after childbirth. The amount is a maximum 1 800 EUR. [13]

[29] Federal Government Report on the Demographic Situation and Future Development of Germany.

5.3 Poland

5.3.1 General information

The Republic of Poland has seven neighbors. The border with Lithuania and Russia runs in the north, Belarus and Ukraine in the east, Germany in the west. Southern neighbors of Poland are the Czech Republic and Slovakia. The Baltic Sea in the north is a border of Poland and Sweden. Its area is about 312,680 square kilometers. Capital and the largest city of Poland is Warsaw. Poland is a democracy, with a president as a head of state.

5.3.2 Demographic trends

Poland has nowadays (2012) about 38.5 million inhabitants however the current demographic situation is bad. This situation is primarily due to a low natural increase and the post-1989 emigration of young people, especially after Poland's accession to the European Union in 2004.

The year 1989 was an important turning point, when fundamental changes in the organization, structure and operation of the state took place. Disintegration of the Soviet bloc caused the communist state was overthrown and democratic rule was re-established in the form of the current Poland. Thus demographic situation of the country was also significantly affected.

"There are many causes of the low natural increase that differ in significance and impact. Among them are the absence of the state's population policy, economic conditions, a difficult housing situation, a rise in the working activity of women, changes in the value systems adopted, a crisis of the family (including partnerships), re-evaluation in the morality system (including sexual freedom and abortions), postponing motherhood untila later period in life, a faith crisis, and advancing secularization of public life, and many other.

The emigration of young people has been largely due to the economic crisis, unemployment, increasing poverty, and lack of perspectives for life. What enhance it are the open labor markets of the European Union states, although recently they have clearly been suffering the effects of the post-2007 economic breakdown.

The demographic situation evolving in the recent years in Poland has generated many unfavorable processes, like the ageing of society and disturbing the age and economic structures of the population, with the country's depopulation as a later consequence.

The probable effects of those processes may include disturbances on the labor markets and a threat to the budgets of the state and regions as well as towns and communes (scarcity of funds for old-age and disability pensions, health care, welfare, investment in infrastructure, etc.). In a later perspective, a highly real demographic breakdown can be a threat to the state's existence and national identity. Therefore one cannot but be concerned about the rather carefree attitude of the authorities to the demographic changes taking place, which reduce this complicated problem to a shift in retirement age and seek a solution of disturbances on the labor market in the opening of the state borders to immigrants."[30]

5.3.3 Population policy

According to the analysis of the situation of polish families presented in the "Report on the situation of Polish Families," the main objectives of family policy in the coming years are following:

- Assist families in obtaining financial independence.
- Improving the living conditions of the population.
- Prepare children and youth for the Family and Social function in society.
- Inhibition of the current negative trends in population and economic development of the country and improvement of the demographic situation.

[30] PARYSEK, Jerzy J., MIERZEJEWSKA, Lidia .Bulletin of geography. Socio–economic Series No. 17 (2012): 109–115.Trajectories of the demographic development of Poland after 1989. ISSN 1732–4254

Ways to accomplish this task are listed in the "Schedule Task" attached to the full version of the "pro-family policy." The specific tasks of attention:

1) Changes in reproductive attitudes to increase the fertility of the family.

2) Stop the decline in the number of marriages.

3) Implementation of an effective support system for housing.

4) Establishing in addition to a joint submission spouses, other family-friendly solutions in the amendment to the tax laws.

5) To improve the working and living conditions of people living in rural areas, including a farmers' income.

6) The introduction of new arrangements for the funding of education and higher education, such as running in the academic year 1998/99 system of student loans.

7) Supporting parents in raising children and young people.

8) A change in the social security system in order to increase the efficiency of their operations.

In general the important ways which Poland should focus on connected to its demographic sphere are following:

- Changes in the demographic and family structure.
- Improving the financial health of families.
- Improving housing conditions and education of the young generation.
- Improving the health of the family.
- Aid to families with disabled children.
- Children welfare (children care).
- Polish families outside the country.
- Culture and Media and the family.
- Legal protection of the family. [14]

Maternity leave in Poland is going to go through some changes. From the year 2013 the paid maternity leave will be extend from six months to one year. This change is a necessary step of supporting fertility in Poland due to the decreasing number of new born children.

Parental leave can be taken for up to 3 years, but only until a child turns 4. To benefit from parental leave, an employee must have been employed for a period of at least 6 months. [15]

5.4 The Slovak Republic

5.4.1 General information

The Slovak Republic has a common history with the Czech Republic. Slovakia was established on 1st January 1993 after peaceful dissolution of the Czech and Slovak Federative Republic.

It has borders with five neighboring countries. In the west it shares borders with Austria and the Czech Republic, to the south with Hungary, with Ukraine in the east and with Poland to the north. The country covers an area of approximately 49,035 square kilometers.

The Slovak Republic is a parliamentary democratic country, with a president as its head. The capital city is Bratislava. [16]

5.4.2 Demographic trends

At 30 September 2012 the Slovak Republic had 5,408,148 inhabitants. The most significant changes in the period after 1989 in Slovakia occurred in number of marriages and fertility. The number of marriages has declined in the marriage rate from high values to the year 2001. Since that time the evolution of marriage in Slovakia has had a fluctuating character and it is primarily related to delay of marriage to the elderly. In the period 1995 - 2005 the average age at first marriage has increased about 4 years - for men to 29.2 years and for women to 27.3 years. The area of fertility and birth rates after 1989 is characterized by very sharp decline in number of births the fertility. Number of children born between 1989 and 2010 were reduced by about a quarter. Unfortunately a process that shows no tendency of improvement, even in the EU, is divorce. The process does not show a tendency of improvement even in the Czech Republic or in the EU. In Slovakia its intensity has been in recent years even higher than in the EU. On the other hand, there is a positive evolution of abortion. Number of abortions in 2010 declined to 17.2 thousand which represents a half of abortions in 1995. [17]

5.4.3 Population policy

Slovak concept is based on the idea of parallel existence of social and family policy. In contrast, population policy "is understood as a part of family policy." Parallel operation of social and family policy lies in the fact that both policies apply systemic approach, which has the character of pro indirect measures. It must avoid the danger pressure on parents and their aim can only be to create the conditions for families to have as many children as they want.

Within the security of families with children in Slovakia five strategic objectives are presented:

1. Achieving a relative economic independence of families as the basis of their civic independence and exercise their responsibility in choosing their future.
2. Success of families in the implementation of their functions.
3. Social stability and quality marital and parental relationships within the meaning of equality and common division of family roles.
4. Creating optimal conditions for the self-reproduction of society.
5. An adoption of such measures, which will enable consistent application of the principle of choice, respectively compatibility when parents decide for a parental or for a job role.

The main goal of family policy is primarily to plan, promote and coordinate the implementation of policies of other ministries so as to reflect the perspective of a single family and its members.

There are reform processes in several areas taking place in the Slovak Republic which have a direct impact on the family. The family is therefore exposed to the amount of social and economic changes. In keeping with the ongoing reforms and the current socio-economic climate it is in the interest of Slovakia to focus primarily on the areas of family policy that require extensive public support from the company.

These priorities are in the need of support:

- To improve an access to education.
- Better availability of housing.
- Coordination of work and family life.
- Legal protection and assistance to families in crisis situations. [18]

In the area of family benefits a design of family allowances can be inspiring. Allowances are provided comprehensively in Slovakia. [18] Tax measures to support families with children include tax credit for a dependent child living in the taxpayer's household, provided in the form of tax credits. Tax measures for families with children are dealt with in the Ministry of Finance of the Slovak Republic. Similarly as in the Czech Republic, among other things, in addition to health and pension insurance, there is also the social support. The state's welfare state supports families with children, single and multiple state social benefits, in order to contribute financially to parents for expenses associated with the birth of a child or more children at the same time and in providing care for dependent children, their education and nutrition.

In providing support for families with children income of families is not monitored. The exception is the provision of an artificial maintenance. Benefits provided to families with children in the system of state social support benefits are financed exclusively from the state budget. Providing individual benefits is regulated by laws that set the conditions for entitlement to individual benefits, their amount, manner and procedure for their disbursement, including those aimed at minimizing possibilities inefficient use of resources.

Families with children obtain the following contributions:

- child allowance,
- supplement to the child allowance,
- parental contribution,
- contribution to the birth of a child,
- supplement to the birth allowance,

- contribution to parents who gave a birth at the same time to three or more children, or who gave a birth to twins frequently within two years,
- contribution to the care of the child,
- spare maintenance,
- contribution to support the spare care of a child. [18]

The situation in Slovakia is very similar to those in the Czech Republic.

Maternity leave usually takes up to 28, respectively 37 weeks (it cannot be less than 14 weeks) and parental leave which can last up to three years of the child.

5.5 Austria

5.5.1 General information

Austria is a landlocked country in the Central Europe. It is bordered by the Czech Republic and Germany to the north, Slovakia and Hungary to the east, Slovenia and Italy to the south, and Switzerland and Liechtenstein to the west. The territory of Austria covers 83,855 square kilometers and has a temperate and alpine climate. Majority of the population speaks German, which is also the country's official language. The Austro-Hungarian Empire collapsed in 1918 with the end of World War I. The First Austrian Republic was established in 1919. Today, Austria is a parliamentary representative democracy. The capital and largest city is Vienna. It is a federal republic comprised of nine independent Federal Provinces: Burgenland, Carinthia, Lower Austria, Upper Austria, Salzburg, Styria, Tyrol, Vorarlberg and Vienna. [19]

5.5.2 Demographic trends

”The number of population is 8,472,503 million in 2012. Austria, a central European country, has a long history of sub-replacement fertility. Completed fertility had dipped below two children per woman already during the (first) demographic transition and rose temporarily above this level among the 1917-1946 cohorts. Following the peak of the baby boom in the early 1960s a substantial fall in fertility lasted until the mid-1980s. Since then Austria has recorded low and relatively stable period fertility, with the period total fertility rate hovering around the level of 1.4. A long-standing trend towards delayed childbearing has been in part responsible for the persistence of such low fertility levels. Also the desired family size has reached relatively low levels: already the late 1950s cohorts have expressed sub-replacement fertility preferences at a young age. Minor swings in period fertility were associated with changes in family policies, in particular parental leave arrangements.”

”As in other European countries, family and living arrangements have been changing rapidly in Austria since the early 1970s. Cohabitation has increasingly become an alternative to marriage, divorce rates have reached very high levels and extramarital childbearing, which was historically common in many regions, has risen substantially. Migration has become an important component of population change, contributing markedly to the continued increase in population size.”[31]

5.5.3 Population policy

”The most important population-related policy measures that came into effect between 1 January 2004 and 2005 referred to taxation, part-time work, pensions, and asylum.” [32]

As part of the tax reform 2004/05 a children’s supplement to the sole earner’s tax credit was introduced in order to compensate for disadvantages compared to dual-earner families. Thus, sole-earner families and single parents receive supplements of 130 € per year for the first, 175 € for the second and 220 € for each further child. In addition, the upper bound of the partner’s income (exemption limit) was raised for sole earners without disqualification. This enables in particular more women to be employed.”[33]

”As of July 2004, parents are entitled to work part-time (i.e., to reduce working hours by at least 40 per cent) until the child's seventh birthday if they work in enterprises with more than 20 employees and have been continuously employed with their present firm for at least three years. Parents working in smaller companies are entitled to take part-time leave up until the child's fourth birthday. Small firms may receive financial assistance when introducing this measure.”[34]

”The first step of the new general pension regulations has come into force in 2004. Existing pensions are not touched. The main objective is to extend working lifetimes and to reduce the level of pensions, the individual cap on any losses being 10 per cent. The possibility of early retirement will gradually be abolished. The second step

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[31] PRSKAWETZ, Alexia, SOBOTKA, Tomáš, BUBER, Isabella, ENGELHARDT, Henriette, GISSER, Richard. Persistent low fertility since the mid-1980s. Demographic research volume 19, article 12, pages 293-360 published 01 july 2008. © 2008 Prskawetz et al.Austria

[32,33,34,]GISSER , Richard. Recent Demographic Trends in Austria until 2004. Vienna Yearbook of Population Research 2005, pp. 237-242.

as of 1 January 2005 is harmonizing the different pension systems. A distinction is made at current age 50. The new unified pension system will apply for those born after 1954. "[35]

In Austria, the mother's duty is to be on maternity leave 8 weeks before and 8 weeks after birth. During this time the mother receives 100% of their original salary. The rest of the parental leave allowance (allowance for caring for a child) is a fixed sum. After 16 weeks baby can cherish mothers and fathers. Parents can stay with children at home maximum 2 years one month of which can benefit both parents and three months can be postponed to a later time to the age of seven years of age. Parental leave is extended by six months if the child's father stays at home. Parents also have the opportunity to take parental leave at "half-time". That can be used until the age of seven years of age. [20]

[35] GISSER , Richard. Recent Demographic Trends in Austria until 2004. Vienna Yearbook of Population Research 2005, pp. 237-242.

6 Analysis of time series of demographic indicators

Analysis of all demographic indicators in the chapter is performed by using the statistical program IBM SPSS Statistics 20. All the analysis is performed within an assumption *ceteris paribus*. This assumption signifies that it is assumed that all analyzed other factors are unchanged. Hence, all the following predictions that are expressed only apply within the same circumstances and without any major changes around the model.

The analyzing demographic indicators are following:

- Total number of population.
- Fertility.
- Mortality.
- Marriages.
- Divorces.
- Migration.

The analysis is derived from actual statistics data from verified sources. The Time series of each indicator is from the year 1989 to the year 2011 (2012) and it does not contain a seasonal component. The objective is to adjust the parameters of a model function to best fit a data set by using OLSM within a regression analysis. The least squares method finds its optimum when the sum of squared residuals is a minimum. Thus the values of time series need to be plot by an appropriate line. In addition, a prediction is made by 2015, with a confidence interval of 95%. An integral part of the analysis is the calculation of residuals, which indicate the difference between the actual values of dependent variables and the values predicted by the model. At the end of the analysis these levels between countries will be correlated. Correlation is performed using the Pearson correlation coefficient and it indicates how demographic indicators of the countries dependent on each other, whether they influence each other.

Other additional tables such as tables of real (observed) values and graphs will be found in supplements.

6.1 Recent demographic trends

Since the beginning of 1990s, Czech, Slovakia and Poland experienced a fundamental shift from a communist regime to a democratic regime and also entered the European Union in 2004. The political, economic, and social changes that accompanied the transformation had a profound influence on the demographic patterns in these countries. Germany also experienced a demographic shock after the fall of the Berlin Wall in 1989 and Austria has recorded low and relatively stable period fertility since 1980s. These all events have affected not only the recent demographic development but also the future demographic development of the states.

The recent demographic trends from 1990´s to the 21st century are represented in the tables within *Supplements no. 1-10*. Those tables express the real data of the demographic indicators. Generally, these data explicit trends which are characterized by low birth rates and reducing mortality, hence it follows an ageing population. In terms of family formation, these are the postponement or even abandonment of marriage and childbearing, the spread of alternative living and increasing numbers of divorces. Nevertheless it is necessary to explain the trends concretely by the real data from the tables mentioned above.

The table of the number of total population shows that population of Czech, Germany, Austria and Slovakia has a similar decreasing and increasing character without any perceptible changes. However in Poland there is a significant decrease in total number of population within the whole time series. The decrease is 403 680 of population between the years 1999 and 2000. This decline could be probably caused by rapid demographic changes in Poland in the 1990s. The ongoing socio-economic transformation influences changes in the family formation which results in the considerable drop in the total fertility rate. The other factor is influencing the total population in Poland is a prevailing negative crude migration rate since 1989.

In the table of the total live births it is shown a significant decrease in the numbers of total live births. The change affected the Czech Republic, Austria, Poland and the Slovak Republic in the year 1994. In case of Czech and Slovakia it lasted to the year 2008. ”Population development in 2008 recorded a further increase in the number of live-born children and total fertility. The number of live-born children in 2008 was 4.9 thousand higher than in the previous year and reached 119.6 thousand. The last time the number of births was higher than this was in 1993"[36]. "The demographic development in 2008 is relatively most positive element significantly increase the number of live births, which is given to the level of 1998."[37] "Poland experienced a major change in fertility patterns, reflected mainly in a drastic drop in fertility rates over the first six years of economic transformation and a further decline accompanied by a shift in birth intensities toward higher ages since the mid-1990s."[38] In connection to the table of the crude birth rate the lowest crude birth rate is recorded in Germany and the highest one in Slovakia.

Mortality is explained by the total numbers of deaths. From the table is noticeable decline of numbers of deaths. Given observed trend in the improvement in mortality will continue in the future. The most probably it is a result of a rapid increase in living standards and the spread of a healthy life style and improving medical care. However the highest crude death rate is recorded in Germany on the other hand the lowest one in Austria.

Formal marriage has not only become less frequent but is also occurring later in life. Due to the fact the total numbers of marriages in the observed countries are rapidly decreasing from the year 1989. The observed example is that in 1989 the highest crude rate of marriages belonged to the Czech Republic, even so in 2011 the country has the lowest crude marriage rate Czech with Austria. Despite the highest crude rate of marriages and strong religion background in Poland, total number of marriages is also decreasing.

The number of divorces in Czech in the past remained just above 31 thousand. The numbers recorded in recent years were also not far from this figure. In spite of that Czech has the highest crude divorce rate within the observed countries. The lowest one is in Poland. The incidence of divorce has tripled since the 1960s in Austria.

Austria as the only one from observed countries is represented by positive crude rates of net migration during all estimated period. More people are entering the country instead

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[36] *Czech Demography: Czech Demography 2010, Vol. 4*. [online]. Praha: the Czech Statistical Office, 2009 [cit. 2013-03-19]. ISSN 1802-7881. Dostupné z: http://www.czso.cz/eng/redakce.nsf/i/czech_demography_2010_vol_4

[37] *Vývoj obyvateľstva v Slovenskej republike*. Bratislava: Štatistický úrad Slovenskej republiky, 2009. ISBN 978-80-89358-30-4

[38] *Demographic Research, Volume 17, Kniha 1*: Stochastic forecast of the population of Poland, 2005-2050. Norderstedt: BoD – Books on Demand, 2008. ISBN 978-38370-3195-9

of leaving it. From the table in *Supplement no. 10* is noticeable that crude net migration rate in Austria and Germany was from the year 1990 to 1992 increasing and in comparison to other countries it was quite high. This trend is connected to fact that in the golden era of economic boom period of the first half of the sixties and seventies was reflected in the rich European countries the lack of local labor. Therefore there was a recruitment of movement and importation of foreign labor from nearby southern Europe, Africa and Asia. At the same time internal European economic space was creating and it involved the common market. The common market consisted of the free movement of goods, services, capital and labor. On the other hand Poland and Slovakia display a negative crude rate of net migration from 1989 to 1992. In case of Poland the negative trend lasted almost whole analyzed times series. This fact has connection to the already mentioned radical political changes during that time in those countries. However it could be also explained as an opposite effect than in case of Austria and Germany. The situation in those countries caused workers moved out as a labor force. In Czech after 1989 political situation was changed and borders were open. Hence in 1990 there was a significant negative crude net migration rate.

6.2 Future estimated demographic trends

6.2.1 Total number of population

A very first analyzed indicator which explains a demographic situation of a country is a total number of the population. The total number of population explains a statement of each mentioned country and the statement is influenced by a movement of the population. The movement is generally explained by indicators as fertility, mortality, marriages, divorces and net migration which play a key role in the demographic development of those countries.

Selections of appropriate models to the indicator of total number of population of each country are based on the following *Tables no. 1-5.*

In case of the Czech Republic, a quadratic model to predict future observations was used. The model was used due to the least relevant error, even though the highest index of determination (R^2) pertains to a cubic model. From the *Graph no. 1* is also distinct that the cubic function is more rapid growing. However, according to the estimated data the growth of population in Czech has a less rapid character. Therefore the quadratic function was selected.

Table no. 1: Model summary and parameters estimates of Czech

Czech						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.104	10274752.181	4098.822			1.49
Quadratic	0.674	10443159.997	-34764.520	1554.534		0.02
Cubic	0.822	10327828.213	15534.595	-3374.175	131.432	1.29
Exponential	0.102	10275184.177	0.00039120			1.50

In case of Germany, Poland and Slovakia a cubic function was used. From the *Graphs no. 2, 4, 5* it is quite clear to observe that the cubic function fits the best.

Table no. 2: Model summary and parameters estimates of Germany

Germany						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.505	80186299.569	112125.888			1.50
Quadratic	0.962	78314327.571	544119.426	-17279.742		0.76
Cubic	0.987	77729254.741	799284.522	-42282.854	666.750	0.17
Exponential	0.504	80176882.721	0.0013884			1.52

Choosing a model for Austria was disputable because all the R squares are high and except a cubic model all relevant errors are low. Nevertheless in connection with estimated data and the *Graph no. 3*, population is expected to have not that increasing character as in case of the cubic function. Despite the lowest relevant error of an exponential model, the exponential trend line is a curve that is used when data values rise or fall in ever larger increments. Thus a linear model was used.

Table no. 3: Model summary and parameters estimates of Austria

Austria						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.968	7640063.714	33261.400			0.07
Quadratic	0.968	7630917.695	35372.019	-84.425		0.21
Cubic	0.979	7545682.360	72545.310	-3726.960	97.134	0.93
Exponential	0.965	7646822.266	0.0041346			0.02

Table no. 4: Model summary and parameters estimates of Poland

Poland						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.001	38330900.891	-1116.471			0.72
Quadratic	0.098	38159374.538	38466.533	-1583.320		1.40
Cubic	0.869	37509265.237	321995.684	-29365.769	740.865	0.13
Exponential	0.001	38329906.859	-2.835E-05			0.72

Table *no. 5*: Model summary and parameters estimates of Slovakia

Slovakia						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.751	5301724.293	5232.827			0.50
Quadratic	0.897	5261284.148	14565.168	-373.294		0.23
Cubic	0.928	5236478.193	25383.674	-1433.377	28.269	0.24
Exponential	0.750	5301753.842	0.0009780			0.51

Predicted data for the total number of population of selected countries, according to the used models, are presented in the *Table no. 6*. In the case of all the observed countries except Germany the number of total population will be increasing.

Table no. 6: Estimated data of total population with a point-wise forecast

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
2013	**10,545,631**	**81,702,548**	**8,471,599**	**38,781,572**	**5,416,911**
2014	**10,590,147**	**81,646,235**	**8,504,860**	**39,051,342**	**5,424,345**
2015	**10,637,773**	**81,609,370**	**8,538,122**	**39,377,955**	**5,433,322**

6.2.2 Fertility

Total number of live births was estimated by using a cubic model within the Czech Republic. In spite of the second highest relative error, the cubic function fit the best into the model. It is displayed in the *Graph no. 6* that number of total live births does not have a rapid increasing character as a quadratic function shows but its character is closer to the cubic model.

Table no. 7: Model summary and parameters estimates of Czech

Czech						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.042	111627.704	-436.486			7.79
Quadratic	0.785	142754.423	-7906.899	311.267		23.20
Cubic	0.825	152541.332	-12336.103	762.971	-12.547	20.85
Exponential	0.030	109932.634	-0.0034604			7.81

Estimation of data within Germany, Austria, Poland and Slovakia was performed by using a quadratic model. Not only for its low relative error and in most of cases high R square, but also that the quadratic model fits the best in to the data. It is shown in the *Graphs no. 7, 8, 9 ,10.*

Table no. 8: Model summary and parameters estimates of Germany

Germany						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.894	867692.107	-9672.813			3.15
Quadratic	0.907	887781.511	-14494.270	200.894		0.45
Cubic	0.908	893247.819	-16968.1252	453.185	-7.008	1.61
Exponential	0.908	872650.700	-0.0127748			2.20

Table no. 9: Model summary and parameters estimates of Austria

Austria						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.717	93441.375	-870.049			7.16
Quadratic	0.790	98154.120	-2001.108	47.127		2.01
Cubic	0.862	91857.618	848.463	-243.480	8.072	7.01
Exponential	0.722	93590.625	-0.0102791			6.43

Table no. 10: Model summary and parameters estimates of Poland

Poland						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.573	514414.261	-7469.043			14.09
Quadratic	0.951	617007.880	-32091.512	1025.936		12.77
Cubic	0.951	612287.631	-29955.297	808.079	6.052	18.94
Exponential	0.557	511869.609	-0.0164639			11.55

Table no. 11: Model summary and parameters estimates of Slovakia

Slovakia						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	b1	b2	b3	
Linear	0.515	73396.368	-998.422			20.39
Quadratic	0.960	89075.879	-4761.505	156.795		4.16
Cubic	0.962	87521.140	-4057.886	85.038	1.993	8.78
Exponential	0.496	72878.246	-0.0151371			18.10

According to the *Table no. 12*, the total number of live births will be from 2012 to 2015 increasing. However the *Table no. 13* demonstrates the lowest crude rate of births will be measured in Germany and the highest one will be measured in 2015 in Slovakia.

Table no. 12: Estimated data of total number of live births

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
2012	122,492	655,634	77,273	437,751	65,114
2013	124,944	650,984	77,581	455,930	68,035
2014	127,039	646,735	77,983	476,161	71,270
2015	128,703	642,888	78,480	498,445	74,819

The same model for each country as in the case of the total number of live births was used.

Table no. 13: Estimated data of crude birth rate (per 1,000 of the population)

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
2012	11.53	8.09	9.15	11.51	12.08
2013	11.66	8.08	9.16	12.01	12.64
2014	11.73	8.07	9.18	12.56	13.25
2015	11.75	8.07	9.21	13.16	13.93

6.2.3 Mortality

To analyze data for Czech a cubic model was used. In the *Graph no. 11* there is presented a situation of total deaths. The cubic function has the highest R square and the lowest relevant error. Therefore it is the most precise model in this case. The line of the function lies between the other models thus it comports with future prognosis that the number of total deaths will not be either rapidly decreasing neither rapidly increasing, it will be somewhere in between.

Table no. 14: Model summary and parameters estimates of Czech

Czech						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.801	124091.917	-970.080			5.67
Quadratic	0.955	131284.184	-2696.224	71.923		0.66
Cubic	0.957	132507.564	-3249.882	128.386	-1.568	0.49
Exponential	0.812	124203.946	-0.0084481			5.10

Situation of total number of deaths in Germany, Austria and Poland was solved by using a quadratic model. In all these cases the quadratic function occurs in the middle of other models (*Graphs no. 12-14*). It also has the lowest relevant error of prognosis.

Table no. 15: Model summary and parameters estimates of Germany

Germany						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.612	902209.186	-3443.642			4.11
Quadratic	0.851	938590.191	-12175.084	363.810		0.23
Cubic	0.899	916584.266	-2215.992	-651.848	28.213	2.81
Exponential	0.607	902247.770	-0.0039581			3.99

Table no. 16: Model summary and parameters estimates of Austria

Austria						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.752	83355.751	-411.849			4.06
Quadratic	0.878	86207.578	-1096.287	28.518		0.78
Cubic	0.940	83522.538	118.865	-95.407	3.442	3.18
Exponential	0.748	83404.568	-0.0052090			3.88

Table *no. 17*: Model summary and parameters estimates of Poland

Poland						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.335	390597.372	-977.078			2.35
Quadratic	0.580	404708.679	-4363.792	141.113		1.39
Cubic	0.700	391382.165	1667.310	-473.957	17.085	6.20
Exponential	0.330	390489.391	-0.0025530			2.31

In Slovakia, a decision about a model was not that obvious. The lowest errors are within a linear model and an exponential model. However in the *Graph no. 15* lines of those models do not intersect the data correctly. A cubic model has the highest R square but it reflects that total number of deaths will be a rapidly decreasing. On the other hand a cubic function shows an increase in deaths with expected decline in future. Hence, the quadratic model was used.

Table no. 18: Model summary and parameters estimates of Slovakia

Slovakia						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.040	53148.783	-28.217			1.37
Quadratic	0.327	54426.479	-334.864	12.777		4.55
Cubic	0.499	55756.554	-936.809	74.165	-1.705	3.12
Exponential	0.038	53133.986	-0.0005225			1.37

Estimated prognosis of the total number of deaths analyze that the number will be slowly increasing within Czech, Germany, Austria Poland and Slovakia.

Table no. 19: Estimated data of total number of deaths

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
2012	106,779	855,943	76,323	381,259	53,749
2013	106,995	861,594	76,624	383,810	54,040
2014	107,233	867,974	76,982	386,643	54,357
2015	107,483	875,080	77,398	389,758	54,700

The crude rate of deaths within the countries is without significant differences.

Table no. 20: Estimated data of crude death rate (per 1,000 of the population)

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
2012	10.27	10.54	9.05	10.02	9.94
2013	10.31	10.66	9.06	10.10	9.99
2014	10.36	10.78	9.07	10.18	10.05
2015	10.43	10.92	9.10	10.28	10.12

6.2.4 Marriages

Nuptiality refers to a frequency of marriages. This indicator was analyzed by using a cubic function for both the total number of marriages and for the crude marriage rate within all of the states. The cubic model has the highest R square for all the countries.

The relevant error is the lowest for Czech, Germany and Slovakia. In case of Austria a quadratic function has the lowest relevant error. However, the cubic function was applied because it intersected the data the best. The lowest relevant error for Poland belongs to an exponential model. Unfortunately it is impossible to use this model in this analyzes as it was already mentioned in the analysis of the total number of population. Therefore nuptiality in Poland was analyzed by the cubic function as well.

In case of this indicator it is predictable that popularity of marriages has and in close future will have a decreasing character. This tendency is presented in the *Graphs no. 16, 17, 19, 20*.

Event so the *Graph no. 18* for Austria displays a decline in nuptiality hence there could be expected in a short future an increase in total number marriages. This increase could also have a decreasing character in few years later.

Table no. 21: Model summary and parameters estimates of Czech

Czech						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.655	74342.336	-1366.238			5.87
Quadratic	0.822	85976.816	-4158.513	116.345		22.30
Cubic	0.904	97014.457	-9153.753	625.774	-14.151	0.92
Exponential	0.706	74236.449	-0.0219884			0.97

Table no. 22: Model summary and parameters estimates of Germany

Germany						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.801	485214.423	-5718.521			7.63
Quadratic	0.910	520893.076	-14281.398	356.787		1.32
Cubic	0.919	535309.796	-20805.887	1022.174	-18.483	2.81
Exponential	0.831	486513.769	-0.0133344			6.23

Table no. 23: Model summary and parameters estimates of Austria

Austria						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.764	45218.431	-458.148			5.72
Quadratic	0.793	46749.837	-825.686	15.314		2.32
Cubic	0.839	44205.019	326.008	-102.139	3.263	5.28
Exponential	0.757	45383.174	-0.0114229			4.99

Table no. 24: Model summary and parameters estimates of Poland

Poland						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.000	219562.079	-65.525			6.70
Quadratic	0.448	255615.244	-8718.284	360.532		28.46
Cubic	0.559	279864.153	-19692.470	1479.712	-31.088	24.73
Exponential	0.001	218691.617	0.0004223			6.10

Table no. 25: Model summary and parameters estimates of Slovakia

Slovakia						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	b1	b2	b3	
Linear	0.523	33515.949	-423.046			8.56
Quadratic	0.805	38772.055	-1684.512	52.561		12.89
Cubic	0.867	42100.067	-3190.651	206.162	-4.267	1.92
Exponential	0.538	33283.627	-0.0137950			6.43

Nowadays unpopularity of marriages evokes that the total numbers of marriages from 2012 to 2015 will be decreasing, except in Austria where the numbers are going to increase.

Table no. 26: Estimated data of total number of marriages

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
2012	**42,149**	**369,232**	**38,299**	**229,794**	**25,291**
2013	**38,173**	**365,225**	**39,496**	**226,617**	**24,518**
2014	**33,326**	**360,489**	**40,978**	**221,737**	**23,517**
2015	**27,522**	**354,915**	**42,765**	**214,966**	**22,263**

However, Poland will obtain in two years the highest crude marriage rate, while Czech will get the lowest one.

Table *no. 27*: Estimated data of crude marriage rate (per 1,000 of the population)

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
2012	**3.92**	**4.52**	**4.47**	**6.02**	**4.63**
2013	**3.49**	**4.48**	**4.56**	**5.93**	**4.47**
2014	**2.96**	**4.43**	**4.69**	**5.79**	**4.25**
2015	**2.34**	**4.36**	**4.85**	**5.59**	**3.99**

6.2.5 Divorces

Analysis of a divorce situation was measured by using a quadratic function, within Czech, Germany and Poland. Despite the lowest error of a cubic model in Czech and Austria and the highest R square for this model in case of all three countries, the quadratic function was used.

The *Graphs no. 21, 22, 23* explain the decision of this selected model. The cubic model is decreasing too rapidly and the quadratic function is located in the middle, between the cubic function and the other functions. Hence, the quadratic model was chosen.

Table no. 28: Model summary and parameters estimates of Czech

Czech						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.0003	30937.043	6.554			12.64
Quadratic	0.049	29492.015	353.361	-14.450		9.89
Cubic	0.151	32330.924	-931.427	116.576	-3.640	1.31
Exponential	0.00013	30852.436	0.0002840			12.20

Table no. 29: Model summary and parameters estimates of Germany

Germany						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.450	157213.731	2105.291			11.46
Quadratic	0.660	132921.619	7935.397	-242.921		0.56
Cubic	0.753	154723.726	-1931.454	763.330	-27.951	14.84
Exponential	0.453	156326.086	0.0123029			12.74

Table no. 30: Model summary and parameters estimates of Austria

Austria						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.442	16484.838	150.466			18.31
Quadratic	0.790	14229.095	691.845	-22.557		7.89
Cubic	0.888	15841.759	-37.989	51.873	-2.068	0.49
Exponential	0.454	16474.854	0.0084272			18.95

The situation in Poland and Slovakia was analyzed by using a cubic function. The cubic model fits into the data the best which is displayed in the *Graphs no. 24, 25.*

Table no. 31: Model summary and parameters estimates of Poland

Poland						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.724	28916.474	1661.113			4.68
Quadratic	0.771	36076.514	-57.297	71.600		18.59
Cubic	0.894	51721.012	-7137.435	793.654	-20.057	3.88
Exponential	0.710	31279.554	0.0341724			7.54

Table no. 32: Model summary and parameters estimates of Slovakia

Slovakia						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.855	7500.609	219.098			15.47
Quadratic	0.857	7669.973	178.450	1.694		21.10
Cubic	0.920	9031.171	-437.579	64.518	-1.745	14.03
Exponential	0.870	7720.566	0.0216409			17.43

The total number of divorces will be decreasing within all the countries from the year 2012-2015.

Table no. 33: Estimated data of total number of divorces

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
2012	**29,649**	**183,449**	**17,840**	**60,299**	**11,567**
2013	**29,295**	**179,481**	**17,427**	**55,928**	**11,148**
2014	**28,911**	**175,027**	**16,968**	**50,135**	**10,596**
2015	**28,499**	**170,088**	**16,465**	**42,801**	**9,901**

The lowest crude rate will still be measured in Poland.

Table no. 34: Estimated data of crude divorce rate (per 1,000 of the population)

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
2012	**2.82**	**2.26**	**2.13**	**1.56**	**2.14**
2013	**2.77**	**2.22**	**2.07**	**1.43**	**2.06**
2014	**2.72**	**2.17**	**2.00**	**1.27**	**1.95**
2015	**2.66**	**2.12**	**1.93**	**1.06**	**1.82**

6.2.6 Net migration

The last demographic indicator, net migration is expressed by a crude rate of net migration. Migration, generally, is one of the most complicated demographic indicators. Monitoring of a movement of people can never be precisely determined. Due to the fact, selection of parameters to estimate future international migration is difficult.

Development of international migration within the selected European countries is almost unpredictable. However it is mainly dependent on the attractiveness of the countries. In spite of the membership in the European Union, relationships between these states within migration should be closely associated. Significant differences in the prices and wage level, the possibility of a higher standard of living in another EU country could be a natural motive for emigration from one country to another and vice versa.

Analysis of the crude rate of net migration rates was performed by using a quadratic function in all cases except in case of Austria, where a linear model was used.

To select an appropriate model was quite difficult. Nevertheless the recent data from each time series were the key drivers in choosing right model for a future prognosis.

In the Czech Republic and the Slovak Republic is observed stable and positive crude rate of net migration. Those countries are attractive for those from countries who now make up the majority of migrants, as. Ukrainians, Vietnamese citizens and other Eastern European countries However mass migration in close future is not expected. In the *Graphs no. 26* and *30* it is displayed the development. The quadratic function fits the best.

Situation of migration is quite similar within Germany and Austria. These countries will need greater immigration by skilled and highly qualified workers in order to mitigate the negative impact of shortages of skilled labor on productivity and growth. In order to make Germany more attractive to highly qualified and skilled workers, the Federal Government will reduce bureaucratic obstacles for eligible workers. The most important single federal measure of the nation-wide integration program published in September 2010 is the integration course, a basic service for all new immigrants and those already living here. From 1st May 2011 workers from the Czech Republic, Estonia, Latvia, Lithuania, Poland, Slovakia, Hungary and Slovenia allowed to enter the German and Austrian labor market without restrictions.

Due to the facts in Germany and Austria, it is expected the net migration to increase. According to the *Graphs no. 27* and *28* the best model for Germany is the quadratic and for Austria it is the linear model.

Poland, on the other side, is the only one country with a negative rate of net migration. The emigration of young people has been largely due to the economic crisis, unemployment, increasing poverty, and lack of perspectives for life. What enhance it are the open labor markets of the European Union states. In connection with that, it is expected that this negative trend is going to last in close future. Nevertheless as a member of EU, Poland could improve its economic, living and social conditions which could be a way how to convince these young people to return and to support their country. Hence in distant future the situation could get improve.

Table no. 35: Model summary and parameters estimates of Czech

Czech						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.325	-1.449	0.236			178.25
Quadratic	0.326	-1.696	0.296	-0.002		205.07
Cubic	0.337	-0.735	-0.1396284	0.042	-0.001	207.87

Table no. 36: Model summary and parameters estimates of Germany

Germany						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.644	7.535	-0.361			146.37
Quadratic	0.841	10.906	-1.170	0.034		68.93
Cubic	0.841	10.874	-1.1553714	0.032	4.155E-05	93.17

Table no. 37: Model summary and parameters estimates of Austria

Austria						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	b1	b2	b3	
Linear	0.033	4.904	-0.073			31.79
Quadratic	0.202	7.692	-0.742	0.028		33.12
Cubic	0.430	12.055	-2.716	0.229	-0.006	74.71
Exponential[a,b,c,d]	0.015	2.147	0.0199630			26.57

Table no. 38: Model summary and parameters estimates of Poland

Poland						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.098	-0.485	0.009			215.58
Quadratic	0.142	-0.383	-0.015	0.001		152.60
Cubic	0.337	-0.670	0.1140087	-0.012	0.00037	137.59

Table no. 39: Model summary and parameters estimates of Slovakia

Slovakia						
Model	**R Square**	Parameters Estimates of Equation				**Relative error**
		Constant	**b1**	**b2**	**b3**	
Linear	0.170	-1.502	0.114			149.87
Quadratic	0.177	-1.910	0.212	-0.004		93.64
Cubic	0.179	-2.165	0.3274803	-0.016	0.00033	189.86

Table no. 40: Estimated data of net crude migration rate (per 1,000 of the population)

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
2012	**3.98**	**2.25**	**3.16**	**-0.17**	**0.83**
2013	**4.15**	**2.73**	**3.08**	**-0.14**	**0.85**
2014	**4.32**	**3.28**	**3.01**	**-0.10**	**0.85**
2015	**4.49**	**3.89**	**2.94**	**-0.06**	**0.85**

6.3 Correlations of indicators

It is also interesting to mention estimated relationships of demographic indicators in comparison with Czech and the other countries. The relationships are represented by correlations of residuals. The correlations are measured by the Pearson correlation coefficient.

In case of total number of population, the Czech Republic has the most significant relationship with the Slovak Republic. The Pearson coefficient is 0.51. This number represents a moderate degree of dependence.

Table no. 41: Correlation of residuals of total number of population

Correlations of residuals of total number of population						
		Czech	**Germany**	**Austria**	**Poland**	**Slovakia**
Czech	Pearson	1	-0.33	0.47*	-0.03	0.51*
	Sig. (2-tailed)		0.12	0.02	0.88	0.01
	N	24	24	24	24	24
Germany	Pearson	-0.33	1	0.58**	-0.07	-0.53**
	Sig. (2-tailed)	0.12		0.00	0.76	0.01
	N	24	24	24	24	24
Austria	Pearson	0.47*	0.58**	1	-0.04	-0.16
	Sig. (2-tailed)	.021	0.00		0.86	0.46
	N	24	24	24	24	24
Poland	Pearson	-0.03	-0.07	-0.04	1	0.05
	Sig. (2-tailed)	0.88	0.76	0.86		0.83
	N	24	24	24	24	24
Slovakia	Pearson	0.51*	-0.53**	-0.16	0.05	1
	Sig. (2-tailed)	0.01	0.01	0.46	0.83	
	N	24	24	24	24	24
*. Correlation is significant at the 0.05 level (2-tailed).						
**. Correlation is significant at the 0.01 level (2-tailed).						

According to all analyzed correlations, the highest Pearson coefficient is observed within crude birth rates. The coefficient is 0.81. This value reflects a strong degree of dependence between Czech and Poland.

Table no. 42: Correlation of residuals of crude birth rates

Correlations of residuals of crude birth rates						
		Czech	**Germany**	**Austria**	**Poland**	**Slovakia**
Czech	Pearson	1	-0.45*	0.54**	0.81**	0.79**
	Sig. (2-tailed)		0.03	0.01	0.00	0.00
	N	23	23	23	23	23
Germany	Pearson	-0.45*	1	-0.62**	-0.26	-0.26
	Sig. (2-tailed)	0.03		0.00	0.23	0.22
	N	23	23	23	23	23
Austria	Pearson	0.54**	-0.62**	1	0.34	0.56**
	Sig. (2-tailed)	0.01	0.00		0.11	0.00
	N	23	23	23	23	23
Poland	Pearson	0.81**	-0.26	0.34	1	0.60**
	Sig. (2-tailed)	0.00	0.23	0.11		0.00
	N	23	23	23	23	23
Slovakia	Pearson	0.79**	-0.26	0.57**	0.60**	1
	Sig. (2-tailed)	0.00	0.22	0.00	0.00	
	N	23	23	23	23	23
*. Correlation is significant at the 0.05 level (2-tailed).						
**. Correlation is significant at the 0.01 level (2-tailed).						

Dependence within crude death rates is very low. However the strongest relationship is between Czech and Slovakia. A value of the Pearson coefficient is only 0.17.

Table no. 43: Correlation of residuals of crude death rates

Correlations of residuals of crude death rates						
		Czech	**Germany**	**Austria**	**Poland**	**Slovakia**
Czech	Pearson	1	0.14	0.01	-0.23	0.17
	Sig. (2-tailed)		0.52	0.95	0.30	0.44
	N	23	23	23	23	23
Germany	Pearson	0.14	1	0.69**	0.48*	-0.25
	Sig. (2-tailed)	0.52		0.00	0.04	0.25
	N	23	23	23	23	23
Austria	Pearson	0.01	0.69**	1	0.45*	-0.30
	Sig. (2-tailed)	0.95	0.00		0.03	0.17
	N	23	23	23	23	23
Poland	Pearson	-0.23	0.48*	0.45*	1	0.21
	Sig. (2-tailed)	0.30	0.04	0.03		0.35
	N	23	23	23	23	23
Slovakia	Pearson	0.17	-0.25	-0.30	0.21	1
	Sig. (2-tailed)	0.44	0.25	0.17	0.35	
	N	23	23	23	23	23
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

On the other side, Czech has a significant relationship with Slovakia within crude marriage rates. There is observed a strong degree of dependence with a level 0.77.

Table no. 44: Correlation of residuals of crude marriage rates

Correlations of residuals of crude marriage rates						
		Czech	**Germany**	**Austria**	**Poland**	**Slovakia**
Czech	Pearson	1	0.10	0.23	0.29	0.77**
	Sig. (2-tailed)		0.64	0.28	0.19	0.00
	N	23	23	23	23	23
Germany	Pearson	0.10	1	0.05	0.19	0.30
	Sig. (2-tailed)	0.64		0.82	0.38	0.16
	N	23	23	23	23	23
Austria	Pearson	0.23	0.05	1	-0.17	0.48*
	Sig. (2-tailed)	0.28	0.82		0.44	0.03
	N	23	23	23	23	23
Poland	Pearson	0.29	0.19	-0.17	1	0.31
	Sig. (2-tailed)	0.19	0.38	0.44		0.15
	N	23	23	23	23	23
Slovakia	Pearson	0.77**	0.30	0.45*	0.31	1
	Sig. (2-tailed)	0.00	0.16	0.03	0.15	
	N	23	23	23	23	23
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

A Relationship between Czech and Germany within crude divorce rates is 0.41 which still represented only by a moderate degree of dependence.

Table no. 45: Correlation of residuals of crude divorce rates

Correlations of residuals of crude divorce rates						
		Czech	**Germany**	**Austria**	**Poland**	**Slovakia**
Czech	Pearson	1	0.41	0.11	0.01	0.06
	Sig. (2-tailed)		0.05	0.62	0.97	0.78
	N	23	23	23	23	23
Germany	Pearson	0.41	1	0.08	-0.03	-0.30
	Sig. (2-tailed)	0.05		0.71	0.89	0.17
	N	23	23	23	23	23
Austria	Pearson	0.11	0.08	1	0.10	0.22
	Sig. (2-tailed)	0.62	0.71		0.64	0.32
	N	23	23	23	23	23
Poland	Pearson	0.01	-0.03	0.10	1	0.47*
	Sig. (2-tailed)	0.97	0.89	0.64		0.02
	N	23	23	23	23	23
Slovakia	Pearson	0.06	-0.30	0.22	0.47*	1
	Sig. (2-tailed)	0.78	0.17	0.32	0.02	
	N	23	23	23	23	23
*. Correlation is significant at the 0.05 level (2-tailed).						

Accordingly to crude rates of net migration, the highest, but still quite low dependence is between Czech and Slovakia 0.06. This fact is also connected to common historical events in the past. However Germany and Austria have an average degree of dependence 0.48, which is quite expected due to the common development in this situation.

Table no. 46: Correlation of residuals of crude rates of net migration

Correlations of redisuals of crude rates of net migration						
		Czech	**Germany**	**Austria**	**Poland**	**Slovakia**
Czech	Pearson	1	-0.31	-0.08	-0.34	0.06
	Sig. (2-tailed)		0.14	0.73	0.11	0.79
	N	23	23	23	23	23
Germany	Pearson	-0.31	1	0.48*	0.02	-0.11
	Sig. (2-tailed)	0.14		0.02	0.93	0.62
	N	23	23	23	23	23
Austria	Pearson	-0.08	0.48*	1	0.03	-0.36
	Sig. (2-tailed)	0.73	0.02		0.89	0.09
	N	23	23	23	23	23
Poland	Pearson	-0.34	0.02	0.03	1	-0.01
	Sig. (2-tailed)	0.11	0.93	0.89		0.95
	N	23	23	23	23	23
Slovakia	Pearson	0.06	-0.11	-0.36	-0.01	1
	Sig. (2-tailed)	0.79	0.62	0.09	0.95	
	N	23	23	23	23	23
*. Correlation is significant at the 0.05 level (2-tailed).						

7 Conclusion

The diploma thesis deals with development assessment of selected demographic indicators in the Czech Republic and selected European countries which are Germany, Poland, Slovakia and Austria. Analyzing indicators are total number of population, fertility, mortality, marriages, divorces and migration.

The main aim of the thesis was to analyze the demographic indicators according to their recent development from the year 1989 to 2011 (2012) and then to predict their future development to the year 2015. Another objective was to analyze and compare correlation within these indicators between the states. These indicators were analyzed by using the statistical program IBM SPSS Statistics 20.

As a first and most important step during the analysis of the indicators it was necessary to select an appropriate model to each indicator within an each state. The selection of the models was not always a clear choice therefore decisions about the models were sometimes based on intuition. All the analysis was performed within an assumption *ceteris paribus* which assumed predictions that were expressed only applied within the same circumstances and without any major changes around the model. Hence, the results of the analysis are following.

Estimated data of the total population with a point-wise forecast show that number of inhabitants will be increasing except in Germany where the population is declining.

Estimated data of the total number of live births present in all cases an increasing character. In Poland the increase is relatively significant. However in Germany the data illustrate a decreasing character.

The total number of deaths will be increasing within all the observing states.

Future development of the total number of marriages and divorces has a decreasing character within a majority of the states.

In case of the crude rates of net migration there are observed significant differences between the states. Poland as the only one state will have a negative crude rate of net migration. Slovakia will also have a notably low crude rate of net migration. Czech, Germany and Austria will have a relatively similar slowly increasing level of crude rate of net migration. Although in Austria the crude rate of net migration will be from the year 2014 to 2015 declining.

Dependence of development of demographic indicators such as the total number of population, the crude death rate, the crude marriage rate and crude rate of net migration in comparison with Czech is the highest with Slovakia. The key driver in this case is a common history. However, Czech has a significant degree within the crude birth rate with Poland and a strong degree of dependence between Czech and Germany is within the crude divorce rate.

All the evaluated prognosis of each indicator is based on the point forecast. However it is necessary to consider its suitability for example in connection with prognosis of Central Statistical Offices. In some cases the point forecast could be quite optimistic therefore estimated data from an interval forecast could be more suitable. For instance within total number of population in all the states except Austria, I consider the data from lower limit of the interval forecast as more appropriate. In case of Austria I suggest the point forecast as suitable.

According to the prognosis demographic trends in the selected countries will have from the period 2012-2015 more or less similar character. The total number of population of Czech, Austria, Poland and Slovakia will slowly increase, in Germany it will decrease. The crude birth rate will be increasing and the crude death rate as well. Unfortunately in case of Germany, the number of total births will decrease. The total number of marriages and divorces will be decreasing, however in Austria the number of marriages will increase. Situation of the crude rate of net migration is quite difficult to predict as it was mentioned, however the positive crude rate of net migration is expected in the analyzed period, except in Poland where the prediction shows the negative crude rate of net migration.

Despite the results, it is necessary to point out that all the forecasts are only estimated data. Nevertheless, in consequence of the political and social-economic changes in 90´s, the main demographic trend for these European countries is generally ageing of population due to the low fertility. This is also connected to the significant decline in nuptiality.

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9 Supplements

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Supplement no. 1: Total number of population

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
1989	10,360,034	78,389,735	7,594,315	37,884,655	5,264,220
1990	10,362,102	79,112,831	7,644,818	38,038,403	5,287,663
1991	10,304,607	79,753,227	7,710,882	38,183,160	5,310,711
1992	10,312,548	80,274,564	7,798,899	38,309,226	5,295,877
1993	10,325,697	80,974,632	7,882,519	38,418,108	5,314,155
1994	10,334,013	81,338,093	7,928,746	38,504,707	5,336,455
1995	10,333,161	81,538,603	7,943,489	38,580,597	5,356,207
1996	10,321,344	81,817,499	7,953,067	38,609,399	5,367,790
1997	10,309,137	82,012,162	7,964,966	38,639,341	5,378,932
1998	10,299,125	82,057,379	7,971,116	38,659,979	5,387,650
1999	10,289,621	82,037,011	7,982,461	38,666,983	5,393,382
2000	10,278,098	82,163,475	8,002,186	38,263,303	5,398,657
2001	10,266,546	82,259,540	8,020,946	38,253,955	5,378,783
2002	10,206,436	82,440,309	8,063,640	38,242,197	5,378,951
2003	10,203,269	82,536,680	8,100,273	38,218,531	5,379,161
2004	10,211,455	82,531,671	8,142,573	38,190,608	5,380,053
2005	10,220,577	82,500,849	8,201,359	38,173,835	5,384,822
2006	10,251,079	82,437,995	8,254,298	38,157,055	5,389,180
2007	10,287,189	82,314,906	8,282,984	38,125,479	5,393,637
2008	10,381,130	82,217,837	8,318,592	38,115,641	5,400,998
2009	10,467,542	82,002,356	8,355,260	38,135,876	5,412,254
2010	10,506,813	81,802,257	8,375,290	38,167,329	5,424,925
2011	10,486,731	81,751,602	8,404,252	38,529,866	5,392,446
2012	10,505,445	81,843,743	8,443,018	38,538,447	5,404,322

Source: epp.eurostat.ec.europa.eu (07.03.2013)

Supplement no. 2: Total number of live births

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
1989	128,356	880,459	88,759	564,431	80,116
1990	130,564	905,675	90,454	547,720	79,989
1991	129,354	830,019	94,629	547,719	78,569
1992	121,705	809,114	95,302	515,214	74,640
1993	121,025	798,447	95,227	494,310	73,256
1994	106,579	769,603	92,415	481,285	66,370
1995	96,097	765,221	88,669	433,109	61,427
1996	90,446	796,013	88,809	428,203	60,123
1997	90,657	812,173	84,045	412,635	59,111
1998	90,535	785,034	81,233	395,619	57,582
1999	89,471	770,744	78,138	382,002	56,223
2000	90,910	766,999	78,268	378,348	55,151
2001	90,715	734,475	75,458	368,205	51,136
2002	92,786	719,250	78,399	353,765	50,841
2003	93,685	706,721	76,944	351,072	51,713
2004	97,664	705,622	78,968	356,131	53,747
2005	102,211	685,795	78,190	364,383	54,430
2006	105,831	672,724	77,914	374,244	53,904
2007	114,632	684,862	76,250	387,873	54,424
2008	119,570	682,514	77,752	414,499	57,360
2009	118,348	665,126	76,344	417,589	61,217
2010	117,153	677,947	78,742	413,300	60,410
2011	108,673	662,685	78,109	388,416	60,813

Source: epp.eurostat.ec.europa.eu (07.03.2013*)*

Supplement no. 3: Crude birth rates

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
1989	12.4	11.2	11.6	14.9	15.2
1990	12.6	11.4	11.8	14.4	15.1
1991	12.5	10.4	12.2	14.3	14.8
1992	11.8	10.0	12.2	13.4	14.1
1993	11.7	9.8	12.0	12.9	13.8
1994	10.3	9.5	11.6	12.5	12.4
1995	9.3	9.4	11.2	11.2	11.5
1996	8.8	9.7	11.2	11.1	11.2
1997	8.8	9.9	10.5	10.7	11.0
1998	8.8	9.6	10.2	10.2	10.7
1999	8.7	9.4	9.8	9.9	10.4
2000	8.8	9.3	9.8	9.9	10.2
2001	8.9	8.9	9.4	9.6	9.5
2002	9.1	8.7	9.7	9.3	9.5
2003	9.2	8.6	9.5	9.2	9.6
2004	9.6	8.6	9.7	9.3	10.0
2005	10.0	8.3	9.5	9.5	10.1
2006	10.3	8.2	9.4	9.8	10.0
2007	11.1	8.3	9.2	10.2	10.1
2008	11.5	8.3	9.3	10.9	10.6
2009	11.3	8.1	9.1	10.9	11.3
2010	11.1	8.3	9.4	10.8	11.1
2011	10.4	8.1	9.3	10.1	11.3

Source: epp.eurostat.ec.europa.eu (07.03.2013)

Supplement no. 4: Total number of deaths

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
1989	127,747	903,441	83,407	383,074	53,902
1990	129,166	921,445	82,952	390,343	54,619
1991	124,290	911,245	83,428	405,716	54,618
1992	120,337	885,443	83,162	394,729	53,423
1993	118,185	897,270	82,517	392,259	52,707
1994	117,373	884,661	80,684	386,398	51,386
1995	117,913	884,588	81,171	386,083	52,686
1996	112,782	882,843	80,790	385,495	51,236
1997	112,744	860,389	79,432	380,200	52,124
1998	109,527	852,382	78,339	375,354	53,156
1999	109,768	846,330	78,200	381,415	52,402
2000	109,001	838,797	76,780	368,027	52,724
2001	107,755	828,541	74,767	363,220	51,980
2002	108,243	841,686	76,131	359,486	51,532
2003	111,288	853,946	77,209	365,230	52,230
2004	107,177	818,271	74,292	363,522	51,852
2005	107,938	830,227	75,189	368,285	53,475
2006	104,441	821,627	74,295	369,686	53,301
2007	104,636	827,155	74,625	377,226	53,856
2008	104,948	844,439	75,083	379,399	53,164
2009	107,421	854,544	77,381	384,940	52,913
2010	106,844	858,768	77,199	378,478	53,445
2011	106,848	852,328	76,479	375,501	51,903

Source: epp.eurostat.ec.europa.eu (07.03.2013)

Supplement no. 5: Crude death rates

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
1989	12.3	11.5	10.9	10.1	10.2
1990	12.5	11.6	10.8	10.2	10.3
1991	12.1	11.4	10.8	10.6	10.3
1992	11.7	11.0	10.6	10.3	10.1
1993	11.4	11.1	10.4	10.2	9.9
1994	11.4	10.9	10.2	10.0	9.6
1995	11.4	10.8	10.2	10.0	9.8
1996	10.9	10.8	10.2	10.0	9.5
1997	10.9	10.5	10.0	9.8	9.7
1998	10.6	10.4	9.8	9.7	9.9
1999	10.7	10.3	9.8	9.9	9.7
2000	10.6	10.2	9.6	9.6	9.8
2001	10.5	10.1	9.3	9.5	9.7
2002	10.6	10.2	9.4	9.4	9.6
2003	10.9	10.3	9.5	9.6	9.7
2004	10.5	9.9	9.1	9.5	9.6
2005	10.5	10.1	9.1	9.6	9.9
2006	10.2	10.0	9.0	9.7	9.9
2007	10.1	10.1	9.0	9.9	10.0
2008	10.1	10.3	9.0	10.0	9.8
2009	10.2	10.4	9.3	10.1	9.8
2010	10.2	10.5	9.2	9.9	9.8
2011	10.2	10.4	9.1	9.7	9.6

Source: epp.eurostat.ec.europa.eu (07.03.2013)

Supplement no .6: Total number of marriages

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
1989	81,262	529,597	42,523	255,643	36,525
1990	90,953	516,388	45,212	255,369	40,435
1991	71,973	454,291	44,106	233,206	32,721
1992	74,060	453,428	45,701	217,240	33,880
1993	66,033	442,605	45,014	207,674	30,771
1994	58,440	440,244	43,284	207,689	28,155
1995	54,956	430,534	42,946	207,081	27,489
1996	53,896	427,297	42,298	203,641	27,484
1997	57,804	422,776	41,394	204,850	27,955
1998	55,027	417,420	39,143	209,430	27,494
1999	53,523	430,674	39,485	219,398	27,340
2000	55,321	418,550	39,228	211,150	25,903
2001	52,374	389,591	34,213	195,122	23,795
2002	52,732	382,911	36,570	191,935	25,062
2003	48,943	382,911	37,195	195,446	26,002
2004	51,447	395,992	38,528	191,824	27,885
2005	51,829	388,451	39,153	206,916	26,149
2006	52,860	373,681	36,923	226,181	25,939
2007	57,157	368,922	35,996	248,702	27,437
2008	52,457	377,055	35,223	257,744	28,293
2009	47,862	378,439	35,469	250,794	26,356
2010	46,746	382,047	37,545	228,337	25,415
2011	45,137	377,816	36,426	206,471	25,621

Source: epp.eurostat.ec.europa.eu (07.03.2013)

Supplement no. 7: Crude marriage rates

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
1989	7.8	6.7	5.6	6.7	6.9
1990	8.8	6.5	5.9	6.7	7.6
1991	7.0	5.7	5.7	6.1	6.2
1992	7.2	5.6	5.8	5.7	6.4
1993	6.4	5.5	5.7	5.4	5.8
1994	5.7	5.4	5.5	5.4	5.3
1995	5.3	5.3	5.4	5.4	5.1
1996	5.2	5.2	5.3	5.3	5.1
1997	5.6	5.2	5.2	5.3	5.2
1998	5.4	5.1	4.9	5.4	5.1
1999	5.2	5.3	4.9	5.7	5.1
2000	5.4	5.1	4.9	5.5	4.8
2001	5.1	4.7	4.3	5.1	4.4
2002	5.2	4.6	4.5	5.0	4.7
2003	4.8	4.6	4.6	5.1	4.8
2004	5.0	4.8	4.7	5.0	5.2
2005	5.1	4.7	4.8	5.4	4.9
2006	5.1	4.5	4.5	5.9	4.8
2007	5.5	4.5	4.3	6.5	5.1
2008	5.0	4.6	4.2	6.8	5.2
2009	4.6	4.6	4.2	6.6	4.9
2010	4.4	4.7	4.5	6.0	4.7
2011	4.3	4.6	4.3	5.4	4.7

Source: epp.eurostat.ec.europa.eu (07.03.2013)

Supplement no. 8: Total number of divorces

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
1989	31,376	176,692	15,489	47,189	8,304
1990	32,055	154,786	16,282	42,436	8,867
1991	29,366	136,317	16,391	33,823	7,893
1992	28,572	135,010	16,296	32,024	8,057
1993	30,227	156,425	16,299	27,891	8,143
1994	30,939	166,052	16,928	31,574	8,666
1995	31,135	169,425	18,204	38,115	8,978
1996	33,113	175,550	18,079	39,449	9,402
1997	32,465	187,802	18,027	42,549	9,138
1998	32,363	192,416	17,884	45,230	9,312
1999	23,657	190,590	18,512	42,020	9,664
2000	29,704	194,408	19,552	42,770	9,273
2001	31,586	197,498	20,582	45,308	9,817
2002	31,758	204,214	19,918	45,414	10,960
2003	38,824	213,975	19,066	48,632	10,716
2004	33,060	213,691	19,590	56,332	10,889
2005	31,288	201,693	19,453	67,578	11,553
2006	31,415	190,928	20,336	71,912	12,716
2007	31,129	187,072	20,516	66,586	12,174
2008	31,300	191,948	19,701	65,475	12,675
2009	29,133	185,817	18,806	65,345	12,671
2010	30,783	187,027	17,474	61,300	12,015
2011	28,113	187,640	17,295	64,594	11,102

Source: epp.eurostat.ec.europa.eu (07.03.2013)

Supplement no. 9: Crude divorce rates

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
1989	3.0	2.2	2.0	1.2	1.6
1990	3.1	1.9	2.1	1.1	1.7
1991	2.8	1.7	2.1	0.9	1.5
1992	2.8	1.7	2.1	0.8	1.5
1993	2.9	1.9	2.1	0.7	1.5
1994	3.0	2.0	2.1	0.8	1.6
1995	3.0	2.1	2.3	1.0	1.7
1996	3.2	2.1	2.3	1.0	1.7
1997	3.2	2.3	2.3	1.1	1.7
1998	3.1	2.3	2.2	1.2	1.7
1999	2.3	2.3	2.3	1.1	1.8
2000	2.9	2.4	2.4	1.1	1.7
2001	3.1	2.4	2.6	1.2	1.8
2002	3.1	2.5	2.5	1.2	2.0
2003	3.8	2.6	2.3	1.3	2.0
2004	3.2	2.6	2.4	1.5	2.0
2005	3.1	2.4	2.4	1.8	2.1
2006	3.1	2.3	2.5	1.9	2.4
2007	3.0	2.3	2.5	1.7	2.3
2008	3.0	2.3	2.4	1.7	2.3
2009	2.8	2.3	2.2	1.7	2.3
2010	2.9	2.3	2.1	1.6	2.2
2011	2.7	2.3	2.1	1.7	2.1

Source: epp.eurostat.ec.europa.eu (07.03.2013)

Supplement no. 10: Crude net migration rates

GEO/TIME	Czech	Germany	Austria	Poland	Slovakia
1989	0.1	9.5	5.9	-0.7	-0.5
1990	-5.7	8.3	7.6	-0.3	-0.4
1991	0.3	7.5	9.9	-0.4	-7.3
1992	1.1	9.6	9.1	-0.3	-0.6
1993	0.5	5.7	4.2	-0.4	0.3
1994	1.0	3.9	0.4	-0.5	0.9
1995	1.0	4.9	0.3	-0.5	0.5
1996	1.0	3.4	0.5	-0.3	0.4
1997	1.2	1.1	0.2	-0.3	0.3
1998	0.9	0.6	1.1	-0.3	0.2
1999	0.9	2.5	2.5	-0.4	0.3
2000	0.6	2.0	2.2	-0.5	-4.1
2001	-4.2	3.3	5.2	-0.4	0.2
2002	1.2	2.7	4.3	-0.5	0.2
2003	2.5	1.7	5.2	-0.4	0.3
2004	1.8	1.0	6.6	-0.2	0.5
2005	3.5	1.0	6.1	-0.3	0.6
2006	3.4	0.3	3.0	-0.9	0.7
2007	8.1	0.5	4.1	-0.5	1.3
2008	6.9	-0.7	4.1	-0.4	1.3
2009	2.7	-0.1	2.5	0.0	0.8
2010	1.5	1.6	3.3	-0.1	0.6
2011	1.6	3.4	4.4	-0.1	0.5

Source: epp.eurostat.ec.europa.eu (07.03.2013)

Supplement no. 11: Estimated intervals of total numbers of population with a confidence interval 95%

	LCL_1	UCL_1	LCL_2	UCL_2	LCL_3	UCL_3	LCL_4	UCL_4	LCL_5	UCL_5
GEO/TIME	**Czech**		**Germany**		**Austria**		**Poland**		**Slovakia**	
2013	**10,411,316**	**10,679,945**	**81,309,019**	**82,096,076**	**8,372,412**	**8,570,786**	**38,531,452**	**39,031,692**	**5,381,243**	**5,452,579**
2014	**10,448,307**	**10,731,988**	**81,183,274**	**82,109,196**	**8,404,725**	**8,604,995**	**38,757,091**	**39,345,592**	**5,382,384**	**5,466,306**
2015	**10,486,818**	**10,788,728**	**81,052,791**	**82,165,949**	**8,436,976**	**8,639,267**	**39,024,202**	**39,731,708**	**5,382,876**	**5,483,768**

Supplement no. 12: Estimated intervals of total live births with a confidence interval 95%

	LCL_1	UCL_1	LCL_2	UCL_2	LCL_3	UCL_3	LCL_4	UCL_4	LCL_5	UCL_5
GEO/TIME	**Czech**		**Germany**		**Austria**		**Poland**		**Slovakia**	
2012	**103,267**	**141,717**	**599,664**	**711,604**	**68,809**	**85,737**	**398,479**	**477,023**	**60,083**	**70,144**
2013	**102,062**	**147,826**	**591,619**	**710,348**	**68,604**	**86,558**	**414,276**	**497,584**	**62,699**	**73,371**
2014	**99,202**	**154,876**	**583,239**	**710,230**	**68,382**	**87,585**	**431,609**	**520,714**	**65,563**	**76,977**
2015	**94,588**	**162,819**	**574,517**	**711,259**	**68,141**	**88,819**	**450,471**	**546,418**	**68,674**	**80,964**

Supplement no. 13: Estimated intervals of crude birth rates with a confidence interval 95%

	LCL_1	UCL_1	LCL_2	UCL_2	LCL_3	UCL_3	LCL_4	UCL_4	LCL_5	UCL_5
GEO/TIME	**Czech**		**Germany**		**Austria**		**Poland**		**Slovakia**	
2012	**9.70**	**13.35**	**7.38**	**8.81**	**8.22**	**10.08**	**10.49**	**12.54**	**11.16**	**13.00**
2013	**9.48**	**13.83**	**7.32**	**8.84**	**8.17**	**10.15**	**10.92**	**13.09**	**11.66**	**13.62**
2014	**9.09**	**14.38**	**7.26**	**8.89**	**8.12**	**10.23**	**11.39**	**13.72**	**12.21**	**14.30**
2015	**8.51**	**14.99**	**7.20**	**8.95**	**8.07**	**10.35**	**11.91**	**14.41**	**12.81**	**15.06**

Supplement no. 14: Estimated intervals of total deaths with a confidence interval 95%

	LCL_1	UCL_1	LCL_2	UCL_2	LCL_3	UCL_3	LCL_4	UCL_4	LCL_5	UCL_5
GEO/TIME	**Czech**		**Germany**		**Austria**		**Poland**		**Slovakia**	
2012	**101,953**	**111,605**	**825,403**	**886,483**	**73,343**	**79,303**	**361,599**	**400,919**	**51,670**	**55,828**
2013	**101,251**	**112,739**	**829,202**	**893,987**	**73,464**	**79,785**	**362,957**	**404,662**	**51,835**	**56,246**
2014	**100,245**	**114,221**	**833,327**	**902,620**	**73,602**	**80,363**	**364,339**	**408,946**	**51,999**	**56,716**
2015	**98,919**	**116,047**	**837,774**	**912,387**	**73,758**	**81,038**	**365,742**	**413,773**	**52,160**	**57,239**

Supplement no. 15: Estimated intervals of crude death rates with a confidence interval 95%

	LCL_1	UCL_1	LCL_2	UCL_2	LCL_3	UCL_3	LCL_4	UCL_4	LCL_5	UCL_5
GEO/TIME	**Czech**		**Germany**		**Austria**		**Poland**		**Slovakia**	
2012	**9.80**	**10.74**	**10.23**	**10.86**	**8.72**	**9.39**	**9.53**	**10.50**	**9.52**	**10.36**
2013	**9.81**	**10.81**	**10.32**	**10.99**	**8.70**	**9.42**	**9.58**	**10.61**	**9.55**	**10.44**
2014	**9.83**	**10.90**	**10.42**	**11.14**	**8.69**	**9.46**	**9.63**	**10.74**	**9.58**	**10.53**
2015	**9.85**	**11.00**	**10.53**	**11.31**	**8.68**	**9.51**	**9.69**	**10.88**	**9.61**	**10.64**

Notes:

LCL = lower limit, UCL = upper limit

Supplement no. 16: Estimated intervals of total marriages with a confidence interval 95%

	LCL_1	UCL_1	LCL_2	UCL_2	LCL_3	UCL_3	LCL_4	UCL_4	LCL_5	UCL_5
GEO/TIME	**Czech**		**Germany**		**Austria**		**Poland**		**Slovakia**	
2012	**30,905**	**53,394**	**330,223**	**408,241**	**33,772**	**42,826**	**184,265**	**275,322**	**20,708**	**29,874**
2013	**24,789**	**51,557**	**318,794**	**411,655**	**34,108**	**44,884**	**172,427**	**280,807**	**19,063**	**29,973**
2014	**17,043**	**49,608**	**304,004**	**416,974**	**34,423**	**47,533**	**155,812**	**287,661**	**16,881**	**30,153**
2015	**7,567**	**47,477**	**285,690**	**424,140**	**34,732**	**50,799**	**134,171**	**295,760**	**14,130**	**30,396**

Supplement no. 17: Estimated intervals of crude marriage rates with a confidence interval 95%

	LCL_1	UCL_1	LCL_2	UCL_2	LCL_3	UCL_3	LCL_4	UCL_4	LCL_5	UCL_5
GEO/TIME	**Czech**		**Germany**		**Austria**		**Poland**		**Slovakia**	
2012	**2.83**	**5.04**	**4.00**	**5.06**	**3.93**	**5.00**	**4.83**	**7.25**	**3.79**	**5.49**
2013	**2.19**	**4.82**	**3.87**	**5.12**	**3.93**	**5.20**	**4.52**	**7.39**	**3.47**	**5.49**
2014	**1.39**	**4.59**	**3.69**	**5.22**	**3.92**	**5.47**	**4.07**	**7.57**	**3.04**	**5.50**
2015	**0.42**	**4.34**	**3.46**	**5.33**	**3.90**	**5.80**	**3.50**	**7.79**	**2.50**	**5.52**

Supplement no. 18: Estimated intervals of total divorces with a confidence interval 95%

	LCL_1	UCL_1	LCL_2	UCL_2	LCL_3	UCL_3	LCL_4	UCL_4	LCL_5	UCL_5
GEO/TIME	**Czech**		**Germany**		**Austria**		**Poland**		**Slovakia**	
2012	**22,828**	**36,470**	**150,566**	**216,331**	**15,977**	**19,704**	**46,625**	**73,973**	**10,129**	**13,005**
2013	**22,060**	**36,529**	**144,604**	**214,358**	**15,450**	**19,404**	**39,652**	**72,203**	**9,436**	**12,860**
2014	**21,173**	**36,649**	**137,724**	**212,331**	**14,854**	**19,083**	**30,335**	**69,935**	**8,514**	**12,678**
2015	**20,166**	**36,831**	**129,920**	**210,256**	**14,188**	**18,741**	**18,535**	**67,067**	**7,349**	**12,453**

Supplement no. 19: Estimated intervals of crude divorce rates with a confidence interval 95%

	LCL_1	UCL_1	LCL_2	UCL_2	LCL_3	UCL_3	LCL_4	UCL_4	LCL_5	UCL_5
GEO/TIME	**Czech**		**Germany**		**Austria**		**Poland**		**Slovakia**	
2012	**2.15**	**3.49**	**1.86**	**2.66**	**1.87**	**2.39**	**1.19**	**1.92**	**1.87**	**2.41**
2013	**2.06**	**3.48**	**1.80**	**2.64**	**1.79**	**2.34**	**1.00**	**1.87**	**1.74**	**2.38**
2014	**1.96**	**3.48**	**1.72**	**2.63**	**1.71**	**2.30**	**0.74**	**1.80**	**1.56**	**2.35**
2015	**1.84**	**3.48**	**1.64**	**2.61**	**1.61**	**2.25**	**0.42**	**1.71**	**1.34**	**2.30**

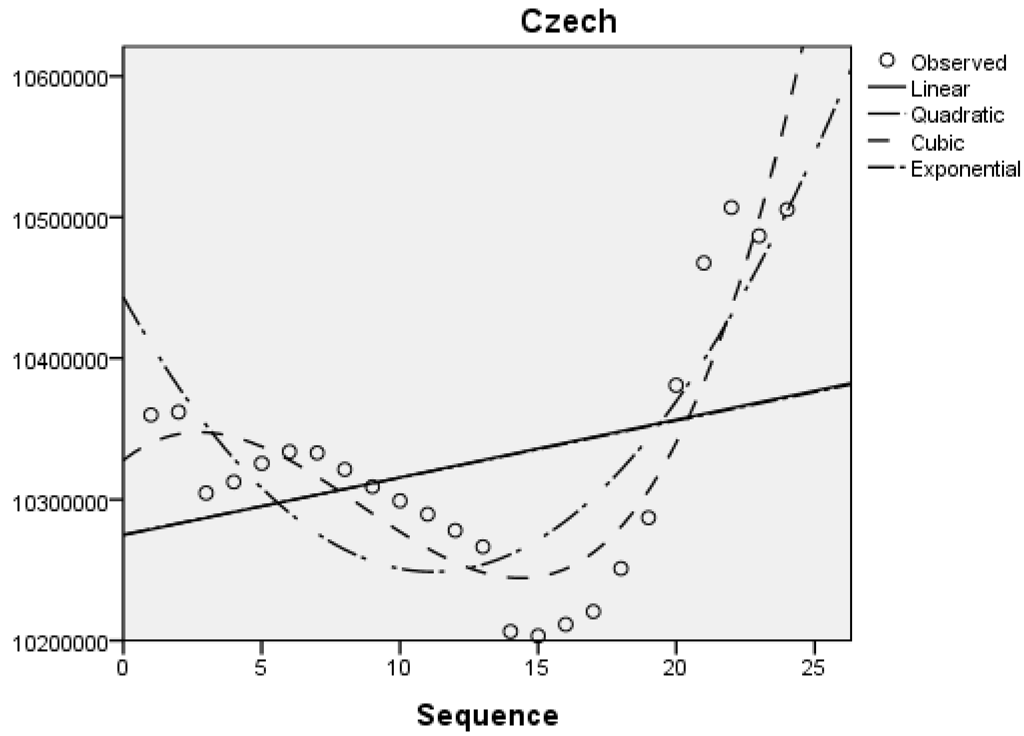
Supplement no. 20: Estimated intervals of crude net migration rates with a confidence interval 95%

	LCL_1	UCL_1	LCL_2	UCL_2	LCL_3	UCL_3	LCL_4	UCL_4	LCL_5	UCL_5
GEO/TIME	**Czech**		**Germany**		**Austria**		**Poland**		**Slovakia**	
2012	**-4.25**	**10.28**	**-0.97**	**5.47**	**-4.93**	**8.09**	**-0.38**	**0.61**	**-3.69**	**5.36**
2013	**-5.93**	**11.35**	**-0.69**	**6.14**	**-7.73**	**7.77**	**-0.30**	**0.89**	**-3.95**	**5.65**
2014	**-8.21**	**12.82**	**-0.38**	**6.93**	**-11.34**	**7.51**	**-0.22**	**1.22**	**-4.28**	**5.98**
2015	**-11.10**	**14.67**	**-0.04**	**7.83**	**-15.82**	**7.29**	**-0.14**	**1.63**	**-4.68**	**6.37**

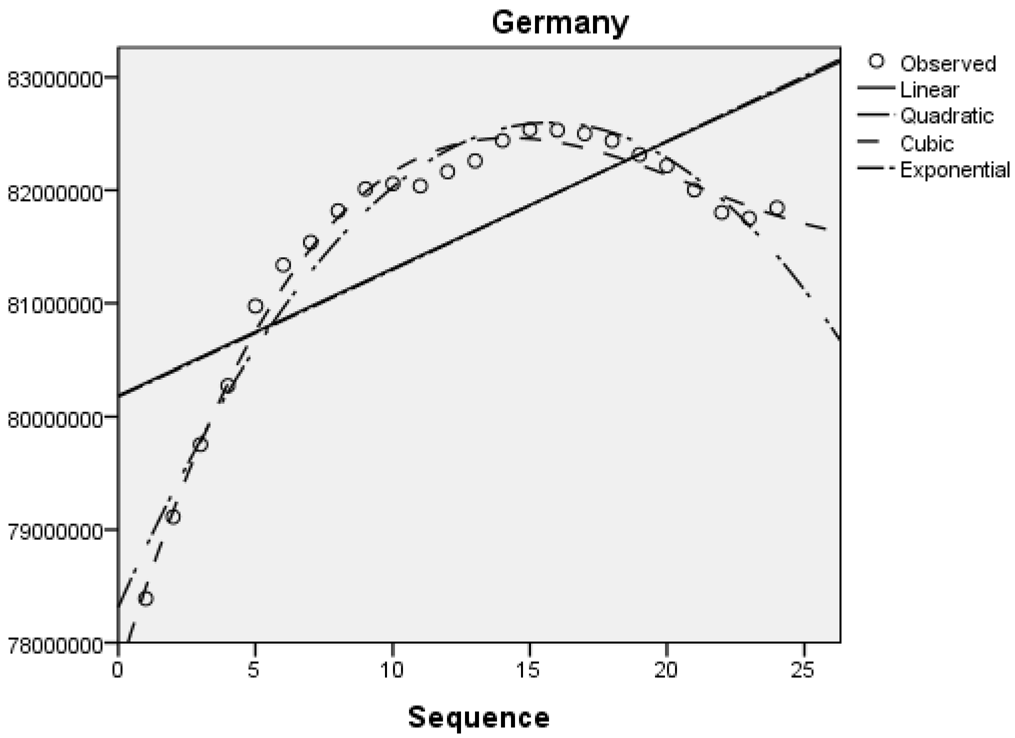
Notes:

LCL = lower limit, UCL = upper limit

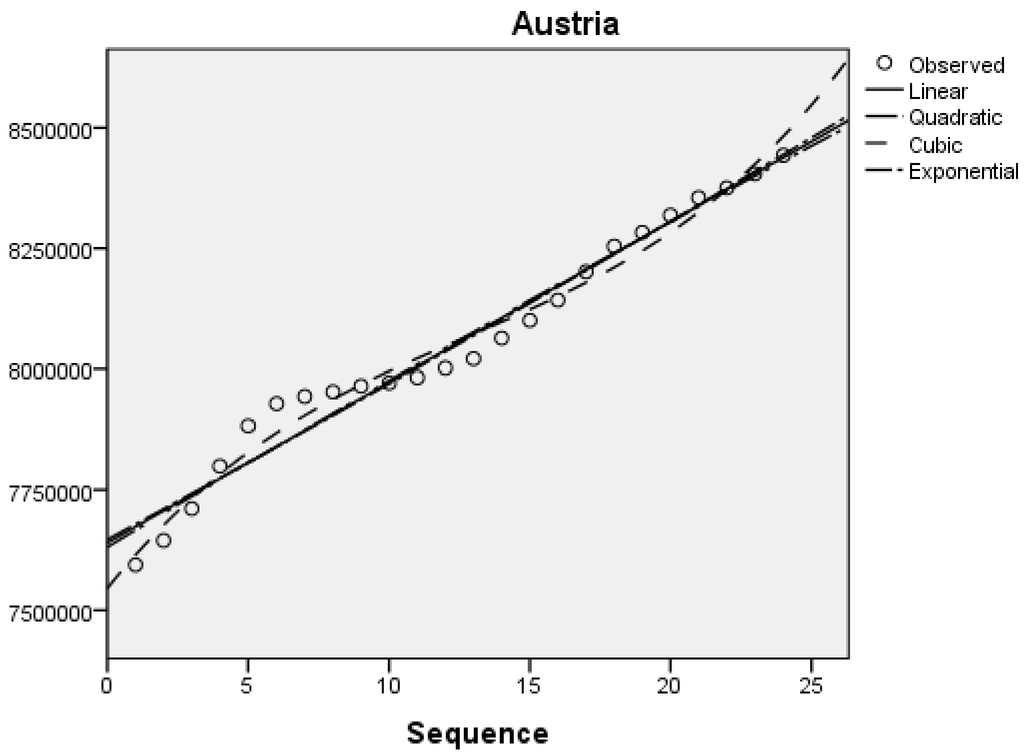
Graph no. 1: Development of total number of population in Czech



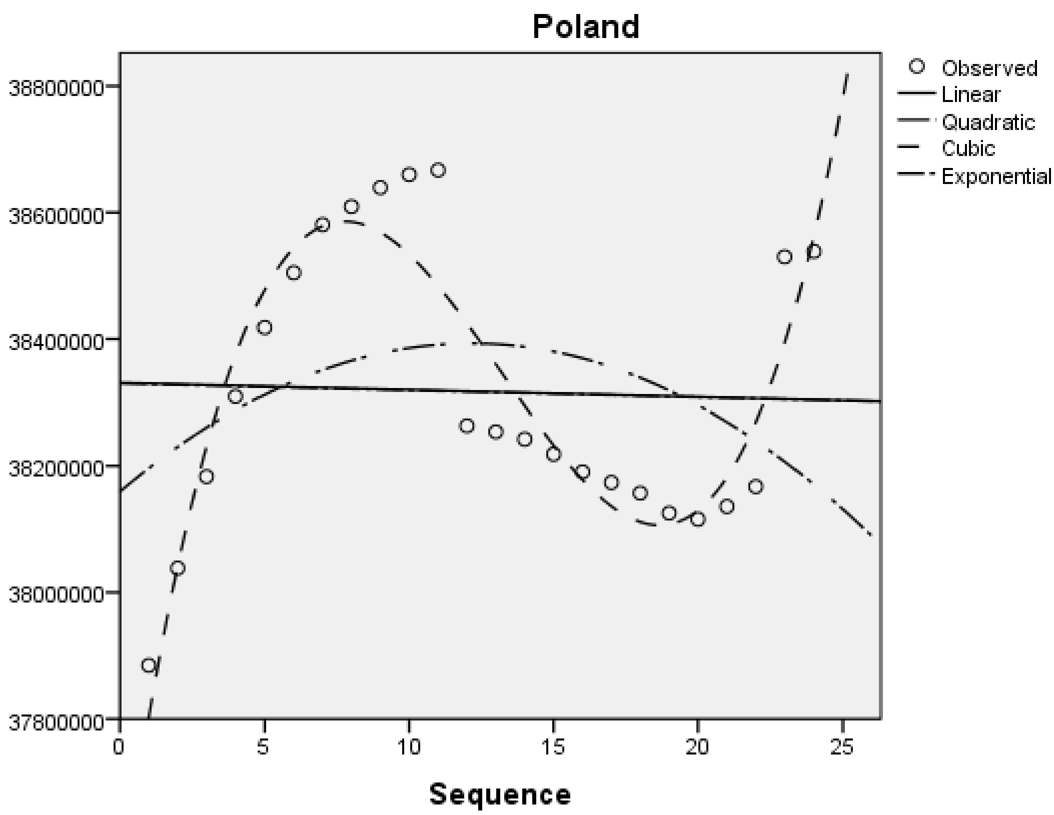
Graph no. 2: Development of total number of population in Germany



Graph no. 3: Development of total number of population in Austria

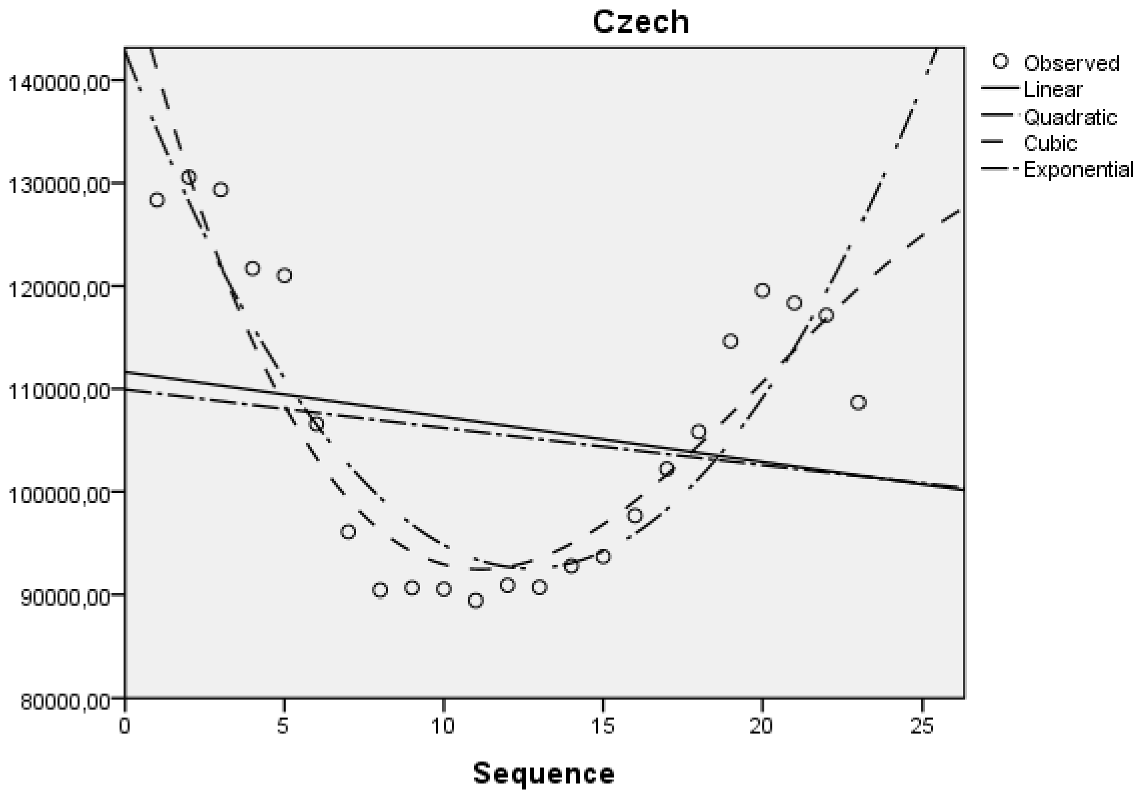


Graph no. 4: Development of total number of population in Poland

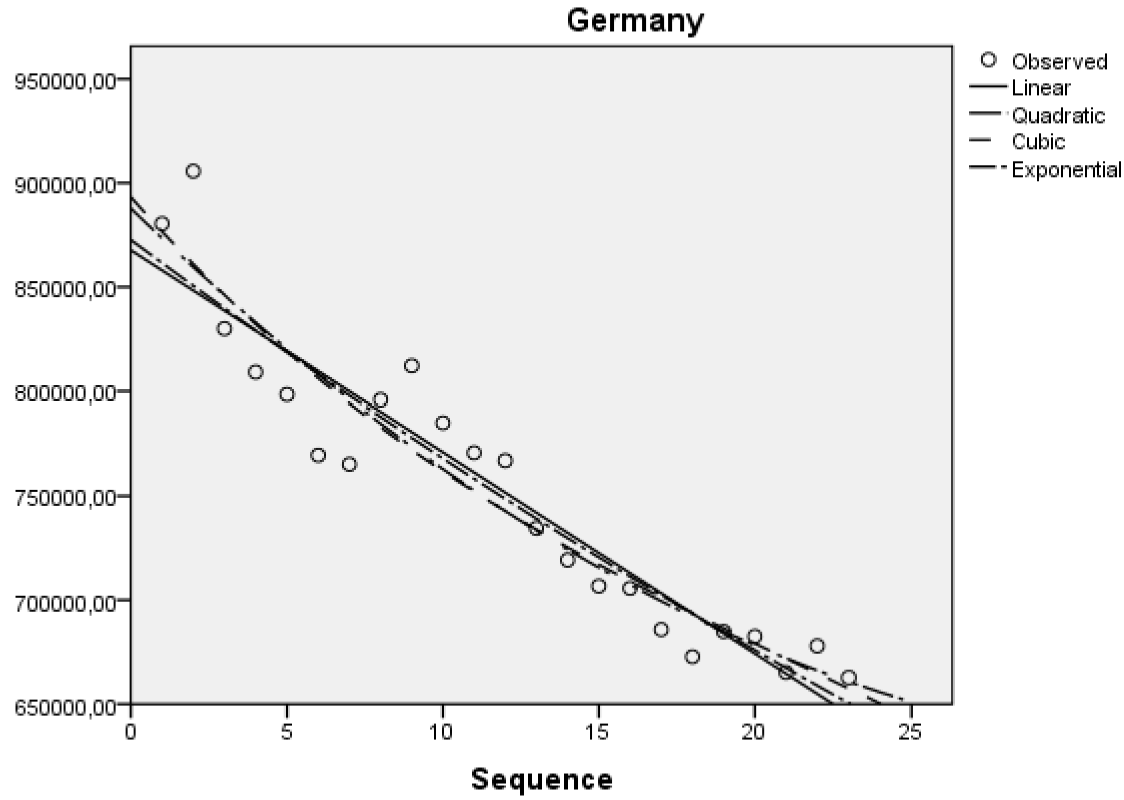


Graph no. 5: Development of total number of population in Slovakia

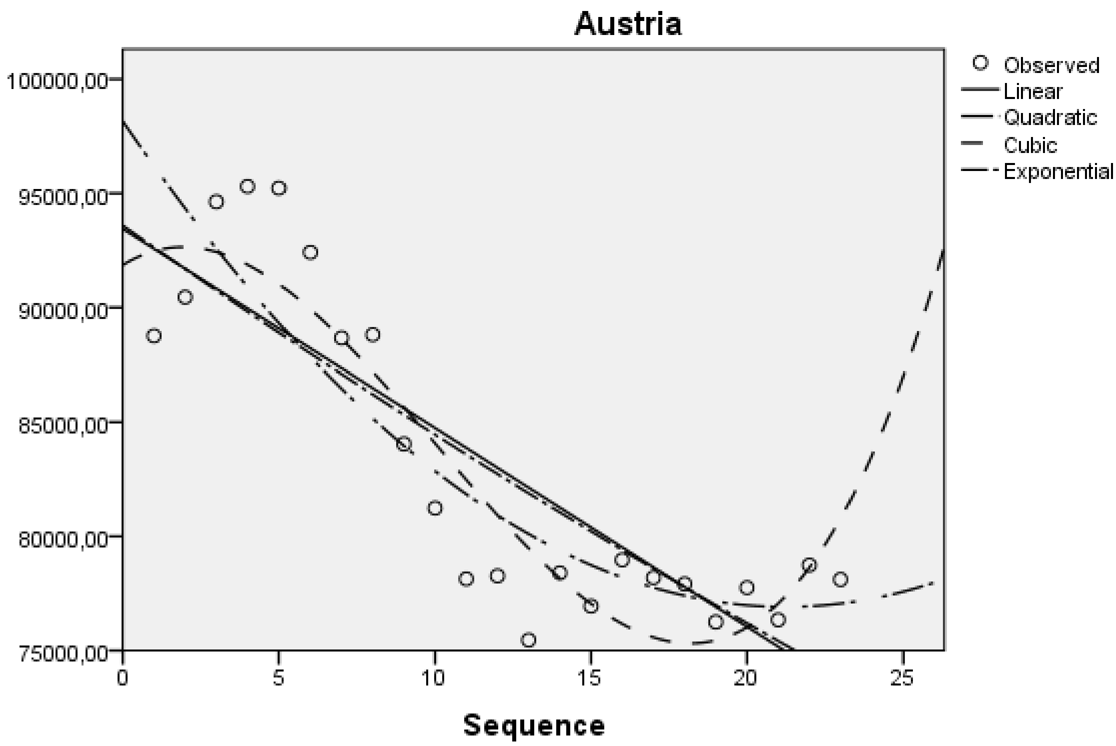
Graph no. 6: Development of total number of live births in Czech



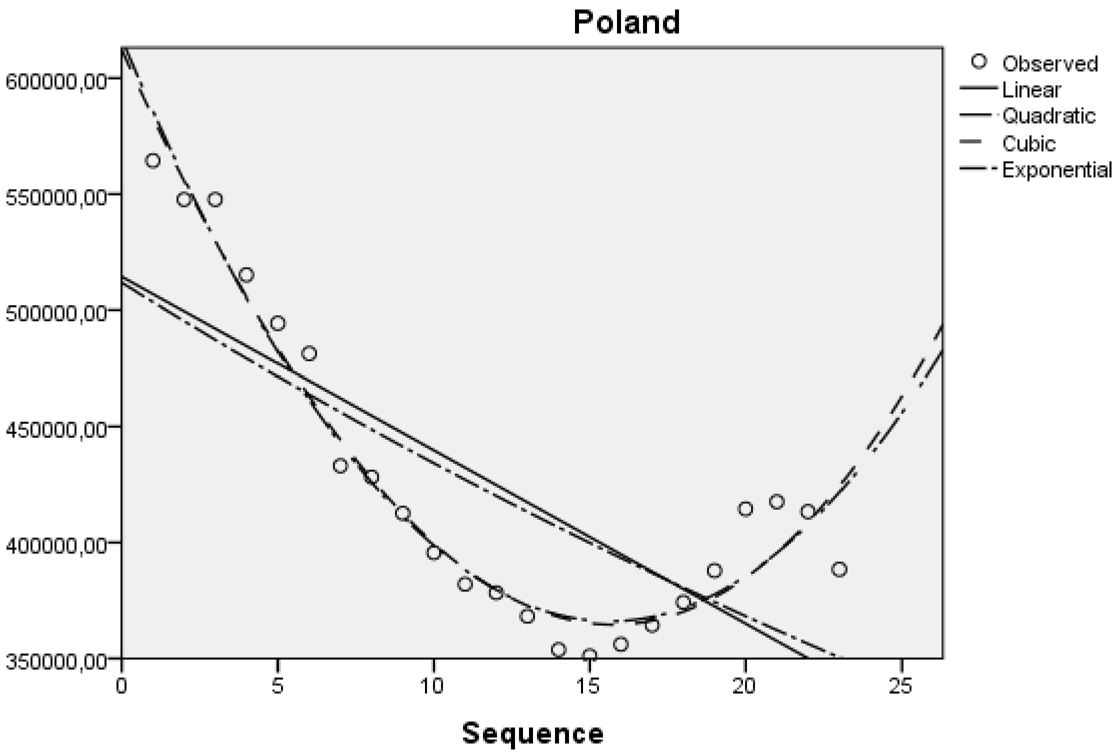
Graph no. 7: Development of total number of live births in Germany



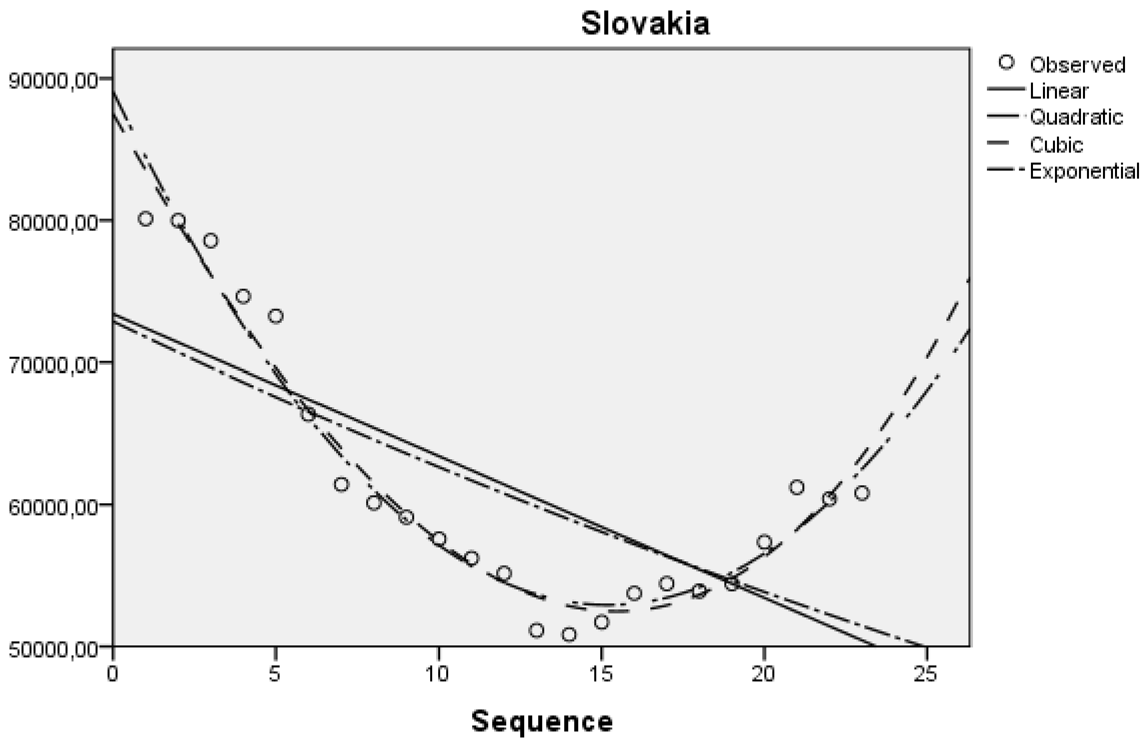
Graph no. 8: Development of total number of live births in Austria



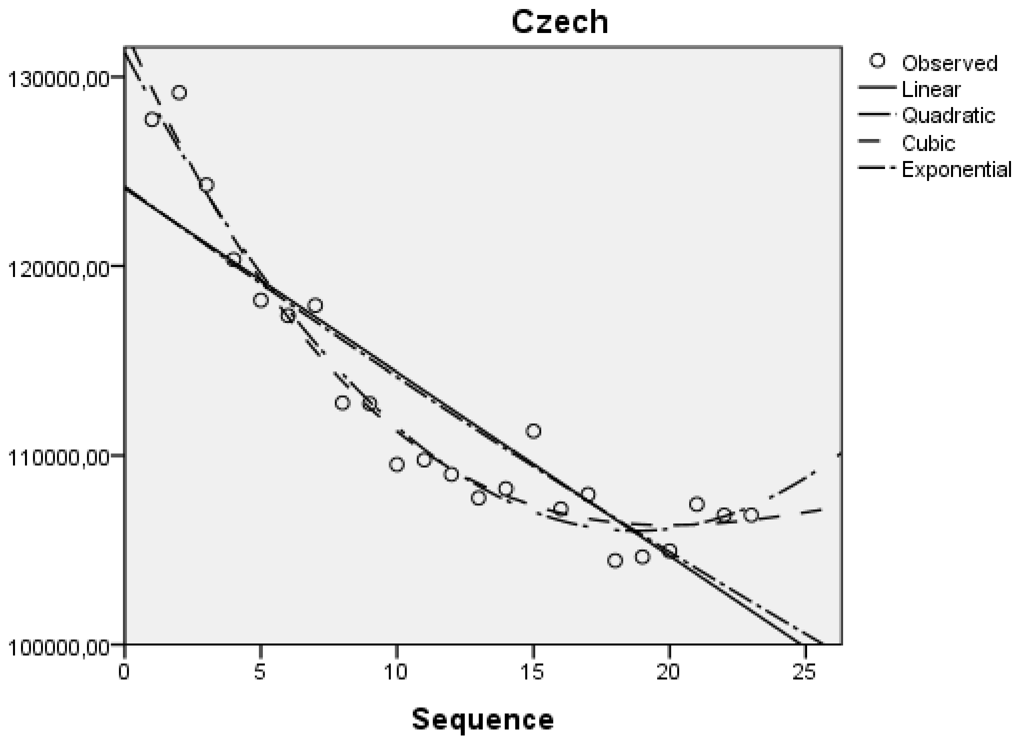
Graph no. 9: Development of total number of live births in Poland



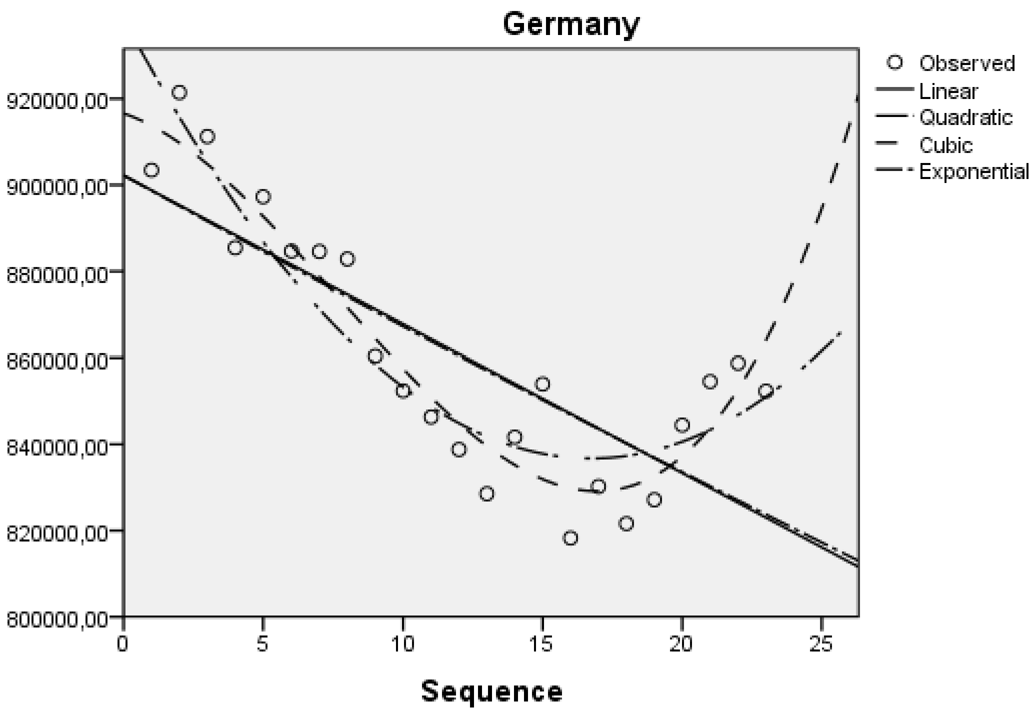
Graph no. 10: Development of total number of live births in Slovakia



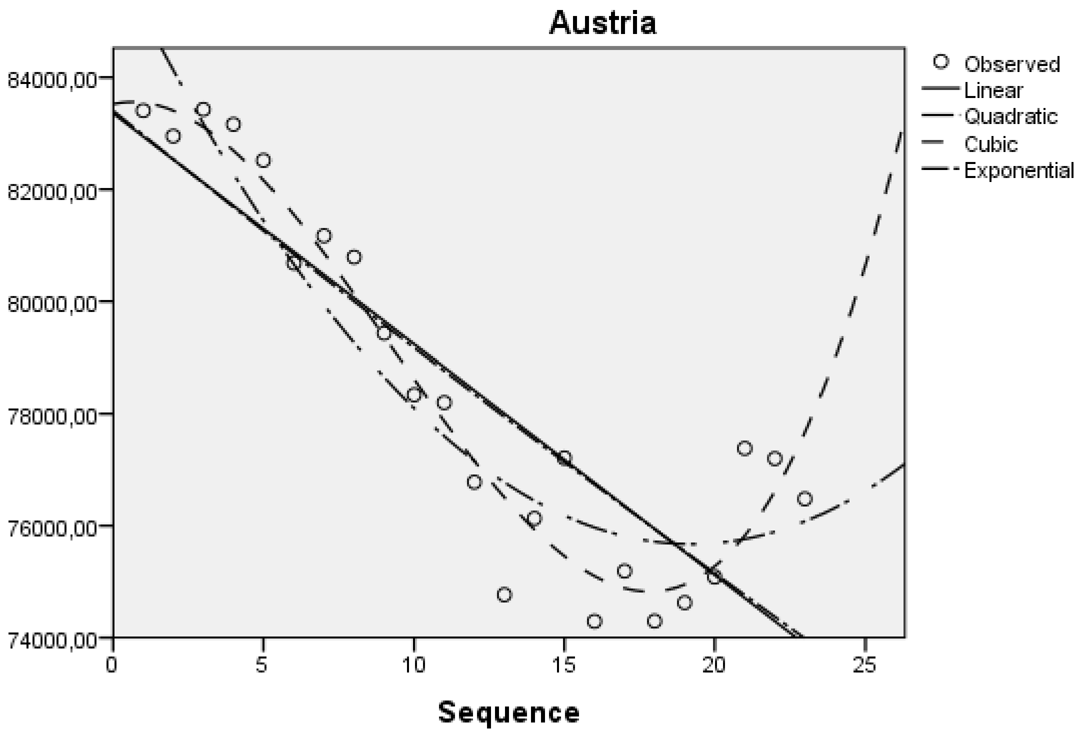
Graph no. 11: Development of total number of deaths in Czech



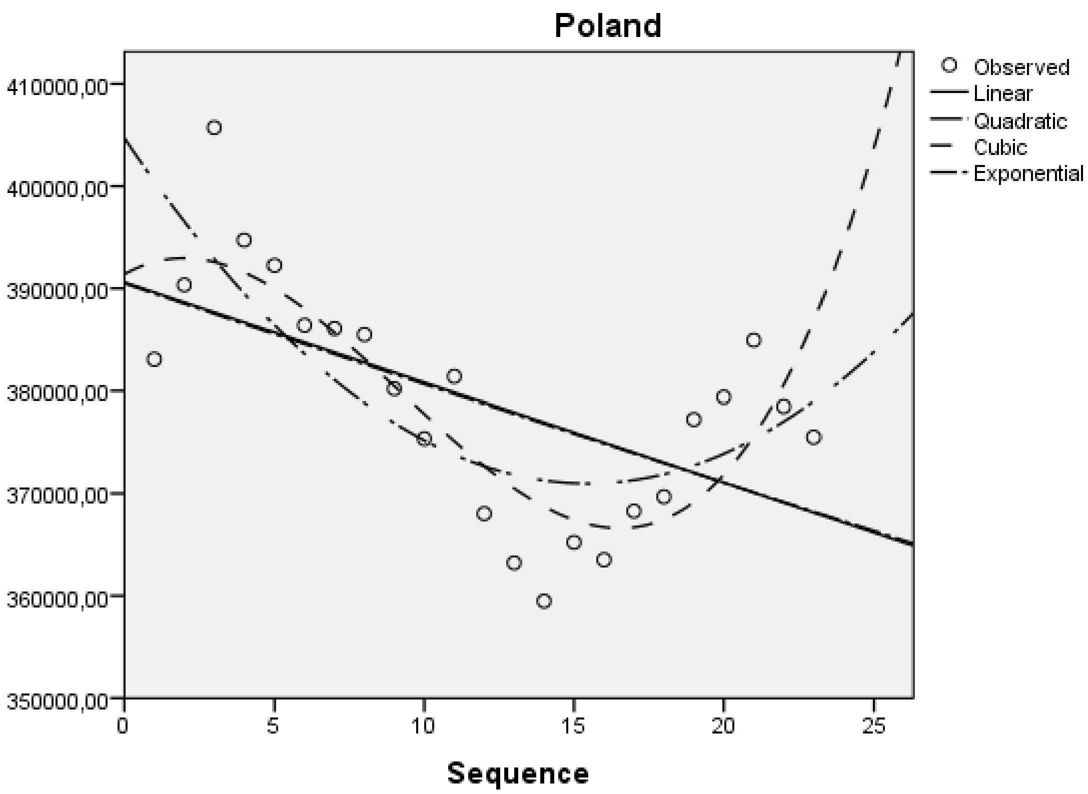
Graph no. 12: Development of total number of deaths in Germany



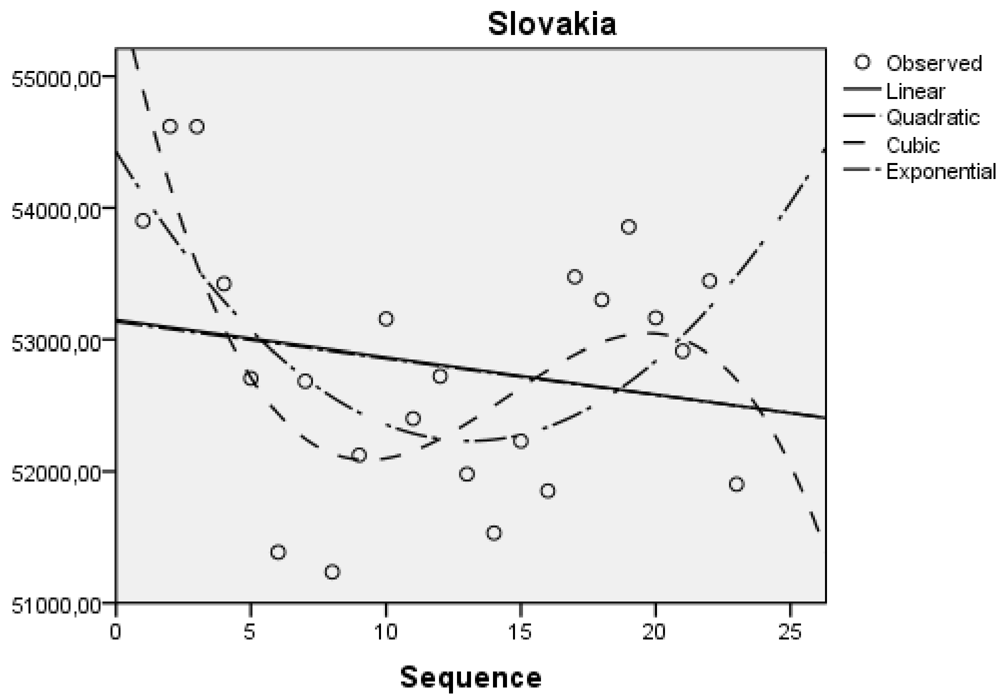
Graph no. 13: Development of total number of deaths in Austria



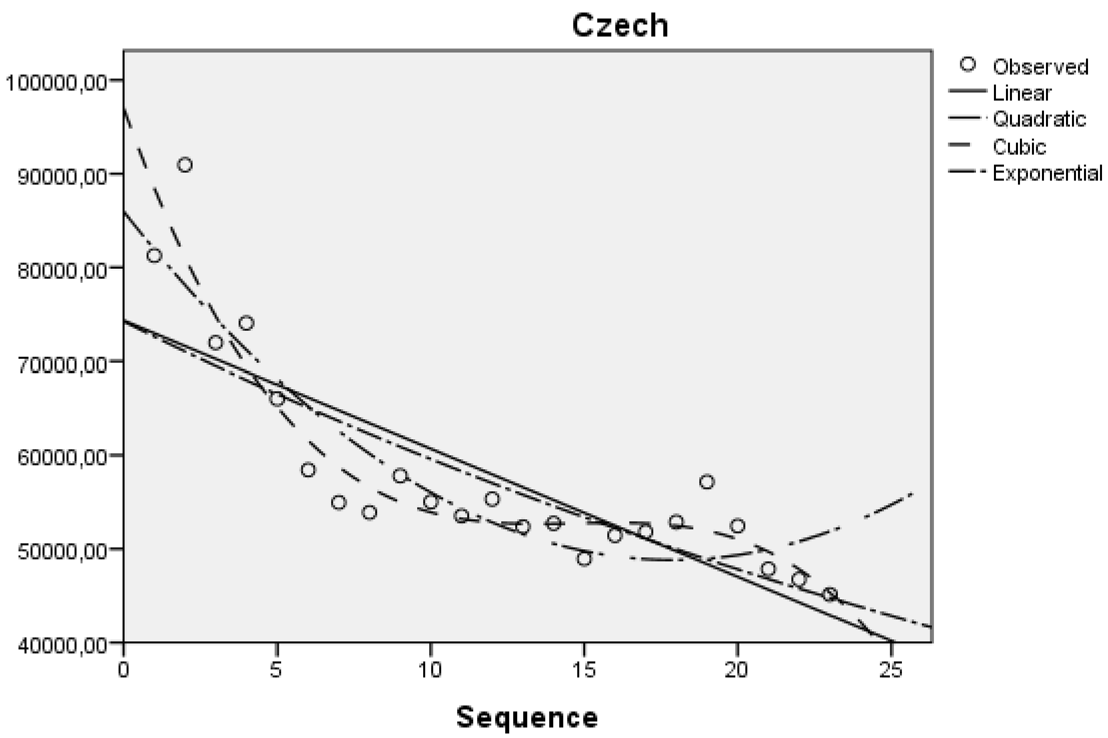
Graph no. 14: Development of total number of deaths in Poland



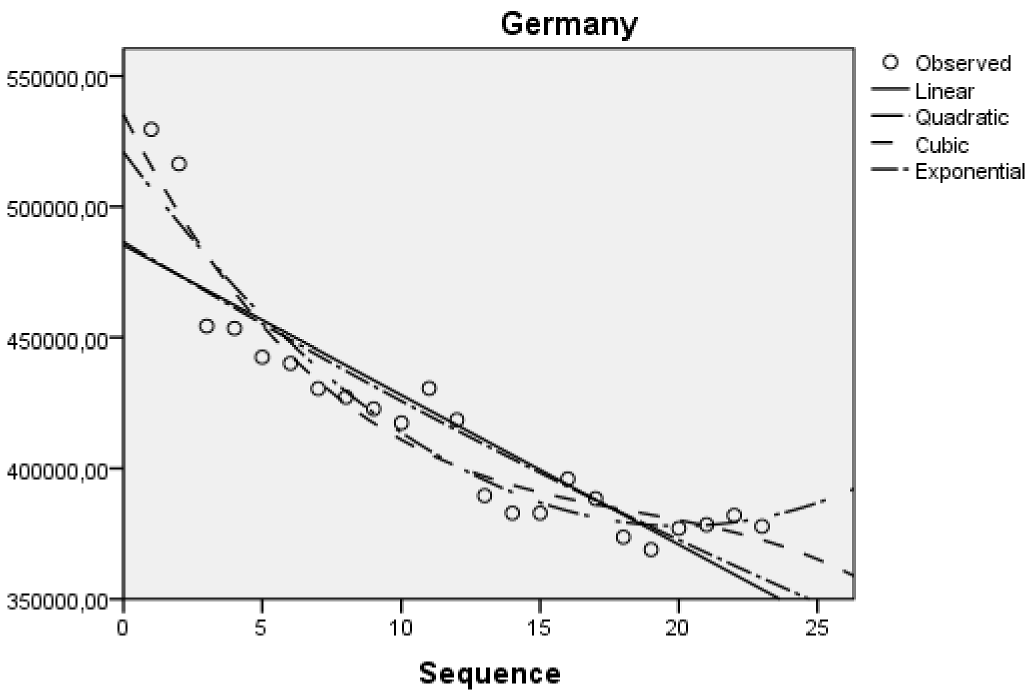
Graph no. 15: Development of total number of deaths in Slovakia



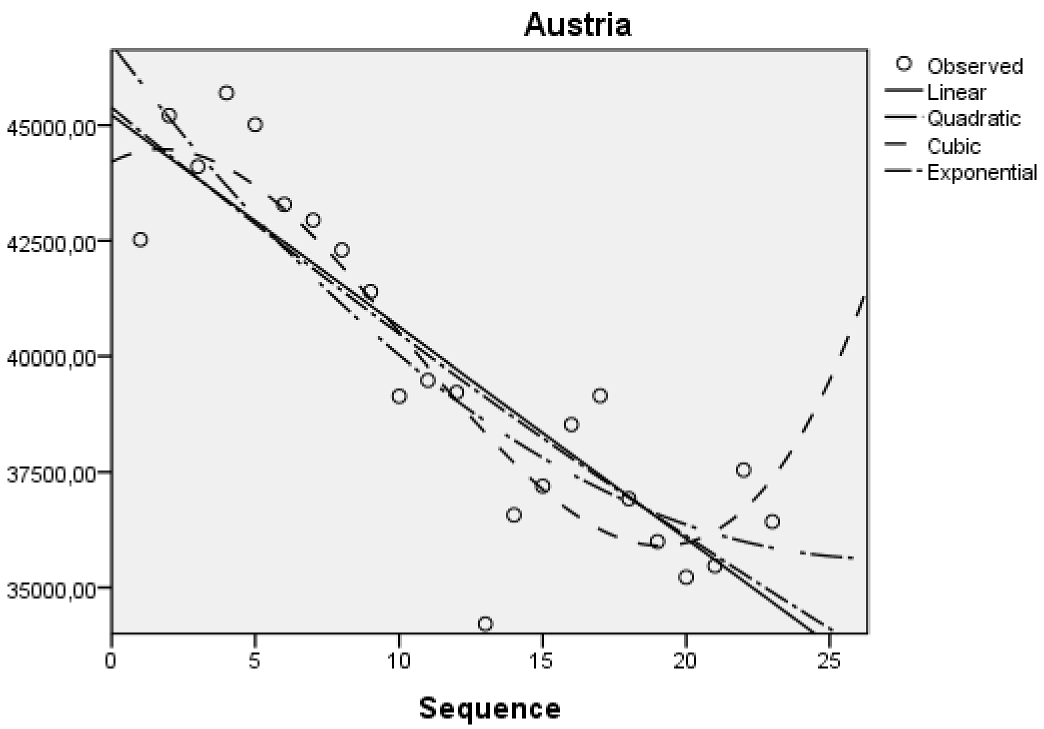
Graph no. 16: Development of total number of marriages in Czech



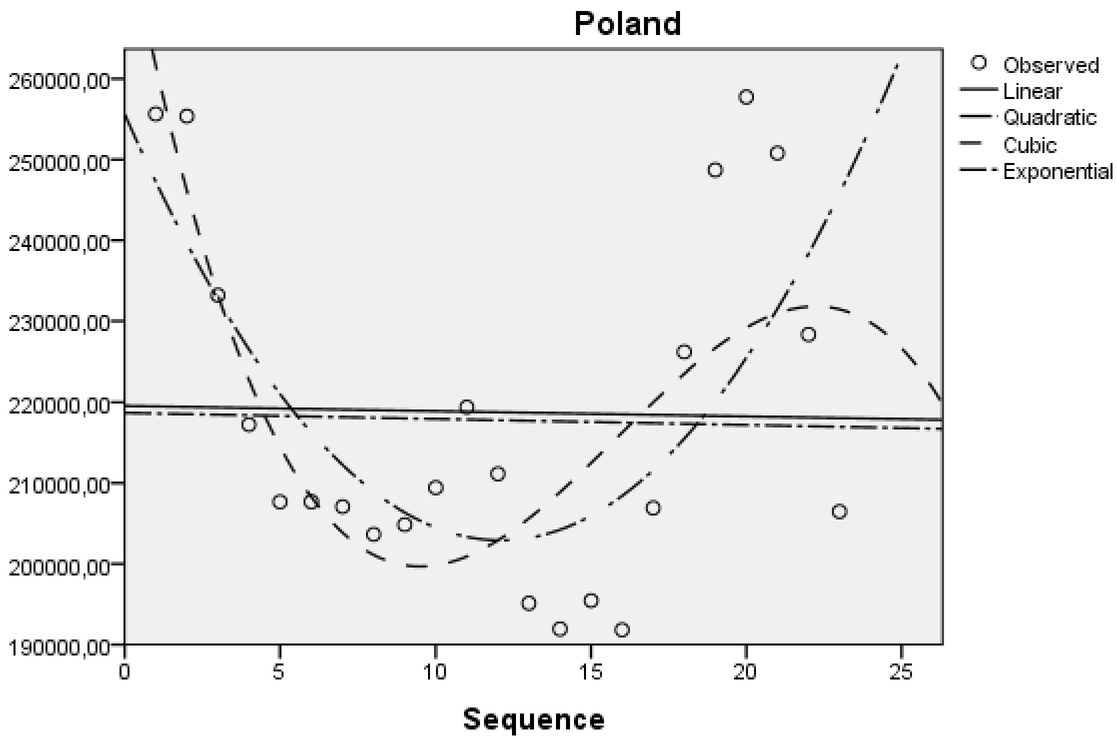
Graph no. 17: Development of total number of marriages in Germany



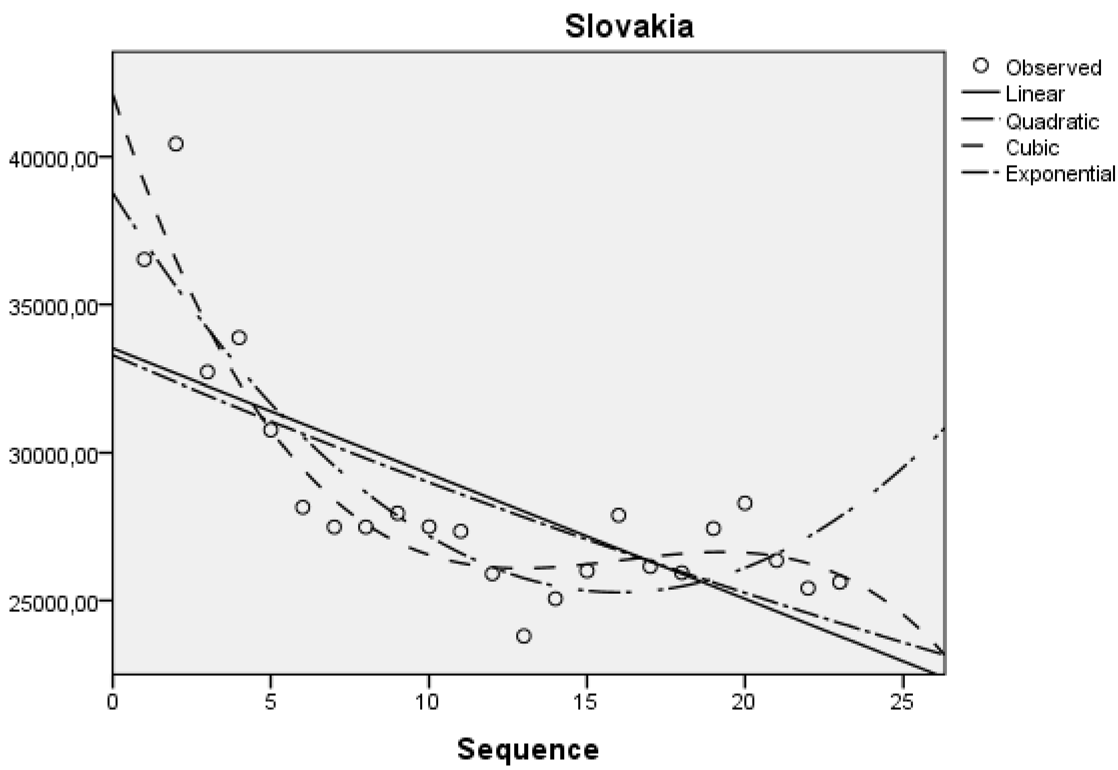
Graph no. 18: Development of total number of marriages in Austria



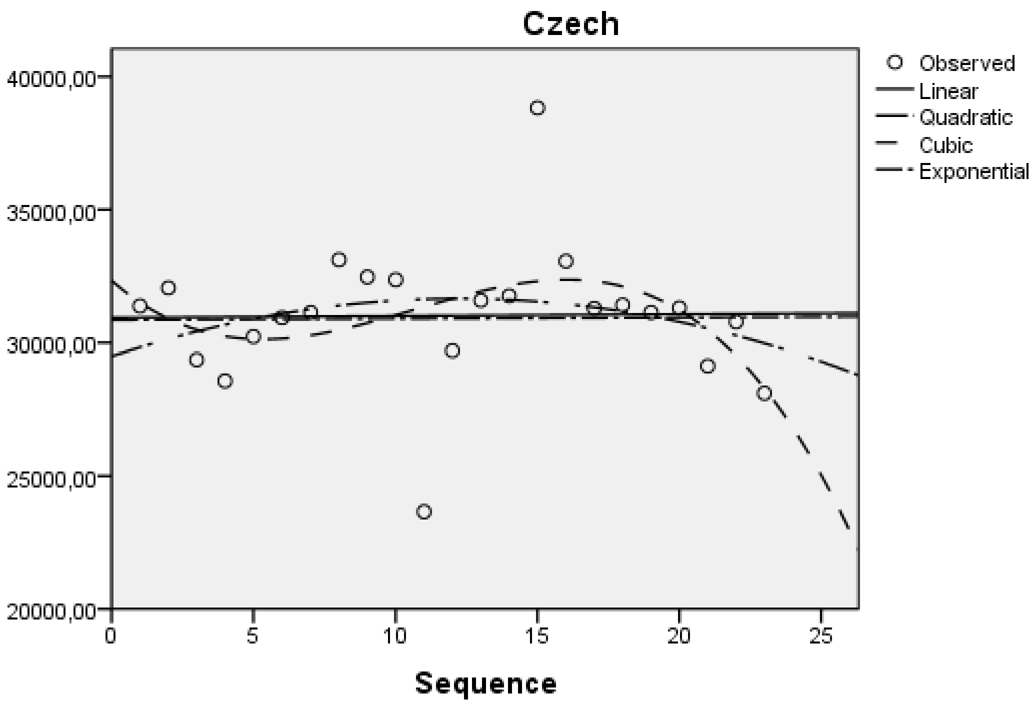
Graph no. 19: Development of total number of marriages in Poland



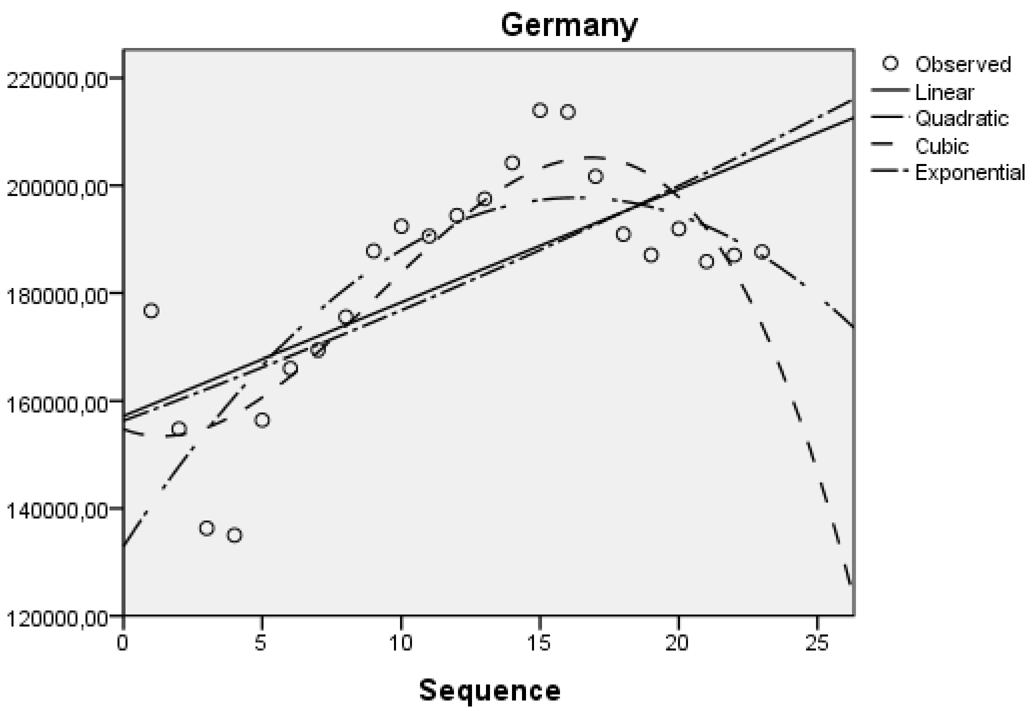
Graph no. 20: Development of total number of marriages in Slovakia



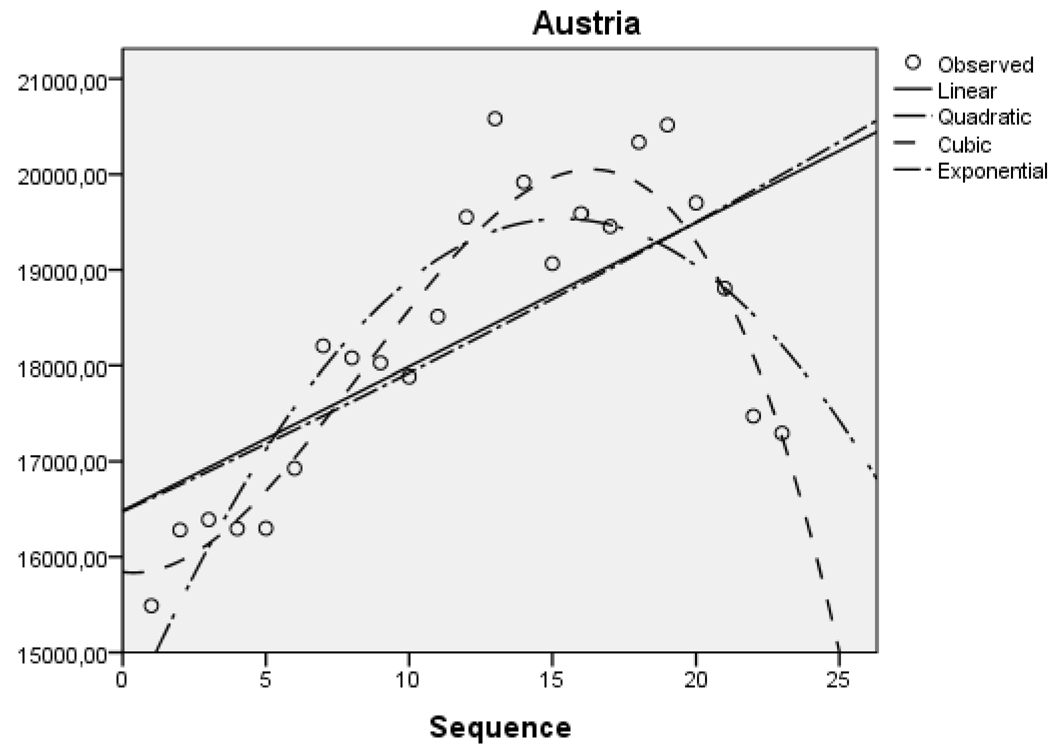
Graph no. 21: Development of total number of divorces in Czech



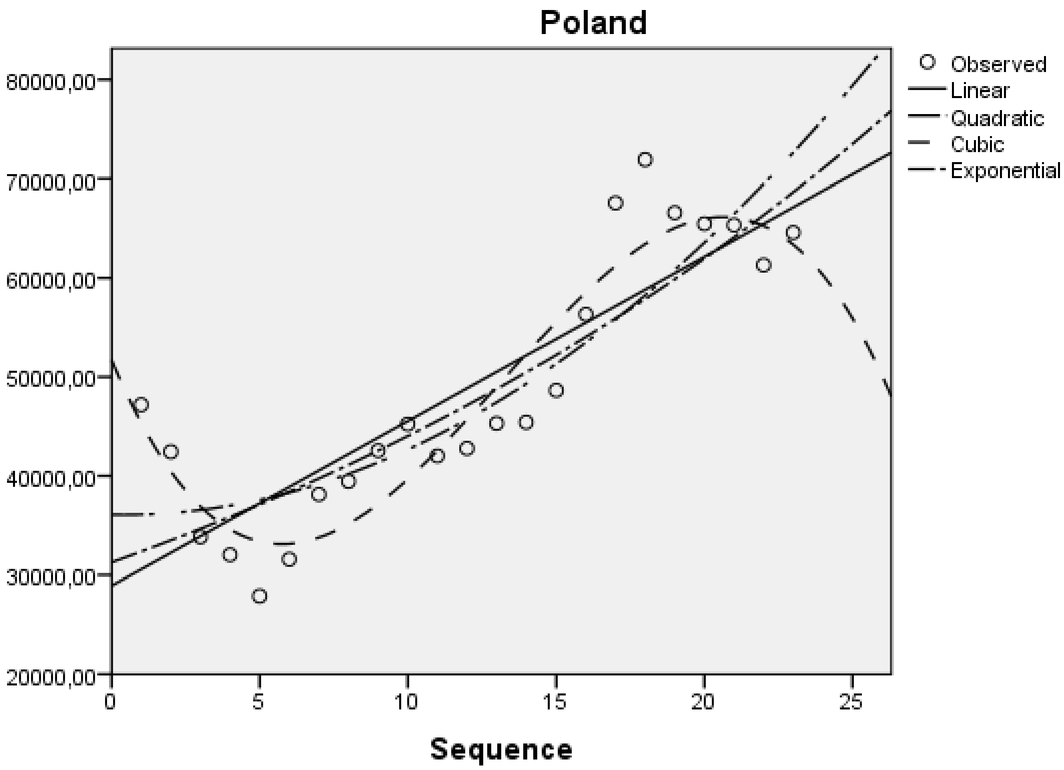
Graph no. 22: Development of total number of divorces in Germany



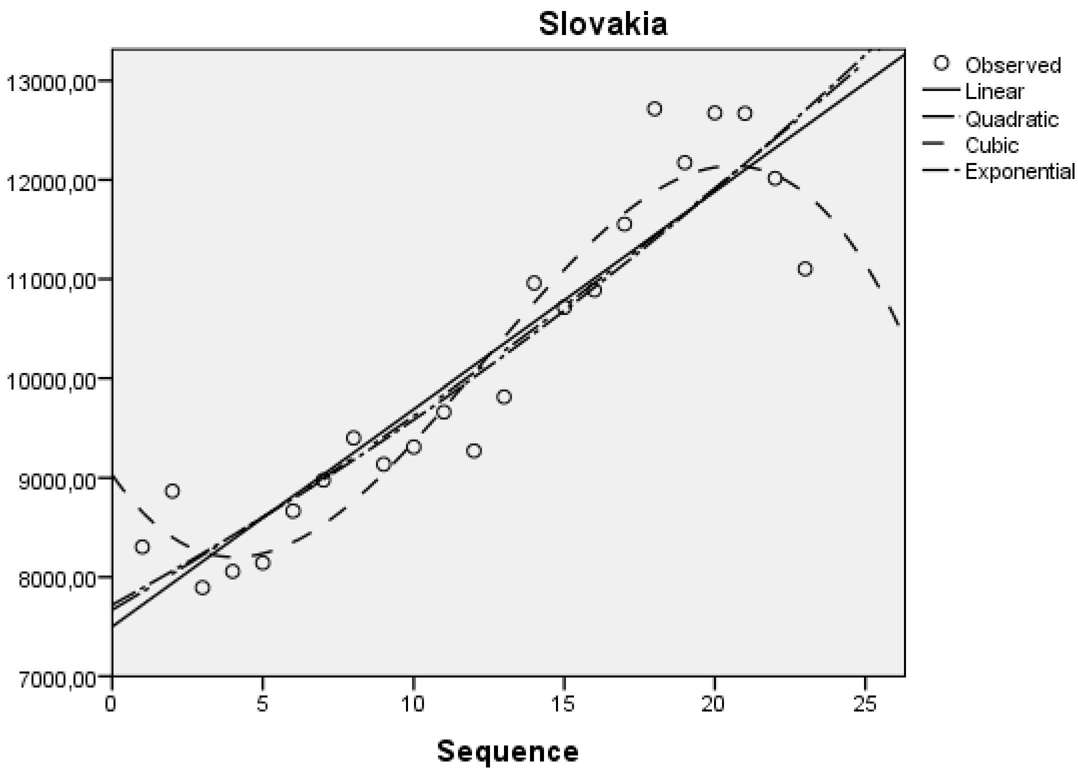
Graph no. 23: Development of total number of divorces in Austria



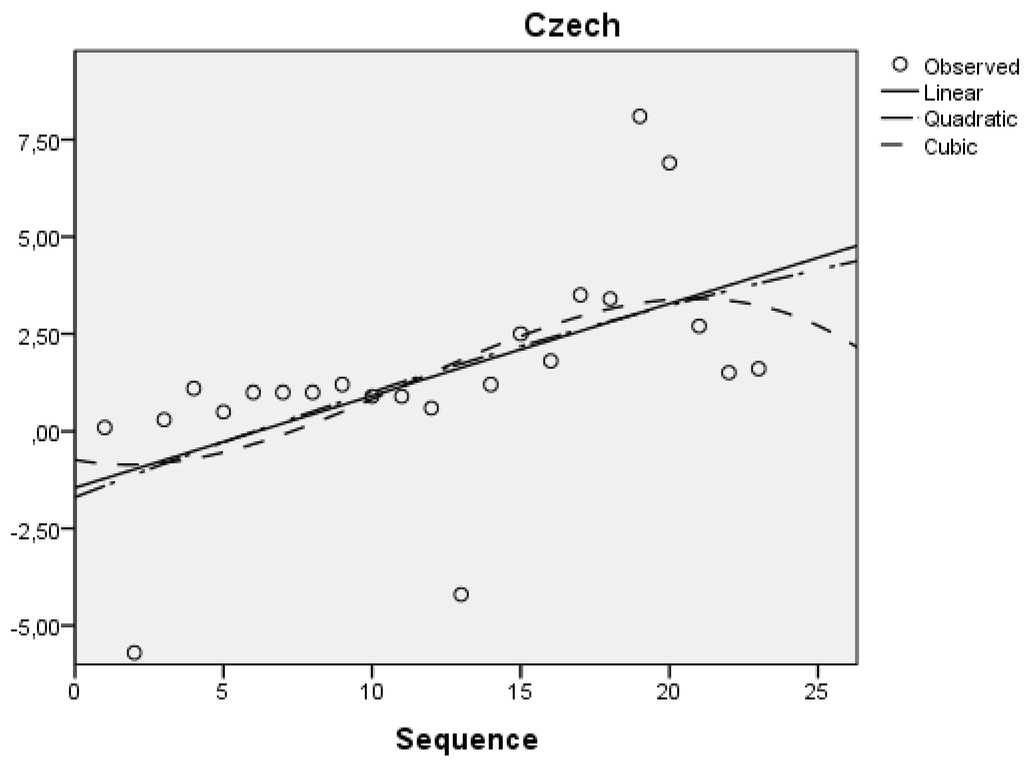
Graph no. 24: Development of total number of divorces in Poland



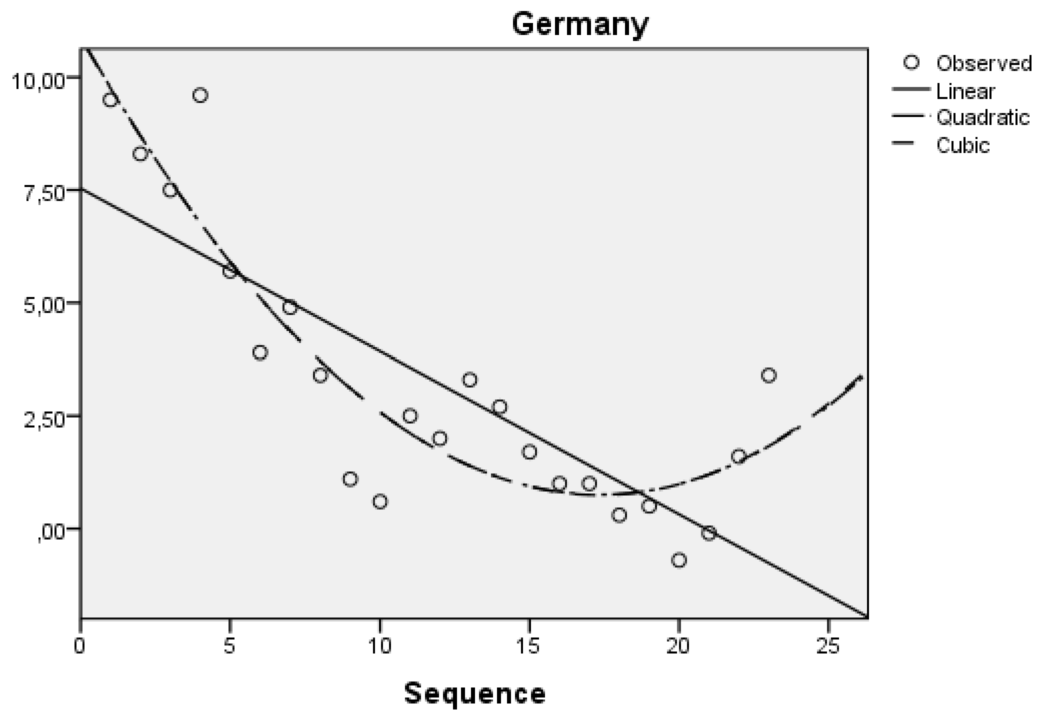
Graph no. 25: Development of total number of divorces in Slovakia



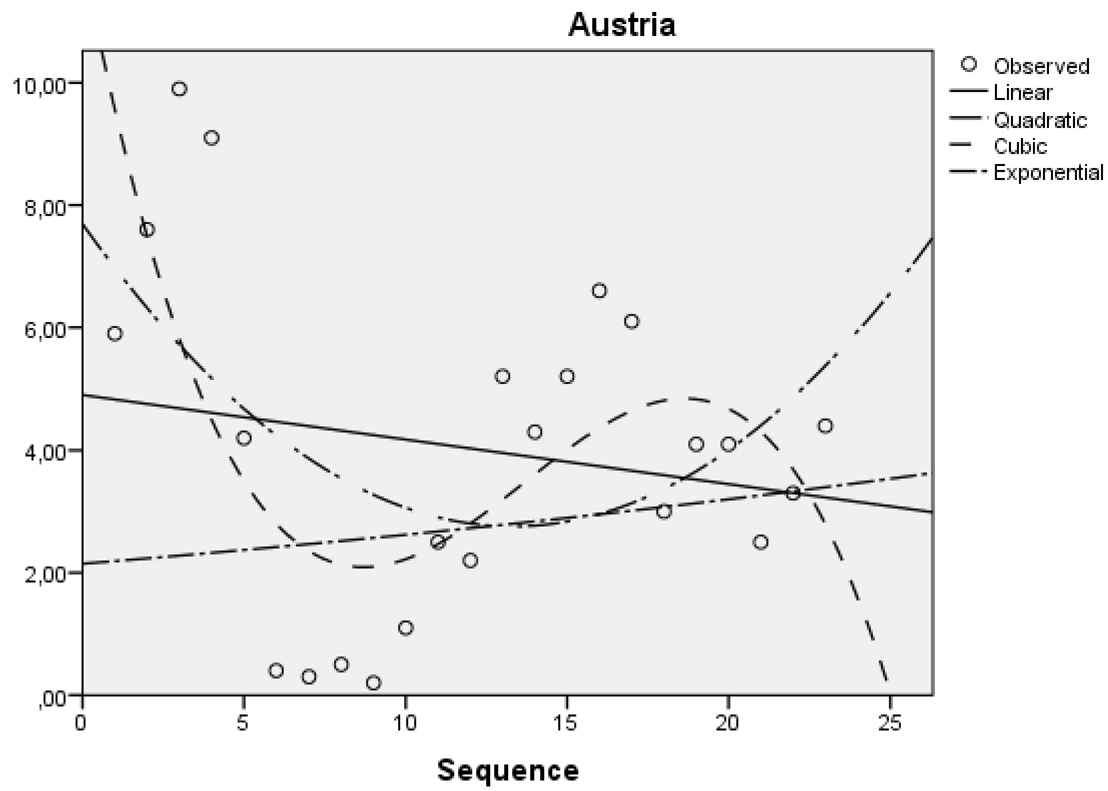
Graph no. 26: Development of crude rate of net migration in Czech



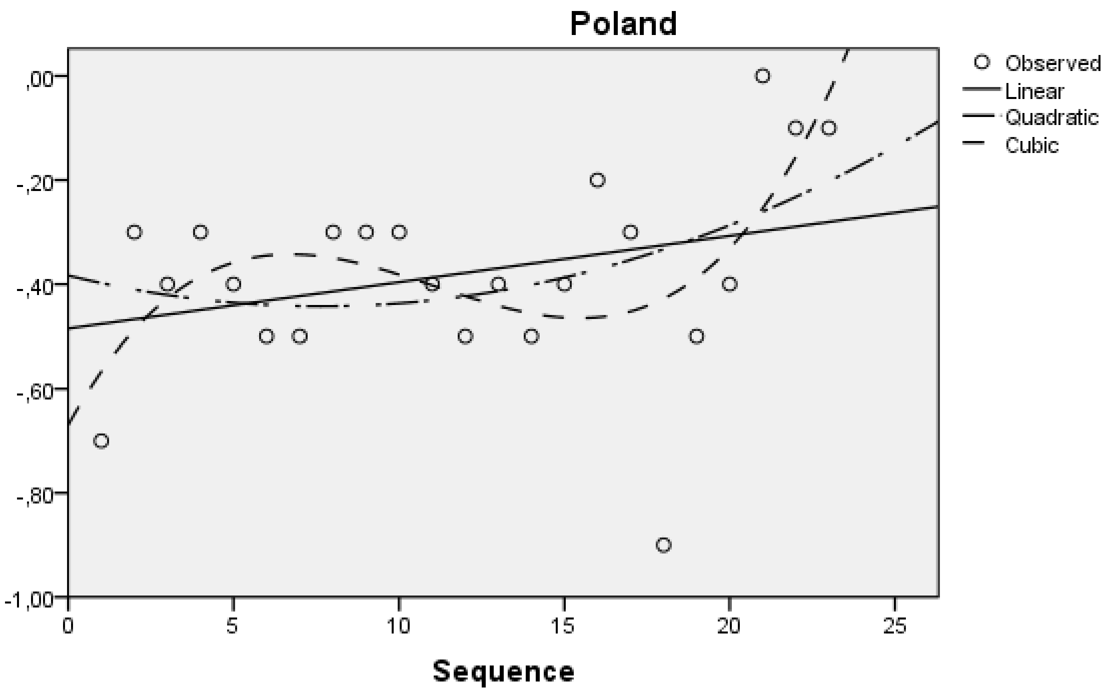
Graph no. 27: Development of crude rate of net migration in Germany



Graph no. 28: Development of crude rate of net migration in Austria



Graph no. 29: Development of crude rate of net migration in Poland



Graph no. 30: Development of crude rate of net migration in Slovakia