

**Charles University in Prague**  
**Faculty of Social Sciences**  
**Institute of Economic Studies**

**Bachelor Thesis**

**2009**

**Hana Roháčková**

CHARLES UNIVERSITY IN PRAGUE  
FACULTY OF SOCIAL SCIENCES  
INSTITUTE OF ECONOMIC STUDIES



Bachelor Thesis

**Cross-Listing of Central European Countries:  
International Capital Market Integration based on  
the Granger Causality Test**

Author: **Hana Roháčková**  
Supervisor: **PhDr. Filip Hájek**  
Academic Year: **2008/2009**

## **Prohlášení**

Prohlašuji, že jsem bakalářskou práci vypracovala samostatně a použila pouze uvedené prameny a literaturu.

V Praze dne

.....  
Hana Roháčková

## **Poděkování**

Na tomto místě bych ráda poděkovala PhDr. Filipovi Hájkovi za odborné vedení práce, za trpělivost a za cenné rady a připomínky. Dále děkuji Gilbertovi Mbarovi, M.A. za cenné připomínky k ekonometrické analýze.

## **Abstract**

The aim of this thesis is to analyze capital markets integration in Europe. It focuses on the integration of the Central European markets (so-called emerging markets) with the more developed Western markets: the Frankfurt Stock Exchange, the London Stock Exchange. We use data of stock prices from the Central European countries that are cross-listed in London or Frankfurt stock exchanges or both.

We begin by explaining the different approaches to financing a company – both domestically and internationally. We then describe in detail the concept of cross-listing that is widely used in order to obtain non domestic sources of finance.

We investigate the integration of the emerging markets with the Frankfurt Stock Exchange and the London Stock Exchange using the Granger Causality test of information flows. The results show that there is a strong evidence of unidirectional causality from the local markets to the developed markets in both cases – London and Frankfurt. That indicates the European capital markets are still fragmented.

## **Abstrakt**

Tato bakalářská práce se zaměřuje na integraci kapitálových trhů v Evropě se zaměřením na trhy ze středoevropského regionu s vyspělými západními trhy, jako jsou burzy v Londýně a ve Frankfurtu. Do naší analýzy jsme zahrnuli data zachycující vývoje cen akcií na domácích středoevropských trzích, které jsou duálně kótovány v Londýně nebo ve Frankfurtu nebo na obou trzích zároveň.

V první části této práce jsou vysvětleny způsoby financování společností – pomocí domácího trhu i mezinárodně. Zde podrobněji vysvětlíme pojem duální kotace, která slouží jako běžný nástroj pro získávání mezinárodního zdroje financování.

V další části zkoumáme integraci rozvíjejících se trhů s trhy ve Frankfurtu a Londýně, kterou jsem postavili na testu Grangerovy Kausalitě vypovídající o informačních tocích. Výsledky ukazují, že zde probíhají jednosměrné informační toky plynoucí z domácích trhů na vyspělé trhy ve Frankfurtu i v Londýně. To indikuje, že evropské kapitálové trhy jsou stále fragmentovány.

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## Introduction

Financial markets are very important institutions in the economy all around the world. They serve as tools for raising capital and allocation of financial resources and this should be done as efficiently as possible. Within the globalization process they have been subject to integration. It has a positive impact from the point of view that the more integrated and large a market is, the better role in economic system it may play.

Charlie McCreevy, the European Commissioner for Internal Market and Services, said about the integration in Europe<sup>1</sup>: *“Integration has become a second nature of Europeans. Because in Europe we have understood that with local policies, continued fragmentation and frictions, we will never be successful in the long term. Too often in our history we have learned this lesson the hard way, by war, bloodshed and tears.”*

Licht (1997) said the following about the situation of capital markets in Europe: *“Western Europe boasts over 35 stock exchanges - a number which is almost unanimously agreed to be high. Too high, in fact, when we remember that the United States, whose population and GDP are roughly within the same order of magnitude, has three national and five regional stock exchanges.”*

We agree with the idea that European markets need to be more integrated. The fundamental question for this thesis will be whether financial markets in Europe have become indeed integrated based on the evidence from cross-listing. The theme of this paper closely follows that of Podpiera (2001) in which the author investigated the integration of Central European capital markets, i.e. the Czech, Hungarian and Polish stock exchanges, with the major Western European market, the London Stock exchanges<sup>2</sup>. He used the data of companies that are cross-listed on, at least, one other foreign capital market.

The first chapter addresses the basics – we primarily focus on the sources of financing of a company - the instruments that can be used, and how firms may finance from either domestic or international sources. With international financing we will come across the concept of **cross-listing (cross-border listing or dual-listing)** of a share, which is the most frequently used instrument for international financing. We will go more into detail when describing the prevailing options for cross-listing by considering the types of **depository receipts**. Chapter 2 talks about the cross-listing in Europe and the integration process of capital markets in

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<sup>1</sup> That was the speech about “Financial Capital Markets Integration in Europe” for Reuters in 2006

<sup>2</sup> We add the analysis of the integration of the Central European markets with Frankfurt Stock Exchange since Podpiera analyzed just the case of London. We used these two markets as two most developed ones in Europe.

Europe. Chapter 3 provides the highlights of previous research on cross-listing, how cross-listing influences factors such as the liquidity of a market, the share's price. What follows is the previous research on the recognition of capital market integration based on the data of cross-listed companies. In the last part we present our analysis. We describe the process of financing a company in the Czech Republic, Poland and Hungary and characterize the local stock markets in each country. We investigate the integration of these markets with the Frankfurt Stock Exchange and the London Stock Exchange based on the Granger Causality test of information flows as used by Podpiera (2001). In this analysis we use the set of data of the companies that cross-listed shares on, at least, one foreign market in the period of 2005 – December 2008. This study may be considered as an attempt to review Podpiera's results<sup>3</sup>. Surprisingly, we did not obtain identical results – we found that markets are still fragmented as found by Podpiera (2001) but in contrast to his results, there are information linkages from the local markets to foreign markets. The Implications of these results are discussed in the last chapter of this thesis.

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<sup>3</sup> Podpiera analyzed the period of June 1993 – 2001.

# 1. Corporate Finance - Capital Structure

At the beginning of any business venture, the key players in the venture must make decisions about the financial structure that the firm will take. This involves deciding about the capital structure of the firm, including what mixtures of debt and equity the firm should have. In modern times, a firm can usually raise both equity and debt financing locally and in some cases internationally. We address each of these financing options in more details in this chapter.

## 1.1. Equity

Equity is a good instrument for financing the company itself. It is quite “cheap” and a good instrument to use for financing without harming the financial situation inside a company. It continues to the level where a company gets to the size of profit that debt financing is getting more reasonable (or even necessary as we discuss later). It happens because the income tax levied on the profit may get quite high.

There are a variety of forms of equity, depending on several factors. The main factor is whether the firm is privately held or publicly traded. Other factors include the firm’s growth and risk characteristics. The following table gives the most common instances of equity.

**Table 1: Classification of securities**

<b>Debt</b>	<b>Equity</b>	<b>Hybrid Securities</b>
Bank Debt	Owner’s Equity	Convertible Debt
Commercial Paper	Venture Capital	Preferred Stock
Corporate Bonds	Common Stock	Option-linked Bonds
	Warrants	

Source: Damodaran (1999)

The simplest form of equity to raise the financing that is needed is Common Stock. The owners of a firm or corporation are in the position of common stockholders. They are entitled to its profits; they have the right to decide about management in the company, etc. In order to raise equity financing from sources outside a firm, it may reasonable to issue an IPO to the public and consequently get listed on the stock exchange.

## 1.2. IPO (Initial Public Offering)

**Initial public offering (IPO)** is a process of gaining a source of financing by using a capital market. It is also referred to simply as a "*public offering*"<sup>4</sup> refers to raising capital through selling stock(s) to the public for the first time. A company can raise money by issuing either **debt or equity**. When a company issues stock through an IPO, it changes its character from being private to being public. "*Anybody can go out and incorporate a company: it is enough put in some money, file the right legal documents and follow the reporting rules of the jurisdiction.*"<sup>5</sup> Being a public company means to be subject to stricter rules and regulations. There must be a board of directors in a public company and they must report financial information every quarter. Public companies are overseen by the National Bank in the Czech Republic<sup>6</sup>.

There are many reasons for going public:

- *"Because of the increased scrutiny, public companies can usually get better rates when they issue debt.*
- *As long as there is market demand, a public company can always issue more stock. Thus, mergers and acquisitions are easier to do because stock can be issued as part of the deal.*
- *Trading in the open markets means liquidity. This makes it possible to implement things like employee stock ownership plans, which help to attract top talent."*<sup>7</sup>

### 1.2.1. IPO on the Prague Stock Exchange

The company is able to enter the stock market in Prague when it fulfills several requirements: legal requirements, expectations of investors, and transparency of structure and financial flows in the company. The key for entering the market is sufficient turnover of a firm and the ability to switch to the International Financial Reporting Standards (IFRS). Section 44 of Capital Market Enterprise Act,<sup>8</sup> sets the minimal turnover of 1 000 000 Euros of a free float<sup>9</sup>,

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<sup>4</sup> Wikipedia, free encyclopedia

<sup>5</sup> Available online: [www.investopedia.com/university/ipo/ipo.asp](http://www.investopedia.com/university/ipo/ipo.asp)

<sup>6</sup> The Czech National Bank has taken over this position since 2006 when the Czech Securities and Exchange Commission united with the other bodies taking control over the financial market and now is the only supervisor of the Czech financial market.

<sup>7</sup> Available online: [www.investopedia.com/university/ipo/ipo.asp](http://www.investopedia.com/university/ipo/ipo.asp)

<sup>8</sup> Czech equivalent: Zákon o podnikání na kapitálovém trhu

<sup>9</sup> That is a part of the fixed capital which is publicly traded and is not owned by strategic investors.

thus the turnover of publicly traded stocks has a minimum high of 25 %. Another important factor is that it keeps the willingness for sharing information about a company, as well as keeping definite and transparent structure with clear financial flows.

In the next part, we will address how the company has grown since its establishment and why it does not have enough profit to be capable of financing its operations from sources. It may happen because of the quick growth of production and sale which is connected with the assets enlargement. In this case, other financial sources must be used - and that is why a company gets to use a debt for its financing. The other reason for using debt financing may be because of the high income tax levied on the profit. A firm might have such a big profit (and thus taxation) that using debt financing with the amount of the interest rate paid to creditors will become more profitable than financing by its own equity.

Thus, after a certain level of size, the debt financing would be more profitable. But this is not a rule! With the increasing amount of debt financing a company becomes more risky and thus, greater costs of some external sources of financing appear (loans, etc.). With this decision-making about whether to use debt or equity financing, there have been developed several models that enable to decide what is better for a company<sup>10</sup>.

### **1.3. Debt**

A debt is a clear alternative to using equity, which is a residual claim - to borrow money. This option both creates a fixed obligation to make cash flow payments, as well as provides the lender with prior claims if the firm is in financial trouble. It is widely used by companies to meet part of their external funding needs. Debt comes in many different varieties. Debt can be classified in terms of its maturity, repayment provisions, and seniority of the debt, security, interest payment, issue procedures, and currency of the debt. Table 1 above gives the certain types of a debt. Among the most common ones we will name bank loans (loans for fixed assets, working capital loans, etc.) and corporate bonds<sup>11</sup> which are widely used. A debt financing may happen also on the private or public level. To change its character from being private to being public, a company may issue stock (here in the form of a debt) through an IPO.

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<sup>10</sup> For instance, WACC (Weighted Average Cost of Capital) for measuring the costs of own equity

<sup>11</sup> The owner of this security is eligible for repayment of the amount of debt and its yield (i.e. coupon) to the certain maturity date.

## 1.4. Hybrid (Derivative) Securities

This group of securities set apart because there have arisen the need for adjusting to some situations when certain securities did not fit to the group neither of equities nor of debt. The hybrid securities are characterized by sharing some features with equity and debt. The examples of hybrid securities are given in the table 1 above. The most common hybrid security is preferred stock. It has features of both debt and common stock: it has a fixed payment, but it is legally considered equity, and payments to preferred stockholders are not tax-deductible. Preferred stocks are used only in some special situations. Another four common derivative securities covered are – options, futures, forwards, and swaps. Corporations use hybrid securities to protect against risk related to external factors.

Many other ways exist on how to finance a company. So far we only described the financing on the domestic level. A company may also raise new capital internationally. That may happen, among others, in the form of IPO on some foreign capital market or in the form of depositary receipts. These are two instruments for doing called cross-listing and we will describe it closely in the next section. It is a long way for a company to get to this point and a company which does cross-list its share abroad, is usually already stabilized and consolidated.

## 1.5. Cross-Listing<sup>12</sup> and its Characteristics

Nývltová, Režňáková (2007) describes a **cross-listing** as a situation when shares of a company are listed on one or more foreign stock exchange in addition to its domestic stock exchange at the same time. The process of cross-listing can happen in the following way:

- A firm has issued its shares on the domestic market and wants to issue the same shares on another foreign market at the same time. The form of the issuing is kept (common stock, preferred stock, bonds, etc.). There could be also issued abroad a representing form of a given security - depositary receipts<sup>13</sup>. In this case, a firm does not gain new sources of financing since it did not do IPO in foreign market(s). It just “signed” its shares for trading. That is the reason why it has the impact only on the secondary stock market since more investors have access to the same securities on

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<sup>12</sup> Other names for cross-listing are cross-border listing or dual-listing.

<sup>13</sup> “*Depositary receipts are financial securities which represents publicly traded stock (or bond) of the company that is registered on some other stock exchange than is the domestic market of a security. Usually they are denominated in USD but they could be denominated also in some other currency*” (Hana Bartůňková, 2006).

several different markets at the same time. The currency expression of stocks may differ market to market;

- A firm (which does or does not have their stocks listed in the domestic market) proceeds IPO (partial or complete) of a new share on some foreign market. Those shares are consequently traded in the same form, as they are in the domestic market, or in the form of depositary receipts.

### **1.5.1. Types of Entering Foreign Markets**

Over time, several ways for entering foreign markets have developed. It was the reaction to the demand for money by companies, at a time when there was a lack of liquidity in their home country, and thus companies considered looking for liquidity abroad. They however had to adjust to different requirements of every single stock market. According to [Holická \(2004\)](#), the major ways for how to raise foreign capital are as follows:

- Foreign direct investment (including foreign venture capital)
- Joint ventures with foreign companies
- Portfolio investment
  - Local companies listing shares on a foreign exchange
  - Depositary receipts
  - Foreign investors purchasing stocks on the home market.

In the category of portfolio investment, there belong the types of cross-listing. The most prestigious form of cross-listing is a direct listing of a share on a foreign market. Depositary receipts represent a second possibility for cross-listing and this form of cross-listing is the most widely used.

#### **1.5.1.1. Direct Listing of Shares Abroad**

As has been mentioned above, the direct listing of a share represents the most prestigious possibility for entering a foreign market. Nevertheless, it also brings more requirements that are even more stringent. [Romana Nývltová \(2006\)](#) notes that whenever any company intends to approach for this listing, the exchange carries on an investigation of the company. The company must meet the requirements proposed by the exchange, such as to provide various pieces of information, to fulfill criteria as the minimum level of market capitalization, certain

accounting variables (income). Companies usually must report their financial statements and other disclosures in the format prescribed by the exchange. The whole process is challenging, and that is in many cases the reason why companies prefer listing on a foreign market in the form of depositary receipts.

### **1.5.1.2. Depositary Receipts (DRs)**

The depositary receipts are world-wide used financial securities that are listed on one market and traded in a foreign market. This allows investors to hold shares which are listed abroad without entering a foreign market.

The first Depositary Receipts were issued on the financial market on April 29<sup>th</sup>, 1927 by investment bank J. P. Morgan. Those were the American Depositary Receipts of a British company called Selfridges Provincial Stores Limited. It was the reaction to the British legislation which disabled the domestic stocks to leave Great Britain.

There are several types of depositary receipts as they have developed over a long period of time. The most common types are the American Depositary Receipts (ADR), Global Depositary Receipts (GDR) and European Depositary Receipts (EDR). The difference between those mentioned is mostly in the place where they are mainly listed. Depositary Receipts has been in evolution process and thus, they have reached large flexibility of their structure (the types of DRs will be described later). Other, less known types of depositary receipts are International Depositary Receipts (IDR) which are denominated in Euro and are listed on Brussels Stock Exchange. There have also been depositary receipts developed which represent debt. Those are American Depositary Debentures (ADD), to name some of them.

#### **1.5.1.2.1. ADRs and their hybrids<sup>14</sup>**

There have been several types of American Depositary Receipts (ADRs) developed in reaction to the issuer's and investor's need to fulfill different criteria. Issuers usually choose the DR program which may provide the best meeting of their objectives. The aim of issuers would be to greater firm's popularity in order to achieve more in the global markets; an increased shareholder base and new ways on how to raise capital. Investors then prefer DRs

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<sup>14</sup> We specify just GDR and ADR since we use it later in our analysis. There is more about the other types of depositary receipts in Holická (2004) and Depositary Receipts Information Guide, Citigroup (2005).



because the trades with DRs are very transparent in terms of the U.S. market requirements. The following table depicts all types of ADRs and sorts them according to various conditions of trading, business usage, and the place where they are traded.

**Table 2: Types of ADRs**

	<b>Broaden Shareholder Base with Listing Shares</b>		<b>Raise Capital with New Shares</b>	
	<b>Over-the-Counter Level 1</b>	<b>Exchange Traded Level II</b>	<b>Public Offering Level III</b>	<b>Private Placement – U.S. Rule 144A ADR (RADR)</b>
<b>Description</b>	<b>Unlisted program in the U.S.</b>	<b>Listed program on a recognized U.S. exchange</b>	<b>Offered and listed on a recognized U.S. exchange</b>	<b>Private placement in the U.S. of Qualified institutional Buyers (QIBs)</b>
<b>Trading</b>	<b>Quoted in the Pink Sheets and/or on the OTC Bulletin Board</b>	<b>NYSE<sup>15</sup>, AMEX<sup>16</sup> or Nasdaq<sup>17</sup></b>	<b>NYSE, AMEX or Nasdaq</b>	<b>Quoted on PORTAL in the U.S.</b>

Source: Citibank (2005)

**1.5.1.2.1.1. Level I ADRs**

Level I ADRs are especially for those firms that want to broaden and deepen their shareholder’s base in U.S. They are traded in the Over-the-Counter (OTC) market and are not listed on an exchange. The Level I issuers are not required to file a Form 20-F with the SEC<sup>18</sup>. Thus, they acquire the Rule 12g3-2(b) exemption from the SEC and must adhere to the rules of this exemption<sup>19</sup>.

<sup>15</sup> New York Stock Exchange

<sup>16</sup> American Stock Exchange

<sup>17</sup> National Association of Securities Dealers Automated Quotation System

<sup>18</sup> Security Act since 1933

<sup>19</sup> For more detailed information, see Depositary Receipt Information Guide, Citibank (2005)

### **1.5.1.2.1.2. Level II ADRs**

Level II are for those who want enhance the level of visibility and be involved in more active trading. U.S financial media and analysts also pay closer attention to the Level II ADRs and look for more information about foreign firms for U.S. investors.

Level II ADRs are listed on one of the U.S. exchanges (see the table above) and must be registered under the Securities Act of 1933. Issuers must keep the rules of the Securities Exchange Act of 1934 and give the registration statement and periodic reports in a certain required format. Financial statements must comply with U.S. GAAP<sup>20</sup> (it refers to financial reporting).

### **1.5.1.2.1.3. Level III ADRs**

This program provides issuers with the ability to raise capital by entering the widest US shareholder base. Through Level III ADRs issuers can offer new shares to U.S. investors. The criteria are more stringent in order to perform on an initial public offering in the U.S. For instance, the must fully reconcile their financial statements to U.S. GAAP and conform certain forms to the SEC<sup>21</sup>. Issuers using this type of program also choose an investment bank where they may underwrite the offering and where they can take advice. The program is executed after the offering completion and is enabled to receive deposits from investors.

### **1.5.1.2.1.4. Rule 144A ADRs**

Rule 144A Depositary Receipts (RADRs) have been used since 1990 and are, in contrast to the other types, privately placed on the U.S. market. With a private placement of DRs, issuers find out more simply what the investor's appetite looks like. Issuers also may gain greater liquidity when they choose this type of program. The process of gaining liquidity of privately placed securities works on the basis of Qualified Institutional Buyers<sup>22</sup> (QIBs) that are allowed to resell these securities to other QIBs privately and do not have to fulfill any special requirements with holding, administration, etc. A potential handicap of this program would be

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<sup>20</sup> U.S. Generally Accepted Accounting Principles

<sup>21</sup> Form F1 to register underlying shares and Form F6 to register DRs

<sup>22</sup> QIBs are institutional investors who privately own and invest large amounts of securities. They must own securities that are not affiliated to the investors ranging from \$10 million up to \$100 million depending on the type of QIB (Securities and Exchange Commission (2006)). They also do their own research that exempts their trades from certain disclosure and reporting requirements.

less visibility occasions while issuers are prohibited from any type of advertising in U.S. media.

Rule 144A ADRs need not satisfy periodic reporting requirements required by the Security Exchange Act (1934) and do not have to be registered under SEC (1933). But they must deliver certain financial disclosures to investors. Thus, it takes less time to the Rule 144A DRs to complete a private placement in the U.S. equity market than to registered offerings. The costs related to raising capital are also lower and are comparable to the costs of the European markets.

**1.5.1.2.2. GDRs and its hybrids**

Global Depositary Receipts (GDRs) represent other forms of DRs and are a typical tool to use for companies from emerging markets. By GDRs, issuers may raise capital contemporaneously in two or more markets. GDRs can be issued in the U.S. or other countries, also in either private or public markets. However, GDRs are primarily listed on the London Stock Exchange. They are also usually listed on the Luxembourg Stock exchange or quoted on SEAQ<sup>23</sup> International in Europe. GDRs are an instrument for raising capital (similarly to the Level III ADRs and Rule 144A ADRs) by broadening and widening the shareholder base which works on the basis of accessing shareholders in capital markets outside of the issuer’s domestic market.

**Table 3: Characteristics of Global Depositary Receipts (GDR)**

<b>Description</b>	<b>Private Placement - Global Depositary Receipt (GDR)</b> Global private placement in two or more markets outside the issuer's home market.
<b>Trading</b>	London Stock Exchange, Luxembourg Stock Exchange for non-U.S. component, and/or PORTAL if there is a U.S. tranche

Source: Citibank (2005)

<sup>23</sup> Stock Exchange Automated Quotation System

For better access to a global market, there has been established a global settlement agreement. There is an important link between DTC<sup>24</sup>, Euroclear and Clearstream that makes the whole process of settlement easier and also improves the liquidity by cross-listing<sup>25</sup>.

#### **1.5.1.2.2.1. Reg S GDRs**

Regulation S (Reg S) Depositary Receipts are for those issuers that want to place DRs privately in global markets with the exception of the U.S. market. Reg S GDRs reflect in many ways Rule 144A ADR programs. It coheres with the fact that SEC adopted Reg S in 1990 in association with the adoption of Rule 144A. Reg S GDRs along with Rule 144A ADRs are strong instruments that may enhance liquidity of a private placement or global offering.

Reg S GDRs settled its own conditions to offer and sell securities outside of the U.S. These conditions were defined in order to enable the exemption from SEC registration requirements.

#### **1.5.1.2.3. The DR Issuing Process**

As it shown in the figure 1, the whole process of issuing DR runs in several steps:

1. The investor sends forth the instructions about purchasing depositary receipts to a broker.
2. The broker contacts to a local broker in the issuer's domestic market.
3. The local broker purchases ordinary shares on the stock exchange in a domestic market.
4. The shares are deposited with a domestic custodian.
5. The domestic custodian gives instructions to the depositary about issuing DRs that represent the shares received from the issuer.

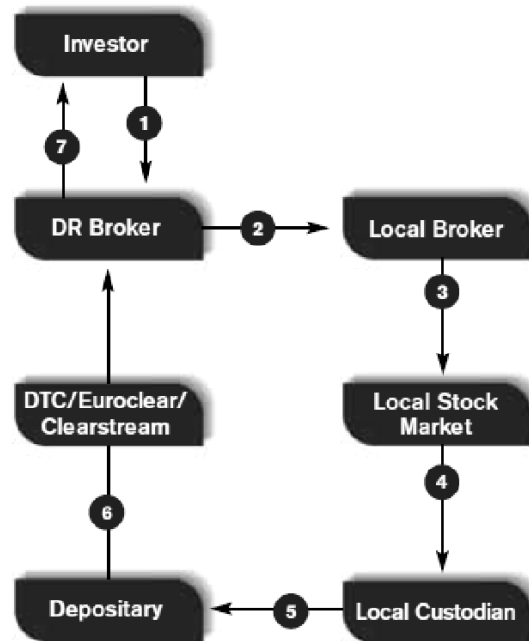
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<sup>24</sup> „DTC stands for the Depositary Trust Company, which serves as a clearinghouse for settlement of trades of corporate and municipal securities in the US. DTC is an important player in the DR market, as it, among other things, issues and cancels DRs, delivers them to the brokers, facilitates distribution of dividends to investors.“ (Kateřina Holická, 2004)

<sup>25</sup> To better understand the concept of settlement and issuing process of DRs, see next section.

6. The depositary bank finally issues DRs and forwards them to the broker abroad that has originated the trade (it has to go in a physical form or book entry through DTC as for ADRs or Euroclear/Clearstream as for EDRs or through either of them as for GDRs, as applicable).
7. The investor finally receives DRs from the broker or he gets credits on his account.

**Figure 1: Process of Issuing DR**



Source: Citibank (2005)

### 1.5.2. Motivation to Cross-List

The primary motive for cross-border listings is to raise capital from non domestic source. This may also provide to investors the opportunity to easily invest in some shares of a foreign firm (what they would not be able to do it due to legal restrictions and costs associated with trading and acquiring information on firms listed abroad). Nowadays, cross-listing has become the instrument of getting higher prestige and passing over the weak sides of domestic capital markets. There are several reasons why cross-listing and selling shares on a foreign market are so attractive, and what firms intend to accomplish by it.

Firstly, it provides more liquidity to cross-listed shares, already existing shares and improves the liquidity in a secondary market for new equity issues in foreign markets. Firms from

smaller illiquid markets usually overgrow their markets and are constrained on how to raise new equity in their markets. Firms should optimally cross-list and issue equity in foreign and more liquid markets in order to maximize liquidity. **Bris, Cantale, Nishiotis (2005)** proved this fact when they examined liquidity of cross-listed shares in U.S. markets. *“Our results are consistent with ADR improving the liquidity in the domestic markets and the access of foreign investors to the firm.”*

Cross-listing in foreign markets may improve corporate image, advertise trademarks and products, which implicates better local press coverage, and cause them to become more familiar with the local financial community in order to increase local working capital.

**Nývltová (2006)** says that *“it increases the firm’s visibility and political acceptance to its customers, suppliers, creditors, and host governments“*. She also mentions that creating a secondary market for shares could be used to compensate local management and employees in foreign subsidiaries – in case there are company’s foreign subsidiaries and the company wishes to use financial sources such as stock options and share purchase compensation plans to pay for local management and employees. Then cross-listing enables the reduction in transaction and foreign exchange costs for these local beneficiaries.

Firms find cross-listing attractive for many other reasons. Among the main ones, it is worth it to mention that the cross-listing process enables the investor to diversify their portfolio; it helps to raise new capital as well as moves local market trading for shares on a higher level. The bigger markets, such as NYSE or London Stock Exchange also provide more liquid secondary markets with shares. In the case of US, the firms are motivated because of higher product market sales or they could be used as an instrument to compensate managers of U.S. subsidiaries. With these advantages, other additional costs appear, such as additional reporting requirements, reporting costs, and listing fees. As a consequence of this, many types of listings have been developed to accommodate companies in their attempt to convert costs into the potential benefit (**Karolyi (1998)**).

### **1.5.3. Barriers and Disadvantages to Cross-List**

. Cross-listing generates other costs and disadvantages which a firm must handle. **Karolyi (1998)** names barriers that are connected with investments. He groups these investment barriers into “direct” and “indirect” costs. Direct costs are represented by regulatory frictions from foreign exchange controls, taxes connected with withholding, treaties about international

taxation, foreign ownership limitations and restrictions connected with capital or dividend payment, and last but not least higher brokerage and trading costs. Indirect costs comprise mostly monitoring costs that appear when there is a lack of information about foreign companies caused by non-synchronous business and trading hours.

With cross-listing there also becomes a space for arbitrage. *“One might expect that ADR prices could deviate from their underlying dollar-price equivalent, but efficient arbitrage should force a realignment of the two dollar prices within some no-arbitrage band”* (Karolyi, 1998). He mentions also that investors must face disadvantages connected with cross-border listings. He points out the alternative taxation rules, limited ownership of foreign equity and also greater costs related to cross-border trading.

The requirements for entering capital markets differ on the global scale. Every stock exchange has its own requirements. In general, the bigger the market is, the more requirements the issuer must follow and keep.

## 2. Cross-Listings in Europe

Europe has been in the continual process of integration. There is no unitary financial market yet. But the integration of financial markets has been in a dynamic process and it is nowadays the goal of the European Union to unify and settle them.

Under the biggest long-lasting problems, a unified infrastructure is missing. It was caused when all markets had been single-acting to create a system by which they would get along, especially with their domestic needs. Other difficulties demonstrate the stock-trading settlement system. [Milne \(2002\)](#) points out that the high additional costs and additional risk connected to the cross-border trade settlement discourage cross-border investors to demand for foreign stocks. There are 17 national central depositories<sup>26</sup> in Europe and every of them they mostly settle trades only on the national level.

This is also the reason why cross-border listing stays so popular in Europe. This trend has been recently active especially in case of smaller exchanges. These emerging capital markets found it useful to cross-list shares abroad because of more liquidity, getting higher prestige and other above mentioned reasons. But we bring here the following part which talks about the integration of European stock exchanges. We put it here because it may symbolize that cross-listing will not be as necessary in the future since capital markets are getting unified and thus having a common system of trading.

### 2.1. The Financial Integration Process in Europe

As the result of all current problems pointed above there is a forth-coming process of inter-stock-exchange cooperation. Stock exchanges have been lately frequently creating alliances and mergers. Among the first stock exchange alliances that were created in the modern history of stock exchanges are NOREX and EUREX. NOREX was established in 1997 as a strategic alliance between stock exchanges in Copenhagen and Stockholm. The Alliance currently consists of the OMX Exchange<sup>27</sup> and Oslo Børs. EUREX was established in 1998 and it was

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<sup>26</sup> "A depository bank is a bank which provides all the stock transfer and agency services in connection with a depository receipt program. This function includes arranging for a custodian to accept deposits of ordinary shares, issuing the negotiable receipts which back up the shares, maintaining the register of holders to reflect all transfers and exchanges, and distributing dividends." ([Wikipedia, free encyclopedia](#))

<sup>27</sup> Nordic OMX Exchange is a part of NASDAQ OMX Group Inc. and includes Stockholm, Helsinki, Copenhagen and Iceland Stock Exchanges. Available online: [www.omxnordicexchange.com](http://www.omxnordicexchange.com)



the alliance of Deutsche Terminbörse<sup>28</sup>, Swiss Option and Financial Futures Exchange<sup>29</sup>. In 1999, Helsinki Exchanges Group Ltd. got connected and one year later EUREX expanded to U.S. market by Dow Jones STOXX Futures. EUREX is focused on the trading with financial derivatives and nowadays it is the largest world market for trading and settlement of futures and options. The Vienna Stock Exchange has taken over a majority stake in the Prague Stock Exchange recently in 2008.

At the end of 20<sup>th</sup> century there has spread a trend to form implicit mergers<sup>30</sup> in the case of stock exchanges caused by the increasing competition. Forming implicit mergers was accompanied by the centralization of the electronic trading function and continued realization of others on a decentralized basis. Implicit mergers between existing exchanges entail positive effect of liquidity. They also allow to individual exchanges to set prices above marginal cost (Domowitz (1995)). To simplify it, stock exchanges are going to work better when they are closer and deeper cooperated (Malkamaki (2000)).

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<sup>28</sup> German derivatives stock exchange

<sup>29</sup> Swiss derivatives stock exchange

<sup>30</sup> Domowitz (1995) explains „implicit merger“ as a common electronic platform.

### 3. Previous Economic Research

There has been written a wide range of literature addressing the questions connected with cross-listing of shares. Karolyi (1998) is the first one who transparently summarizes previous literature and splits it to the groups according to what were the studies focused on. Since that time there have been many other literatures but Karolyi's paper has become the primary reference used by other researchers. We will mention here the previous surveys on the factors influencing or influenced by cross-border listing that are most frequently discussed. We do not model our own results connected with these factors since it goes over the horizon of our research.

#### 3.1. Factors Discussed in Connection with Cross-Listing

The past gives us many papers, ideas and notes about the aspects of cross-listing that have an impact on market liquidity, information disclosure, etc. In this section we combine the notes of several researchers; among them we will cite the paper of Karolyi (1998). We draw the most discussed points related to cross-border listing<sup>31</sup>.

##### 3.1.1. Size of Firms

This concept is influenced by cross-listing from the point of view of increasing the finance. As Khurana, Martin and Periera (2008) say, cross-listing will have a positive impact on firm growth that is caused particularly by external financing.

Another research related to this factor is of the authors Reese and Weisbach (2001). They inquire the concept of the rights for minority shareholders in the countries outside of the U.S. A manager, who is going to decide whether to cross-list the firm's stock in the U.S., "*must balance the expected change in private benefits with the expected change in shareholder protection*". Firms from the countries with strong protection rights for minority shareholders are assumed that they have higher potential to issue their equity in the U.S. Adversely; there is

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<sup>31</sup> This literature mostly evaluates only the U.S. markets with the relation to the other markets. The evaluation of the markets in Europe and some other developed or emerging markets has become a trend just in the past decade and will hopefully spread to the future.

a low probability that firms from low protection rights will issue their equity in U.S. They may decide to cross-list somewhere else outside the U.S.

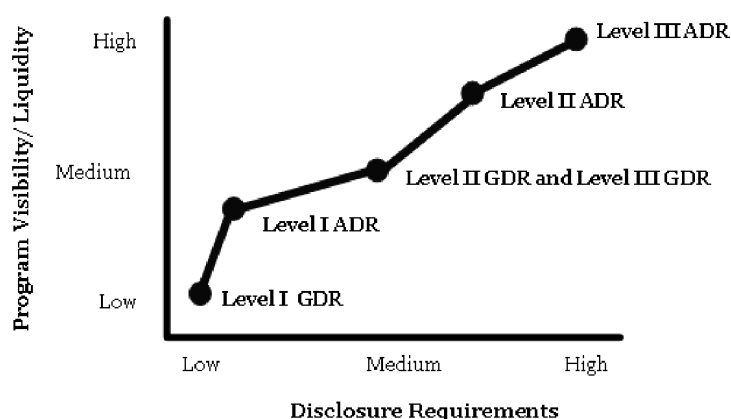
Minority shareholder rights in a firm, that does cross-list, encourage the fact, that cross-listing reduces the ability of expropriation of minority shareholder's wealth. We can see the process of cross-listing as a guarantee that minority shareholders will not be expropriated. To summarize this problem, the size of firms is going to be positively influenced by cross-listing in the countries where is a strong protection of minority shareholders.

### **3.1.2. Liquidity**

For many firms, cross-listing in foreign countries, especially in the more developed ones as in the U.S., means the positive aspect of liquidity. As **Miller (1998)** mentions, foreign firms notice the highest abnormal returns when they issue their stock on a major U.S. exchange. The effect of change in liquidity is closely connected with the change of share's price. Its increase even reflects the positive change in liquidity and investor recognition.

From the other point of view, Reese and **Weisbach (2001)** talk about lowering cost of capital following cross-listing. Other reasons to enhance liquidity would be that *“access to more investors could lead to higher volume, information asymmetries could decrease due to increased disclosure, and there could be exchange-specific reasons why transactions costs might be lower in the U.S. than in the home country”*. In the graph below we show the relationship of disclosure requirements and program visibility (i.e. liquidity) of individual types of depositary receipts.

**Figure 2: Individual DRs - relationship of Disclosure Requirements and Liquidity**



Source: Bank of New York<sup>32</sup>

On the other side, **Miller (1998)** says the liquidity is negatively affected when firms must adopt the policy to gain more liquidity. He associates himself with the idea that this liquidity problem might be the major impediment to investing, especially in emerging markets<sup>33</sup>.

### 3.1.3. Share's price

When a firm decides to cross-list its stock, the stock price always reacts in a positive or negative way. Many studies talk about the abnormal increase of the stock price in the period up to one week after cross-listing<sup>34</sup>. After this period of up to one year the stock price may diminish. This evidence is prevalent but it also differs with every individual firm (**Karolyi (1998)**).

### 3.1.4. Location

To evaluate this cross-listing and its consequences by location might be generalized just to evaluate the reactions of developed or emerging markets<sup>35</sup>. Emerging markets are significant by low liquidity, almost no investment barriers and investor protection, and low accounting standards. Developed markets feature the highest liquidity, the largest base of shareholders

<sup>32</sup> Available online:

[www12.georgetown.edu/sfs/ccas/ccas/www/files/Accessing%20the%20Global%20Capital%20Markets.ppt](http://www12.georgetown.edu/sfs/ccas/ccas/www/files/Accessing%20the%20Global%20Capital%20Markets.ppt)

<sup>33</sup> He associates himself with the paper of **Chuhan (1992)**. His paper is unpublished, though.

<sup>34</sup> To be precise, it exactly means after the announcement of cross-listing.

<sup>35</sup> In this case location means either developed or emerging markets, not more specific (**Miller (1998)**).

(that is even caused by very strong investor protections) and also very strict requirements for disclosure. The U.S. market is considered as the strongest capital market, while it shows all these characteristics.

The research on this concept has been also more specific. **Van Dijk and Roosenboom (2007)** did research about how cross-listing influences the value of firms according to the area and what are the major factors that decide about enhancing these values. *“Our evidence is broadly consistent with liquidity, disclosure, and bonding<sup>36</sup> playing a role in the value creation of cross-listings on U.S. markets. Disclosure and investor protection are also significantly related to abnormal returns for firms cross-listing in London. Measures of the four explanations of value creation suggested by the literature have little power in explaining cross-listing returns for Europe and Tokyo”.*

There are also different levels of legal barriers that segment the markets. Those markets with the highest restrictions on international flow should experience the highest abnormal returns. Abnormal returns are most evident around the announcement date on U.S. exchanges, followed by London. Europe and Tokyo does not experience such significant returns.

**Miller (1998)** brings another approach to classify the markets. According to the Investment Regulations Summary settled by the International Finance Corporation (IFC) markets are separated into the groups: *“developed markets, free emerging markets, and restricted markets”*. Chile is the example of a restricted emerging market because it repatriates capital just after the period of one year of holding.

### **3.1.5. Legal Framework and Legislation**

In this section we would divide the effects of external financing according to the legal origin (**La Porta, Lopez-de-Silanes, Shleifer, Vishny<sup>37</sup> (1997)**). We recognize different legal roots in English, French, German and Scandinavian law. English law varies from the others that it is made by judges making their decisions in courts, applying their common sense and knowledge of legal precedent into the legislature. French, German and Scandinavian laws belong to the group of civil law tradition created by scholars and legislators.

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<sup>36</sup> Bonding means investor protection.

<sup>37</sup> In their paper, they omit the cross-border listings in the analysis of external finance. We still use the results because it might give us the similar ones. It is also necessary to point out that they use only the largest firms, so it might distort results, if we aggregate it.

Capital markets with French common law are unpopular for the lowest investor protections and they lag behind the other capital markets. They are less developed and it also coheres with the negative impact on the other factors such as size and breadth of the capital market. Thus because of the bad shareholder protection some legal origins might have the limited access to external finance and therefore, smaller equity markets.

On the other hand, as **La Porta, Lopez-de-Silanes, Shleifer, Vishny (1997)** say: “*common law countries protect both shareholders and creditors the most, French civil law countries the least, and German civil law and Scandinavian civil law countries somewhere in the middle*”.

Countries, where there are even better conditions for accessing external finance will gain more foreign firms because they are able to provide higher evaluations of stocks and also ensure a broadening of their capital base.

### **3.2. Previous Research on Capital Market Integration in Europe**

The idea of European market integration has a long history. Jeffrey H. Bergstrand, professor of Finance at the University of Notre Dame, said in his article (2008)<sup>38</sup> that the European economic integration celebrated the 50th anniversary in 2008. The process has even intensified significantly in the past two decades. This topic has attracted many researchers and there come some of the highlights of the research on the European market integration.

**Yang, Min and Li (2005)** made a survey on European market integration and found out that after the formation of the EMU, European stock markets have become more integrated.

This is an important issue and thus we decided to evaluate capital market integration of Central-European markets with developed ones such as British and German markets. We used the method of information flows that was closely described in the paper of **Domowitz, Glen and Madhavan (1998)**.

#### **3.2.1. Enquiry of Integration Based on the Model of Information Flows**

**Domowitz, Glen and Madhavan (1998)** emphasized the importance of informational linkages between markets and their transparency concentrated more on the linkages between emerging

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<sup>38</sup> The article is called „How much has European economic integration actually increased members’ trade?”. Available online: [www.voxeu.org/index.php?q=node/1623](http://www.voxeu.org/index.php?q=node/1623)

and developed markets<sup>39</sup>. *“There has been a dramatic increase in the trading of foreign stocks as investors recognize the need for international diversification and as foreign companies seek to broaden their shareholder base and raise capital.”* On one hand, domestic companies decide to cross-list in order to gain higher values, but on the other hand, these changes in liquidity and volatility and the costs connected with trading (that are especially caused by the order flow migration) may have a negative impact on the quality of the domestic capital market.

Along with the intermarket price information we can recognize the market quality. When the information is freely available, the whole act of cross-listing might lead the market quality to higher level. In such case, it attracts more traders which may lower spreads, enhance the public information and finally, it may improve the liquidity on both markets.

Adversely, when this information is not available or extremely weak, the information order flow will diverse overseas and thus, decrease the domestic market quality. It may consequently cause the higher intermarket competition which is demonstrated by lower liquidity and increased price volatility<sup>40</sup>. If that becomes accompanied by the lower trading intensity, it will coincide with the increasing of the domestic market spread.

Thus the enquiry of information flow migration will also intervene to the next part of this paper where by using this instrument we investigate the integration of capital markets.

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<sup>39</sup> In particular, they researched the informational linkages between Mexican Stock Exchange (Bolsa Mexicana de Valores) and the U.S. ADR market.

<sup>40</sup> The process of cross-listing is very complex. We can see all the aspect from the costs of order flow fragmentation up to the benefits of increased intermarket competition (Domowitz, Glen and Madhavan (1998)).

## 4. Introduction to Analysis

We focus on capital market integration between countries in the Central – European area, particularly of the Czech Republic, Poland and Hungary with Western capital markets such as the Frankfurt Stock Exchange and the London Stock Exchange. We use the Granger Causality Test to investigate in particular the capital market integration of the Central-European capital markets with developed capital markets. The method of Granger Causality uses information flows as the essential instrument to inspect the presence of the integration<sup>41</sup>. The selection of the markets in Germany and Great Britain appears suitable, considering that these are the most developed markets in Europe. This analysis creates the core of this paper. There comes at first a short description of the markets we use in the analysis – the London Stock Exchange, the Frankfurt Stock Exchange<sup>42</sup> representing developed markets and Prague Stock Exchange, Warsaw Stock Exchange and Budapest Stock Exchange representing emerging markets.

### 4.1. London Stock Exchange

The London Stock Exchange is one of the most famous, most developed and oldest stock exchanges. The history goes back to 1801 when the first regulated stock exchange was founded in London and from that was born the first modern Stock Exchange<sup>43</sup>. However, its roots begin in 1698 when John Castaing issued in Jonathan’s Coffee-house a list of stock and commodity prices. That was the first evidence of organized security trading in London. The London Stock Exchange consists of the Main Market<sup>44</sup> and the Alternative Investment Market (AIM)<sup>45</sup>. In November 2007, there were 708 companies from 67 jurisdictions listed on either the Main Market or the Aim.

*“The Main Market is a regulated market and is defined by the Investment Services Directive. All companies seeking admission to the Main Market are required to meet the eligibility requirements set out in the Listing Rules (LR), Prospectus Rules (PR) and Disclosure and Transparency Rules (DTR). Companies must also comply with the Exchange’s Admission and Disclosure Standards” (London Stock Exchange (2009)).* The companies may choose between a primary or secondary listing. A primary listing demands of a company to meet the

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<sup>41</sup> We will basically examine the relationship of local share’s prices and their DR’s prices on foreign markets.

<sup>42</sup> For the graphs and tables, we will use the abbreviations LSE and DB for these markets, respectively.

<sup>43</sup> The official name „The London Stock Exchange“ has been since 1991

<sup>44</sup> Since 2001, also called „Main Board“

<sup>45</sup> Since 1995



highest regulation level and disclosure requirements in Europe. However, it does not have to be the first company's listing. Investors may then obtain more detailed information about the financial situation and control of a company. Companies have to meet certain criteria set by the relevant EU directives in order to process a secondary listing which is not necessarily the issuer's second listing.

The AIM is a special market for young companies in progress from all around the world. Companies meet less stringent criteria to list on AIM rather than on Main Market. *“There is no minimum trading record required and there is no minimum public shares requirement. The key to getting listed on AIM is to appoint a nominated adviser. The nominated adviser will assist your company through the application to help you make full disclosure in your listing document and help you meet regulatory requirements on a continuing basis”* (Pricewaterhouse Coopers (2006))<sup>46</sup>.

The Stock Exchange Electronic Trading Service (SETS) was introduced in 1997 to provide a higher speed and efficiency to the market. The last important milestone in the LSE history dates in 2007 when London Stock Exchange had merged with Borsa Italiana in order to create *“Europe's leading equity platform”* (London Stock Exchange (2009)).

## **4.2. Frankfurt Stock Exchange**

*“The Frankfurt Stock Exchange (Frankfurter Wertpapierbörse) is one of the world's largest trading centers for securities. With a share in turnover of more than 90 percent, it is the largest of Germany's seven stock exchanges. Deutsche Börse AG operates the Frankfurt Stock Exchange, an entity under public law. In this capacity it ensures the smooth functioning of exchange trading in Frankfurt.*

*The Frankfurt Stock Exchange facilitates advanced electronic trading, settlement and information systems. Thus, it is able to meet the steadily growing requirements of cross-border trading. Besides traditional floor trading, its fully electronic trading system Xetra® is one of the leading electronic trading platforms in the world. With its launch in 1997, the Frankfurt Stock Exchange succeeded not only in strengthening its own competitive position. It also created attractive framework conditions for foreign investors and market participants.*

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<sup>46</sup> That resembles to process of a secondary listing on the Main Market.

Today, the Frankfurt Stock Exchange is an international trading center. This is also reflected in the structure of its participants. Some 160 of around 330 market participants come from abroad” (Deutsche Börse (2009)).

### **4.3. Emerging Markets – the Czech Republic, Hungary and Poland<sup>47</sup>**

We describe the stock markets – the Prague Stock Exchange in the Czech Republic, the Warsaw Stock Exchange in Poland and the Budapest Stock Exchange in Hungary<sup>48</sup> and depict the general situation of these capital markets involved in our analysis. These three markets are also members of the Federation of European Securities Exchanges (FESE).

#### **4.3.1. The Czech Republic and the Prague Stock Exchange**

The history of the Prague Stock Exchange is not very long. Its roots go back to the 19th century when commodities such as corn and other agricultural products were traded at the Horse Market<sup>49</sup> and later at the Hay Market Square<sup>50</sup>. Those were just commodity trades. In 1871 (and after several unsuccessful attempts) was established „*the monetary exchange for merchandise and agricultural products (commodities)*“ where the founder Mr. Alois Oliva was a successful wholesaler dealing in sugar. On account of that, Prague exchange became „*a central marketplace for that commodity within the entire Austrian-Hungarian monarchy*“<sup>51</sup>. The Prague exchange was closed after the Second World War and its door were reopened in the 1990s. In 1992, after the adoption of the Stock Exchange Act, the new Prague Stock Exchange was founded, a. s. (by signing in the Trade Register). The trading itself came true again on 6<sup>th</sup> of April in 1993.

Nowadays, the Prague Stock Exchange contains three official markets – the Main Market, the Secondary Market and the Free Market. The Main Market represents the most prestigious market among those three markets due to its fees for entering, other financial requirements and demands on the information disclosures that the company must meet the entire time of listing. There is a body called the Exchange Listing Committee that decides about whether certain securities will be listed on the Main market. Therefore just the most liquid and renowned securities are listed there. The Secondary Market forms the lower level of the Main

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<sup>47</sup> Following information were found on the web pages of the particular stock exchanges.

<sup>48</sup> Later, we will use the abbreviations for the markets PSE, GPW and BSE, respectively.

<sup>49</sup> „Koňský trh“ in Czech

<sup>50</sup> „Senovážné náměstí“ in Czech

<sup>51</sup> Prague Stock Exchange, available online: [www.pse.cz](http://www.pse.cz)

Market. The requirements to enter this market (such as size of the issue or liquidity) are less stringent and the fees are also lower. The Exchange Listing Committee represents the body that decides about the listing of a share (much like in case of the Main Market). The Free Market stands for the place for companies that cannot afford to issue their shares neither on the Main Market nor on the Secondary Market (they have not met the requirements yet) but are interested in listing on the stock exchange.

The trading system of the Prague Stock Exchange has been fully dependent on the electronic platform called automated trading system (ATS) and there is where all trading is performed. Firms (members of the exchange) enter into the system by buying and selling orders to begin the automated process of dealing with securities. The company Český Telecom provides services of communication between the server and clients.

The Capital market situation still has been carrying the consequences of coupon privatization that happened in the 1990s. Privatization predominantly involved large firms and their ownerships scattered widely. This process was not ready to deal with obstacles such as a weak protection of minority shareholders or poor market regulations. There also appeared cases of fraud and it led to the situation that the Czech capital market started to be considered as an insider market. The only “positive” evidence of privatization was noted as fast development of the equity market in terms of capitalization and the volume of traded shares. Nowadays, the Czech market is largely dependent on foreign investors (Podpiera (2001)).

#### **4.3.2. Hungary and the Budapest Stock Exchange**

The Budapest Stock Exchange foundation dates back to the 19<sup>th</sup> century when Franz Josef I, the emperor of Austria, established the Commodity and Stock Exchange in Pest in 1864. Four years later, it was newly renamed as the Budapest Stock and Commodity Exchange (BSCE) and continued for next 80 years in this formation as the leading market trading with grain. During the Second World War, hyperinflation stigmatized the exchange and it was closed. It was reopened again in 1948 when the Forint was launched into the market. The defaulting and some payments with the disability of limited companies to pay dividends led to the government’s decision about the nationalization of the majority of private Hungarian firms and the total takeover of the Budapest Stock and Commodity Exchange’s assets which became state property. The modern Budapest Stock Exchange was established in 1990 after the retaking of the Securities Act of 1989.

The Budapest Stock Exchange Ltd. (BSE) has been playing a key role in the Hungarian stock market since it is the official platform for dealing with publicly emitted securities. The products of BSE may be divided into three areas – equities, debts and derivatives. The products from the equity area have been dealt since the beginning, in debt, area dominates government bonds, *“however mortgage bonds and corporate bonds alike enjoy an increasing popularity”*. The area of derivatives is the youngest but the most in progress<sup>52</sup>. The Hungarian market is open to foreign cooperation and thus, there is a wide range of investment opportunities for both local and foreign investors. It even supports the implementation of the Multi-Market Trading System (MMTS) in 1996. This new remote trading system on the cash market accompanied in 2000 the implementation of the Multi-Market Trading System II (MMTS II) on the derivatives market. *“In 2003 BSE concluded an agreement with Deutsche Börse AG. As a result, Hungarian brokerage firms may deal, through the infrastructure of the BSE, directly on the Frankfurt-based Xetra® system”*.

Thus, the trading system on the BSE is fully computerized, software has been working reliably for years with the average daily transactions of 2,5 million. The system was created and served by a consortium headed by Sweden's CMA Small Systems AB as a general contractor in co operations with Australian and Hungarian IT corporate.

The Hungarian capital market and the Czech Republic went through similar situations. Privatization also took place here but differently - the majority of large Hungarian firms were sold to foreign investors. It caused a better atmosphere in the capital market because investors from abroad were confident with the foreign owners of companies that were having their shares traded on the exchange.

#### **4.3.3. Poland and the Warsaw Stock Exchange<sup>53</sup>**

The Warsaw Mercantile Exchange was the first form of the exchange in Warsaw and was established in 1817. Initially, bonds and other debt instruments took place. Trading in equities became popular in the second half of the twentieth century. The exchange was closed after the Second World War and reopened until 1989 when the communist regime fell. Along with the political changes began the development of a functional capital market. In 1991 the Warsaw Stock Exchange adopted the Act on Public Trading in Securities and Trust Fund and started to

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<sup>52</sup> „Derivatives includes equity futures and options, as well as currency and currency and interest rate futures” (Budapest Stock Exchange(2009)).

<sup>53</sup> In Polish language, it is „Giełda Papierów Wartościowych w Warszawie”

work in its present form. Since the very beginning the trading electronic platform has been used.

The Warsaw Stock Exchange targets primarily on a transparent, effective and liquid market that records a high concentration of buying and selling orders thanks to its electronic system which provides trading in one place and at one time.

In 2004 there were settled two separate markets on the Warsaw Stock Exchange – **the Main Market and the Parallel Market**. Each market also has its own set of rules. The Main Market is the more prestigious place for listing on the WSE and the requirements for listing are more stringent. Among those we may mention that the securities admission to public trading must be covered by a listing application where the market price of the shares covered by the application must equal at least one million Euros. The companies are also required to hold the financial statements for at least a three-year-long period. Along with the Main Market there was also established a segment called **Plus** that covers only the companies that meet the requirements of the best quality (for instance the rules of corporate governance or very good communication levels with investors). The Parallel Market is designated for those who cannot list their shares on the Main Market. A Parallel Market called **Prim** was established for those securities that can handle the higher communication standards with investors and the enhanced reporting of financial statements.

The Polish capital market adjusted well to the overturn towards the capital market. They enforced strict regulations and kept just a few companies on the exchange which attracted many initial public offerings. Nowadays, there are many small shareholders and the capital market is considered to be a retail market. At its 15<sup>th</sup> anniversary, the Warsaw Stock Exchange got to be an “advanced emerging” exchange according to the Financial Times Stock Exchange (FTSE).

## 4.4. Data Description

In order to investigate the integration of the capital markets we work with the data of the Central European companies listed in the table below. Most of these cross-listings were in the form of Global Depositary Receipts (GDRs) and were traded on London or Frankfurt Stock Exchanges or cross-listed on both markets simultaneously. We chose those companies that Bloomberg provided data for the period 1. 1. 2005 until 5. 12. 2008. The first set contains 11 companies from the Central European region cross-listed on the London Stock Exchange.

**Table 4: Companies from the Central European region cross-listed on the London Stock Exchange (5. 12. 2008)**

Company	Number	Ticker of Local Security	Ticker of CR Security	DR Type	Country	Industry
KOMERCNI BANKA, A.S.	1	KOMB CP	KMCA LI	LEVEL I GDR	Czech Republic	Financial Services
TELEFONICA 02 CZECH REPUBLIC A.S.	2	SPTT CP	TECZ LI	144A/REG S GDR	Czech Republic	Telecommunications
ZENTIVA N.V.	3	ZEN CP	ZEND LI	GDR	Netherlands <sup>54</sup>	Pharmaceuticals
MAGYAR OLAJ-ES GAZIPARE RESZVENYTAR	4	MOL HB	MOLD LI	REG S GDR	Hungary	Oil/Gas
MAGYAR TELEKOM TELECOMS.PLC	5	MTEL HB	MAVD LI	LEVEL III ADR	Hungary	Telecommunications
OTP BANK	6	OTP HB	OTPD LI	REG S GDR	Hungary	Financial Services
AGORA	7	AGO PW	AGOD LI	REG S GDR	Poland	Publishing/Information Svcs
BANK PEKAO S.A.	8	PEO PW	BPKD LI	REG S GDR	Poland	Financial Services
KGHM POLSKA MIEDZ S.A.	9	KGH PW	KPMD LI	REG S GDR	Poland	Metals/Mining
POLSKI KONCERN NAFTOWY ORLEN S.A.	10	PKN PW	POKD LI	REG S GDR	Poland	Oil/Gas
TELEKOMUNIKACJA POLSKA S.A.	11	TPS PW	TPSD LI	REG S GDR	Poland	Telecommunications

Source: The Bank of New York Mellon (2008)<sup>55</sup>

The second set of the Central European companies involves 15 companies cross-listed on the Frankfurt Stock Exchange.

<sup>54</sup> Zentiva is a Dutch company. But we still use it for our analysis since it has been listed on LSE, PSE and DB.

<sup>55</sup> Available online: [www.adrbnymellon.com/dr\\_directory.jsp](http://www.adrbnymellon.com/dr_directory.jsp)

**Table 5: Companies from the Central European region cross-listed on the Frankfurt Stock Exchange (5.12. 2008)**

Company	Number	Ticker of Local Security	Ticker of CR Security	DR Type	Country	Industry
KOMERCNI BANKA, A.S.	1	KOMB CP	KON GR	GDR	Czech Republic	Financial Services
TELEFONICA O2 CZECH REPUBLIC A.S.	2	SPTT CP	TEEN GR	GDR	Czech Republic	Telecommunications
ZENTIVA N.V.	3	ZEN CP	UWW1 GR	GDR	Czech Republic	Pharmaceuticals/Bitech
MOL HUNGARIAN OIL AND GAS PLC.	4	MOL HB	MOGG GR	GDR	Hungary	Miscellaneous Service
OTP BANK	5	OTP HB	OSZG GR	GDR	Hungary	Financial Services
RICHTER GEDEON PLC.	6	RICHT HB	RIG1 GR	GDR	Hungary	Pharmaceuticals/Bitech
TISZA CHEMICAL GROUP PLC.	7	TVK HB	TVK1 GR	GDR	Hungary	Chemicals
AGORA	8	AGO PW	AGQ GR	GDR 144A	Poland	Publishing/Information Svcs
ASSECO POLAND S.A.	9	ACP PW	SFB GR	GDR	Poland	Computer Software/Services
BANK BPH	10	BPH PW	BP9G GR	GDR	Poland	Financial Services
BANK PEKAO S.A.	11	PEO PW	BP1A GR	GDR	Poland	Financial Services
KGHM POLSKA MIEDZ S.A.	12	KGH PW	KGH GR	GDR 144A	Poland	Metals/Mining
POLSKI KONCERN NAFTOWY ORLEN S.A.	13	PKN PW	PKY GR	GDR	Poland	Oil/Gas
STALEXPORT S.A.	14	STX PW	SAX GR	GDR	Poland	Metals/Mining
TELEKOMUNIKACJA POLSKA S.A.	15	TPS PW	TPA GR	GDR	Poland	Telecommunications

Source: Deutsche Bank (2008)<sup>56</sup>

Polish, Czech and Hungarian stock price developments were modified with corresponding exchange rates and were then converted to Euro in case of the Frankfurt Stock Exchange and to British Pound in case of the London Stock Exchange. We show the price developments in the local markets and their GDRs of each company in the appendix 1. Data is in a daily frequency.

<sup>56</sup> Available online: [adr.db.com/Shared/ViewDR.asp](http://adr.db.com/Shared/ViewDR.asp)

## 4.5. Theoretical Background of the Granger-Causality Test

According to Granger (1969), the cross-spectral methods enable a skillful analysis of the relationship between two (or more) variables when one causes the other(s). In this theory, the central characters will be the stochastic nature of the variables and the direction of the flow of time. However, this is not relevant for non-stochastic variables and indeed, we have to take into account the assumption that “*the future cannot cause the past*”.

### 4.5.1. Two-Variable Model

Granger (1969) uses only the linear predictors and all definitions are used under the assumption of linearity. He uses the variance<sup>57</sup> as “*a natural criterion to use in connection with linear predictors*” because it is quite mathematically simple to handle and give an interpretation.

“*The definition of causality is based entirely on the predictability of some series, say  $X_t$ . If some other series  $Y_t$  contains information in past terms that helps in the prediction of  $X_t$  and if this information is contained in no other series used in the predictor, then  $Y_t$  is said to cause  $X_t$ . The flow of time clearly plays a central role in these definitions*”.

He emphasizes again that “*a purely deterministic series*”, defined as non-stochastic series that are characterized by the ability of exact prediction from its past, may not be causal-influenced else than by its own past.

#### Definition

Let  $X_t, Y_t$  be two stationary time series with zero means. The simple causal model is

$$X_t = \sum_{j=1}^m a_j X_{t-j} + \sum_{j=1}^m b_j Y_{t-j} + \varepsilon_t \quad (1)$$

$$Y_t = \sum_{j=1}^m c_j X_{t-j} + \sum_{j=1}^m d_j Y_{t-j} + \eta_t \quad (2)$$

where  $\varepsilon_t, \eta_t$  are taken to be two uncorrelated white-noise series, i.e.  $E[\varepsilon_t \varepsilon_s] = 0 = E[\eta_t \eta_s]$ ,  $s \neq t$ , and  $E[\varepsilon_t \varepsilon_s] = 0$  all  $t, s$ .

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<sup>57</sup> That is the reason why it could be called “*causality in mean*”.



There may be  $m$  equal to infinity in the equations but in practice (and due to the finite length of the available data),  $m$  appears to be a finite number and shorter than the given time series.

From the definition, we can say that  $Y_t$  causes<sup>58</sup>  $X_t$  with some  $b_j$  significantly different from zero (equation 1). Similarly  $X_t$  causes  $Y_t$  if some  $c_j$  is significantly different from zero (equation 2).

The four possible situations may be found: there may occur two one-way Granger-causality cases ( $x$  Granger-causing  $y$  and  $y$  Granger-causing  $x$ , only in these certain directions), both-way Granger-causing case ( $x$  Granger-causing  $y$ , and vice versa), and no Granger-causality ( $x$  not Granger-causing  $y$ , and vice versa)<sup>59</sup>.

In our specific case, we can thus say that there occurs the Granger-causality in the way from local markets (Budapest, Prague, Warsaw) to London or vice versa, in both directions or in no direction. The same analysis will be applied on Frankfurt as another developed market.

**Podpiera (2001)** brings the idea that “*the evidence of causality in either or both directions suggests that the markets are fragmented*”. Failure to reject the null hypothesis of no causality leads to the idea that the markets are integrated. However, it is not as clear because that might also show that the developments of prices in local and foreign markets are not related at all<sup>60</sup>.

#### 4.5.2. Theoretical Background for our Specific Analysis

At first, we will test the Granger-Causality on the basis of OLS estimator. We use the **Breusch-Pagan (1979)** approach to test whether we accept or reject the null hypothesis about the homoscedasticity of residuals. In case of rejection of the null hypothesis, we will test the Granger-Causality by the robust method of OLS estimator.

The assumption to run Granger-Causality is the stationarity of time series (in our case, of the developments of the stock prices in home and foreign markets). We use Augmented **Dickey-Fuller (1984)** test to test the stationarity of time series (null hypothesis stands for the non-stationary time series). If we do not reject the null hypothesis, we will have to look for another way how to make the time series stationary. We chose the approach based on the first differences.

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<sup>58</sup> According to the author, we may use „Granger-causes“.

<sup>59</sup> We can also say that there occur **information flows** in two one-way directions, **information flows** in both ways and **no information flow**.

<sup>60</sup> We may find it out by testing the cointegration of the two time series and estimating an error-correction model. We are not capable of doing that in this thesis, though.

In order to find out the optimal number of lags (m) we use the standard Akaike (AIC) and Schwarz Bayes (SIC) Information Criteria. The best model is recognized according to the lowest value of AIC and SIC. Then we go for the F-test because we want to say if the coefficients of the lagged variables are jointly significant (i.e. different from zero). This instrument decides about whether there is a presence of Granger-Causality<sup>61</sup>.

#### **4.6. Sensitive Results and Information Flow between Markets**

Because we found the presence of heteroscedasticity in most cases (21 out of 22 cases as for LSE and 29 out of 30 as for DB) we corrected the models in all cases by using the robust standard errors. We used first differences in any data that showed non-stationarity.

Following Podpiera (2001), we decided to test the different numbers of lags with the maximum of six lags. To get the optimal model, we follow the Akaike and Schwarz Bayes Information Criteria. We found out that the optimal models were predominantly with six lags (12 out of 22 models in case of London and 20 out of 30 models in case of Frankfurt).

In case of the London Stock Exchange, the results strongly show there is a presence of the Granger Causality from the emerging markets to London. The Czech Republic and Hungary show this unidirectional Granger Causality in two out of three cases. Moreover, most rejections were at the 1 % significance level. Thus, we can say there is a presence of an information flow from the emerging markets to London. This one-way direction of information flows signals the markets are fragmented.

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<sup>61</sup> There is a presence of Granger-Causality if we reject the null hypothesis about no causality.

**Table 6: Results of Granger Causality Tests in case of the London Stock Exchange**

Company Number	Dependent Variable	Number of lags (London to local m.)	Number of lags (local m. to London)	H <sub>0</sub> : No causality (F-statistics)	From London to local market	From local market to London	N	R <sup>2</sup>
1	Local price	6	6	1,61	No	No	887	0,06
	GDR price			1,36				887
2	Local price	6	6	1,16	No	Yes	389	0,14
	GDR price			2,34 (5% sig.level)				389
3	Local price	3	3	0,75	No	Yes	686	0,03
	GDR price			13,82 (1% sig.level)				686
4	Local price	4	5	1,03	No	No	842	0,02
	GDR price			1,92				842
5	Local price	6	6	1,84	No	Yes	636	0,04
	GDR price			3,52 (1% sig.level)				636
6	Local price	6	6	1,48	No	Yes	954	0,04
	GDR price			2,44 (5% sig.level)				954
7	Local price	1	5	0,07	No	Yes	536	0,00
	GDR price			4,98 (1% sig.level)				536
8	Local price	6	5	0,72	No	Yes	759	0,05
	GDR price			10,38 (1% sig.level)				759
9	Local price	6	6	0,69	No	Yes	911	0,01
	GDR price			20,96 (1% sig.level)				911
10	Local price	5	6	3,71 (1% sig.level)	Yes	Yes	855	0,02
	GDR price			5,83 (1% sig.level)				855
11	Local price	1	5	0,85	No	Yes	929	0,00
	GDR price			6,18 (1% sig.level)				929

Source: Author

In case of the Frankfurt Stock Exchange, the results strongly show that the stock price development in emerging markets Granger -causes GDR price development in Frankfurt (similarly with London). There is a unidirectional Granger Causality in 13 out of the 15 cases. Just in the case of Agora, there was recorded the Granger Causality in both directions. In the case of Bank BPH, there was no causality in any direction. Moreover, 14 out of 15 rejections were at the 1 % significance level. Thus, there is a presence of a strong information flow from the emerging markets to Frankfurt. We can say that the Frankfurt Stock Exchange and the markets in the Central European region are fragmented.

**Table 7: Results of the Granger Causality Test in case of the Frankfurt Stock Exchange**

Company Number	Dependent Variable	Number of lags (Frankfurt to local m.)	Number of lags (local m. to Frankfurt)	H <sub>0</sub> : No causality (F-tstatistics)	From Frankfurt to local market	From local market to Frankfurt	N	R <sup>2</sup>
1	Local price	6	6	0,24	No	Yes	980	0,05
	GDR price			42,29 (1% sig.level)				980
2	Local price	5	6	0,49	No	Yes	954	0,02
	GDR price			132,69 (1% sig.level)				954
3	Local price	2	6	1,63	No	Yes	987	0,02
	GDR price			34,88 (1% sig.level)				987
4	Local price	3	6	2,06	No	Yes	944	0,01
	GDR price			7,01 (1% sig.level)				944
5	Local price	1	6	1,46	No	Yes	632	0,02
	GDR price			3,66 (1% sig.level)				632
6	Local price	6	6	1,52	No	Yes	981	0,03
	GDR price			29,70 (1% sig.level)				981
7	Local price	6	5	1,22	No	Yes	960	0,03
	GDR price			19,67 (1% sig.level)				960
8	Local price	1	6	5,52 (5% sig.level)	Yes	Yes	985	0,01
	GDR price			72,65 (1% sig.level)				985
9	Local price	6	6	0,67	No	Yes	978	0,02
	GDR price			21,96 (1% sig.level)				978
10	Local price	5	5	1,40	No	No	975	0,01
	GDR price			0,65				975
11	Local price	2	6	0,69	No	Yes	986	0,00
	GDR price			15,73 (1% sig.level)				986
12	Local price	6	6	0,67	No	Yes	986	0,02
	GDR price			26,78 (1% sig.level)				986
13	Local price	5	6	2,05	No	Yes	986	0,02
	GDR price			28,17 (1% sig.level)				986
14	Local price	6	6	0,92	No	Yes	986	0,02
	GDR price			22,86 (1% sig.level)				986
15	Local price	6	6	1,49	No	Yes	974	0,01
	GDR price			40,37 (1% sig.level)				974

Source: Author

According to our results, the development of local prices is an important informational linkage for the development of prices in London and Frankfurt. Because there was found Causality in the opposite direction just twice out of 36 cases, we may say that both London

and Frankfurt stock markets do not have any impact on the price development on the stock markets from the Central European region. However, this fact is opposite to those results Podpiera (2001) published in his paper. He rejected the null hypothesis of no Granger Causality in 20 out of the 22 instances for the London to local market Causality and 14 out of the 22 instances for the Causality from local market to London. That may be caused either by that the emerging markets are becoming important players or the volumes of trade concentrate especially on the local markets, and therefore the prices there have greater weigh.

To test the fact of greater weigh, we evaluate the volumes of trade of each share on the local markets and of the corresponding GDRs on the foreign markets. In case of shares and their GDRs on the London Stock Exchange, the volumes range from 75 % up to 99,5 % on the local markets and thus, there is proceeded the majority of trades. The shares cross-listed on the Frankfurt Stock Exchange show the same and even more apparent results when the volumes of trade of all shares do not go under 97 % on the local markets. The results of the analysis based on the Granger Causality test of information flows are then supported. The strong information linkages from the local markets to the developed ones may be because of the prevailing volume of trade on the local markets. The rates of volumes may have changed over time and it could be the reason why Podpiera (2001) and Černý (2004) got different results of information flows.

According to our results, we agree with the Podpiera's hypothesis that *"not only the F-test rejects the null hypothesis of no causality and allows us to conclude that the lagged price changes on the other market are jointly different from zero, but also many of the coefficients for individual lagged changes are highly significant"*. In the appendix 2, there are tables showing the coefficients with the level of significance of each model and the corresponding t-values. We really noticed that higher price on the local emerging market implies the higher price in London (in both cases of Frankfurt and London)<sup>62</sup>.

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<sup>62</sup> Podpiera (2001) got the opposite results when higher price in London causes higher price on local emerging market.

## Conclusion

The first chapter gave the transparent overview of the financing of a company. The source of financing can be in the form of equity, debt or some hybrid security. The instruments may be also combined. The sources of financing come from the domestic market or are international. A company can choose the type(s) of financing that mostly depends on the phase where a company in a certain situation occurs.

A company can be financed by its own equity, i. e. by profit that a company makes. If a company fulfills several criteria as a size, a transparency and some other requirements, it can realize the initial public offering (IPO) on the local stock exchange and “go public” with its equity in order to gain another source of financing. If a company gets to the position that an equity financing is for some reason not profitable (for instance, it gets too big for financing on its own or the tax burden gets too high), a company may use the other type of financing – a debt financing. It can easily sell a part of the equity to some other entity. The levy may get lower or it may help to finance a company that is in a bad financial situation. We can “go public” with a debt security as well. Hybrid securities (preferred stock, options, etc.) as the other type of financing have been developed as the combination of characteristics of equity and debt and thus, may be more comfortable for a company to use. All of these possibilities of financing happen on the domestic level.

It all can happen internationally as well. Moreover, there exist many other ways how to reach some non-domestic capital market for financing. A company can cross-list its shares. The concept of “cross-listing” means **either** a company does the IPO on some foreign stock exchange (which is expensive and keeps very stringent criteria) where its shares are consequently traded **or** a company lists its shares in a local market and trades them in one or more foreign markets. This second possibility of cross-listing works through so-called depositary receipts (DRs). DRs are worldwide used financial securities in order to obtain the international source of financing. They work only on the secondary stock markets where more investors can reach them in the same time. They can again be in the form of equity, debt or some hybrid security. However, the type of a share (security) must correspond to the security listed on the local market. The certain types of DRs were described in the first chapter in detail because we used this instrument for our analysis. Cross-listing increases the liquidity and the prestige of a company but it generates more additional costs which may be the invincible obstacles to use it.

In the second chapter we mentioned the European financial integration process that may once cause there will be created one unified financial market with the common electronic platform. In such case, the instruments such as depositary receipts or other forms of cross-listing would not be needed anymore in Europe.

The third chapter gave highlights on the research related to cross-listing. We mentioned the main factors that either influences or are influenced by cross-listing such as size of a firm, liquidity, share's price, location, and legal framework and legislature. The first well-arranged summary on this research is made by [Karolyi \(1998\)](#) and his paper appeared to be fundamental when many other researchers afterwards cite him in their articles. We brought here the previous research on capital market integration based on the data recording the developments of DRs or other forms of cross-listing. [Domowitz, Glen and Madhavan \(1998\)](#) investigated the capital market integration based on the model of information flows. This method also used [Podpiera \(2001\)](#) in his paper and it was also the inspiration for our analysis. At the fourth chapter we completed our enquiry based on the Granger-Causality test and its information flows ([Granger \(1969\)](#)). We used for our analysis companies from three Central European emerging markets – the Czech Republic, Hungary and Poland, that are cross-listed in the form of GDRs on two European most developed markets – the London Stock Exchange and the Frankfurt Stock Exchange.

Thus, we found out that - based on the Granger Causality test - there are strong information linkages from the local (emerging) markets to the developed markets. That indicates that the European markets are still fragmented. It does not exactly fit with the results of [Podpiera \(2001\)](#) when he found strong information linkages from London to the emerging markets. But we conform on the statement about the European market fragmentation. Our results were supported by discussion about the trading volume of shares. In our sample, the average volumes of trade on the local markets are 92 % and 99 % for the analysis of the London Stock Exchange and the Frankfurt Stock Exchange, respectively. There may have been some trading spillovers over time and now the volumes cause the information flows going in the direction from the local markets to the developed ones.

In our analysis we used the data with daily frequency. However, [Černý \(2004\)](#) in his paper uses the data with the frequency from five minutes to one day. This gives him very exact result about the information flows where he found out that the emerging markets react to the information from the developed markets in the minimum of thirty minutes. That might be the inspiration for the next analysis.

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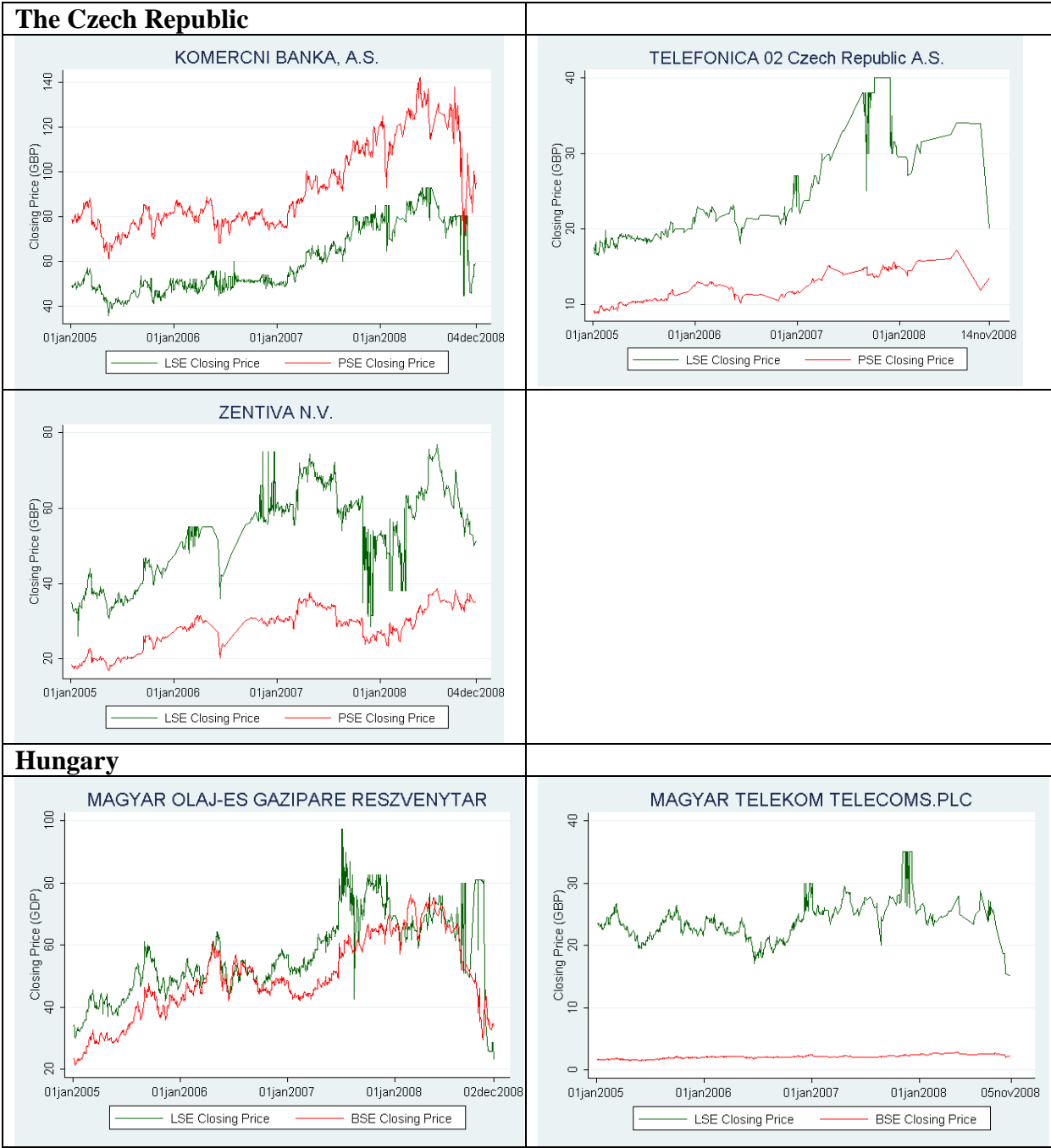
[www.londonstockexchange.com](http://www.londonstockexchange.com)

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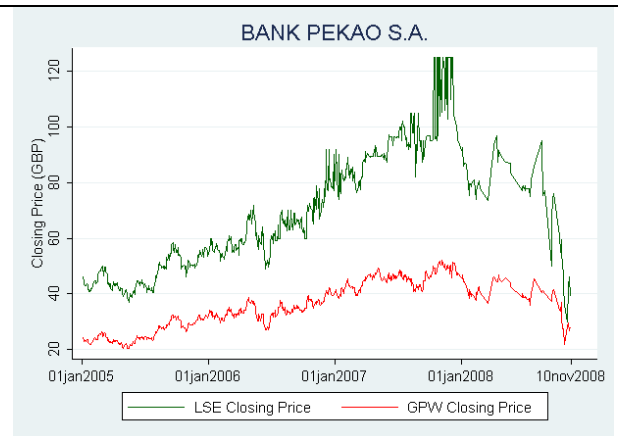
**APPENDIX 1: Illustrations of GDRs and their respective share's price developments**

**Figure 3: Developments of GDR prices on the London Stock Exchange and their domestic shares (1. 1. 2005 – 5. 12. 2008)**

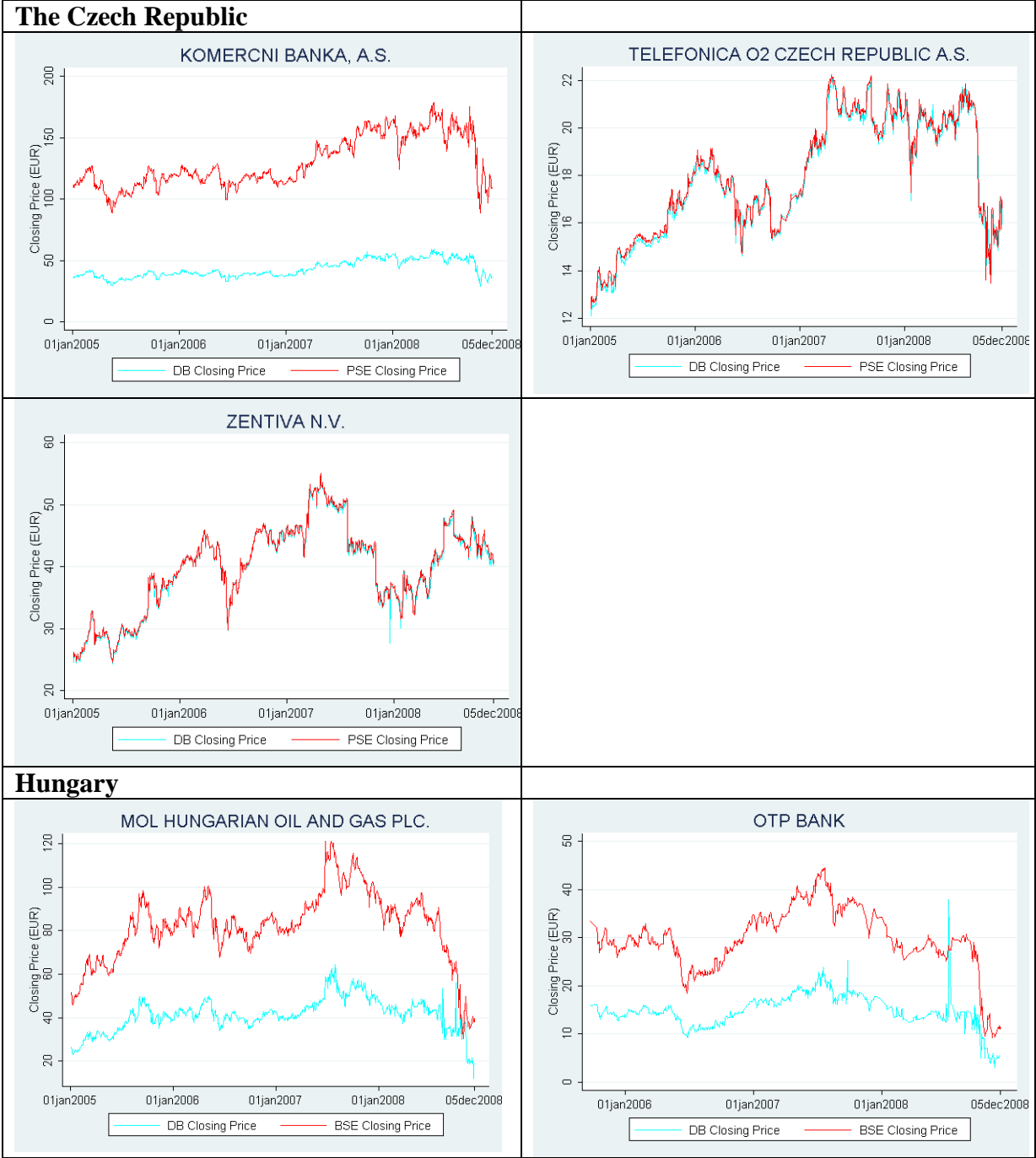


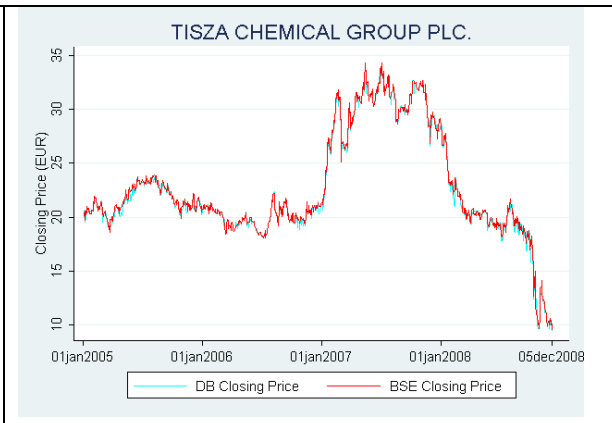
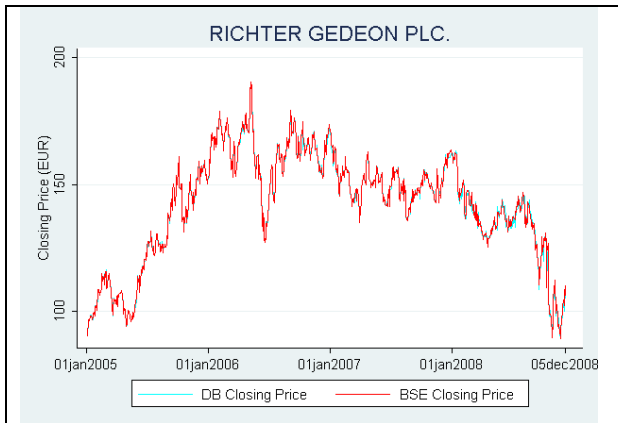


## Poland

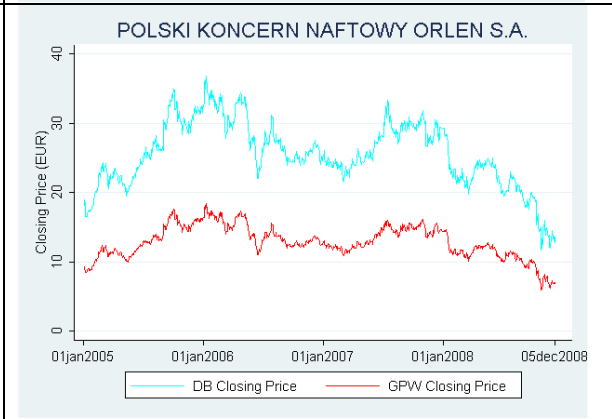
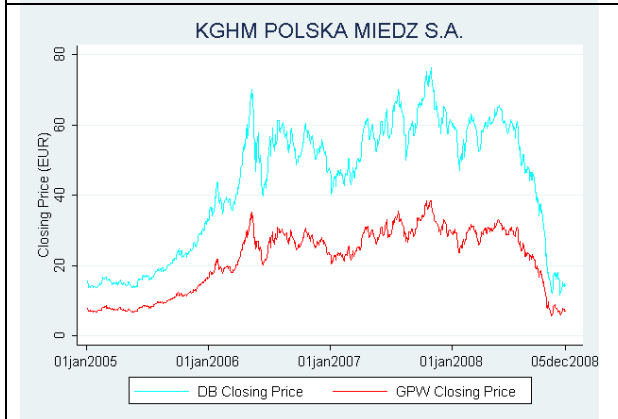
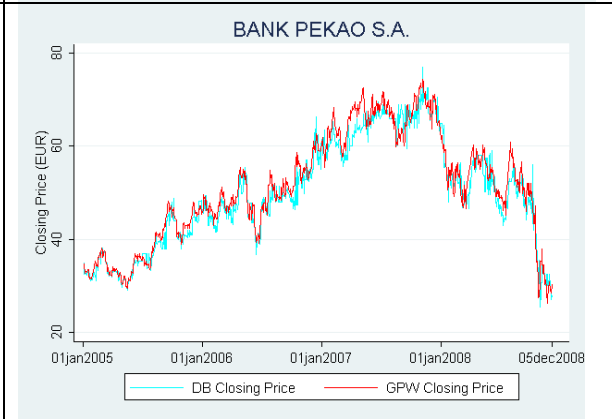
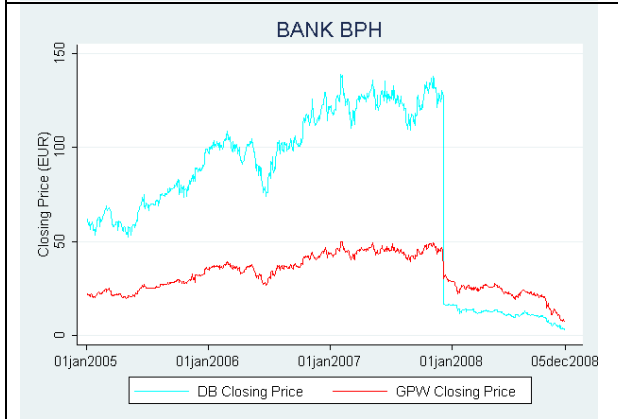
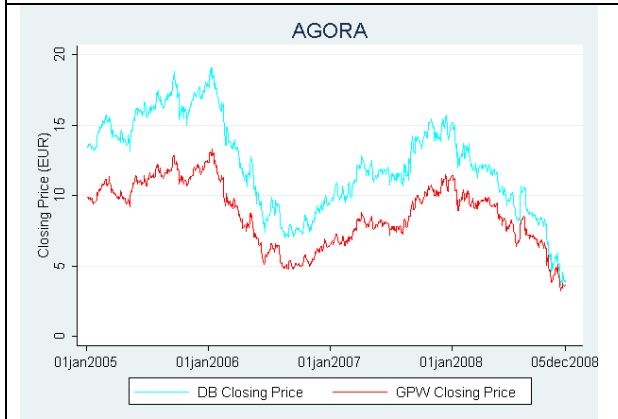


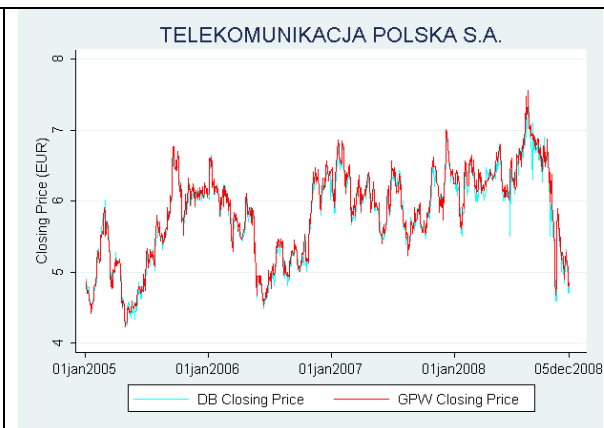
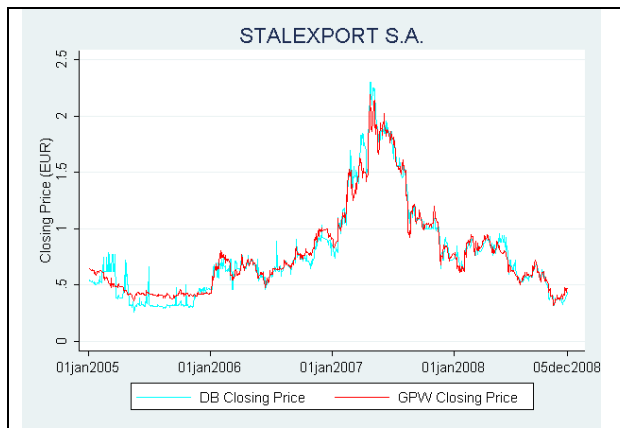
**Figure 4: The Developments of GDR prices on the Frankfurt Stock Exchange and their domestic shares (1. 1. 2005 – 5. 12. 2008)**





## Poland







**APPENDIX 2: The following tables represent the price on the local market (LOC) and its corresponding t-values with significance levels. LI and DB stands for the GDR prices on the London Stock Exchange and the Frankfurt Stock Exchange, respectively. \*\* means that the null hypothesis that the coefficient equals to zero was rejected at the 1 % significance level and \* at the 5 % significance level.**

**Table 8: London Stock Exchange, Individual Coefficient Estimates for Granger Causality Test (corresponding t-statistics below the coefficient estimates)**

	Dep.var.	LOC -1	LOC -2	LOC -3	LOC -4	LOC -5	LOC -6	LI -1	LI -2	LI -3	LI -4	LI -5	LI -6
<b>1</b>	Local	-0,24 -1,45	0,92 1,81	-1,39 -1,71	1,25 1,82	-0,58 -1,92	0,10 1,79	0,36* 2,01	-1,09* -2,15	1,49* 2,12	-1,16* -2,11	0,51* 2,20	-0,10* -2,33
	GDR	0,13 0,45	0,64 0,85	-1,57 -1,37	1,39 1,00	-0,56 -1,32	0,08 1,06	1,29** -3,57	2,04* 2,27	-2,02 -1,61	1,33 1,31	-0,51 -1,14	0,09 1,07
<b>2</b>	Local	-0,63 -1,61	1,26 1,25	-1,94 -1,30	1,46 1,32	-0,49 -1,25	0,06 1,01	-0,01 -0,13	0,02 0,12	-0,12 -0,58	0,17 0,97	-0,09 -1,15	0,02 1,20
	GDR	2,54 2,42	-0,49 -0,17	-0,86 -0,18	0,75 0,19	-0,19 -0,11	0,02 0,06	-0,51 -1,82	-0,04 -0,04	0,67 0,48	-0,85 -0,77	0,50 1,14	-0,11 -1,59
<b>3</b>	Local	0,10 1,15	0,13 1,42	-0,08 -1,76				-0,02 -1,06	0,02 1,21	-0,01 -0,96			
	GDR	2,70** 5,17	-1,35* -2,33	0,36 1,65				1,29** -5,02	0,78** 2,90	-0,16 -1,75			
<b>4</b>	Local	-0,10 -0,62	0,19 0,81	-0,11 -0,54	0,03 0,43			0,07 0,74	-0,10 -0,82	0,06 0,87	-0,02 -1,15		
	GDR	0,01 0,02	0,12 0,11	0,54 0,40	-0,76 -0,89	0,22 0,12		-0,67* -2,25	0,56 0,91	-0,47 -0,72	0,25 0,73	-0,05 -0,70	
<b>5</b>	Local	-0,37* -2,10	0,58 1,3	-0,43 -0,69	0,25 0,49	-0,12 -0,56	0,03 0,80	0,01 1,06	-0,02 -0,54	0,02 0,42	-0,01 -0,56	0,01 0,75	-0,00 -0,92
	GDR	3,03 0,66	5,20 0,34	-2,69 -0,11	-0,71 -0,03	0,56 0,06	-0,01 -0,01	-0,54* -1,99	0,00 0,05	-0,13 -0,08	0,44 0,31	-0,33 -0,53	0,08 0,73
<b>6</b>	Local	-0,07 -0,51	0,35 0,85	-0,59 -0,90	0,66 1,20	-0,34 -1,39	0,06 1,35	0,02 0,74	-0,07 -1,15	0,10 1,36	-0,08 -1,51	0,03 1,56	-0,00 -1,38
	GDR	1,61 1,91	-3,15 -1,27	3,28 0,86	-1,54 -0,49	0,04 0,03	0,17 0,72	2,23** -3,33	2,57* 2,21	-1,49 -0,96	0,56 0,45	-0,23 -0,47	0,06 0,80
<b>7</b>	Local	-0,05 -0,88						0,00 0,26					
	GDR	2,46** 4,03	4,00** -2,67	3,70* 2,13	-1,57 -1,48	0,29 1,03		1,21** -4,54	1,50** 2,69	-1,15* -1,99	0,53 1,77	-0,11 -1,75	
<b>8</b>	Local	-0,39 -1,73	0,67 1,10	-1,07 -1,22	1,09 1,53	-0,56 -1,78	0,12 1,95	0,07 1,13	-0,16 -0,81	0,19 0,68	-0,12 -0,57	0,04 0,43	-0,00 -0,27
	GDR	3,91** 5,51	5,70** -3,64	4,61** 2,68	-1,75 -1,82	0,27 1,15		1,77** -5,68	2,72** 4,36	2,31** -3,60	0,94** 2,74	-0,15* -2,04	

<b>9</b>	Local	0,14	-0,48	0,73	-0,69	0,34	-0,07	-0,02	0,07	-0,09	0,05	-0,01	0,00
		0,77	-0,90	0,96	-1,14	1,31	-1,41	-0,52	0,60	-0,57	0,46	-0,30	0,16
	GDR	9,85**	12,35**	8,56	-4,01	1,25	-0,19	2,14**	1,98	-0,67	-0,16	0,18	-0,04
		6,31	-2,80	1,36	-0,82	0,63	-0,55	-5,23	1,86	-0,48	-0,16	0,47	-0,59
<b>10</b>	Local	0,04	-0,02	-0,10	0,13	-0,04		-0,01	-0,02	0,05	-0,04	0,01*	
		0,36	-0,09	-0,32	0,71	-0,87		-0,44	-0,39	1,26	-1,74	2,10	
	GDR	7,73**	15,06**	18,14**	12,89**	4,98**	0,81**	1,97**	3,54**	3,76**	2,43**	0,87**	0,14*
		4,82	-3,92	3,58	-3,31	3,07	-2,80	-4,84	3,88	-3,29	2,95	-2,68	2,43
<b>11</b>	Local	-0,00						-0,01					
		-0,09						-0,92					
	GDR	3,12**	-4,85**	4,21*	-1,94	0,36		1,61**	2,29**	-1,69*	0,65	-0,11	
		4,34	-2,94	2,29	-1,86	1,53		-4,34	3,17	-2,23	1,58	-1,16	

Source: Author

**Table 9: Frankfurt Stock Exchange, Individual Coefficient Estimates for Granger Causality Test (corresponding t-statistics below the coefficient estimates)**

	Dep.var.	LOC -1	LOC -2	LOC -3	LOC -4	LOC -5	LOC -6	DB -1	DB -2	DB -3	DB -4	DB -5	DB -6
<b>1</b>	Local	0,15	-0,46	0,48	0,01	-0,24	0,09	-0,86	3,06	-4,48	3,42	-0,35	0,22
		0,42	-0,46	0,35	0,02	-0,52	1,06	-0,72	0,98	105,00	1,04	-1,00	0,94
	GDR	0,93**	1,59**	1,64**	0,97**	0,30*	-0,04	2,61**	4,41**	4,47**	2,69**	-0,90*	0,12*
		10,03	-6,13	4,40	-3,21	2,33	-1,66	-8,31	5,47	-3,97	3,06	-2,50	2,09
<b>2</b>	Local	0,06	-0,49	0,66	-0,34	0,07		-0,22	0,58	-0,65	0,36	-0,08	
		0,20	-0,72	0,94	-0,96	0,94		-0,67	0,93	-1,16	1,36	-1,51	
	GDR	3,70**	6,48**	6,48**	3,77**	1,20**	0,17**	3,14**	4,79**	4,29**	2,31**	0,69**	0,09**
		12,97	-7,58	5,81	-4,82	4,13	-3,61	2,85	-3,56	4,25	-5,11	6,44	-9,80
<b>3</b>	Local	0,06	0,08					-0,02	0,04				
		0,81	0,69					-0,24	1,18				
	GDR	2,57**	3,71**	3,28**	1,68**	0,46*	-0,05	2,27**	3,04**	2,30**	0,96**	-0,17*	-0,01*
		9,49	-5,41	3,83	-2,86	2,11	-1,44	-8,40	5,09	-3,67	2,94	-2,52	-2,50
<b>4</b>	Local	-0,05	0,13	-0,03				0,15	-0,14	0,07			
		-0,54	1,21	-0,67				1,57	-1,43	1,89			
	GDR	0,71**	-0,97	0,98	-0,65	0,27	-0,05	1,39**	2,34**	-2,42*	1,58*	-0,56	0,09
		3,55	-1,83	1,37	-1,12	1,02	-1,02	-3,53	2,80	-2,41	2,11	-1,81	1,59
<b>5</b>	Local	0,12*						-0,05					
		2,09						-1,21					
	GDR	0,92*	-1,17	1,00	-0,66	0,28	-0,05	-1,90*	3,54	-3,94	2,63	-0,96	0,14
		2,53	-1,24	0,77	-0,65	0,65	-0,63	-2,04	1,95	-1,86	1,86	-1,85	1,70
<b>6</b>	Local	-0,64	0,74	-0,02	-0,46	0,32	-0,07	0,57	-0,30	-0,46	0,78	-0,42	0,08
		-1,20	0,53	-0,01	-0,32	0,54	-0,72	1,04	-0,21	-0,24	0,53	-0,71	0,82
	GDR	2,25**	3,31**	3,16*	-1,88*	0,64	-0,09	2,23**	3,34**	-3,03*	1,69	-0,52	0,07
		6,03	-3,40	2,52	-2,06	1,76	-1,57	-5,72	3,38	-2,42	1,90	-1,51	1,20
<b>7</b>	Local	-0,47	0,90	-1,32	1,05	-0,44	0,08	0,40	-0,89	1,23	-0,96	0,40	-0,07
		-1,74	1,21	-1,31	1,38	-1,43	1,44	1,52	-1,21	1,21	-1,23	1,23	-1,25
	GDR	1,86**	2,57**	1,87**	0,72**	0,11*		1,78**	2,37**	1,81**	0,74**	0,14**	
		8,35	-5,46	3,75	-2,75	2,05		-8,23	5,38	-3,96	3,13	-2,70	

<b>8</b>	Local	0,06 1,22	-	-	-	-	-	-0,06* -2,35	-	-	-	-	-
	GDR	3,20** 11,36	4,49** -5,84	4,04** 3,94	2,24** -2,87	0,70* 2,17	-0,10 -1,69	1,87** -9,65	2,73** 5,94	2,67** -4,49	1,62** 3,64	0,56** -3,06	0,08** 2,61
<b>9</b>	Local	-0,09 -0,54	0,38 0,81	-0,70 -1,00	0,49 0,86	-0,15 -0,61	0,01 0,31	-0,02 -0,14	-0,11 -0,30	0,15 0,28	-0,07 -0,17	0,02 0,12	-0,00 -0,11
	GDR	1,93** 8,71	3,08** -5,18	2,94** 3,43	-1,69* -2,44	0,57 1,89	-0,09 -1,58	1,63** -7,55	2,46** 4,93	2,46** -3,56	1,50** 2,72	-0,51* -2,14	0,07 1,74
<b>10</b>	Local	-0,07 -0,54	0,35 1,11	-0,50 -1,19	0,30 1,15	-0,07 -1,14		0,00 0,18	-0,03 -0,54	0,06 0,84	-0,03 -0,89	0,01 0,90	
	GDR	4,29 1,75	-2,88 -1,5	2,33 1,34	-1,06 -1,21	0,20 1,07		-0,50 -1,69	0,47 1,72	-0,41 -1,73	0,21 1,83	-0,04 -1,77	
<b>11</b>	Local	-0,02 -0,42	0,01 0,26					-0,04 -1,03	0,03 1,18				
	GDR	1,50** 8,00	2,76** -5,20	2,88** 3,70	-1,66* -2,55	0,48 1,62	-0,06 -0,98	1,72** -8,86	2,20** 4,45	1,98** -2,97	1,19* 2,33	-0,40 -1,93	0,06 1,62
<b>12</b>	Local	0,22 0,67	-0,45 -0,51	0,77 0,64	-0,68 -0,72	0,27 0,67	-0,04 -0,55	-0,45 -0,26	0,05 0,12	-0,07 -0,12	0,00 0,00	0,04 0,20	-0,02 -0,45
	GDR	4,70** 7,67	7,84** -4,82	8,41** 3,83	5,47** -3,19	1,94** 2,67	-0,29* -2,20	2,05** -5,96	3,19** 3,75	3,07** -2,66	1,69 1,88	-0,48 -1,26	0,05 0,70
<b>13</b>	Local	-0,32 -1,52	0,98* 2,12	-1,11* -2,26	0,60* 2,33	-0,12* -2,27		0,17 1,65	-0,51* -2,45	0,62** 2,89	0,34** -3,06	0,07** 3,09	
	GDR	3,46 6,30	-3,77 -2,71	3,09 1,63	-1,87 -1,26	0,79 1,25	-0,16 -1,43	-1,59 -6,11	1,58 2,44	-1,08 -1,28	0,54 0,84	-0,20 -0,78	0,04 0,94
<b>14</b>	Local	0,16 0,94	-0,40 -0,79	0,40 0,52	-0,22 -0,33	0,08 0,26	-0,01 -0,19	-0,19 -1,27	0,65 1,48	-0,87 -1,43	0,64 1,40	-0,25 -1,40	0,05 1,45
	GDR	1,81** 8,95	2,90** -5,08	2,90** 336,00	-1,89* -2,51	0,74* 2,10	-0,13 -1,84	1,20** -6,61	1,33** 2,79	-1,31 -1,92	0,94 1,72	-0,38 -1,60	0,06 1,41
<b>15</b>	Local	0,03 0,12	0,02 0,03	0,14 0,15	-0,29 -0,4	0,19 0,62	-0,04 -0,78	-0,09 -0,38	0,29 0,47	-0,75 -0,9	0,82 1,33	-0,41 -1,67	0,08 1,89
	GDR	2,83** 10,83	4,91** -7,22	5,16** 5,64	3,32** -4,76	1,21** 4,18	0,19** -3,77	2,61** -9,48	4,32** 6,50	4,54** -5,28	2,90** 4,56	1,03** -4,01	0,15** 3,50

Source: Author

UNIVERSITAS CAROLINA PRAGENSIS  
založena 1348

Univerzita Karlova v Praze  
Fakulta sociálních věd  
Institut ekonomických studií



Opletalova 26  
110 00 Praha 1  
TEL: 222 112 330,305  
TEL/FAX:  
E-mail:  
[ies@mbox.fsv.cuni.cz](mailto:ies@mbox.fsv.cuni.cz)  
<http://ies.fsv.cuni.cz>

Akademický rok 2007/2008

## TEZE BAKALÁŘSKÉ PRÁCE

Student:	Hana Roháčková
Obor:	Ekonomie
Konzultant:	PhDr. Filip Hájek

Garant studijního programu Vám dle zákona č. 111/1998 Sb. o vysokých školách a Studijního a zkušebního řádu UK v Praze určuje následující bakalářskou práci

Předpokládaný název BP:

**Duální listing akcií**

Charakteristika tématu, současný stav poznání, případné zvláštní metody zpracování tématu:

Mou bakalářskou práci bych chtěla věnovat problematice duálního listingu akcií a důvodům, které vedou společnosti k úpisu akcií na více burzách. Zvláštní důraz bude kladen na společnosti ze středoevropského regionu a ověření, jestli důvody, které ověřují autoři ekonomických studií na rozvinutých kapitálových trzích, platí i pro tento specifický vyvíjející se trh.

## Struktura BP:

1. Úvod
2. Financování společností
  - 2.1. Financování dluhem, financování úpisem kapitálu
  - 2.2. Duální listing akcií a jeho charakteristiky
3. Současný ekonomický výzkum
  - 3.1. Přehled a geneze výzkumu
  - 3.2. Faktory ovlivňující duální listing akcií
    - 3.2.1. Velikost firmy
    - 3.2.2. Likvidita
    - 3.2.3. Právní rámec a legislativa
    - 3.2.4. Lokace firmy
4. Duální listing akcií v Evropě
  - 4.1. Duální listing v západní Evropě
  - 4.2. Duální listing v středoevropském regionu
    - 4.2.1. Přehled společností využívající duální listing
    - 4.2.2. Význam duálního listingu pro tyto firmy
5. Zhodnocení celkového stavu a předpověď dalšího vývoje duálního listingu akcií

## Seznam základních pramenů a odborné literatury:

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Datum zadání:	Prosinec 2007
Termín odevzdání:	Prosinec 2008

Podpisy konzultanta a studenta:

V Praze dne