

UNIVERSITY OF ECONOMICS, PRAGUE

Faculty of Finance and Accountancy

Department of Banking and Insurance

Field of Study: Banking and Insurance

Market Linkages: Chinese Influence on Global Financial Markets

Author: Bc. Veronika Horniaková

Supervisor: Ing. Bohumil Stádník Ph.D.

Year: 2017

Declaration:

I hereby declare that I am the sole author of the thesis entitled “Market Linkages: Chinese Influence on Global Financial Markets“. I duly marked out all quotations. The used literature and sources are stated in the attached list of references.

Prague, 5th May 2017

.....
Veronika Horniaková

Acknowledgement

I would like to thank my friends and family members who supported me throughout my studies and writing of this thesis. I would like to express my gratitude to the supervisor of my thesis, Ing. Bohumil Stádník, Ph.D..

Abstract

This thesis is looking into the current issue of financial market integrations and linkages between them. In recent years, the topic of China has been emerging to the forefront of academic research, therefore the focus of this paper is dedicated to the integration of the Chinese market. The goal is to establish whether there exists an interdependency between Chinese and world stock markets and evaluate and analyse the potential influence of China on world indices.

The theory standing behind financial integration suggests that individual markets are becoming mutually dependant. Chinese efforts to become a part of the global economy gradually become successful which creates room for academic research.

This paper focuses on stock indices of two Chinese stock markets in relation to American, English, Japanese, German, Dutch and French indices.

Cross-correlation analysis, causal analysis and co-integration analysis are applied to individual indices in order to find the results.

Keywords: financial integration, market indices, financial market, China

Abstrakt

Práca sa zaoberá aktuálnou témou integrácie finančných trhov a prepojeniami medzi nimi. V posledných rokoch sa téma Číny dostáva stále viac do popredia a preto je pozornosť v tejto práci venovaná práve integrácii čínskeho trhu. Cieľom je zistiť, či existuje vzťah medzi čínskymi a svetovými akciovými trhmi a overiť potenciálny vplyv Číny na svetové indexy.

Teória stojaca za finančnou integráciou naznačuje, že jednotlivé trhy sa stávajú vzájomne závislé. Čínske snahy stať sa súčasťou globálnej ekonomiky sa postupne ukazujú ako úspešné, čo vytvára priestor pre skúmanie.

Skúmané sú akciové indexy dvoch čínskych akciových búrz vo vzťahu k americkému, anglickému, japonskému, nemeckému, holandskému a francúzskemu indexu.

Indexy sú postupne podrobené kros-korelačnej analýze, kauzálnej analýze a kointegračnej analýze.

Kľúčové slová: finančná integrácia, akciové indexy, finančný trh, Čína

Contents

Abstract.....	3
Abstrakt.....	3
List of Tables	6
List of Figures	6
1.0 Introduction	7
2.0 Theoretical Background	8
2.1 Economic Integration.....	8
2.1.1 Single Market	10
2.2 Financial Integration	11
2.2.1 Benefits of Financial Integration	12
2.2.2 Potential Costs of Financial Integration	14
2.3 Financial Integration of Capital Markets.....	16
2.3.1 Correlation of Capital Markets.....	17
2.3.2 Consequences for International Portfolio Investments.....	21
3.0 Chinese Economy	23
Introduction	23
3.1 Chinese Transition.....	24
3.1.1 History	24
3.1.2 Reforms	25
3.2 Chinese Trade & Investments	30
3.2.1 Foreign Trade	30
3.2.2 Foreign Direct Investments.....	32
3.2.3 Currency	33
3.3 Financial Market	35
3.3.1 Capital Market.....	38
3.3.2 Equity Market.....	39
4.0 Analysis	41
4.1 Data Description	41
4.2 Methodology.....	44
4.2.1 Cross-correlation.....	44
4.2.2 Lead and Lag Relationship.....	45
4.2.3 Causality Analysis	45

4.2.4 Cointegration Analysis	46
4.3 Empirical Analysis.....	49
4.3.1 Cross-correlation.....	49
4.3.2 Lead-Lag Analysis	52
4.3.3 Causality Analysis.....	54
4.3.4 Integration Analysis.....	58
5.0 Conclusion.....	60
List of References.....	62
Appendix A: Causality Results, Full Table	71

List of Tables

Table 1: Sectorial diversification of export and import	31
Table 2: World Stock Exchanges' Opening Hours (UTC)	42
Table 3: Summary Statistics	43
Table 4: Stationarity tests	44
Table 5: Cross-correlation results- Main indices.....	49
Table 6: Cross-correlation results- Country indices.....	50
Table 7: Cross-correlation Matrix	51
Table 8: Lead and Lag Analysis Results- Shanghai Composite	52
Table 9: Lead and Lag Analysis Results- Shenzhen Composite	52
Table 10: Results of Granger Causality Analysis	54
Table 11: Results of Granger Causality Analysis.....	55
Table 12: Integration with Shanghai Composite.....	58
Table 13: Integration with Shenzhen Composite.....	58

List of Figures

Figure 1: Number of influenced indices.....	57
---	----

1.0 Introduction

This paper attempts to expand on the currently existing body of research discussing stock market linkages and critically analyse and evaluate the impact of China on American, European and Asian financial markets. It does so by focusing on and applying econometric analysis on stock market indices in the global setting.

Theoretical background of this paper relies on concepts of economic integration as the primary cause and reason for the existence of market linkages. Theory of economic integration, specifically financial integration, as described in later sections, is further followed by discussions around capital market integration. Capital market integration creates a link between the concept of integration and correlation of individual markets. As a specific part of global capital markets, this paper attempts to address the topic of stock market linkages as the key focus.

Chinese economy and its recent development is described in the second part of this paper, in order to further provide deeper insight into Chinese transformation over the years and its overall economic history. The theory gradually covers Chinese transition in the past all the way to discussing current issues and situation within trade and investments. Particularly close attention is given to Chinese financial markets, especially equity market.

Next part of the thesis is focused on empirical analysis, including addressing its methodology, presenting findings of this research and focusing on data description. The work is concluded with a summary and proposes areas of research to be addressed in the future.

2.0 Theoretical Background

This chapter focuses on explaining how and why financial markets influence one another, channels available which are affecting the relationship between the markets, and in particular, how this affects market participants. More specifically, it will discuss the issues of global economic integration, and will attempt to explain economic integration as the theoretical background behind market interdependency. Problem of economic integration is then followed by explaining concept of financial integration. Integration of capital markets as a more specific part of financial integration is linked to correlation of capital markets, particularly stock markets. This chapter finishes with consequences for investors on global financial markets.

2.1 Economic Integration

It has been documented that the world economy is becoming more interdependent and this is happening through trade, common creditors and similar macro-economic trends.¹

A complete economic integration is in theory presented with a single market. Single market means the removal of discrimination in goods, services and factor markets which leads into economic efficiency and raise of the economic growth.²

Increased **efficiency** of national economies by formation of global markets is caused by allowing them to specialize in the production of goods in which they have comparative advantage and afterwards to economic growth.

Integration can possibly accelerate the rate of **growth** of real GDP and average incomes in individual economies. This is considered according to *Lloyd* as the most important outcome of integration as it is persistent through time.³

A number of empirical studies showed significant link between liberalization of trade and growth. For example, *Sachs et al.* in their wide study documented the process of global integration. They specialized on reforming countries. They provided strong evidence of

¹ Kim, Young Joon et al. (2010)

² Lloyd, Peter (2010)

³ Lloyd, Peter (2010)

convergence among open economies as well as evidence of accelerating growth in the countries which have undertaken market reforms recently.⁴

This and many more examples led to modification of neoclassical growth model invented by *Solow* and *Swan* into its modified version including openness to trade.

Original version of this neoclassical model is an exogenous growth model of long run economic growth. Solow attempts to explain economic growth by capital accumulation, labour and increases in productivity also known as technological progress.⁵ With his model he offered the primary framework for examination of economic growth.⁶

In 1987 Solow was awarded The Nobel Prize in Economics ‘for his contributions to the theory of economic growth’.⁷

In its modified version *David* and *Leowy* focused on dynamic growth effects of trade liberalization. This led them to adding endogenous growth process into the model. Process, which is affected by the extent of openness to trade into the model.⁸

According to them, economic growth is influenced by openness through knowledge spillovers from abroad.

With this addition, traditional closed-economy exogenous model is converted into the multi-country open-economy endogenous model.

Their idea was that trade serves as a channel for knowledge flows between countries. The consequence of these flows is then increased productivity of capital and labour and therefore increased growth rate. They suggest that since trade tariffs have impact on imports and exports, hence knowledge flow, trade liberalization can influence process of economic growth.

In this modified growth model, they preserved close relationship to the original Solow model by keeping majority of its growth and conditional predictions. In fact, the model is identical with the original one in the case of trade prohibition.⁹

⁴ Sachs, Jeffrey et al. (1995)

⁵ Solow, Robert (1956)

⁶ Dan, Ben-David and Leowy, Michael (2002)

⁷ www.nobelprize.org (2014)

⁸ Dan, Ben-David and Leowy, Michael (2002)

⁹ Dan, Ben-David and Leowy, Michael (2002)

To conclude, trade liberalization leads to faster global technological growth which also leads to countries' economic growth. In addition, with more countries liberalizing trade, the growth rates increase further. As it will be shown in the next chapters, China serves as a great example of this pattern.

2.1.1 Single Market

Dixit and *Norman* provided a definition of an integrated world economy. They use phrase 'integrated equilibrium' which is place where all prices of goods and factor markets are cleared with one world price.¹⁰

This approach can be applied to all world's economies or to a group of nations.¹¹

According to *Lloyd*, the idea of a single market came from European Economic Community, which was created by the 1957 Treaty of Rome. This concept of common market was defined by four freedoms: freedom of trade in goods, services, capital and labour.

Requirements of Common Market were abolition of all border restrictions on the movement of goods, services, capital and labour and establishment of common policies in areas of external trade, agriculture, transport and competition.¹²

Originally, the main idea of a single market is that there should not be any discrimination according to source in the regional market of goods, services and factors or, market with no geographic segmentation. However, it was realized that abolition of borders is not sufficient for equal access to market for both, foreign and domestic suppliers.¹³

Economists tried to offer precise definition of a single market, which is according to *Flam* one in which the law of one price should hold for all sales of the commodity in the market.¹⁴

According to theory of a single market, a single price should exist for every tradable commodity alongside with a factor which would express the real costs of moving goods. Such definition can be applied also to the world economy.

Globally, achieving single market with law of one price is very demanding.

¹⁰ Dixit, Avinash and Norman, Victor (1980)

¹¹ Lloyd, Peter (2010)

¹² Lloyd, Peter (2010)

¹³ Lloyd, Peter (2010)

¹⁴ Flam, Harry (1992)

It would mean common treatment of all goods, services and factors alongside with harmonization of taxes and standards. Another condition would be common currency and global competition policy.¹⁵

According to *Lloyd* this kind of market is currently not real nor requested but it provides certain standard according to which degree and progress over time of market integration can be measured.¹⁶

2.2 Financial Integration

Financial integration is a subsystem of a vast topic of economic integration discussed briefly above. According to MIF, financial integration is a degree of not restricting cross-border transactions.¹⁷

European Central Bank defines Financial Integration as market where for all participants same rules apply while dealing with financial instruments and services. All participants should have also equal access to these instruments and services. In addition, all participants of the market should be treated equally while being active on the market.¹⁸

MIF and ECB definitions notable differ. ECB applies definition of integrated market to Eurozone and Euro system. This paper focuses on global world integration, therefore we subscribe to MIF's definition.

Financial integration significantly increased during the last decades as a consequence of diversification and liberalization in developed and developing countries. Private capital has started to flow towards the developing countries with expectations of high economic growth.¹⁹

Many countries encouraged these inflows by lowering restrictions and controls on capital outflows, foreign direct investments, deregulating domestic financial markets and implementing market-oriented reforms. As an example, *Agenor* mentions developing economies in East Asia, Latin America and Eastern Europe. They removed restrictions on

¹⁵ Lloyd, Peter (2010)

¹⁶ Lloyd, Peter (2010)

¹⁷ Edison, Hali et al. (2002)

¹⁸ <https://www.ecb.europa.eu> (2016)

¹⁹ Johansson, C. Anders (2010)

international financial transactions alongside with lowering regulations of domestic financial market.²⁰

Financial openness is often considered as beneficial, as it expands investors' possibilities for portfolio diversification and provides potential higher risk-adjusted rates of return. Access to world capital markets allows countries borrowing the money for smoothing the consumption in the case of a sudden shock.²¹

According to *Obstfeld* international risk sharing can cause potential growth and welfare and these can be large and permanent.²²

On the other hand, openness can bring costs in the form of higher volatility and abrupt reversals in capital flows.²³

2.2.1 Benefits of Financial Integration

Arguments which support financial openness can be divided into four different areas: consumption smoothing through global risk sharing, domestic investment and growth through foreign capital flows, improved macroeconomic discipline and stability of financial system.

a. Consumption Smoothing

The country has opportunity to borrow during the recession or deterioration and lend during the expansion or improvement of the country by accessing world capital markets. Country becomes engaged in risk sharing and consumption smoothing, which can lead to increased welfare. This scenario applies mainly when shocks have temporary character and has counter-cyclical character.²⁴

b. Domestic Investment and Growth

Capability of accessing world's capital resources may also affect domestic investment and growth. Reason for this is, that in many developing countries is capacity of savings limited by lower level of income. Foreign sources can supply these savings as long as marginal return

²⁰ Agénor, Pierre-Richard (2001)

²¹ Agénor, Pierre-Richard (2001)

²² Obstfeld, Maurice (1992)

²³ Agénor, Pierre-Richard (2001)

²⁴ Agénor, Pierre-Richard (2001)

from investment equals or is greater than the cost of borrowed capital. Moreover, levels of capital per worker are increased as long as economic growth and living standards.²⁵

Benefits mentioned above can be especially great for foreign direct investments.²⁶ Apart from effect on growth, FDI may have long-run impact on technological know-how and therefore improve labour force skills.²⁷

Levine adds another effect of liberalized restrictions. He suggests that lowered restrictions tend to improve stock market liquidity. Liquidity then accelerates economic growth by boosting productivity growth.²⁸

c. Enhanced Macroeconomic Discipline

The other potential benefit of international capital markets can be discipline of policymakers. There is always temptation to exploit a closed domestic capital markets. As example serves excessive government borrowing or inappropriate bank regulation. However, speculative capital would react quickly with great outflow as well as domestic interest rates with raise. Theoretically, fear of these consequences should help to avoid such behaviour.²⁹

Greater policy discipline then leads to greater macroeconomic stability and it may also lead to higher rates economic growth by ensuring efficient allocation of the capital.

d. Increased Banking System Efficiency and Financial Stability

There are several key arguments supporting the financial openness and its ability to help domestic financial markets. Firstly, it can increase the depth and breadth of such markets and ultimately help increase the efficiency of the financial intermediation process. Efficiency is reached by lowering costs and profits of monopolistic and cartelized markets. Secondly, effective market provides lower costs of investment and higher growth rates.³⁰

All in all, developed economy can be achieved by focusing on improving domestic financial system.³¹

²⁵ Agénor, Pierre-Richard (2001)

²⁶ FDI

²⁷ Berthélemy, Jean-Claude and Démurger, Sylvie (2000)

²⁸ Levine, Ross (2001)

²⁹ Obstfeld, Maurice (1998)

³⁰ Baldwin, E. Richard and Forslid, Rikard (2000)

³¹ Levine, Ross (2001)

2.2.2 Potential Costs of Financial Integration

Despite the great benefits financial integration brings, it may also result in severe costs. According to *Agenor* these costs are: high degree of concentration of capital flows and lack access to financing for small countries, an inadequate domestic allocation of these flows, the loss of macroeconomic stability, pro-cyclical movements in short-term capital flows and a high degree of volatility of capital flows.³²

a. Concentration of Capital Flows and Lack of Access

It has been documented that capital flows have tendency to be over-concentrated to small number of countries-recipients.

In this case, small developing countries may be knocked out from the financial integration process, no matter how their policy and accounts are open.

b. Domestic Misallocation of Capital Flows

After foreign capital enters open economy, it may increase domestic investment. However, if such capital is invested in low-quality investments such as real estate sector, long-run growth can be restricted. Investments in the non-tradable sector may have small return and overall may have impact on exporting capacity of the economy.

Lower export may then cause negative trade balance which affects the whole economy.³³

c. Loss of Macroeconomic Stability

As a potential threat of capital inflows for macroeconomic stability *Agenor* considers fast monetary expansion, pressures on inflation, real exchange rate appreciation and widening current account deficits.

He differentiates between effects on economy with a flexible and fixed exchange rate. In the first case, growing current account imbalance brings a currency depreciation. After the currency weakens, change in relative prices results in the correction of trade flows and afterwards, balance is reached again. In the second case, current imbalance may affect the

³² Agénor, Pierre-Richard (2001)

³³ Agénor, Pierre-Richard (2001)

security of pegged currency and therefore cause a currency crisis and increased financial instability.³⁴

d. Pro-cyclicality of Short-Term Flows

Asymmetric character of the availability of capital markets resources in small developing countries may cause financial instability. Consumption smoothing effect of open economy works only in good times. However, in time of recession, these economies tend to be rationed out of the capital markets.

This pro-cyclical effect of short term flows firstly support consumption and spending. Secondly, this short-time consequences are not sustainable in long run, therefore country is forced to undergo economic adjustments when the foreign capital outflows.³⁵

Agénor suggests two explanation of pro-cyclical behaviour.

Primarily, developing countries are more prone to negative economic shocks. When shock hits the country, which is mostly dependent on the commodity export, it reflects in the creditworthiness and riskiness of the country's borrowers. Afterwards, creditors are not willing to lend the capital any more.

Moreover, effect of 'herding' behaviour may occur. Non-rational investors may behave according to other non-fully rational investors and withdraw their investments from the country where shock arose without complete knowledge about particular economy.³⁶

e. Volatility of Capital Flows

Financial openness brings higher degree of a capital volatility. Higher volatility in regards of financial openness can be caused by **herding** or **contagion**.

Risk of 'liquidity runs' is an issue all borrowers have to face. The higher debt in relation to country's international reserves, the higher the risk is.

Highly leveraged investors e.g. hedge funds have very sensitive responses on new information which creates market overshooting. In the worst scenario, leading to financial crisis.

³⁴ Agénor, Pierre-Richard (2001)

³⁵ Agénor, Pierre-Richard (2001)

³⁶ Agénor, Pierre-Richard (2001)

Another reason for higher volatility can be contagion effects. Contagion can be described as a significant increase in cross-market linkages after a shock to an individual country.³⁷

Contagion is measured by the degree of movement of asset prices or financial flows together across markets in relation with co-movement in peaceful times. *Dornbusch et al.* explain that elevated co-movements do not have to indicate irrational behaviour of investors. In the situation country is hit by a shock, investors may be forced to withdraw their investments from other countries due to liquidity limitations. It is not completely clear what factors are responsible for vulnerability to contagion. However, the authors suggest usage of prudential controls for financial institutions in order to limit sudden capital outflows of capital, setting up limits for net open positions for financial institutions in particular currency alongside with intensive monitoring of risky positions.³⁸

This paper focuses on stock market movements, therefore following part will be dedicated to effects of financial integration mainly on stock markets.

2.3 Financial Integration of Capital Markets

As was explained above, financial integration attracts attention of numerous authors. Growing economic and financial integration between countries was documented by many e.g. *Mittoo, Hamao, Levine, Obstfeld*.

The topic of integration of capital markets, as part of financial integration, has become greatly discussed because of its wide implications, specifically for portfolio investors in sense of diversification.

Integration of capital markets is usually defined as situation when risk-adjusted returns of assets with the same risk are the same regardless of their origin. In an integrated capital market, risk and return of diversified portfolio should be influenced only by global factors. On the other hand, local events will influence only segmented markets.³⁹

The growth of capital flows between countries alongside with globalization, development and adoption of ICT⁴⁰ has been the basis for assumption that markets are becoming more integrated.

³⁷ Dornbusch, Rudiger et al. (2000)

³⁸ Dornbusch, Rudiger et al. (2000)

³⁹ Ragunathan, Vanitha et al. (2004)

⁴⁰ Digital information and communications technologies

Integration has been encouraged mainly by removing numerous investment barriers also known as market liberalization.^{41,42}

As study of *Mittoo* confirmed, stock markets have tendency to move from segmentation to integration. The author studied relationship between Canadian and U.S. stock markets. Mittoo compared period before enhanced liberalization and after. As the beginning of integration process he recognizes two major changes in 1974: removal of capital flows controls and exchanging fixed rate for floating rate regime. In his study, he found the evidence that through time, stocks move from segmentation to the integration of Canadian and U.S. markets. Moreover, he found that segmentation occurs more often in the domestic Canadian stocks while stocks which are listed on U.S. stock exchanges and NASDAQ are priced relative to integrated market.⁴³

Similarly, *Srivastava et al.* suggested that stock market integration had increased over time. They studied stock markets of U.S., Japan, Hong Kong, Singapore and India. They also found out that for all Asian markets except of the Japanese market, the movement of indices can be significantly explained by the U.S. market. To analyse the inter-dependence they used Cointegration test, Granger causality test and variance decomposition analysis.⁴⁴

2.3.1 Correlation of Capital Markets

As was mentioned in the previous paragraphs, capital markets are becoming integrated. This fact led to the argument that growing integration results in higher correlations between returns of national stock markets.⁴⁵ This argument has been supported by empirical studies that show impact of financial integration on behaviour of average excess returns and cross-country equity market returns correlations e.g. *Donadelli* (2013); *Dellas and Hess* (2005).

Financial instruments such as equities, bonds, derivatives can be traded both, domestically and internationally. Domestic markets are naturally segmented. On the other hand, international equity markets are not, hence active trading creates higher degree of co-movement between international equity market returns.⁴⁶

⁴¹ Ragunathan, Vanitha et al. (2004)

⁴² Panourgias S. Nikoforos (2015)

⁴³ Mittoo, R. Usha (1992)

⁴⁴ Srivastava Aman et al. (2010)

⁴⁵ Ragunathan, Vanitha et al. (2004)

In their study *Donadelli* and *Paradiso* focused on risk-sharing effects on equity market returns. Risk sharing, according to them, represent level of integration, therefore full risk-sharing means full financial integration. They conducted their study on US-Canada data as these two economies represent close relationship, which developed through observed time. They supported previous empirical studies that full risk-sharing provides strong positive cross-country EMR⁴⁷ correlation. They also emphasize that this relationship increases during the period of increased aversion to risk.⁴⁸

Nonetheless cross-correlation between stock returns has been well documented, **the source** of it varies.

One of the common explanations is **non-synchronous trading**.

Lin suggests that information published during a trading day on one market globally influences returns on the other markets. They examined New York stock market in relation to Tokyo stock market. They suppose, that broker trading on one market, incorporates information about performance of the other market into the stock price. Especially, when this market closed a few hours before.⁴⁹

Not all researchers agree on this statement. Another opinion on non-synchronous trading is that it can be the reason for some of the cross-autocorrelations, but market would have to be extremely thin to explain all cross-autocorrelations with non-synchronous trading.⁵⁰

When two economies are connected through trade and investment, naturally **any news** about economic fundamentals have impact on the other country. This behaviour makes portfolio managers more responsive to changes in foreign markets.⁵¹

Secondly, another reason may be **market contagion**. Contagion takes place when domestic stock prices are affected by changes in price levels in stocks from another country while reasons for this change are not caused by economic connection.⁵²

There have been several discussions regarding definition of contagion. We have already discussed one approach in the previous part, where contagion was related to higher volatility

⁴⁷ Equity Market Return

⁴⁸ Donadelli, Michael and Paradiso, Antonio (2014)

⁴⁹ Lin, Wen-Ling (1994)

⁵⁰ Chan, Kalok (1993)

⁵¹ Lin, Wen-Ling (1994)

⁵² Lin, Wen-Ling (1994)

caused by financial openness. Contagion was defined as increased cross-market linkages after a shock to an individual country. Some authors refer to this as an '**interdependence**' of market instead of market contagion.⁵³

Contagion in sense of stock movements is explained as a rational effort of investors to deduct information from price-change on the foreign market relevant to equity values. Since investors have different access to information about the market, they are willing to use price changes in other market as a source of knowledge. In theory, published news should have the same effect on all markets. However, in reality, not every significant information is public or able to proceed. Therefore, trader may suppose that important information can be hidden in the price-movement on the foreign stock market.⁵⁴

Another attempt to explain correlation is model of **imperfect information**.

Chan explains this approach through observed signals. He assumes market maker observes signal which consists of market-wide information and uncorrelated noise. Therefore, any additional signal about the value of other stock is providing market-wide information. Consequently, when market makers are correcting their pricing errors according to previous price changes of other stock, stock returns are becoming cross-autocorrelated.⁵⁵

This approach can be illustrated with an example of two stocks, A and B. In the beginning a market maker of stock A notices positive signal for his stock. However, signal also contains noise, which means that his response upward is only partial. Afterwards, he observes price movements of stock B as it should contain valuable information. If stock increased, he interprets this signal positively and he adjusts price of stock A more upward. However, if stock B decreased, market maker loses confidence about his stock and changes the price downward. This behaviour causes positive autocorrelation between price change of stock A in the second period and stock B in the first period.⁵⁶

Another potential reason for correlation between stock markets is a **lead lag effect** and it is closely related to imperfect information theory.

⁵³ Forbes, J. Kristin and Rigobon, Roberto (2002)

⁵⁴ King A. Mervyn and Wadhwani, Sushil (1990)

⁵⁵ Chan, Kalok (1993)

⁵⁶ Chan, Kalok (1993)

Similarly, lead lag effect operates with transmission of information between stocks. However, it focuses on different characteristics of the stocks. Effect can be applied on large vs. small-firm stocks, institutional ownership, foreign vs. domestic stocks.

Large firms are on the main focus of investors and institutional traders. Hence, they provide more analysis for large firms-stocks. Consequently, more quality information is available for such firms compared to small firms-stocks. Assuming movements of large-firm stocks contain valuable market information, market makers of small size stocks are adjusting their prices accordingly. As a result, large stocks returns are leading small stocks return.⁵⁷

As it was mentioned above, lead lag effect is not tied up with size of the firm. *Badrinath* documented that returns on portfolio of stocks with the higher range of institutional owners lead the one with lower level of institutional ownership. With this finding they confirmed that size is not the only one relevant factor in equity price lead lag dynamics. ⁵⁸

Explanation is that institutional investors are usually more informed. They are analysing firms they favour. Preferring certain type of firms is mostly caused by legal restrictions for institutional investors. On the other hand, favoured and un-favoured firms may have similar perspective. Consequently, their analysis then provides information also on un-favoured firms. Non-institutional investors do not have access to this information but they are able to observe stock price movements. Therefore, they adjust the price of their institutionally un-favoured stocks according to stocks, which are in the interest of institutional investors.⁵⁹

As another example of lead lag effect serves cross-autocorrelation between shares in China. Difference in two kind of shares isn't in this case size nor institutional ownership but segmentation. It was until 2003, when listed companies in China could issue only two types of shares: A and B. Domestic investors in China could buy and sell only A-type shares and foreign international investors only B-type. Theoretically, both A and B shares issued by the same company should react simultaneously on new information. However, since there was media controls in China, foreign investors received news about China earlier than people in China. In addition, international investors were more capable of using modern technologies to analyse and process the information. Therefore, rational investors on A-share market observed movements on B-share market and conditioned their prices accordingly. As a consequence,

⁵⁷ Chui, C. W. Andy and Kwok, C.Y. Chuck (1998)

⁵⁸ Badrinath, S.G. et al. (1995)

⁵⁹ Badrinath, S.G. et al. (1995)

returns on B-shares and A-shares were positively cross-autocorrelated and lead lag relationship occurred.⁶⁰

2.3.2 Consequences for International Portfolio Investments

As it was shown above, correlation on stock markets is present. Important question is, how it affects investors.

Global portfolio diversification stands on low international correlations across markets. Investors diversify their investments on markets with low correlation in order to reduce their overall risk.⁶¹

Due to trade, financial liberalization and increasing integration of stock markets the process of globalization was encouraged. As a result, stock correlations across countries are predicted to rise over time.⁶²

Another feature of correlation is that international correlations evolve through time. *Solnik* and other authors found evidence for relationship between correlation and volatility on stock market. They noticed that in period of higher market volatility international correlation increases. It is considered as bad news for portfolio investors, since in time of higher volatility international diversification is needed the most. However, higher correlation decreases the benefits of it. They pointed out that portfolio managers are making a mistake by using the unconditional risk measures in the computing. With ‘unconditional’ they refer to calculations with constant variances and correlations performed over long historical periods.⁶³

They suggest, that in time when national markets volatilities rise, global portfolio’s volatility will increase more than it would increase in domestic portfolio.⁶⁴

Madaleno et al. emphasize importance of exploring **stock markets linkages as inevitable tool for portfolio managers** diversifying risk and deriving high return. They found strong and significant relation between world stock market indices (European, US, Asian and Latin American). However, they noticed relation was not homogenous across time. Arbitrage opportunities are present because of slow transmission of innovations in UK and US.

⁶⁰ Chui, C. W. Andy and Kwok, C.Y. Chuck (1998)

⁶¹ Solnik, Bruno et al. (1996)

⁶² Madaleno, Mara and Pinho, Carlos (2011)

⁶³ Solnik, Bruno et al. (1996)

⁶⁴ Solnik, Bruno et al. (1996)

Moreover, they pointed out that higher level of market connections is taking place between countries, which are geographically or economically linked.⁶⁵

In addition, authors offer one more implication for investors who want to diversify their portfolio. As it was said, correlation at the international level may reduce benefits from international diversification in the case of serious decline of the market. Although, long-term gains from diversified portfolio still remain economically attractive.⁶⁶

To conclude, examination and analysis of stock markets is not only essential but also needed in order to understand how vulnerable stock markets are to different financial circumstances, therefore to be able to manage investments properly.

Since the world is becoming more and more integrated, linkages between markets are changing, arising and vanishing.

Connection with US market has been well documented, as US market has been considered as a leading financial market.

However, lately, new markets are coming to the forefront of financial world. China, as one of four largest emerging markets is becoming a strong player on financial markets.

⁶⁵ Madaleno, Mara and Pinho, Carlos (2011)

⁶⁶ De Santis, Giorgio and Gerard, Bruno (1997)

3.0 Chinese Economy

Introduction

Chinese economic development in last few decades has been unprecedented. Numbers of reforms and institutional changes have turned China from a centrally planned command economy into a productive market-oriented economy.

Process of industrialization made an agrarian, low-income country to become an economy with highest long-term average GDP growth rate in the fastest growing region of the global economy.⁶⁷

Moreover, China has become second largest economy in the world, following United States of America.⁶⁸

Economic growth rapidly lowered population living in absolute poverty and China became, according to The World Bank, upper middle-income country.^{69,70}

Chinese efforts to integrate with the world economy are also notable. Joining World Trade Organization or globalization its currency are significant attempts to become part of the global economy.⁷¹ Gradually, Chinese financial market is becoming to integrate with global markets too.⁷²

In turn, process of Chinese integration has begun to influence not only Chinese nation, but entire global economy.⁷³

This section briefly describes Chinese economy on its journey from closed centrally planned economy to one of the biggest trading nations as well as a leader on certain markets.

Development through reforms, trade liberalization and international integration is discussed.

Chinese export and import as main engines of the economy are also studied.

Paper pays close attention to Chinese financial market and its development alongside with potential effects on global market. Deeper understanding of Chinese capital market is proposed.

⁶⁷ Das, Dilip K. (2012)

⁶⁸ Song, Shunfeng (2015)

⁶⁹ www.worldbank.org (2016)

⁷⁰ Gross National Income per capita between \$4,036 and \$12,475

⁷¹ Fung, Hung-Gay (2013)

⁷² Wang, Hao et al. (2016)

⁷³ Das, Dilip K. (2012)

3.1 Chinese Transition

It is crucial to understand the background of China in order to explain its impact in the current time.

3.1.1 History

Before the commencement of the modern era, China had been perceived as one of the most developed, advanced and powerful countries in the world. This period of time lasted thousands of years. According to a historians in the field of economics, China was the most dominant power in world economies for almost two thousand years and remained in this position until the middle of the nineteenth century. Europeans in their works often regarded China as very affluent, with Adam Smith describing China in *Wealth of Nations* as a country with very high productivity and advanced economy.⁷⁴

China's position ahead of the curve however, was to a large degree influenced by industrial revolution in Europe in mid-eighteen century. This has been considered the leading cause of the lag that developed between China and Europe. Before the fifteenth century, technology and innovations flowed one way – from China to Europe; from East to West. This was overturned by the Industrial revolution, where the first technological innovations started flowing West to East as early as 16-17th century.⁷⁵

China's large population was the key to their enormous advantage in pre-modern times. Since the key to inventions and technological innovations was in the capabilities and experience of peasants and craftsmen, China enjoyed a leading position in the world as the strongest economy. However, with Industrial Revolution in the west, the merits for achieving long-term economic development and advantage had changed and scientist implemented controlled experiments as the basis for invention. This fact not only help put western countries to an advantage, but also helped their structural transformation and economic development.⁷⁶

China was left behind in terms of economic development until the founding of People's Republic of China in 1949. More specifically, key changes occurred with reforms and opening programme starting in late 1978 when China changed its course of poverty and backwardness.⁷⁷

⁷⁴ Lin, Justin Yifu Lin (2011)

⁷⁵ Lin, Justin Yifu Lin (2011)

⁷⁶ Naughton, Barry (2007)

⁷⁷ The Chinese economy, Barry Naughton, 2007

3.1.2 Reforms

The overall global and regional integration of China was achieved on its own, which some argued is an unconventional way.⁷⁸ The transition in the economic system for China was vastly different to other from socialist countries.⁷⁹ There was a fair level of scepticism in international and academic circles in regards to China's policies. Despite this scepticism, China managed to see thirty years of rapid economic growth and number of achievements producing so called 'China miracle'.

A number of researchers and academics in the late 1980s and early 1990s did not understand enough about the reforms taking place in China. The international economic research community along with many economists were pessimistic as the thought at that time was that any market economy must be based on private property. This was lacking in China in that period of time. The largest state owned enterprises in China still remained in the ownership of the country and were not privatised. The dual-track system (to be explained in later paragraphs) was prevalent and decision revolved around state planning. Economists predicted in this time, that the dual-track system implemented in China would eventually, and inevitably lead to efficiency loss and institutionalised state opportunism, which would remain to be an inferior institutional arrangement. Some economists also suggested that this system was ultimately going to fail.⁸⁰

On the other hand, countries in Eastern Europe and former Soviet Union followed fundamental principles of neoclassical economists. Main elements of so called 'the shock therapy' which took place were price liberalization, rapid privatization and economic stabilization by closing fiscal deficits, all in order to develop an efficient economic system.⁸¹

Different approach to transition towards market economy led to different outcomes in China than Eastern Europe. Costs of "shock therapy" were much higher than Chinese gradual approach and took more time to overcome initial downturn than originally anticipated.⁸²

One of the popular opinions to explain this phenomenon lays in the root of neoclassical theory. These economic theories were created mostly to explain processes in developed countries.

⁷⁸ The Chinese Economy, Dilip Das, 2012

⁷⁹ The Chinese economy, Barry Naughton, 2007

⁸⁰ Naughton, Barry (2007)

⁸¹ Boycko, Maxim et al. (1993)

⁸² Naughton, Barry (2007)

However, system of enterprises in developing and transitional economies was different. Enterprises in socialist planned economies were in the wrong sector, therefore not profitable. This fact stays against basic assumption of rationality in neoclassical economy. Economists concluded that the weak performance of the firms was due to a corporate governance, government interventions and problems with property rights, whilst profitability depended mostly on the position in the industrial chain.⁸³

The transition of China has been carried out in two phases. The first one can be explained by dual-track system. The second one is more complex and it is still in place currently. The next two sub-chapters will explain key events in Chinese transition up until recent past.

First Phase

China's opening program is characterized by a gradualist dual-track approach. It is considered as the most characteristic feature of departure from planned economy. It can be described as coexistence of both, traditional plan and market channel for the allocation of goods. Instead of annulling the plan, reformers kept a role of the plan to secure stability as well as government priorities such as investing in energy and infrastructure. The dual track meant a two-tier pricing system for most of the goods. Commodities had two prices: one which was planned and set by a state, typically low and second one, market price which was typically higher. By this step, all factories, including state-run, were presented to the market and were able to start a process of adaptation to market environment. System also helped state firms to gain flexibility by cooperating with non-state firms and making transactions with them.⁸⁴

The main objective was to gradually start the dismantling of central planned economy without endangering economic growth. This goal was successfully reached and competition a diversification in ownership created. Special economic zones were created and allowed foreign business to operate freely within. China attracted foreign investments and managed to transfer technology to China, while keeping overall control of the economy.⁸⁵

Continuously, entry of new subjects to the economy started to change balance between plan and market system. This point is considered as a beginning of new phase of economic reform. New focus was on making new rules and tax rates in all sectors. Most prices were finally unified

⁸³ Lin, Justin Yifu (2011)

⁸⁴ Naughton, Barry (2007)

⁸⁵ Naughton, Barry (2007)

and dual track system was terminated. Transition process passed off without any major ‘shocks’ or economic disruption while social stability was relatively secured.⁸⁶

Second Phase

Second phase of reforms in China started in 1993 and is still ongoing. The main purpose of this phase has been rebuilding of the institutions for market economy, alongside with reducing of state sector in order to create equal conditions for all market participants.⁸⁷

After **fiscal reforms**, which successfully broadened tax base, **the banking system** underwent deep reconstructions.

The People’s Bank of China had been established as central bank in 1983, but was given a workable organizational structure in 1998. Central bank started to be active in determining and implementing monetary policy. Asset management corporations were established in order to liquidate non-performing loans. In 2003, supervisory functions of central bank were unified in China Bank Regulatory Commission.⁸⁸

Another key market sector which underwent restructuring was state-owned corporate sector. The passage of the Company Law in 1993 meant change in the structure of China’s large state-owned companies. They were listed on newly opened stock markets and created a need for regulation.

Before **the unification of exchange rate** in 1994, China had dual exchange rates. In swap centres, permitted companies were able to buy and sell renminbi at the market rate. Other rate, was administered, official.⁸⁹

In-plan trade was conducted by official exchange rate, as above-plan rate was used market determined swap rate. On one side, it was innovative mechanism of internal convertibility of the domestic currency, especially to meet the demand of importers. On the other hand, it created uneven chances for accession of foreign exchange. It was also not fair to foreign investors, whose equity participation was calculated with the official rate.⁹⁰

⁸⁶ Naughton, Barry (2007)

⁸⁷ Naughton, Barry (2007)

⁸⁸ Naughton, Barry (2007)

⁸⁹ Naughton, Barry (2007)

⁹⁰ Naughton, Barry (2007)

Unifying of the exchange rate meant for all domestic enterprises that they must sell their foreign revenues to foreign exchange banks and all purchases must be settled at the prevailing market rate. To link all the banks and to replace swap centres, a national inter-bank foreign exchange market was created, where all the current account transactions were also included.

Moreover, the effectiveness of central bank's intervention increased and unification led to a **devaluation of the currency** which helped exporters in foreign trade.⁹¹

All these extensive foreign-trade reforms were important steps towards **membership in WTO**.⁹²

The World Trade Organization

The World Trade Organization secures trade openness on global level by dealing with the rules of trade between nations. Main purpose is to provide free and smooth trade flow. On the other side, it ensures participants of the global market that these rules are transparent and predictable.⁹³

Accession of WTO meant fundamental step in developing openness of the Chinese economy as well as it meant possibility of competition of foreign companies in China.⁹⁴ The fact that China joined WTO in 2001 was seen as an important step towards world economic integration.⁹⁵

By accession of WTO, China committed to several important changes in its foreign policy. First of all, it was substantial reducing of tariffs and non-tariffs barriers. Elimination of import quotas and licenses was another step towards friendlier business environment.⁹⁶ Another set of regulation included state sector. China's state owned enterprises were large, non-productive and subsidized. Reforming of this sector was inevitable in order to reach higher economic effectivity.⁹⁷

Increased transparency of trade and investment policies were also important commitments which provided improved market access for foreign investments. China promised to open key

⁹¹ Zhang, Zhaoyong (1999)

⁹² Naughton, Barry (2007)

⁹³ www.wto.org

⁹⁴ Naughton, Barry (2007)

⁹⁵ Bajona, Claustre et al. (2010)

⁹⁶ Jiang, Neng et al. (2012)

⁹⁷ Bajona, Claustre et al. (2010)

service for foreign investors, sector such as telecommunications, financial services and insurance.⁹⁸

New foreign policy effectively attracted **foreign investors**. By 2004, China became largest foreign investment destination in the world, with net **FDI** inflow exceeding \$50 billion.⁹⁹

China became important destination for foreign direct investments. Capital has started to inflow heavily after 1992, when Chinese foreign policy started to open marketplace for foreign investors. FDI By 2004 reached \$63 billion. Large proportion went to manufacturing industry which led to creation of global manufacturing networks.

Investors from Hong Kong and Taiwan started the first and afterwards became the most important. Other developed countries followed and inflows of FDI started to have fundamental effects on Chinese economy, as it was its primary source of global capital.¹⁰⁰

By accessing WTO, China not only accepted broad regulatory reforms to harmonize with international standards, but also made an important step in opening of Chinese economy.¹⁰¹ Integration of China with the global economy helped international trade to grow. Its imports and export were growing extraordinarily. China's business relations with the world deepened and it has started to play important role in Asian regional economy.

WTO commitments still continue and help China to integrate even more with global economy.¹⁰²

All the reforms and changes described in this chapter have given China direction into the position it currently holds. Following part will discuss current position in the global market of goods and investments.

⁹⁸ Jiang, Neng et al. (2012)

⁹⁹ Jiang, Neng et al. (2012)

¹⁰⁰ Naughton, Barry (2007)

¹⁰¹ Naughton, Barry (2007)

¹⁰² Blancher, R. Nicolas et al. (2004)

3.2 Chinese Trade & Investments

3.2.1 Foreign Trade

As it was enhanced above, over past three decades China has changed into an economic giant. By overcoming United States, it has become the world's largest trader of goods. By entering global trade market, China has made another step towards the global integration.

At the beginning, China was focused on labour-intensive light manufacturing sector. Export was concentrated in textiles, apparel, footwear and toys. In 1980s and 1990s exports in this sector continuously increased and China obtained share of world markets.¹⁰³

Maximising export has been priority of government policy in China.¹⁰⁴ Alongside with tax holidays and direct export subsidies, low-cost labour and abundance of raw materials, Chinese exporters have been able to set competitive export prices. Together with unique geographical position and large population, china is expected to have great influence in exporting industry on global level.¹⁰⁵

It was Chinese comparative advantage, to produce labour intensive products, as it has always been labour-abundant country. However, thanks to government's support, production in advanced technological industries started to develop.¹⁰⁶

Export structure changed from light to hard manufacturing, such as machinery, electronic goods and computers. High technology exports has reached almost one third of all exported goods.¹⁰⁷

Following Table (1) is showing sectoral diversification of export, respectively import as an average share in 2011-2015.

¹⁰³ Das, K. Dilip (2012)

¹⁰⁴ Buck, Trevor et al. (2000)

¹⁰⁵ Liu, Xiaohui et al. (2005)

¹⁰⁶ Das, K. Dilip (2012)

¹⁰⁷ Das, K. Dilip (2012)

Table 1: Sectorial diversification of export and import

Export Sector	Average Share	Import Sector	Average Share
IT & Consumable Electronics	21.0 %	Minerals	26.7 %
Miscellaneous manufacturing	14.5 %	Electronic Components	16.2%
Electronic Components	12.0 %	Chemicals	12.3 %
Basic Manufactures	9.3 %	Non-electric Machinery	7.0 %
Clothing	8.4 %	Miscellaneous Manufacturing	6.7 %
Non-electric Machinery	8.0 %	Transport Equipment	5.7 %
Chemicals	6.7 %	Basic Manufactures	5.4 %
Textiles	4.9 %	Fresh Food	5.1 %
Transport Equipment	4.7 %	Unclassified products	4.4 %
Leather Products	3.5 %	IT & Consumable electronics	3.7 %
Minerals	1.7 %	Wood Products	2.3 %
Fresh Food	1.6 %	Processed Food	1.8 %
Processed Food	1.6 %	Textiles	1.0 %
Wood products	1.4 %	Clothing	0.5 %
Unclassified Products	0.1 %	Leather Products	0.4 %

Source: www.intracen.org (2017)

China's major exports are electromechanical products and labour intensive products such as clothing, footwear, plastic products and toys.

China overtook Japan as the leading Asian exporter in 2004, three years after its accession to the WTO. China surpassed the United States in 2007 and Germany in 2009 to become the world's leading exporter.¹⁰⁸

Main importing commodity are mineral fuels, oil, machinery, iron ore, plastics and soy beans. Import of crude oil is significantly leading as China is the largest importer of crude oil in the world, closely followed by USA. As a consequence, great Chinese demand for natural resources even contributes to price changing of crude oil and other primary commodities.¹⁰⁹

China's main export partners are the United States, the European Union, Hong Kong and Japan.

From the countries in European Union, leading position has Germany, United Kingdom and Netherlands.

¹⁰⁸ www.wto.org (2015)

¹⁰⁹ www.marketrealist.com (2016)

China's main importing partners are again European Union, United States, Korean republic, Japan and Taiwan. From the states in European Union, leading position has Germany, then France and Netherlands.¹¹⁰

In every economy, trade and investments are closely linked. FDI played crucial role in development of Chinese foreign trade.¹¹¹

3.2.2 Foreign Direct Investments

Foreign direct investments significantly contribute to amount of capital, technologies and skills in host countries.¹¹²

As it was mentioned previously, China's gradual opening process towards investments led to great rates of FDI.¹¹³

Chinese ability to attract foreign investment not only brought new technologies and capital, which significantly enhanced its economic growth, but resulted in China being first recipient of FDI between developing countries and second on the global scale^{114,115}

However, situation from 1990s has started to change. Before, majority of FDI originated in developed countries. Foreign direct investments were often viewed as a way how to spread technology and know-how to developing countries.¹¹⁶ The rise of FDI from emerging markets outwards has created one of the fundamental changes in FDI environment with effect on global economy. ¹¹⁷

In 2014, FDI outflows from emerging markets reached 38% of world FDI outflows, comparing it with 2% average during 1980-1985, with China as a significant leader. Among all emerging countries, China represents the most important home country and remains the third-largest investing country worldwide, after the United States and Japan. In fact, in 2014 China's ratio of outward FDI reached 96% of its FDI inflows.

¹¹⁰ www.wto.org (2015)

¹¹¹ Naughton, Barry (2007)

¹¹² Sauvant, P. Karl (2016)

¹¹³ Liu, Xiaohui et al. (2005)

¹¹⁴ Berthélemy, Jean Claude et al. (2000)

¹¹⁵ Excluding Hong Kong

¹¹⁶ Balasubramanyam V.N. et al. (1996)

¹¹⁷ Sauvant, P. Karl (2016)

China is investing in both, developed and developing countries. It has arisen as a leading investor in some developed economies. China took on several important deals in 2015 and 2016 such as acquisitions in appliance and entertainment industry in United States, investments to chemical industry in Italy and Switzerland as well as purchasing a 67% stake in the largest Greek harbour.¹¹⁸ Another major Chinese investment in Europe was acquisition of Britain's yacht maker. China is also involved in property developments in Great Britain and France.¹¹⁹ From developing region, China has become a leading investor in African countries.¹²⁰

Via outflow FDI, emerging markets enterprises have chance to improve its technology and organizational and managerial skills. When transferred back home, these skills can help to strengthen whole national competitiveness.

Moreover, investing abroad brings increased efficiency of Chinese enterprises and opportunity to spread its influence and control beyond the Chinese boundaries.¹²¹

3.2.3 Currency

Exchange rate of renminbi was pegged to the US dollar until 2005. As China gradually transitioned from central planning to market economy, renminbi was devaluated to increase competitiveness of China's export industry. China has moved to a market based exchange rate system, with a reference to a basket of currencies.¹²² Managed floating exchange rate is based on supply and demand of the market with reference to a basket of foreign currencies and controlled by a system of foreign exchange interventions driven by the China's central bank, People's bank of China.¹²³

China's yuan¹²⁴ has become world's most traded emerging-market currency by overtaking the Mexican peso in 2016.¹²⁵

¹¹⁸ www.unctad.org (2016)

¹¹⁹ Le Core, Phillippe et al. (2016)

¹²⁰ www.unctad.org (2016)

¹²¹ Luo, Yadong et al. (2010)

¹²² Yu, Yongding et al. (2017)

¹²³ Zhang Zhichao et al. (2017)

¹²⁴ The yuan is the basic unit of the renminbi, but is usually used to refer to the Chinese currency in general.

¹²⁵ www.reuters.com (2016)

In October 2016 Chinese currency was also added to the International Monetary Fund's basket of currencies. It has joined five most-used currencies in the world: US dollar, as number one trading currency, Japanese yen, British pound sterling and euro.¹²⁶

The Special Drawing Right¹²⁷ is an international reserve asset, which was created in 1969 by International Monetary Fund¹²⁸ as a supplement to the existing official reserves of member countries. SDRs are allocated to members according to proportion to their IMF quotas. It is a potential claim on the freely usable currencies of the members. The SDR also serves as the unit of account of the IMF and other international organizations. Current currency basket consists of 41% US dollar, 30.93% euro, 10.92% renminbi, 8.33% yen and 8.09% pound sterling.¹²⁹

The renminbi's inclusion to the basket has been the first time a new currency was added to the basket since the euro, in 1999. It is considered as an important milestone in the integration process of China's economy into global financial system. Moreover, it further diversifies SDR basket and makes it more representative of the world's major currencies.¹³⁰

Including RMB into the SDR basket means that China is now considered as one of the top exporters of the world and plays central role in global economy. Secondly, it means that RMB is determined by the IMF as 'freely usable', which stands for using it in international transactions and trading in the main exchange markets.¹³¹

As it was mentioned, the inclusion in the SDR strengthens China's internalization process. It reflects China's expansion in global trade as well as progress made in monetary, exchange and financial systems. Furthermore, it is closely linked to the openness of the capital markets in China.¹³²

Supposedly, more market participants will invest in securities denominated in renminbi, followed by increasing number of central banks. Nonetheless, there are still numbers of opportunities how to further improve renminbi's importance. Accession of the capital markets is still not fully open for foreign investors and there is need for complete opening and liberalisation of the China's financial markets.

¹²⁶ www.bis.org (2016)

¹²⁷ SDR

¹²⁸ IMF

¹²⁹ www.imf.org (2015)

¹³⁰ www.bis.org (2016)

¹³¹ www.imf.org (2016)

¹³² www.bis.org (2016)

3.3 Financial Market

Topic of Chinese financial market is vast and complicated. With ongoing changes in policy and reforms alongside with China's often criticized approach to publication of information, obtaining complex and up-to date information is a challenging task. In this part capital market will be described, leaving money market for attention of other researchers.

Although, China's financial sector has undergone significant changes during opening process in China since 1979.¹³³

Liberalization of capital markets has been another inevitable part of China's integration with global economy, which attracted attention of many researchers.¹³⁴

Despite the government's efforts of 'sound development of the capital market'¹³⁵, financial sector has been developing slowly, staying behind the real economy.¹³⁶

One of the possible reason for China's slow financial development is bank-dependence of the financial system, meaning that banks form majority of subjects on the financial market.

Despite major state-owned banks were transformed into corporations and were given operational independence, local governments can still intervene in the lending decisions towards certain firms.¹³⁷

Administrative regulation of the banks such as credit ceilings and deposit-to-loan ratios has been active since 1990s. Due to the administrative measures, they are highly motivated to multiply assets rather than to focus on shareholder returns. Moreover, banks are offering cheap loans to SOE¹³⁸, considering it as a safer option then lending money SME¹³⁹ and private companies.¹⁴⁰ Authors stress that in order to reach full market integration, banks have to have operational independence in order to make decisions based on market principles.¹⁴¹

¹³³ www.cityoflondon.gov.uk (2015)

¹³⁴ Korhonen, Iika (2015)

¹³⁵ Main mission of China's securities regulatory commission

¹³⁶ www.cityoflondon.gov.uk (2015)

¹³⁷ Yang, Zhou et al. (2016)

¹³⁸ State-owned Enterprise

¹³⁹ Small-medium Enterprise

¹⁴⁰ www.cityoflondon.gov.uk (2015)

¹⁴¹ Yang, Zhou et al. (2016)

Complete liberalization of interest rates in China has been **another** subject for discussion amongst economists, as an issue in shifting from centrally planned economy.

Interbank interest rates and bond yields have been market determined since 1990s, however other key interest rates have remained regulated.¹⁴²

Main interest rates have been controlled by system of loan quotas and deposit price limits set by central bank. Subjects benefitting from this regime have been mostly SOEs and banks which haven't been forced to develop competitive business structure. Policy makers were afraid of economic and social instability caused by premature reform of financial sector.¹⁴³

Consequently, to avoid strict regulatory controls, money has had to move through different channel. Banks issue off-balance sheet wealth management products to depositors and make trust loans to borrowers. Banks also hold position of intermediaries when issuing entrust loans for large corporations. China's shadow banking has been specific in two ways. Firstly, it is mostly initiated by banks, as they are dominant in the credit system. Secondly, it has a covert, strategic role in liberalizing interest rates by providing dual-track solution to controlled interest rate policy.¹⁴⁴

Very recently, China has taken another step forward market-driven economy, by cancelling minimum interest rate for corporate loans. According to *The New York Times*, it was one of the strongest signs of China's intention to let market forces play a larger role in the country. In addition, this step was also part of the broader strategy of reducing the dominant role of state in the economy.¹⁴⁵

Strategy of steady liberalizing of interest rates continued and finally in 2015 China disengaged deposit rate ceiling on deposit rates. This step was called by central bank, the 'riskiest' part of freeing up of nation's interest rates, as it could induce excessive competition for deposits. Consequently, it could lead to increased borrowing costs for companies.¹⁴⁶

¹⁴² www.imf.org (2009)

¹⁴³ Wang, Hao et al. (2016)

¹⁴⁴ Wang, Hao et al. (2016)

¹⁴⁵ www.nytimes.com (2013)

¹⁴⁶ www.bloomberg.com (2015)

Although, PBOC stressed, that despite the liberalization, it won't give the banks free rein. Financial institutions which would use high rates to attract deposits or disrupt the market will be disciplined.¹⁴⁷

Level of openness of capital markets is additional key implication for integrated and developed financial market.¹⁴⁸

China has recently broadened the range of investors who can enter the market.

Qualified Foreign Institutional Investor¹⁴⁹ Scheme was launched in 2002. It is a transitional arrangement which enables institutional investors who pass qualification requirements to invest in a limited quota of cross-border financial products.¹⁵⁰

As a consequence of growing capital market and higher demand of foreign institutional investors the quota for investments was gradually enlarged from initial 10 billion dollars to current 80 billion dollars.¹⁵¹

Renminbi Qualified Foreign Institutional Investor¹⁵² Scheme was launched in 2011 and it allows fund management companies and securities companies to use of RMB funds, raised in Hong Kong, to invest in domestic securities market. However, Hong Kong subsidiary must obtain the approval of China Securities Regulatory Commission as well as the investment quota approved by State Administration of Foreign Exchange.¹⁵³

PBC stated that in the future, in order to 'further open up the financial market', it will adopt more measures to attract more overseas long term capital to China's capital market.¹⁵⁴

¹⁴⁷ www.bloomberg.com (2017) b)

¹⁴⁸ www.cityoflondon.gov.uk (2015)

¹⁴⁹ QFII

¹⁵⁰ www.english.sse.com (2015)

¹⁵¹ www.csrc.gov.cn (2012) b)

¹⁵² RQFII

¹⁵³ www.csrc.gov.cn (2012) a)

¹⁵⁴ www.csrc.gov.cn(2012) b)

3.3.1 Capital Market

Marketplace is divided into the Interbank Market and Stock exchange market.

On the **Interbank Market**, subjects¹⁵⁵ are allowed to trade with cash bond, repo, bond lending, bond forward, interest rate swap, forward rate agreement and other transactions permitted by the PBC.

In order to ‘building a deep and liquid bond market’¹⁵⁶, China’s government introduced a registration system, eliminated quotas for foreign institutions and broadened range of interest rate instruments.¹⁵⁷

The Public Bank of China is encouraging overseas institutional investors to invest for longer periods, to secure stable development of the bond market.¹⁵⁸

After its rapid growth, China’s bond market has become the third largest in the world. With better access of investors, risk has grown too. In 2014, the first company on the domestic bond market defaulted, followed by several more. In 2016, as *Bloomberg agency*¹⁵⁹ predicted, more than ten companies missed local debt payments, defaulted in the bond market.¹⁶⁰

Number of defaults indicates, that the larger and more open bond market is, it is also becoming riskier and those events are more likely to occur again in the future.¹⁶¹ Moreover, it has led to a negative sentiment of the investors in the bond market. As a consequence, companies have cancelled or postponed issuing of bond on the market and spread widened between higher and lower rated corporate bonds.

According to *Borst*, an analyst from the Federal Reserve Bank of San Francisco, these trends could mean, potentially, positive development. Bigger and more open bond market that has relevant pricing of the risk could help the China’s financial system become more efficient and less bank-dependent.¹⁶²

Stock exchange market as a second part of capital market, is focused on equity instruments.

¹⁵⁵ Foreign Central Banks, International Financial Institutions and Sovereign Wealth Funds with RMB Funds in the Inter-bank Market

¹⁵⁶ www.pbc.gov.cn (2015) b)

¹⁵⁷ www.pbc.gov.cn (2015) a)

¹⁵⁸ www.pbc.gov.cn (2015) b)

¹⁵⁹ www.bloomberg.com (2017) a)

¹⁶⁰ www.bloomberg.com (2016)

¹⁶¹ www.frbsf.org (2016)

¹⁶² www.frbsf.org (2016)

3.3.2 Equity Market

Modern stock market in China was opened in 1990, mostly for privatizing state owned enterprises. Selection of listed companies was strictly controlled by the government and only one third of shares were tradable.

After numerous reforms over the last decade, China's stock market has become the world's second largest stock market with over \$7 trillion market capitalization.¹⁶³

There are two main stock exchanges in mainland China: Shanghai Stock Exchange and Shenzhen Stock Exchange both established in 1990. They are self-regulated entities under the supervision of CSRC¹⁶⁴.

Shenzhen Stock Exchange is developing multi-layered capital market system, comprising the Main Board, Small-Medium Enterprise¹⁶⁵ Board and the ChiNext market. It is designed for different enterprises at more stages of growth and different risk profiles.¹⁶⁶ Introducing SME and ChiNext Boards opened capital channels for smaller firms.¹⁶⁷

ChiNext market aims for innovative enterprises with profitability, in areas such as technology, business models and management. It has not strong financial requirements, nonetheless requires high quality.

On the other hand, SME board serves enterprises in mature stage of development and stable profits. Most of the listed companies are from manufacturing field, therefore SME board is considered as a barometer of China's manufacturing sector.¹⁶⁸

In addition, they coexist with Main Boards of the Shanghai and Shenzhen Exchanges, which are focusing on larger and more mature firms.

On the China's market, there are three types of shares. Shares A, B and H. Shares A are issued by companies which are incorporated in mainland China and shares are denominated in the local currency. Companies which are issuing B shares are listed in Shanghai and Shenzhen

¹⁶³ Guo, Bin et al. (2017)

¹⁶⁴ China Securities Regulatory Commission

¹⁶⁵ SME

¹⁶⁶ www.szse.cn (2013)

¹⁶⁷ Carpenter, N. Jennifer et al. (2016)

¹⁶⁸ Carpenter, N. Jennifer et al. (2016)

Exchange but their shares are trade in US dollars. This designed so foreign investors could also invest in the market. B share issuance has stopped when QFII program was introduced.¹⁶⁹

China's stock market represents an important alternative channel, as expansive banking and shadow banking sectors have raised doubts about the stability and efficiency on the financial system. Stock market creates source of capital for firms, investment destination for individuals and offers better corporate prospects about the firms.

Stock market crash in 2015 gained global attention by causing turbulences through global financial markets. Moreover, China Securities Regulatory Commission still negotiates with MSCI regarding inclusion of China's stock market in its emerging markets indices.¹⁷⁰

MSCI is according to *Bloomberg*¹⁷¹ one of the world's most followed emerging markets indices. Decision about rejecting China in 2016 surprised analysts over the world, and increased pressure on government for more reforms to increase liquidity and free flow of capital on the stock market.¹⁷²

China's position in the global market in the future is very unpredictable at the moment. This fact attracts more attention of the researchers and encourages them to grow the body of literature.

This paper aims to contribute with analytical-informative study of Chinese economy and mainly with analysis of Chinese stock market in relation with other global stock markets, proposed in the following chapter.

¹⁶⁹ Carpenter, N. Jennifer et al. (2016)

¹⁷⁰ Carpenter, N. Jennifer et al. (2016)

¹⁷¹ www.bloomberg.com (2017) c)

¹⁷² Carpenter, N. Jennifer et al. (2016)

4.0 Analysis

Aim of this part of the study is to econometrically analyse index Shenzhen Composite and Shanghai Composite with several global indices. Two types of indices are chosen for study. Firstly, main world indices - S&P 500 as a benchmark for American market, FTSE 100 for British market and Nikkei 225 for Japanese market, in order to find out relationship between China and large world indices. Secondly, indices are chosen from main trading partners in Europe, again to discover relationship and possible impact of China, but in this case on the European indices. We study French index CAC 40, Dutch index AEX and German index DAX.

According to the theory from the first chapter, more integrated markets tend to influence each other. This study aims to clarify level of inter-dependency of chosen stock markets represented by its stock indices. For this purpose, cross-correlation analysis will be conducted, alongside with the analysis of lead lag effect, to detect direction of possible relationship. To find out if causality between the stock indices exists, Granger causality will be tested. To explore long-term relationship, cointegration test will be conducted.

The reminder of the paper is organized as follows:

Section 4.1 describes data and presents preliminary statistics. In Section 4.2 methodology is explained. Section 4.3 includes analyses of the correlations of the financial returns between selected indices, lead and lag analysis, tests of Granger causality and cointegration analysis. The last section concludes.

4.1 Data Description

This paper analyses altogether eight indices: **Shenzhen Composite, Shanghai Composite, S&P 500, FTSE 100, Nikkei 225, DAX, AEX and CAC 40.**

We collect data from past 5 years. Date range is March, 2012- March 2017. In the case of intraday data (explanation is in the following paragraph), we were able to obtain data only for past 4 years. Therefore, data range for intraday data is March 2013-March 2017.

International stock markets have different trading hours, what causes non-synchronicity problem when analysing them. One possible way how to by-pass the problem is to use weekly or monthly data. However, the use of low frequency data is leading to small samples. Moreover,

they cannot capture daily correlation dynamics. Other option is to use synchronous stock market prices but this method requires some overlapping trading periods. Therefore, it is not possible to use it to study correlation with Asian stock returns, as they do not have any common trading time with other American or European stock markets.¹⁷³ Table (2) reports chosen World Stock Exchanges' trading hours.

Table 2: World Stock Exchanges' Opening Hours (UTC)

MARKET	OPEN	CLOSE
Shanghai S.E.	1:30	7:00
Shenzhen S.E.	1:30	7:00
New York S.E.	14:30	21:00
London S.E.	8:00	16:30
Tokyo S.E.	00:00	6:00
Frankfurt S.E.	7:00	21:00
Euronext Amsterdam	8:00	16:40
Euronext Paris	8:00	16:30

Source: www.worldtimezone.com (2017)

As the table shows, Japanese market is the only one overlapping. To by-pass non-synchronous trading of other markets, we choose to test two approaches.

Firstly, we will use standard daily close-to-close and close-to-open returns for our purposes. Standard, close-to-close return time series will be calculated for Chinese market, to capture its daily performance and for Japanese market, as it is overlapping with the Chinese. Close-to-open returns will be calculated for world's indices in order to identify potential impact of Chinese market's performance from previous day. As it is shown in Table (2), all European market are opening shortly after Chinese markets close. To avoid stale prices, we will be using prices 15 minutes after the official open. By this time, world's indices should be able to incorporate any news from China into its prices. This small adjustment should help identify (if present) impact of Chinese market's performance on global market indices. The methodology used in this study has been adopted from *Hamao et al.*, who were studying short-run interdependencies of stock prices in Tokyo, London and New York.¹⁷⁴

¹⁷³ Martens, Martin et al. (2000)

¹⁷⁴ Hamao et al. (1990)

Secondly, we will use close-to-close returns without any adjustments.

After removing holidays in each country, there are 1100 common trading days among time series, respectively varying from 933 until 960 in case of intraday data.

To make collected data stationary, we will work with continuously compounded returns calculated according to Formula (1) for close-to-close prices:

$$R_{t+1} = \ln\left(\frac{p_{Ct+1}}{p_{Ct}}\right) \quad (1)$$

And Formula (2) for close-to-open prices:

$$R_{t+1} = \ln\left(\frac{p_{Ot+1}}{p_{Ct}}\right) \quad (2)$$

Where R_{t+1} is compounded return in time $t+1$, p_{Ct} is closing price in time t , p_{Ct+1} is closing price following day, and p_{Ot+1} is opening price in time $t+1$, again, following day.

$$t = 1, 2, \dots, T - 1 \quad (3)$$

Where T is number of observations.

Following Table (3) shows descriptive statistics and tests of normality.

Table 3: Summary Statistics¹⁷⁵

STATISTICS	STD. DEV.	MEAN	OBS.	JARQUE-BERA	PROB.
SSE	0.0160	0.0003	1100	2154.2840	0.0000
SZSE	0.0181	0.0006	1100	848.3897	0.0000
S&P C-C	0.0082	0.0004	1100	391.4717	0.0000
S&P C-O	0.0055	0.0003	960	1676.3860	0.0000
FTSE C-C	0.0093	0.0002	1100	364.8170	0.0000
FTSE C-O	0.0065	0.0005	935	10020.6400	0.0000
NIKKEI C-C	0.0146	0.0006	1100	513.6941	0.0000
CAC C-C	0.0124	0.0003	1100	603.2230	0.0000
CAC C-O	0.0084	0.0002	933	24929.4700	0.0000
AEX C-C	0.0109	0.0004	1100	418.4077	0.0000
AEX C-O	0.0079	-0.0004	934	13620.5700	0.0000
DAX C-C	0.0123	0.0004	1100	311.4915	0.0000
DAX C-O	0.0083	-0.0004	937	9672.2870	0.0000

Source: Own Findings

Jarque-Bera test of normality has for all of the time series 0.00 probability which means that we reject null hypothesis of a normal distribution.

¹⁷⁵ C-C refers to close-to-close return, C-O refers to close-to-open return

To test if our data are stationary, we use Augmented Dickey-Fuller test statistic. The results are displayed in Table (4).

Table 4: Stationarity tests

STATISTICS	ADF TEST (t-Statistic)	PROB.
SSE	-32.6442	0.0000
SZSE	-31.6682	0.0000
S&P C-C	-33.6453	0.0000
S&P C-O	-31.0923	0.0000
FTSE C-C	-33.9980	0.0000
FTSE C-O	-24.6162	0.0000
NIKKEI C-C	-35.4374	0.0000
CAC C-C	-34.9329	0.0000
CAC C-O	-24.5049	0.0000
AEX C-C	-33.1666	0.0000
AEX C-O	-23.7545	0.0000
DAX C-C	-33.9000	0.0000
DAX C-O	-24.0506	0.0000

Source: Own Findings

Null hypothesis is that time series is non-stationary and has unit root. We reject the null hypothesis, as probability is 0.00 for all of the time series. We can conclude that our time series are stationary and suitable for further analysis.

4.2 Methodology

4.2.1 Cross-correlation

Cross-correlation indicates whether variables are positively or inversely related. Variables move in the same direction if they are positively related, and opposite direction if inversely related. Cross-correlation coefficient indicates also the degree to which the variables from time series tend to move together.

In time series analysis, cross-correlation between two time series is the normalized cross-covariance function. In this study, cross-correlation test is applied as a preliminary test to identify the relation between stock markets. The results serve as a basis for further econometric analysis later.

The cross-correlation for two time series x and y is given by Formula (4) and (5)

$$r_{xy}(l) = \frac{c_{xy}(l)}{\sqrt{c_{xx}(0)} \cdot \sqrt{c_{yy}(0)}}, \quad \text{where } l = 0, \pm 1, \pm 2, \dots \quad (4)$$

And

$$c_{xy}(l) = \begin{cases} \sum_{t=1}^{T-l} ((x_t - \bar{x})(y_{t+l} - \bar{y})) / T & l = 0, 1, 2, \dots \\ \sum_{t=1}^{T+l} ((y_t - \bar{y})(x_{t-l} - \bar{x})) / T & l = 0, -1, -2, \dots \end{cases} \quad (5)$$

Where r is cross-correlation coefficient and c covariance. \bar{x} and \bar{y} stand for sample means, l represents lag.¹⁷⁶

4.2.2 Lead and Lag Relationship

When studying two time series (y_t and x_t), the series y_t may be related to past lags of x_t series. To identify such relation, we use cross-correlogram calculated according to Formula (4) and (5) above. It displays cross-correlations from 0 to 36 leads-lags for pairs of time series. If y is a leading indicator of x , we observe the highest significant cross-correlation at a lag greater than 0 and vice versa.¹⁷⁷ All cross-correlogram outputs can be found in the attachment.

4.2.3 Causality Analysis

Correlation does not necessarily imply causation. Two time series may be correlated but they do not have to be connected in any way.

The concept of causality is considered a basis in studying dynamics between time series.¹⁷⁸

¹⁷⁶ www.eviews.com (2016) a)

¹⁷⁷ www.eviews.com (2016) a)

¹⁷⁸ Dufour, Jean-Marie and Renault, Eric (1998)

Granger causality test analyses, if x causes y by testing how much of the current y can be explained by past values of y and then if adding lagged values of x can improve explanation.¹⁷⁹ y is said to be Granger-caused by x if x helps to predict y **one period ahead**. Therefore, if the coefficients on the lagged x 's are statistically significant. We run bivariate regression in following form:

$$\begin{aligned} y_t &= \alpha_0 + \alpha_1 y_{t-1} + \dots + \alpha_l y_{t-l} + \beta_1 x_{t-1} + \dots + \beta_l x_{t-l} + \epsilon_t \\ x_t &= \alpha_0 + \alpha_1 x_{t-1} + \dots + \alpha_l x_{t-l} + \beta_1 y_{t-1} + \dots + \beta_l y_{t-l} + u_t \end{aligned} \quad (6)$$

For all pairs of time series. Reported F- statistics are Wald statistics for the hypothesis:

$$\beta_1 = \beta_2 = \dots = \beta_l = 0 \quad (7)$$

The null hypothesis is that x does **not** Granger-cause y in the first regression and that y does **not** Granger-cause x in the second regression.

The Granger causality test is applied to identify **short-run causality** among sample markets, where 'short-run' refers to forecast horizons, not the role played by past observations.¹⁸⁰ Therefore, it helps to identify interdependency between stock markets in the short run.

4.2.4 Cointegration Analysis

Many economic time series contain a unit root thus are non-stationary. *Engle and Granger* introduced approach that a linear combination of two or more non-stationary series may be stationary. If such combination exists, time series are said to be cointegrated. The stationary linear combination is called the cointegrating equation. It is interpreted as a long-run equilibrium between the time series.

¹⁷⁹ Granger, C.W. J (1969)

¹⁸⁰ Dufour, Jean-Marie and Renault, Eric (1998)

Authors explain equilibrium as a stationary point towards economy is pushed back whenever it moves away. If x is a vector of economic variables, then they are in equilibrium when specific linear constraint occurs¹⁸¹:

$$\alpha'x = 0 \quad (8)$$

Cointegration implies that any deviations from equilibrium are stationary with finite variance, despite the series are nonstationary with infinite variance.¹⁸²

This approach allows us to identify **long run** components of variables which are obeying equilibrium rules while short-run components have a flexible dynamic specifications.¹⁸³

For testing, we use vector autoregression model (VAR) of order p to capture linear interdependencies between time series:

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + Bx_t + \epsilon_t \quad (9)$$

where y_t is a k -vector of non-stationary $I(1)$ ¹⁸⁴ variables. X_t is a d -vector of deterministic variables and ϵ_t is a vector of innovations.

The model is rewritten into Granger's representation theorem:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + Bx_t + \epsilon_t \quad (10)$$

Where:

¹⁸¹ Engle, F. Robert, Granger, C.W.J (1987)

¹⁸² Engle, F. Robert, Granger, C.W.J (1987)

¹⁸³ Engle, F. Robert, Granger, C.W.J (1987)

¹⁸⁴ first order

$$\Pi = \sum_{i=1}^p A_i - I, \quad \Gamma_i = - \sum_{j=i+1}^p A_j \quad (11)$$

According to this theorem, if the coefficient matrix Π contains reduced rank $r < k$, then there exist $k \times r$ matrices α and β with such rank r that $\Pi = \alpha\beta'$ and $\beta'y_t$ is $I(0)$. r is number of cointegrating relations and each column of β is the cointegrating factor.¹⁸⁵

Johansen's method is to estimate Π matrix from VAR and to test if we can reject the restrictions implied by the reduced rank of Π . For more detailed explanation see, for example, Johansen, Soren (1991).¹⁸⁶

Johansen cointegration test allows the analysis of the relationship between financial markets in the **long run**, by testing the existence of cointegrating equations. Presence of at least one equation means that time series are cointegrated.¹⁸⁷

Null hypothesis in our case is that there is no cointegration between markets which can be interpreted that the economic conditions in the countries are different and they are not integrated.

¹⁸⁵ www.eviews.com (2016) b)

¹⁸⁶ Johansen, Soren (1991)

¹⁸⁷ Johansen, Soren (1991)

4.3 Empirical Analysis

This section presents the results of the study of inter-dependencies between Chinese and world's financial markets.

First subsection evaluates constant cross-correlation, second analyses if China is in the leading position or is being led by other markets.

Third section is examining causality between the markets, whether movement on one market is causing movement on the other financial market.

The last part is focusing on long-term relationships between the markets where integration is studied.

4.3.1 Cross-correlation

We first examine cross-correlations between Chinese stock market's returns represented by stock indices and three main global indices.

Constant cross-correlation between indices is reported in the Table (5):

Table 5: Cross-correlation results- Main indices¹⁸⁸

INDEX	SSE	SZSE
S&P C-C	0.1500	0.1330
S&P C-O	0.1815	0.1579
FTSE C-C	0.1854	0.1682
FTSE C-O	0.2437	0.2383
NIKKEI C-C	0.2437	0.2031

Source: Own Findings

All correlation coefficients for main indices vary from slight correlation to fair degree of correlation. The strongest relationship (0.2437) for close-to-close returns is shown for Japanese index **Nikkei 225** with Shanghai Composite index, followed again by Japanese stock market with Shenzhen Composite index. Relationship of Chinese indices with British index is stronger than with American index S&P 500. In all cases, close-to-open returns show higher correlation coefficient. The strongest relationship for close to open returns is with British **FTSE 100**.

¹⁸⁸ C-C refers to close-to-close return, C-O refers to close-to-open return

Since they are large indices, their movement during the day is influenced by many factors. The fact that close-to-open returns are showing higher correlation with Chinese market may be caused by the impact of the Chinese market.

Moreover, all correlation coefficients are higher for Shanghai Composite index than for Shenzhen Composite.

Secondly, we examine national stock indices of countries, which are main trading partners of China.

Table (6) summarizes the results:

Table 6: Cross-correlation results- Country indices

INDEX	SSE	SZSE
CAC 40 C-C	0.1465	0.1320
CAC40 C-O	0.2157	0.2102
AMS C-C	0.1489	0.1361
AMS C-O	-0.2371	-0.2295
DAX C-C	0.1370	0.1337
DAX O-C	-0.2191	-0.2254

Source: Own Findings

Cross-correlation analysis of close-to-close returns brings similar results for all indices. Correlation coefficients are for all country indices showing very weak form of correlation. Strongest relationship is with Netherland's index AMS, closely followed by German index DAX. Results again show higher correlation for Shanghai Composite index than for Shenzhen Composite.

Highest measured cross-correlation is measured for French index CAC close-to-open returns. Surprisingly, returns calculated from close-to-open returns for DAX and AMS are negatively correlated. In stock markets, negative correlation means that movement of one stock index upwards is correlated with the movement of other stock index downwards. We could interpret this as a negative relationship between Chinese and German/Dutch stock markets which could be used for diversification of the portfolio.

However, different explanation is suggested by *French and Roll*. They pointed out that equity returns have higher volatility during exchange trading hours than during non-trading hours.¹⁸⁹

¹⁸⁹ French, R. Kenneth and Roll, Richard (1986)

This characteristic, according to *Goodwin and Leech* may lead to changes in correlation coefficients.¹⁹⁰ For this purpose, we examine calculated standard deviation in time series of C-O returns, as it is a suggested method to identify different variability.¹⁹¹

Table (3) shows standard deviations for selected time series. It shows that standard deviations for C-O returns are lower than for C-C returns. We reason that this may lead to distorted results of the correlation analysis at most of the time series. Therefore, we focus on the second approach (C-C returns) in the following Lead-Lag analysis.

At the end, clarify relationship between all studied indices, we construct cross-correlation matrix. Results are shown in Table (6)

Table 7: Cross-correlation Matrix

	CAC	FTSE	SZSE	SSE	DAX	NIKKEI	S&P	AEX
CAC	1.0000	0.8496	0.1157	0.1310	0.9302	0.3179	0.6134	0.9347
FTSE	0.8496	1.0000	0.1688	0.1828	0.8102	0.3321	0.6124	0.8739
SZSE	0.1157	0.1688	1.0000	0.8680	0.1163	0.2159	0.1162	0.1237
SSE	0.1310	0.1828	0.8680	1.0000	0.1222	0.2521	0.1275	0.1387
DAX	0.9302	0.8102	0.1163	0.1222	1.0000	0.3069	0.5894	0.9113
NIKKEI	0.3179	0.3321	0.2159	0.2521	0.3069	1.0000	0.2199	0.3352
S&P	0.6134	0.6124	0.1162	0.1275	0.5894	0.2199	1.0000	0.6180
AEX	0.9347	0.8739	0.1237	0.1387	0.9113	0.3352	0.6180	1.0000

Source: Own Findings

Table clearly shows that strongest relationships are between European markets. Highest cross-correlation is between Dutch and French indices. Correlations with American market varies from very weak to moderate. Chinese markets have the strongest relationship between each other. There is a weak cross-correlation with Japanese market. Surprisingly, index Nikkei has stronger correlation coefficients with European indices than with Chinese or American.

It can be concluded, that when comparing European, American and Asian markets in the larger scale, Chinese markets seem to have minor relationship with the markets. In order to accept or reject this assumption, we conduct more sophisticated analysis in the following sections.

¹⁹⁰ Goodwin, D. Laura and Leech, L. Nancy (2006)

¹⁹¹ Goodwin, D. Laura and Leech, L. Nancy (2006)

4.3.2 Lead-Lag Analysis

Examination of the lead lag relationship between countries is interesting because there is difference in opening times, as was discussed before.

Lead and Lag Analysis results from lag (1) are shown in Table (8) and (9)

The results for the leading (or lagging) more than one day are insignificant, hence we focus only on lag (1) results in this study:

Table 8: Lead and Lag Analysis Results- Shanghai Composite

INDEX	CHINA LEADS (1)	CHINA LAGS (1)
S&P	-0.0355	0.1586
FTSE	-0.0227	0.0900
NIKKEI	0.0214	0.0034
CAC	-0.0206	0.1150
AEX	-0.0022	0.1248
DAX	-0.0214	0.1086

Source: Own Findings

Table 9: Lead and Lag Analysis Results- Shenzhen Composite

INDEX	CHINA LEADS (1)	CHINA LAGS (1)
S&P	-0.0113	0.1515
FTSE	-0.0445	0.1122
NIKKEI	0.0146	0.0164
CAC	-0.0450	0.1340
AEX	-0.0215	0.1426
DAX	-0.0422	0.1273

Source: Own Findings

We find no significant correlation between world's markets and Chinese markets in a position of China as a leading market. More interesting results brings analysis of China in a led position. All correlation coefficients, except Nikkei 225, show very weak to weak form of correlation. The strongest relationship is between American index **S&P 500** and both Chinese indices. Following is Dutch index **AMS** with Shanghai Composite, closely followed by French index **CAC**.

In the case of American index, the correlation with Chinese markets is even greater with S&P500 as a leading market than constant correlation between the markets.

We can conclude that one day lag returns of American S&P 500 provide best predictability for the China's market returns.

All findings show that China is being led by other world's markets. It can be concluded that even when Chinese market is first to open and close on certain day and all markets perform after Chinese market is already closed, it does not seem to affect other indices. Chinese markets seems to be following performance of other markets, mostly **American, Dutch and French**.

It is important to emphasize that this analysis does not confirm the causality but rather determines the time lag between variables. Causality tests will be conducted in the following part.

4.3.3 Causality Analysis

In this part, causality is tested, to determine if time series are inter-dependent in the short run. Table (10) reports results of Granger Causality tests. As there is a great number of tested hypotheses, only pairs with observed **significant** causality are shown. Full table with all the results of the tests is available in the Appendix A.

Table 10: Results of Granger Causality Analysis

H0:	F-Statistic	Probability
S&P does not Granger Cause SSE	14.4570	0.0000
SSE does not Granger Cause S&P 500	1.11124	0.3295
S&P does not Granger Cause SZSE	13.4619	0.0000
SZSE does not Granger Cause S&P 500	1.40259	0.2464
S&P C-O does not Granger Cause SSE	5.84026	0.0030
SSE does not Granger Cause S&P 500 C-O	5.12378	0.0061
S&P C-O does not Granger Cause SZSE	3.88612	0.0209
SZSE does not Granger Cause S&P 500 C-O	3.71743	0.0246
FTSE does not Granger Cause SSE	5.99721	0.0026
SSE does not Granger Cause FTSE	1.06575	0.3448
FTSE does not Granger Cause SZSE	3.51904	0.0299
SZSE does not Granger Cause FTSE	0.38685	0.6793
AMS does not Granger Cause SSE	10.8905	0.0000
SSE does not Granger Cause AMS	0.73312	0.4806
AMS does not Granger Cause SZSE	7.90017	0.0004
SZSE does not Granger Cause AMS	0.87430	0.4174
DAX does not Granger Cause SSE	7.73191	0.0005
SSE does not Granger Cause DAX	1.60768	0.2008
DAX does not Granger Cause SZSE	5.97136	0.0026
SZSE does not Granger Cause DAX	0.93160	0.3942
CAC does not Granger Cause SSE	9.33280	0.0001
SSE does not Granger Cause CAC	1.43712	0.2380
CAC does not Granger Cause SZSE	6.78050	0.0012
SZSE does not Granger Cause CAC	0.71439	0.4897

Source: Own Findings

Results provide some important findings. At 5% level of significance, we reject Null Hypothesis about world's indices not causing movement of Shanghai and Shenzhen Composite. We accept H1, therefore it can be concluded that **all tested indices** except of Nikkei, have causal influence on Chinese stock markets. This results confirm findings from previous Lead and Lag analysis, that Chinese stock markets are being led by world's stock markets.

According to results, Chinese influence is detected in only two cases. Shanghai Composite Granger **Causes American index S&P** calculated from close-to-open returns, at 1% level of significance. Secondly, Shenzhen Composite Granger Causes again American S&P calculated from close-to-open returns, at 5% level of significance. This causal relationship does not exist between close-to-close returns. As cross-correlation analysis has shown, impact of China is very weak. However, it is more observable in close-to-open returns. As it was said, large indices are influenced by many factors, therefore close-to-open prices might be a good way how to capture this weak influences.

To conclude, causality analysis confirmed findings from previous lead and lag analysis. Chinese markets are being led by all studied world's markets except of Japanese market, at 5% level of significance.

In addition, to compare overall impact of indices on each other, we conduct causality analysis with all studied indices using only standard close-to-close returns. Following Table (10) represents the results:

Table 11: Results of Granger Causality Analysis

H0:	Obs	F-Statistic	Prob.
FTSE does not Granger Cause CAC	1077	0.71065	0.4916
CAC does not Granger Cause FTSE		0.29672	0.7433
SZSE does not Granger Cause CAC	1077	0.02926	0.9712
CAC does not Granger Cause SZSE		9.02413	0.0001
SSE does not Granger Cause CAC	1077	0.26513	0.7672
CAC does not Granger Cause SSE		12.3441	0.0000
DAX does not Granger Cause CAC	1077	0.70973	0.4920
CAC does not Granger Cause DAX		0.41938	0.6576
NIKKEI does not Granger Cause CAC	1077	0.34719	0.7068
CAC does not Granger Cause NIKKEI		68.7305	0.0000
S&P does not Granger Cause CAC	1077	22.6570	0.0000
CAC does not Granger Cause S&P		1.35521	0.2583
AEX does not Granger Cause CAC	1077	0.80661	0.4466
CAC does not Granger Cause AEX		0.82242	0.4396
SZSE does not Granger Cause FTSE	1077	0.41878	0.6580
FTSE does not Granger Cause SZSE		5.02801	0.0067
SSE does not Granger Cause FTSE	1077	1.13195	0.3228

FTSE does not Granger Cause SSE		7.67559	0.0005
DAX does not Granger Cause FTSE	1077	0.15823	0.8537
FTSE does not Granger Cause DAX		0.25748	0.7730
NIKKEI does not Granger Cause FTSE	1077	0.07092	0.9315
FTSE does not Granger Cause NIKKEI		54.7063	0.0000
S&P does not Granger Cause FTSE	1077	43.2950	0.0000
FTSE does not Granger Cause S&P		0.64097	0.5270
AEX does not Granger Cause FTSE	1077	0.29137	0.7473
FTSE does not Granger Cause AEX		0.30655	0.7360
SSE does not Granger Cause SZSE	1077	0.68186	0.5059
SZSE does not Granger Cause SSE		1.47539	0.2292
DAX does not Granger Cause SZSE	1077	9.06394	0.0001
SZSE does not Granger Cause DAX		0.17968	0.8356
NIKKEI does not Granger Cause SZSE	1077	0.18820	0.8285
SZSE does not Granger Cause NIKKEI		0.13121	0.8770
S&P does not Granger Cause SZSE	1077	14.8031	0.0000
SZSE does not Granger Cause S&P		0.66056	0.5168
AEX does not Granger Cause SZSE	1077	9.81573	0.0000
SZSE does not Granger Cause AEX		0.05365	0.9478
DAX does not Granger Cause SSE	1077	12.3101	0.0000
SSE does not Granger Cause DAX		0.37046	0.6905
NIKKEI does not Granger Cause SSE	1077	0.45848	0.6324
SSE does not Granger Cause NIKKEI		0.17794	0.8370
S&P does not Granger Cause SSE	1077	15.7616	0.0000
SSE does not Granger Cause S&P		0.56432	0.5689
AEX does not Granger Cause SSE	1077	13.8024	0.0000
SSE does not Granger Cause AEX		0.06749	0.9347
NIKKEI does not Granger Cause DAX	1077	1.09084	0.3363
DAX does not Granger Cause NIKKEI		68.1051	0.0000
S&P does not Granger Cause DAX	1077	22.9926	0.0000
DAX does not Granger Cause S&P		0.93856	0.3915
AEX does not Granger Cause DAX	1077	0.30281	0.7388
DAX does not Granger Cause AEX		0.00283	0.9972
S&P does not Granger Cause NIKKEI	1077	102.414	0.0000
NIKKEI does not Granger Cause S&P		2.04581	0.1298
AEX does not Granger Cause NIKKEI	1077	71.0397	0.0000

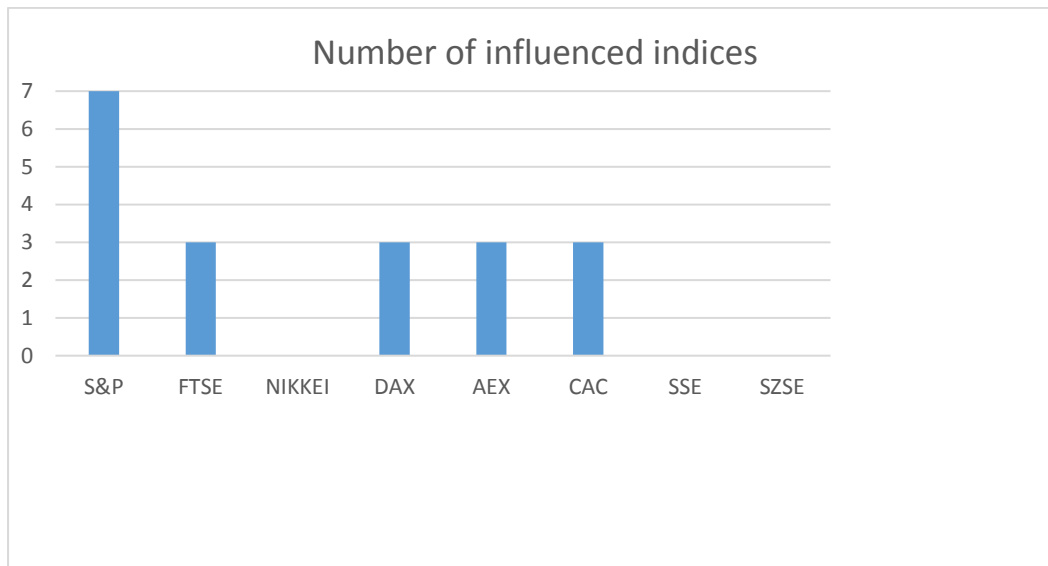
NIKKEI does not Granger Cause AEX		0.21599	0.8058
AEX does not Granger Cause S&P	1077	1.08913	0.3369
S&P does not Granger Cause AEX		30.4813	0.0000

Source: Own Findings

The most influential index is clearly **American S&P**. It Granger causes **all seven** studied indices. European indices (FTSE, DAX, CAC, AEX) have impact on all studied Asian indices (NIKKEI, SSE, SZSE). On the other hand, Asian indices seem to have no impact on other world indices, not even on each other.

Figure (1) illustrates the results:

Figure 1: Number of influenced indices



Source: Own Findings

Last analysis will be conducted to find out long-run interdependency, hence if stock markets are integrated.

4.3.4 Integration Analysis

For the last analysis, to conduct Johansen Cointegration test, we need to analyse original, non-stationary data. We study daily closing prices of stock indices.

After making first difference of time series and conducting Unit root tests, it can be confirmed that all of the time series are stationary, therefore all of them are integrated to order 1 I(1) in levels, thus they are non-stationary in levels and stationary in first differences. Condition of Johansen Cointegration test is met. Following Table (11) and (12) are showing the results.

Table 12: Integration with Shanghai Composite

H0: Cointegration equation does not exist.	Trace Statistic	Probability
S&P	15.8267	0.5065
FTSE	15.0612	0.5694
NIKKEI	9.0943	0.9577
CAC	12.4004	0.7835
AEX	20.7752	0.1892
DAX	14.1884	0.6420

Source: Own Findings

Table 13: Integration with Shenzhen Composite

H0: Cointegration equation does not exist.	Trace Statistic	Probability
S&P	19.8488	0.2337
FTSE	20.5644	0.1987
NIKKEI	12.4271	0.7816
CAC	506.4229	0.0000
AEX	26.6209	0.0403
DAX	25.8721	0.2081

Source: Own Findings

We can accept Null hypothesis of no cointegration equations with index Shanghai Composite. It can be concluded that this index is not integrated with other world's indices in the long term.

Different results brings study of Shenzhen Composite. According to the test, we reject Null hypothesis about no cointegration equations and we accept H1 hypothesis that index is **integrated** with **French** index CAC at 1% level of significance and with **Dutch** index AEX at

5% level of significance. This could be interpreted that these stock markets are integrated and they are reacting similarly to different economic conditions in long run.

Different results for Chinese indices can be caused by different stocks traded on stock exchanges therefore included in the stock indices. As it was mentioned above, Shenzhen Exchange includes trading with stocks of enterprises at more stages of growth and different risk profiles. Therefore, variety of firms on the market may be creating similar trading conditions leading to integration of the market.

5.0 Conclusion

The purpose of this paper was to expand on existing academic research relating to stock market linkages and to analyse current impact of Chinese markets on Asian, American, and European financial markets. The paper poses a question whether there is any relationship between the world stock indices and China and whether Chinese markets has an ability to influence markets in Europe, Asia or Northern America.

In order to address this issue, and establish the level of relationship between individual indices, cross-correlation analysis, lead lag analysis, causality analysis and co-integration analysis have been employed.

The findings of cross-correlation analysis did not produce any significant signs of a relationship. There is a fair level of correlation with all of the markets, however, the strongest correlation is between Japanese and British markets calculated with close-to-close and close-to-open returns respectively. It is worth to note, that all correlation levels were increased for returns calculated with close-to-open returns, which could be viewed as a sign of slowly integrating Chinese market, as close-to-open returns may have a better ability to capture performance from previously closed Chinese markets.

When comparing results of constant cross-correlation with other indices, Chinese markets seemed to have the weakest relationship.

Lead and Lag analysis confirmed that there is no significant correlation between world's markets and Chinese markets in a position of China as a leading market. Moreover, it managed to establish that Chinese market is in fact being led by other markets. According to the results it appear to be following the performance of America, Dutch and French markets. The results also confirmed that a one day lag of returns of American market S&P 500 serve as most appropriate for predictability of China's market returns.

Since Lead and Lag analysis only reports on correlation between delayed movements of indices, the above findings do not prove influence of global or Chinese indices on one another. For this purpose, the Granger Causality analysis has been conducted.

Results of the Granger Causality analysis offer several important findings. The analysis reports that all global indices, except for the Japanese, have significant causal impact on Chinese market. These results further support the Lead and Lag analysis, confirming that Chinese stock

markets are being led by world's stock markets. In addition to this however, it also detects Chinese influence. In two cases, both of the Chinese indices are Granger-causing movements on American index S&P, which has been calculated from close-to-open returns.

Finally, the last analysis was conducted to establish whether the markets are integrated in the long run. The analysis provides positive results in case of French and Dutch indices.

In summary, the predicted strong influence of China on global stock markets has not been proven. The findings suggested that in most cases, Chinese market copies the development of American and European markets, however, Chinese influence could have been observed in case of American index (in causality analysis) and in cases of French and Dutch markets (in long-term co-integration analysis).

There are areas proposed for further research. All of these findings suggest that Chinese market is headed towards integration. The development of Chinese influence should be addressed further in academic literature with particular focus on close-to-open returns, as this approach provided some significant results.

List of References

- AGENOR, Pierre-Richard. Benefits and Costs of International Financial Integration: Theory and Facts, *World Bank Policy Research Working Paper No. 2699* [on-line]. 2001 [cit. 2016-09-30]. Available at: <https://ssrn.com/abstract=632768>
- BADRINATH, S.G., JAYANT, R. Kale, NOE, H. Thomas. Of Shepherds, Sheep, and the Cross-autocorrelations in Equity Returns, *The Review of Financial Studies* [on-line]. 1995, vol. 8, no. 2, p. 401-430 [cit. 2016-09-06]. Available at: <http://www.jstor.org/stable/2962277>
- BAJONA, Claustre and CHU, Tianshu. Reforming State Owned Enterprises in China: Effect of WTO Accession, *Review of Economic Dynamics* [on-line]. 2010, vol.13, no.4, p. 800-823 [cit. 2017-02-01]. Available at: <http://dx.doi.org/10.1016/j.red.2009.07.003>
- BALASUBRAMANYAM, V. N., SALISU M. and SAPSFORD, David. Foreign Direct Investment and Growth in EP and Is Countries. *The Economic Journal* [on-line]. 1996, vol.106, no. 434, p. 92-105 [cit. 2017-02-10]. Available at: <http://dx.doi.org/10.2307/2234933>
- BALDWIN, E. Richard, FORSLID, Rikard. Trade liberalisation and endogenous growth: A q -theory approach, *The National Bureau of Economic Research Working Paper No. 5549* [on-line]. 1996 [cit. 2016-09-15]. Available at: <http://www.nber.org/papers/w5549>
- BARBOZA, David. China Eases Bank Loan Rules, in a Step Toward a Market-Driven Economy. In: *The New York Times* [on-line]. 2013-07-19 [cit. 2017-02-05]. Available at: <http://www.nytimes.com/2013/07/20/business/global/china-liberalizes-lending-rates.html>
- BERTHELEMY, Jean-Claude, DEMURGER, Sylvie. Foreign Direct Investment and Economic Growth: Theory and Application to China. *Review of Development Economics* [on-line]. 2000, vol.4, no. 2, p.140–155 [cit. 2016-10-15]. Available at: <http://doi.org/10.1111/1467-9361.00083>
- BLANCHER, R. Nicolas, RUMBAUGH, Thomas. China: International Trade and WTO Accession, *IMF Working Papers* [on-line]. 2014 [cit. 2017-01-25]. ISSN 1018-5941. Available at: <https://www.imf.org/~media/Websites/IMF/imported-full-text-pdf/external/pubs/ft/wp/2004/wp0436.ashx>
- BORST, Nicolas. China's Bond Market: Larger, More Open, and Riskier. In: *Federal Reserve Bank of San Francisco* [on-line]. 2016-05-20 [cit. 2017-02-27]. Available at: <http://www.frbsf.org/banking/asia-program/pacific-exchange-blog/china-bond-market-growth-openness-risk/>
- BOYCKO, Maxim, SHLEIFER, Andrei, VISHNY, W. Robert, FISCHER, Stanley and SACHS, D. Jeffrey. Privatizing Russia, *Brookings Papers on Economic Activity* [on-line]. 1993, no.2, p. 139-192 [cit. 2017-01-26]. Available at: <http://www.jstor.org/stable/2534566>
- Briefing on QFII Scheme and Its Development. In: *Shanghai Stock Exchange* [on-line]. 2015 [cit. 2017-03-03]. Available at: <http://english.sse.com.cn/investors/qfii/what/>

BUCK, Trevor, FILATOTCHEV, Igor, NOLAN, Peter, WRIGHT Mike. Different paths to economic reform in Russia and China: causes and consequences, *Journal of World Business* [on-line]. 2000, vol. 35, no. 4, p. 379-400 [cit. 2017-01-05]. Available at: [http://dx.doi.org/10.1016/S1090-9516\(00\)00044-4](http://dx.doi.org/10.1016/S1090-9516(00)00044-4)

CARPENTER, N. Jennifer, WHITE LAW, F. Robert. The Development of China's Stock Market and Stakes for the Global Economy, In: *New York University Stern School of Business* [on-line]. 2016 [cit. 2017-02-05]. Available at: <http://people.stern.nyu.edu/jcarpen0/pdfs/Carpenter%20Whitelaw%20-%20The%20Development%20of%20China's%20Stock%20Market%20and%20Stakes%20for%20the%20Global%20Economy.pdf>

CHAN, Kalok. Imperfect Information and Cross-Autocorrelation among Stock prices, *The Journal of Finance* [on-line]. 1993, vol. 48, no. 4, p. 1211-1230 [cit. 2016-10-06]. Available at: <http://dx.doi.org/10.1111/j.1540-6261.1993.tb04752.x>

China in No Rush to Win Inclusion in MSCI, Says Stock Regulator. In: *Bloomberg* [on-line]. Last updated 20.1.2017 [cit. 2017-02-25]. Available at: <https://www.bloomberg.com/news/articles/2017-01-19/china-in-no-rush-for-msci-inclusion-csrc-s-fang-says> c)

China. In: International Trade Centre [on-line]. [cit. 2017-02-10]. Available at: <http://www.intracen.org/country/china/>

China Overview. In: *The World Bank* [on-line]. Last updated 14.9.2016 [cit. 2017-02-04]. Available at: <http://www.worldbank.org/en/country/china/overview>

China Shipbuilder Evergreen Defaults on Bond Amid Cash Shortage. In: *Bloomberg* [on-line]. 2016-05-16 [cit. 2017-03-02]. Available at: <https://www.bloomberg.com/news/articles/2016-05-16/china-shipbuilder-evergreen-defaults-on-bond-amid-cash-shortage>

China Takes 'Riskiest' Step by Ending Deposit-Rate Controls. In: *Bloomberg* [on-line]. 2015-10-23 [cit. 2017-01-31]. Available at: <https://www.bloomberg.com/news/articles/2015-10-23/china-takes-riskiest-step-by-scrapping-deposit-rate-controls>

CHUI, C.W. Andy, KWOK, C.Y. Chuck. Cross-autocorrelation between A shares and B shares in the Chinese stock market. *The Journal of Financial Research*. [on-line]. 1998, vol. 21, no. 3, p. 333-353 [cit. 2016-09-30]. Available at: <http://dx.doi.org/10.1111/j.1475-6803.1998.tb00689.x>

Cross Correlations and Correlograms. In: *Eviews Help* [on-line]. 2016 [cit. 2017-03-02]. Available at: [http://www.eviews.com/help/helpintro.html#page/content%2Fgroups-Cross Correlations and Correlograms.html](http://www.eviews.com/help/helpintro.html#page/content%2Fgroups-Cross%20Correlations%20and%20Correlograms.html) a)

DAN, Ben-David, LEOWY, Michael. Trade and the Neoclassical Growth Model, *Journal of Economic Integration* [on-line]. 2003, vol.18, no. 1, p. 1-16 [cit. 2016-11-10]. Available at: <http://www.jstor.org/stable/23000729>

DAS, K. Dilip. The Chinese Economy, *The Chinese Economy* [on-line]. 2012, vol.45, no.4, p. 7-38 [cit. 2017-01-15]. ISSN 1558-0954. Available at: <http://dx.doi.org/10.2753/CES1097-1475450401>

DE SANTIS, Giorgio and BRUNO, Gerard. International Asset Pricing and Portfolio Diversification with Time-Varying Risk. *Journal of Finance* [on-line]. 1997. vol. 52, no. 4 [cit. 2016-09-15]. Available at: <https://ssrn.com/abstract=64947>

DELASS, Harris, HESS, Martin. Financial development and stock returns: A Cross-country analysis, *Journal of International Money and Finance* [on-line]. 2005, vol. 24, no. 6. p. 891-912 [cit. 2017-02-16]. Available at: <http://doi.org/10.1016/j.jimonfin.2005.07.002>

DIXIT, Avinash, NORMAN, Victor. INTERNATIONAL EQUILIBRIUM AND THE GAINS FROM TRADE, *Theory of International Trade: A Dual, General Equilibrium Approach* [on-line]. 2010, p. 65-92 [cit. 2016-12-05]. Available at: <https://doi.org/10.1017/CBO9780511628627.004>

DONADELLI, Michael. Global integration and emerging stock market excess returns, *Macroeconomics and Finance in Emerging Market Economies* [on-line]. 2013, vol.6, n. 2, p. 244-279 [cit. 2017-02-05]. Available at: <http://dx.doi.org/10.1080/17520843.2013.782885>

DONADELLI, Michael, PARADISO, Antonio. Does financial integration affect real exchange rate volatility and cross-country equity market returns correlation?, *The North American Journal of Economics and Finance* [on-line]. 2017, vol. 28, p. 206-220 [cit. 2016-10-02]. Available at: <http://dx.doi.org/10.1016/j.najef.2014.03.001>

DORNBUSCH, Rudiger, YUNG, Chul Park, CLAESSENS, Stijn. Contagion: Understanding How It Spreads, *World Bank Research Observer* [on-line]. 2000, vol. 15, no. 2, p. 177-197 [cit. 2016-09-30]. Available at: <https://doi.org/10.1093/wbro/15.2.177o/15.2.177>

DUFOUR, Jean-Marie, RENAULT, Eric. Short Run and Long Run Causality in Time Series: Theory, *Econometrica* [on-line]. 1998, vol. 66, no. 5, p. 1099-1125 [cit. 2017-03-20]. Available at: <http://www.jstor.org/stable/2999631>

EDISON, Hali, LEVINE, Ross, RICCI, Luca, SLOK, Torsten. International Financial Integration and Economic Growth, *National Bureau of Economic Research* [on-line]. 2002 [cit. 2016-11-02]. Available at: <http://www.nber.org/papers/w9164.pdf>

ENGLE, F. Robert, GRANGER, C.W. J. Co-Integration and Error Correction: Representation, Estimation, and Testing, *Econometrica* [on-line]. 1987, vol. 55, no. 2, p. 251-276 [cit. 2017-03-10]. Available at: <http://www.jstor.org/stable/1913236>

Expert perspectives on China's capital markets. In: *City of London* [on-line]. 2015 [cit. 2017-01-26]. Available at: https://www.cityoflondon.gov.uk/business/economic-research-and-information/research-publications/Documents/research-2015/Chinas_capital_markets.pdf

Financial Integration in Europe. In: *European Central Bank* [on-line]. 2016 [cit. 2016-12-01]. Available at: <https://www.ecb.europa.eu/pub/pdf/other/financialintegrationineurope201604.en.pdf>

FLAM, Harry. Product Markets and 1992: Full Integration, Large Gains?, *The Journal of Economic Association* [on-line]. 1992, vol. 6, no. 4, p. 7-30 [cit. 2016-11-02]. Available at: <http://www.jstor.org/stable/2138267>

FORBES, J. Kristin, RIGOBON, Roberto. No Contagion, Only Interdependence: Measuring Stock Market Comovements. *Journal of Finance* [on-line]. 2002, p. 2223-2261 [cit. 2016-10-01]. Available at: <http://www.nber.org/papers/w7267>

FRENCH, R. Kenneth, ROLL, Richard. Stock Return Variances; The Arrival of Information and the Reaction Trades. *Journal of Financial Economics* [on-line] 1986, vol. 17, no. 1, p. 5-26 [cit. 2017-03-28]. Available at: [https://doi.org/10.1016/0304-405X\(86\)90004-8](https://doi.org/10.1016/0304-405X(86)90004-8)

FUNG, Hung-Gay. The Integration of China's Economy with the World, *The Chinese Economy* [on-line]. 2013, vol. 46, no. 4, p. 3-5 [cit. 2016-12-20]. ISSN 1558-0954. Available at: <http://dx.doi.org/10.2753/CES1097-1475460400>

GOODWIN, D. Laura, LEECH L. Nancy. Understanding Correlation: Factors That Affect the Size of r , *The Journal of Experimental Education* [on-line]. 2006, vol. 74, no. 3, p. 249-299 [cit. 2017-03-15]. ISSN: 1940-0683. Available at: <http://dx.doi.org/10.3200/JEXE.74.3.249-266>

GORDON, Kristopher. How China Is Creating a Big Crack in the Global crude Oil Market. In: *Market Realist* [on-line]. 2016-01-12 [cit. 2017-02-13]. Available at: <http://marketrealist.com/2016/01/china-creating-big-crack-global-crude-oil-market/>

GRANGER, C. W. J., Investigating Causal Relations by Econometric Models and Cross-spectral Methods, *Econometrica* [on-line]. 1969, vol. 37, no. 3, p. 424-438 [cit. 2017-03-15]. Available at: <http://www.jstor.org/stable/1912791>

GUO, Bin, ZHANG, Wei, ZHANG Yongjie, ZHANG, Han. The five-factor asset pricing model tests for the Chinese stock market, *Pacific-Basin Finance Journal* [on-line]. 2017, vol.43, p. 84-106 [cit. 2017-03-05]. Available at: <http://dx.doi.org/10.1016/j.pacfin.2017.02.001>

HAMAO, Yasushi, MASULIS, W. Ronald, NG, Victor. Correlations in Price Changes and Volatility across International Stock Markets, *The Review of Financial Studies* [on-line]. 1990, vol.3, no.2, p. 281-307 [cit. 2017-03-20]. Available at: <http://www.jstor.org/stable/2962024>

IMF Adds Chinese Renminbi to Special Drawing Rights Basket. In: *International Monetary Fund* [on-line]. 2016-09-30 [cit. 2017-02-10]. Available at: <http://www.imf.org/en/News/Articles/2016/09/29/AM16-NA093016IMF-Adds-Chinese-Renminbi-to-Special-Drawing-Rights-Basket>

IMF's Executive Board Completes Review of SDR Basket, Includes Chinese Renminbi. In: *International Monetary Fund* [on-line]. 2015-11-30 [cit. 2017-02-10]. Available at: <http://www.imf.org/external/np/exr/fag/sdrfaq.htm#one>

International Trade Statistics 2015. In: *World Trade Organization* [on-line]. [cit. 2017-01-23]. Available at: https://www.wto.org/english/res_e/statis_e/its2015_e/its2015_e.pdf

JIANG, Neng, KATTUMAN, A. Paul. China's WTO Accession and Long-Term Profitability of Chinese Firms, *International Journal of the Economics of Business* [on-line]. 2012, vol.19, no.1, p. 53-73 [cit. 2017-01-05]. Available at:

<http://dx.doi.org/10.1080/13571516.2012.642638>

Johansen Cointegration Test. In: Eviews help [on-line]. 2016 [cit. 2017-02-15]. Available at:

[http://www.eviews.com/help/helpintro.html#page/content%2Fcoint-Johansen Cointegration Test.html%23 b\)](http://www.eviews.com/help/helpintro.html#page/content%2Fcoint-Johansen+Cointegration+Test.html%23+b)

JOHANSEN, Soren. Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models, *Econometrica* [on-line]. 1991, vol. 59, no. 6, p. 1551-1580 [cit. 2017-03-05]. Available at: <http://www.jstor.org/stable/2938278>

JOHANSSON, C. Anders, China's Financial Market Integration with the World, *Journal of Chinese Economic and Business Studies* [on-line]. 2010, vol.8, no. 3, p. 293-314 [cit. 2016-11-02]. Available at: <http://dx.doi.org/10.1080/14765284.2010.493642>

KIM, Joon, Young, KIM, Jungryol, KIM, Sang, Bong. Transmission of Stock Prices and Volatility from the Influential Major Markets on the Emerging Market: A Case Study of the Korean Stock Market, *Global Economic Review* [on-line]. 2010, vol. 39, no. 3, p. 247-268 [cit. 2016-11-25]. Available at: <http://dx.doi.org/10.1080/1226508X.2010.513139>

KING, A. Mervyn and WADHWANI, Sushil. Transmission of Volatility Between Stock Markets, *Review of Financial Studies* [on-line]. 1990, vol. 3, no. 1, pp. 5-33 [cit. 2016-11-02]. Available at: <http://www.nber.org/papers/w2910>

KORHONEN, Iikka. Introduction to Collection of Papers from Conference on China's Financial Market Liberalization, *Pacific Economic Review* [on-line]. 2015, vol.20, no.3, p. 442-443 [cit. 2017-01-20]. Available at: <http://dx.doi.org/10.1111/1468-0106.12115>

LE CORE, Phillippe and SEPULCHRE, Alain. Why China is investing heavily in Europe. In: *South China Morning Post* [on-line]. 2016-05-15 [cit. 2017-02-12] Available at: <http://www.scmp.com/comment/insight-opinion/article/1944491/why-china-investing-heavily-europe>

LEVINE, Ross. International Financial Liberalization and Economic Growth, *Review of International Economics* [on-line]. 2001, vol. 9, no. 4, p. 688-702 [cit. 2016-10-10]. Available at: <http://doi.org/10.1111/1467-9396.00307>

LIN, Justin Yifu. *Demystifying the Chinese economy*. Cambridge: Cambridge University Press, 2011. ISBN 978-0-521-19180-7

LIN, Wen-Ling, ENGLE, F. Robert, ITO, Takatoshi. Do Bulls and Bears Move Across Borders? International Transmission of Stock Returns and Volatility, *The Review of Financial Studies* [on-line]. 1994, vol. 7, no. 3, pp. 507-538 [cit. 2016-10-07]. Available at: <http://www.jstor.org/stable/2962266>

Listings Q&A. In: *Shenzhen Stock Exchange* [on-line]. 2013 [cit. 2017-03-02]. Available at: <http://www.szse.cn/main/en/ListingatSZSE/ListingQA/>

LIU, Xiaohui, BUCK, Trevor, SHU, Chang. Chinese economic development, the next stage: outward FDI?, *International Business Review* [on-line]. 2005, vol.14, no.1, p. 97-115 [cit. 2017-01-25]. Available at: <http://dx.doi.org/10.1016/j.ibusrev.2004.12.003>

LLOYD, Peter. Global Economic Integration, *Pacific Economic Integration* [on-line]. 2010, vol. 15, no. 1, p. 71-86 [cit. 2016-11-03]. Available at: <http://dx.doi.org/10.1111/j.1468-0106.2009.00491.x>

LUO, Yadong, XUE, Quizhi, HAN, Binjie. How emerging market governments promote outward FDI: Experience from China, *Journal of World Business* [on-line]. 2010, vol. 45, no. 1, p. 68-79 [cit. 2017-02-15]. Available at: <http://dx.doi.org/10.1016/j.jwb.2009.04.003>

MADALENO, Mara and PINHO, Carlos. International stock market indices comovements: a new look, *International Journal of Finance and Economics* [on-line]. 2012, vol. 17, no. 1, p. 89-102 [cit. 2016-09-13]. Available at: <http://dx.doi.org/10.1002/ijfe.448>

MITTOO, R. Usha. Additional Evidence on Integration in the Canadian Stock Market, *The Journal of Finance* [on-line]. 1992, vol. 47, no. 5, p. 2035-2054 [cit. 2016-10-05]. Available at: <http://dx.doi.org/10.1111/j.1540-6261.1992.tb04696.x>

MARTENS, Martin, POON, Ser-Huang. Returns synchronization and daily correlation dynamics between international stock markets, *Journal of Banking and Finance* [on-line]. 2001, p. 1805-1827 [cit. 2017-03-10]. Available at: <https://ssrn.com/abstract=180391>

Measures for Pilot Domestic Securities Investment Made by RMB Qualified Foreign Institutional Investors of Fund Management Companies and Securities Companies. In: *China Securities Regulatory Commission* [on-line]. 2012-11-29 [cit. 2017-02-27]. Available at: http://www.csrc.gov.cn/pub/csrc_en/OpeningUp/RelatedPolicies/RQFII/201211/t20121129_217391.html

NAG, Anirban. Chinese yuan is most actively traded emerging market currency –BIS. In: *Reuters* [on-line] 2016-09-01 [cit. 2017-01-29] Available at: <http://www.reuters.com/article/bis-currency-yuan-idUSL8N1BC4EH>

NAUGTON, Barry. *The Chinese Economy: Transitions and Growth*. Cambridge: MIT Press, 2007. ISBN 978-0-262-64064-0

Notice of the People's Bank of China (PBC) on Issues Concerning Investment of Foreign Central Banks, International Financial Institutions and Sovereign Wealth Funds with RMB Funds in the Inter-bank Market. In: *The People's Bank of China* [on-line]. 2015-07-14 [cit. 2017-03-05]. Available at: <http://www.pbc.gov.cn/english/130721/2813742/index.html>

OBSTFELD, Maurice. Risk-Taking, Global Diversification, and Growth, *The National Bureau of Economic Research Working Paper No. 4093* [on-line]. 1992 [cit. 2016-09-15]. Available at: <http://www.nber.org/papers/w4093>

OBSTFELD, Maurice. The Global Capital Market: Benefactor or Menace? *The National Bureau of Economic Research Working Paper No. 6559* [on-line]. 1998 [cit. 2016-09-14]. Available at: <http://www.nber.org/papers/w6559>

PANOURGIAS, S. Nikiforos. Capital markets integration: A sociotechnical study of the development of a cross-border securities settlement system, *Technological Forecasting and Social Change* [on-line]. 2015, vol. 99, p. 371-338 [cit. 2016-10-02]. Available at: <http://dx.doi.org/10.1016/j.techfore.2015.02.014>

PBC Official Answered Press Questions about Notice on Issues Concerning Investment of Foreign Central Banks, International Financial Institutions and Sovereign Wealth Funds with RMB Funds in the Inter-bank Market. In: *The People's Bank of China* [on-line]. 2015-07-28 [cit. 2017-02-25]. Available at: <http://www.pbc.gov.cn/english/3251616/2904917/index.html> b)

PORTER, Nathan, XU, TengTeng. What Drives China's Interbank Market?. In: *International Monetary Fund* [on-line]. 2009 [cit. 2017-01-20]. Available at: <https://www.imf.org/external/pubs/ft/wp/2009/wp09189.pdf>

QFII Investment Quota to be Increased by 50 Billion U.S.Dollars. In: *China Securities Regulatory Commission* [on-line]. 2012-04-03 [cit. 2017-02-27]. Available at: http://www.csrc.gov.cn/pub/csrc_en/OpeningUp/RelatedPolicies/QFII/201212/t20121210217805.html b)

RAGUNATHAN, Vanitha, FAFF, W. Robert, BROOKS, D. Robert. Correlations, integration and Hansen-Jagannathan bounds, *Applied Financial Economics* [on-line]. 2004, vol. 14, no. 16, p. 1167-1180 [cit. 2016-09-30]. Available at: <http://dx.doi.org/10.1080/0960310042000281149>

Robert M. Solow – Facts. In: *The Official Web Site of the Nobel Prize* [on-line]. 2014 [cit. 2016-12-01]. Available at: https://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/1987/solow-facts.html

SACHS, Jeffrey, WARNER, Andrew. Economic Reform and the Process of Global Integration, *Brookings Papers on Economic Activity* [on-line]. 1995, vol.1 [cit. 2016-12-03]. Available at: https://www.brookings.edu/wp-content/uploads/2016/07/1995a_bpea_sachs_warner_aslund_fischer.pdf

SAUVANT, P. Karl. China, the G20 and the International Investment Regime, *China & World Economy* [on-line]. 2016, vol. 24, no.4, p. 73-92 [cit. 2017-02-05]. Available at: <http://dx.doi.org/10.1111/cwe.12168>

SOLNIK, Bruno, BOUCRELLE, Cyril, LE FUR, Yann. International Market Correlation and Volatility, *Financial Analysts Journal* [on-line]. 1996, vol. 52, no. 5, p. 17-34 [cit. 2016-10-8]. Available at: <http://www.jstor.org/stable/4479942>

SOLOW, Robert. A Contribution to the Theory of Economic Growth, *The Quarterly Journal of Economics* [on-line]. 1956, vol. 70, no. 1, p. 65-94 [cit. 2016-10-05]. Available at: <http://dx.doi.org/10.2307/1884513>

SONG, Shunfeng. Challenges to China after Becoming an Upper-Middle Income Country, *The Chinese Economy* [on-line]. 2015, vol. 48, no. 1, p. 1-4 [cit. 2017-01-10]. ISSN 1558-0954. Available at: <http://dx.doi.org/10.1080/10971475.2015.993174>

SRIVASTAVA, Aman, BHATIA, Shikha, GUPTA, Prashant. Financial Crisis and Stock Market Integration: An Analysis of Select Economies, *Global Business Review* [on-line]. 2015, vol. 16, no. 6, p. 1127-1142 [cit. 2016-10-05]. Available at: <https://ssrn.com/abstract=2926808>

THIELE, Carl-Ludwig. Internationalization of the renminbi – prospects and challenges. In: *BIS* [on-line]. 2016 [cit. 2017-02-16]. Available at: <http://www.bis.org/review/r161118c.pdf>

TU, Lianting. China's Hot Bond Market Seen at Risk of Default Chain Reaction. In: *Bloomberg* [on-line]. 2016-01-17 Last updated 18.1.2017 [cit. 2017-03-06]. Available at: <https://www.bloomberg.com/news/articles/2016-01-17/china-s-hot-bond-market-seen-at-risk-of-default-chain-reaction> a)

Understanding The WTO: Who we are. In: *World Trade Organization* [on-line]. [cit. 2017-01-23]. Available at: https://www.wto.org/english/thewto_e/whatis_e/who_we_are_e.htm

WANG, Hao, WANG, Honglin, WANG, Lisheng and ZHOU, Hao. Shadow Banking: China's Dual-Track Interest Rate Liberalization, *SSRN* [on-line]. 2016, [cit. 2017-01-05]. Available at: <http://dx.doi.org/10.2139/ssrn.2606081>

Why China's Banks Are Feeling Squeezed. In: *Bloomberg* [on-line]. 2017-02-10 [cit. 2017-03-02]. Available at: <https://www.bloomberg.com/news/articles/2017-02-10/china-banks-caught-in-deleveraging-pinch-forced-to-absorb-costs> b)

World Bank Country and Lending Groups. In: *The World Bank* [on-line]. 2017 [cit. 2017-02-25]. Available at: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519>

World Investment Report 2016. In: *United Nations Conference on Trade and Development* [on-line]. 2016 [cit. 2017-02-10]. Available at: http://unctad.org/en/PublicationsLibrary/wir2016_en.pdf

YU, Yongding, ZHANG, Bin, ZHANG, Ming. Renminbi Exchange Rate: Peg to A Wide Band Currency Basket, *China & World Economy* [on-line]. 2017, vol. 25, no. 1, p. 58-70 [cit. 2017-01-10]. Available at: <http://dx.doi.org/10.1111/cwe.12186>

YANG, Zhou, YE, Zhiqiang. Domestic Market Integration in China: The Role of the Financial Sector, *The Chinese Economy* [on-line]. 2016, vol. 49, n. 5, p. 343-358 [cit. 2017-02-10]. Available at: <http://dx.doi.org/10.1080/10971475.2016.1193389>

ZHANG, Zhaoyong. Foreign Exchange Reform, the Balance of Trade and Economic Growth: an Empirical Analysis for China, *Journal of Economic Development* [on-line]. 1999, vol. 24, no. 2, p. 143-162 [cit. 2017-01-28]. Available at: <http://www.jed.or.kr/full-text/24-2/zhang.PDF>

ZHANG, Zhichao, LI, He, ZHANG, Chuanjie. Oral intervention in China: Efficacy of Chinese exchange rate communications, *International Review of Financial Analysis* [on-line]. 2017, vol. 49, p. 24-34 [cit. 2017-02-25] Available at: <http://dx.doi.org/10.1016/j.irfa.2016.11.006>