EKONOMICKÁ UNIVERZITA V BRATISLAVE
NÁRODOHOSPODÁRSKA FAKULTA

Evidenčné číslo: 15310/I/2012/3045403508

MUTUAL RELATIONS BETWEEN EQUITY, COMMODITY AND BOND MARKETS IN RELATION TO PROFIT

Diplomová práca

2012 **Bc. Martin Vojtek**

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Študijný program: Bankovníctvo

Študijný odbor: 6.2.7.1 Financie, bankovníctvo a investovanie

Školiace pracovisko: Katedra bankovníctva a medzinárodných financií

Vedúci záverečnej práce: Ing. Boris Šturc, CSc.

Bratislava 2012 **Bc. Martin Vojtek**

Ekonomická univerzita v Bratislave
Národohospodárska fakulta

ZADANIE ZÁVEREČNEJ PRÁCE

Meno a priezvisko študenta: Bc. Martin Vojtek
Študijný program: Bankovníctvo (Jednoodborové štúdium, inžiniersky II. st., externá forma)
Študijný odbor:
Typ záverečnej práce: Inžinierska záverečná práca
Jazyk záverečnej práce: slovenský

Názov: Vzájomné vzťahy akciového komoditného a dlhopisového trhu vo vzťahu k výnosnosti.

Anotácia: Práca je zameraná na posúdenie vzájomných vzťahy akciového, komoditného a dlhopisového trhu vo vzťahu k výnosnosti.

Vedúci: Ing. Boris Šturc, CSc.
Katedra: KBaMF NHF - Kat. bankovnictva a medzinar. fin. NHF
Vedúci katedry: prof. Ing. Eva Horvátová, CSc.

Dátum zadania: 24.10.2010

Dátum schválenia: 26.10.2010

prof. Ing. Eva Horvátová, CSc.
vedúci katedry

Čestné vyhlásenie

Čestne vyhlasujem, že záverečnú prácu som vypracoval samostatne a že som uviedol všetku použitú literatúru.

Dátum: **.....**

podpis študenta

Ďakujem vedúcemu diplomovej práce Ing. Borisovi Šturcovi, CSc.za cenné rady a pripomienky.

Martin Vojtek

ABSTRAKT

VOJTEK, M.: *Vzájomné vzťahy akciového komoditného a dlhopisového trhu vo vzťahu k výnosnosti.* – Ekonomická univerzita v Bratislave. Národohospodárska fakulta; Katedra bankovníctva a medzinárodných financií. – Vedúci záverečnej práce: Ing. Boris Šturc, CSc. Bratislava: NHF EU, 2012,

Cieľom záverečnej práce je teoretické vymedzenie komoditného trhu, akciového trhu, dlhopisového trhu a skúmanie ich vzájomných vzťahov. Práca je rozdelená do 3 kapitol, obsahuje 14 grafov, 10 tabuliek.

Prvá kapitola je venovaná teoretickému vymedzeniu akciového, komoditného a dlhopisového trhu. Rozoberám každé aktívum osobitne a definujem ho a rozdeľujem ho podľa rôznych kritérií.

V druhej kapitole sa venujem vzájomným vzťahom akciového, komoditného a dlhopisového trhu vo vzťahu k ich výnosnosti. Analyzujem dané trhy počas trinásťročného obdobia vzájomne pričom sa zameriavam na komplexnosť a vybrané štatistické metódy. Ďalej sa venujem ekonomickému cyklu a aplikujem ho na dané skúmané obdobie.

V záverečnej kapitole sa venujem každému trhu osobitne a podobne ako som analyzoval dané trhy navzájom analyzujem ich individuálne.

Výsledkom riešenia danej problematiky je ucelený pohľad na tematiku vzájomných vzťahov akciového, komoditného a dlhopisového trhu.

Kľúčové slová:

Akciový trh, Komoditný trh, Dlhopisový trh, S&P 500, Dow Jones Industrial Average Index, Russell 2000, Rogers International Commodity Index, Barclay's Aggregate Index, Kondratieffova vlna, Korelácia,

ABSTRACT

VOJTEK,M.: *Mutual Relations between equity, commodity and bond markets in relation to profit* – University of Economics in Bratislava. Faculty of National Economy, Department of international finance. – Thesis Supervisor: Ing. Boris Šturc, CSc., Bratislava: NHF EU, 2012,

The main aim of this thesis is to analyze mutual relations between the commodity futures market, equity market and the bond market. This paper is divided into four chapters and it contains 14 figures and 10 tables.

The first chapter is dedicated to the theoretical definition of the stock market, commodity market and bond market. I analyze each asset class separately and define it on the theoretical basis.

The second chapter is focused on the mutual relations of commodity futures, stock market and bond market. I analyze selected markets over a sample 13 year period. Next, I am describing and exploring the economical and business cycle and I try to implement it on the sample period.

The last chapter is aimed to explore each asset class individually and I have analyzed the sectors separately.

The result of the thesis is a complex view on the problematic of the financial markets and its mutual relations.

Keywords: Equity market, Commodity Futures, Bond market, S&P 500, Dow Jones Industrial Average Index, Russell 2000, Rogers International Commodity Index, Barclay's Aggregate Index, Kondratieff wave, Correlation

Contents

Introduction

The subjects of this thesis are the mutual relations between asset classes and I tried to explore common differences and relations of three asset classes. Each asset class has a different function for example stocks and bonds are developed to raise external resources for a company. Investors are bearing the risk that the future cash flow might be low in times of a recession. These claims represent the discounted value of cash flow over the longer horizons and the value mostly depends on the quality of the management. Investors are compensated for these risks. Commodity futures are developed to secure insurance for the future value of company's outputs or inputs. Investors in Commodity futures receive compensation for bearing the short-term risk of possible commodity price fluctuations.

The main objective of this thesis is to show the potential possibilities or threats of each asset class and to obtain broader picture of the whole financial market.

The first chapter is based on the theoretical introduction of financial markets. In this chapter each asset class is individually described and divided into specific instruments. I wanted to make a quick walkthrough through the financial assets.

The second part is focused on mutual relations between specific asset classes. The main focus of this part was to discover the common and different parts of the financial assets. For many years, the stock and future markets have been considered separate and distinct entities. The stock and bond trading have been considered as the single most viable form of investing for the investor. I tried to explore the possibilities of investing in these asset classes and I have undergo them to various analytical methods. This part is analytical and includes comparison of historical returns as well as correlation analysis and respective connection to the current phases of a business cycle.

Next, I tried to examine the analysis of each asset class separately; this part is focused on intra-market analysis where several financial instruments are compared within each class.

1. Theoretical introduction

1.1 Stocks

Investing is always associated with potential profits as well as potential loses of the investment value. So we can raise a question, why people enter financial markets when there is real possibility of losing substantial part of principal invested? People are attracted to financial instruments by a possibility of yield premium over the classic term or savings bank accounts. Nowadays, almost everybody can enter financial markets through some online brokerage companies. Investing saved funds have become very popular in the United States while in Slovakia the mass interest still lags behind the developed countries. The stock market is very popular by the public we can even say that the stock market is the most popular market. The Stock, which is also called an equity market, is the market in which stocks are issued and traded either through exchanges or over the counter markets. Equity markets serve two main purposes: the first is that it provides companies with needed capital and the second one is to serve investors or speculators, who can possibly make gains based on the company's future performance and with partial ownership in the company. The following text outlines the characteristics of the different types of stocks.

1.1.1 Common Stocks[1]

Owner of common stocks are partial owners of the company, because voting rights and ownership risks are associated with common stocks. Common stocks are sold to shareholders to raise money for the company. When the companies file for bankruptcy owners of common stocks are last to claim residual assets, after bondholders and preferred stocks owners, for claims in residual assets. Common stockholders are entitled to receive dividends after all company's obligations have been paid and on the other hand dividends are paid only after company's board of directors declares dividend. Ownership of common stocks is now only associated with rights, but also with shareholders liabilities. These liabilities are limited to the amount of their investments.

[1] FAERBER, E. 2008: *All About Stocks Third Edition.* New York: McGRAW-HILL, 2008. 310 p. ISBN: 978-0-07-149455-7 p. 12-33

Two main rights are associated with common stock ownership. The first one is the voting right which allows the shareholder right to vote. Shareholder can vote on important issues such as membership of the board of directors, which selects managers to run the company. Common shareholders have to approve any changes in charter of incorporation. For instance, a corporation would like to take over another corporation through issuance of new shares, and then it would need to have an approval from common shareholders. Holders of common stocks also receive voting rights regarding other company matters such as stock splits and company objectives. The common shareholders do not have to attend meetings to vote personally, they can use a proxy vote which gives a designated person temporary power of attorney to vote in shareholder's name. Common shareholders also receive pre-emption rights also called subscription rights, which allow the shareholder to maintain their constant percentage of company's outstanding stocks before they are offered to the public. This right provides existing shareholders with possibility of maintaining their proportional ownership of the company, preventing stock dilution. For instance, if the shareholder owns five percent of company's stocks then is he entitled to purchase five percent of new shares being offered.

Dividends on common stocks

We have to distinguish between interest paid to bondholders on their debt, which is company's obligation, and dividends, which in case of equities are an option.. Companies are not required to pay dividends even if they are profitable. If the board of directors of corporation decides to pay out part of its earnings in form of dividends then all common shareholders have the right to receive them. Date of record determines which shareholders are entitled to earn the dividends. Only shareholders owning stocks on or until the date of record are entitled to receive dividends, stocks purchased after this date does not have the right for dividends. Dividends can have various forms. Here are the forms of dividends:

Cash dividends

Corporations need to have not only sufficient earnings but also cash, meaning even if company has a vast amount of retained earnings, it may not be enough to ensure cash dividends, because the cash amount company has is independent of retained earnings.

Stock Dividends

Another type of a dividend is dividend paid in stock. The company recapitalizes its earnings and then issues new shares, which do not affect its assets and liabilities. Receiving a stock dividend does not increase shareholders wealth.

Property dividends

This is the alternative and less common dividend type than stock or cash paid dividend. A property dividend can either include shares of a subsidiary company or physical assets such as inventories that the company holds. The dividend is recorded at the market value of the asset provided.

Special Distributions

Extra dividends are redistributed in special occasions such as good quarterly financial results and on irregular basis.

Common stock Types

Blue chips

Well-established high quality companies with long track records of steady, secure earnings and sustained dividends. These are corporations with leading position in their industries. Blue chip companies have large capitalization and for instance almost all companies listed in the Dow Jones Industrial Average Index are considered to be blue chip. Blue chip companies are less risky in bad economic weather and in times of uncertainty. In bear markets, blue chip companies tend to decline less than other companies. Blue chip companies deliver regular dividends and are relatively save store of wealth.

Income stocks

Income stocks companies are usually in mature stage of their life cycle. Companies in this category utilize reasonable portion of their earnings in the form of dividend payout.

Income stocks are not expected to rise in price value as much as blue chip companies stocks. This is because income stocks are more mature and do not increase as fast as blue chip companies. Income stock companies have stable level of earnings and tend to pay much higher ratios of their earnings in form of dividends than other types of companies do.

Growth Stocks

Stocks of growth companies are considered to hold great potential for capital appreciation. Growth stock companies are the ones with earnings growth in excess of industry or market averages. Growth companies generally have higher price earnings ratio and strong earnings, but they usually reinvest them into research or expansion rather than pay them out as dividends. Investors buy these stocks for their potential in capital appreciation.

Value Stocks

Patient investors with long time strategies are willing to purchase this type of stocks. Value stocks, unlike growth stock, pay high dividend yields and are probably not the most favorite among the investors at the time. Value stocks usually have low price earnings ratios. Value investors are interested in stocks whose prices are trading at less than their fundamental value and are willing to buy stocks of companies experiencing temporary setbacks and profit from them.

Cyclical stocks

Cyclical stocks tend to move in the same directions as the economy such as companies in businesses providing basic materials or products that are subject to the economic cycle.

These may be big, strong and mature companies with dividends, but we cannot tell they are blue chips, because there exists a possibility that in economic slowdowns and downturns earnings may slump and dividends may vanish.

Defensive Stocks

These are producers of very important and necessary goods for instance food, beverages, and pharmaceutical products and therefore these companies are generally resistant to economical downturns. Defensive stocks tend to hold their levels when the economy declines. It is expected that defensive stocks will hold their prices even in downturns. Examples of defensive stocks are food and beverage companies, utility companies, pharmaceutical companies, consumer goods companies and even car parts manufacturers. In a recession people rather spend money on car repairs then buying new ones.

Speculative Stocks

This type of stocks has potential for above average returns, however it carries more risk of underperforming. Speculative stocks are more likely to suffer losses and not as much likely to gain profits, so they have a higher possibility of substantial price changes. New companies with promising prospects and ideas are often issuers of speculative stocks. Speculative stocks usually end up in large capital gains or large losses.

Penny stocks

Penny stocks are traded at relatively low price on the over the counter markets and pink sheets[2]. These types of stocks are considered to be highly speculative and very risky because of their lack of liquidity, wide bid-ask spreads, small capitalization and limited following and disclosure. Penny stocks are subject to limited listing requirements and regulatory standards from SEC. Penny stocks are low priced stocks in companies not listed on the major market exchanges with unclear future.

[2] A daily publication compiled by the National Quotation Bureau with bid and ask prices of over-the-counter stocks, including the market makers who trade them. Unlike companies on a stock exchange, companies quoted on the pink sheets system do not need to meet minimum requirements or file with the SEC. Read more : http://www.investopedia.com/terms/p/pinksheets.asp#ixzz1s7BmSmT9

Classification by Size

Stocks can be also split by market capitalization to small cap stocks, mid cap stocks and large cap stocks. Market capitalization is market value of company determinate by stock market price multiplied by number of outstanding stocks.

Small cap stocks

Small cap Stocks are stocks of companies with market capitalization of less than 2bn. USD. These stocks offer large potential returns, while they are very volatile. In the long term, small cap stocks have outperformed the large cap stocks. Investing in small caps posses some risks because few companies can go out of business, however some are potentially Microsoft or Google of tomorrow.

Medium cap stocks

These types of stocks belong to medium sized companies with market capitalizations of between 2 billion USD to 5 billion USD. Medium cap companies are not as well known household names as large cap companies, however they offer safety net of having significant assets in terms of capitalization. The classifications such as large cap, small cam and mid could change over the time.

Large cap stocks

The large cap stocks belong to large companies with large capitalization greater than 5 bn. USD. These companies have huge earnings and large amount of stocks outstanding. Large cap stocks represent indices like the Dow Jones Industrial Average and the S&P 500. Large cap stocks accounts for more than 50 percent value of the US equity market. Large cap companies are as well blue chip companies that can be either value or growth companies. These are the leading companies in their respective sectors and industries.

1.1.2 Preferred Stocks[3]

Preferred stocks are classified as equity, however they have many common features with debt securities. Preferred stocks are hybrid instruments that resemble both debt and equity. Generally, preferred stocks have a fixed dividend assigned, although preferred stocks will not provide any voting rights for its holders. Preferred stocks dividends are paid before common stocks dividends. If the company does not meet their liabilities in dividend pay-outs to preferred stockholders does not result in bankruptcy, as it would with the default of interest on bonds. The main benefit to owning preferred stock is that the investor has a greater claim on the company's assets than holders of common stocks. Preferred shareholders continually receive their dividends first. In the event the company goes bankrupt, preferred stockholders rights are senior to common stockholders.

1.2 Bonds

1.2.1 Corporate Bonds[4]

Corporate bonds are as the other types of bonds debt instruments. These types of bonds represent a promise made by a corporation to pay the investor back a face value of a bond on a specified date in the future, called the maturity date, as well as specified interest payments generally twice a year. Bond face value is usually 1000 USD and the interest payments in other words coupon is usually fixed for the whole life of the bond. The maturity date is the date when the corporation has to pay off the bond face value to the bondholder. In the terms of maturity date, we have to distinguish among the term original maturity and current maturity. Original maturity of a bond means the time to maturity at the date of issuance. Current maturity conveys how much time left until the bond mature. We distinguish three forms of bonds registered, bearer, book entry forms.

[3] FAERBER, E. 2008: *All About Stocks Third Edition.* New York: McGRAW-HILL, 2008. 310 p. ISBN: 978-0-07-149455-7 p. 34-41

[4] FAERBER, E. 2000: *All About Bonds And Mutual Funds.* New York: McGRAW-HILL, 342 p. ISBN: 978-0-07-154427-6 p. 107-134

Registered form of a bond is very much alike stock certificates, which means bonds are registered to specific name, interest payments are assigned as well. In case of sale the transfer agent registers the bond in the name of a new owner.

Bearer bonds are owned by whoever holds them. The bearer bonds unlike registered bonds do not have registered owner. It is very easy to sell these bonds, as they are not registered to name. Bearer bonds were often exploited to evade taxes therefore they were banned in the United States in 1982.

Book entry form bonds are saved in computer memory and the bondholder receives a confirmation with computer number that signifies ownership.

Corporate bond classification

Corporate Bonds are commonly classified into five major groups

Utilities

This group consists of both electric and telephone companies. These used to be highly regulated and, as a result, were considered among the safest of all corporate bonds. Since deregulation, that is no longer the case, particularly for bonds in the telecommunication sector.

Transportation

This group includes the bonds of airlines and railroads.

Industrials

This is the largest and most diverse of the five. It contains bonds of some of the premier corporations in the USA, such as Exxon, General Electric (the oldest of the Dow components), and International Business Machines. It also contains so-called junk bonds.

Finance

This group includes banks and insurance companies.

"Yankee" bonds

These are bonds issued by foreign issuers, but denominated in dollars."[5]

1.2.2 Treasury Securities

The U.S. federal government issues a wide variety of debt instruments primarily to fund the ever-growing budget deficit. The U.S. securities are backed by the government, which has few restrictions on its ability to create money that means treasury securities are very safe investments. The government is the largest borrower in the U.S. bond market, selling Treasuries through auctions.[6] There is a very active secondary market with all Treasuries, which is the largest, most active, and most liquid debt market in the world. There are distinct types of treasury offerings consisting of U.S. Treasury bills, U.S. Treasury notes and U.S. treasury bonds, saving bonds, zero-coupon bonds and in 1997 Federal Reserve Bank brought out a new type of Treasury securities: inflation-linked securities.

Treasury Bills[7]

Shorten name T-Bills are short dated instruments with maturity one year or less. Currently there are three types of T-bills based on maturity length, three months, six months and one-year maturities. The minimum denomination T-Bills are offered for ten thousand USD, with multiplies of five thousand USD thereafter. T-bills basically do not posses any regular interest payments; T-Bills are sold at discount from the par value. Yield is the difference between the discounted price and the face value on redemption date.

Treasury Notes[8]

US Treasury notes are securities with original maturities from two to ten years. Currently the Treasury is selling two-year, three-year, five-year, seven-year and ten-year.

[5] THAU, A. 2011: *The Bond Book.* New York: McGRAW-HILL, 2011. 429 p. ISBN: 978-0-07-171309-2 p. 173

[6] FAERBER, E. 2008: *All About Stocks Third Edition.* New York: McGRAW-HILL, 2008. 310 p. ISBN: 978-0-07-149455-7 p. 135

[7] THAU, A. 2011: *The Bond Book.* New York: McGRAW-HILL, 2011. 429 p. ISBN: 978-0-07-171309-2 p. 102

[8] THAU, A. 2011: *The Bond Book.* New York: McGRAW-HILL, 2011. 429 p. ISBN: 978-0-07- 171309-2 p. 103

The price of T-Notes fluctuates more than T-Bills in response to interest rate changes, mainly because of their longer maturities. Therefore, in case of reselling Treasury notes before their maturities, we might get a different price than we paid. T-Notes are very attractive types of securities; they typically yield more than T-Bills, usually from 50 to 150 basis points. If the T-Notes are hold until the maturity, the bondholder has a guaranty to get back full amount of investment. Treasury notes are not callable, and interest payments are made semiannually.

Treasury Bonds[9]

Treasury bonds are the longest-dated instruments issued by the Treasury maturing in 10 to 30 years. Nowadays, Treasury only sells 10-year and 30-year bonds, however it used to sell either 15-year or 20-year bonds as well. 30-year Treasury bonds can be bought with a minimum purchase of 1000 USD and in multiples of 1000 USD thereafter. Unlike T-Notes Treasury bonds expose the bondholder to significant interest rate risk. Corporate bonds and Municipal bonds and other debt instruments have a large disadvantage over T-Bonds, which enjoys far longer call protection and they are not callable for 25 years.

Saving Bonds

The U.S. savings bonds are nonmarketable securities. Since they are direct obligations of the U.S. government, their credit quality is impeccable. The U.S. savings bonds are quite attractive with their guaranteed floor yield of 4 percent per annum over a five-year period.[10] The U.S. government sells two types of saving bonds: Series EE and Series I.[11]

Series EE

Series EE are the first saving bonds issued by the Treasury in 1980.EE Bonds are sold at 50% discount of face value. Series EE saving bonds are sold in eight denominations 50USD, 75USD, 100USD, 200USD, 500USD, 1000USD, 5000USD and 10000USD. The

[9]THAU, A. 2011: *The Bond Book.* New York: McGRAW-HILL, 2011. 429 p. ISBN: 978-0-07-171309-2 p. 104

[10] FAERBER, E. 2000: *All About Bonds And Mutual Funds.* New York: McGRAW-HILL, 342 p. ISBN: 978-0-07-154427-6 p. 148

[11] THAU, A. 2011: *The Bond Book.* New York: McGRAW-HILL, 2011. 429 p. ISBN: 978-0-07-171309-2 p. 118-122

interest is usually paid at maturity or when the bond is cashed in. We cannot predict when the bond will reach the face value; because it depends on the interest rate during the time we hold the saving bonds.

I Bonds[12]

These are the newest series of the saving bonds first time introduced in September 1998. Letter I in I Bonds stands for inflation, I bonds are much alike TIPS. I bonds are accrual bonds, meaning that you do not receive interest while holding the bond, interest coupon is received at maturity or redemption with principal. Interest is added to the bonds on monthly basis. Interest payments are inflation adjusted, based on the CPI-U. I bonds interest payments consists from a fixed rate of return and variable semiannual inflation rate. I bonds are indexed to inflation which means that the value of the bond rises with the rising inflation. They are sold for face amount ranging from 50 USD to 5000USD.

Inflation Indexed securities[13]

In 1997 the Treasury has announced a new type of bond called Treasury Inflation-Indexed Securities also known as the Treasury Inflation-Protected securities, abbreviation TIPS. These bonds are mostly intended to lock in profits even if big inflation prevails and also to protect purchasing power of money invested in these instruments. These inflation-indexed Treasury securities pay a regular coupon rate plus an amount that is indexed for inflation. TIPS are fully backed by the U.S. government. TIPS are currently issued in five-year, ten-year and 30-year maturities. They are sold at auctions on a quarterly basis. In the event of deflation the face value of the TIP would result in decline, this would as well result in corresponding decline in the interest payment. However the owner of TIP carries some protection, at the maturity it will be redeemed at the initial face value or adjusted value of principal, whichever is higher. One of disadvantages in TIPS is if inflation remain low, return on TIPS will be lower in comparison to T-Notes and T-Bonds with similar maturities. The easiest way to buy new Inflation indexed securities issued by the U.S. Treasury is by opening an account with Treasury Direct. There is also secondary market for existing issues, and quotes for the individual issues can be found in the Treasury note and bond sections of various newspapers.

[12]THAU, A. 2011: *The Bond Book.* New York: McGRAW-HILL, 2011. 429 p. ISBN: 978-0-07-171309-2 p. 119

[13]THAU, A. 2011: *The Bond Book.* New York: McGRAW-HILL, 2011. 429 p. ISBN: 978-0-07-171309-2 p. 105

Zero coupon Bonds

Zero coupon bonds short zeros, are as well colloquially called strips an acronym for "separate trading of registered interest and principal securities". The word strips actually describe the process of creating zeros. Behind every zero bond stands a so-called plain vanilla US Treasury bond. The buyer of zero coupon bonds does not receive any interest payments; instead the zero is sold at a deep discount from a par and the difference between the discounted price and the price at par represents the premium. The interest on interest earned by reinvesting the coupons in ordinary bonds is also calculated in the discounted price of zero coupon bonds. The main difference between the Treasury and the Zero at the same maturity is that Zero possesses no reinvestment risk, because we know the exact amount of profit and is guaranteed. In case of zeros with short-term maturity let's say up to five years the ordinary treasury may be better to buy. The zero coupon bonds are very volatile, mostly dependent to their long maturity.

1.2.3 Mortgage-Backed Securities[14]

The first types of MBS issued in 1970 were GNMAs (popularly called Ginnie Maes). GNMAs consisted of mortgages repackaged to be sold as bonds. In 1983 the next generation of MBS was developed and called collateralized mortgage-backed obligations or CMOs. Another type of MBS came out in the late 1990s cash flow such as car loans or credit card debt was repackaged to bonds called asset-backed securities or ABSs. Finally in 2003 came out the two very complex types of asset-backed securities: first was collateralized debt obligations or CDOs and second was collateralized debt swaps or CDSs. Both of these types were designed for institutional investors. By the year 2007 bonds and derivatives based on these securities had become the largest segment of the taxable bond market.

[14] THAU, A. 2011: *The Bond Book.* New York: McGRAW-HILL, 2011. 429 p. ISBN: 978-0-07-171309-2 p. 204

1.2.4 International Bonds[15]

International bonds, from the investor's perspective within the USA, are bonds issued outside the United States. The bond market has become over the years truly international, embracing debt of governments and corporations from almost every corner of the world.

We can make few assumptions on international bonds. There is often little correlation between returns from international bonds and U.S. bonds. We can use this as an diversification argument, even though international bonds may be risky they can lower the total risk of a portfolio. Dollar appreciation and depreciation also affects the value of bonds denominated in foreign currencies. When foreign currency goes up against the dollar we can expect the same in the respect bond value. As a result, investing in international bonds provides a hedge against a falling dollar. The total return of international bonds may be higher than those earned in U.S. bonds. Some key sectors and terms in international debt market are:

Domestic bonds -In the international debt market "domestic" does not mean issued in the Untied States, it means that the bonds are issued in a foreign country and in that country's currency.

Foreign bonds - Borrower located outside the country issues foreign bonds but bonds are intended primarily for local investors. For instance Bulldog bonds which are sterling-denominated bonds issued for UK market by non-British issuers.

Foreign-pay bonds - For U.S. investors are under this mark known bonds that are issued in other currency than the U.S. dollar.

Eurobonds - London is the center of the Euromarkets. The" Euro" part in Eurobonds mean "offshore". Eurobonds are issued in many foreign markets in a variety of currencies, including Yen, Euros and U.S. dollars.

Global Bonds – These are hybrid types of debt issues, they might be issued offshore as well as in the USA. Most of the global bonds are denominated in the U.S. Dollars.

[15] THAU, A. 2011: *The Bond Book.* New York: McGRAW-HILL, 2011. 429 p. ISBN: 978-0-07-171309-2 p. 243

1.3 Commodities

Commodities are separate asset class that cannot be ignored. Commodities have done particularly well in past. No one can actually consider himself a diversified investor if he is not involved in commodities, and commodities are a very important asset class. We can distinguish between several ways of getting exposed to commodity price changes:

Commodity spot trading

Every commodity is traded at the spot market. In the old days buyers and sellers used to meet on the marketplace where transactions let to immediate delivery or with minimum lag between the trade and delivery due to technical constraints. Unlike stock and bond market commodity market is lead by supply and demand An investor can contact directly the producer or can go through an intermediary. Any transaction on commodities may be physical or financial. Paper price changes are closely correlated to analogous quantities in the physical market.

Commodity Futures trading

The commodity futures are an agreement to buy or sell a pre set amount of a commodity at predetermined price and date. Both parts involved in future contracts are trying to benefit from the pre set prices, buyers use these to avoid risk associated with price fluctuation of given commodities, and sellers use future contracts to lock prices for their commodities. In commodity futures is also associated speculation based on price movements. Future contracts are traded on a commodity exchange, which provides transparency.

1.3.1 Agricultural Commodity Markets[16]

Agricultural commodities prices are determined by supply and demand. Supply consists from the inventory (surplus stocks from previous year), current year production

[16] GEMAN, H. 2005: *Commodities and commodity derivatives.* Hoboken: Wiley Publishing, Inc., 396 p. ISBN: 0-470-01218-8 p. 143

and as well imports from the other countries are counted in. The demand part covers domestic use and exports.

The agricultural market can be divided into several submarkets:

The grain markets

Temperature, sudden weather changes and the changes in customer needs, all these changes greatly affect the price of commodities, and the grain markets are essential to managing and observing these price changes and providing global benchmark prices. Lets disclose some of the most important major products of the grain market.

Soybeans

The history of soybeans dates to 4500 years ago in China. Since then soybeans has spread into the whole world. Soybeans culture increased strongly in the 20th century in the United States. Soybeans popularity may be in its similarity to corn culture. Soybeans are a very popular oilseed product with great possibility of various uses. Soybeans are traded in contracts with standardized size of 5000 bushels[17] prior to 1970s USA was the only place to buy a soybeans and was responsible for more than three-quarters of the world production. In recent years South American countries like Argentina and Brazil have developed a strong position in soybeans production with combined production almost as big as the U.S. production.

Corn

The first notes about corn came from Central America about 5000 b.c. when it was used as human food. The Spanish have brought corn into Europe but it remained poorly grown until the 19th century. Today corn represents about 70% of the world coarse grain markets.

The leading producers as 2003 are USA with 38%, China 20%, Brazil 7%, EU 7% and Mexico 3%[18]. Corn is widely used for human consumption as well as livestock such as

[17] A unit of volume or capacity in the U.S. Customary System, used in dry measure and equal to 4 pecks, 2,150.42 cubic inches, or 35.24 liters.

[18] GEMAN, H. 2005: *Commodities and commodity derivatives.* Hoboken: Wiley Publishing, Inc., 396 p. ISBN: 0-470-01218-8

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cattle and pigs. Corn production also benefits from high oil and fuel prices, which made people, look at using corn for ethanol production. Standardized corn contract is 5000 bushels or 127 metric tons. Corn is traditional less volatile than beans or wheat.

Wheat

A grass similar to wheat was cultivated in the Middle East earlier than 8000 b.c.. Wheat is the oldest commodity contract and started trading around the year 1850 on the CBOT. Wheat is also used as a food for humans and food for livestock. Wheat is for many countries the most important diet and is certainly a major part of US diet. Wheat contract is standardized to 5000 bushels of wheat. Wheat is fairly volatile mainly because of its huge variety of usage and in fact it is not uncommon to have news move this market limit up or limit down in a hurry.

Soft commodities

The soft commodities are often called "tropics" because these commodities are grown primarily in tropical or subtropical regions. Tropics are usually grown in developing countries where is harder to get to relevant information. We will discuss some of the most important commodities of this type.

Cocoa

Cocoa beans are grown on trees, hence, changes in production occur over long cycles as new trees take approximately 7 years to mature and fruit. So we can make quite precise forecasts in cocoa production. International Cocoa Organization releases cocoa statistics on yearly basis. The International Cocoa Organization headquarters in London. Cocoa is priced in sterling in contrast to most other commodities.

Coffee

Coffee is grown in many varieties, but the two main types are Arabica, which is mostly grown in Africa and Robusta from Latin America. We can notice this difference even in contracts where London coffee contract is Arabica and New York coffee contracts are Robusta. USA almost exclusively imports Robusta coffee, probably the U.S. consumers have gotten used to its taste. Coffee is the second largest U.S. import. USA is

also the largest consumer of the coffee. Coffee grows as bushes and it takes from 3 to 5 years to mature and fruit. The largest Robusta producers are Brazil, Colombia, Ecuador and Costa Rica.

Sugar

The Portuguese brought sugar to Brazil and by the year 1540 Brazil has 2000 sugar mills. . During the 18th century, Europeans built sugar plantations on the Caribbean islands.

Sugar is grown by sugarcane or sugar beet, where sugar beets are grown mainly in the US and alike non-tropical countries. Sugar cane grows in warmer tropical climates such as Brazil or Caribbean. As in other commodities sugar production is lead by supply and demand. The particular growth of current years is dependent on weather conditions and possible diseases.

The biggest importers as of 2008 are among Russia, the United States, the European Union, Japan and China.[19]

Cotton

Cotton is another crop that needs hot weather. Cotton is grown only in few parts of the USA and that in Georgia, Arizona and California while California cotton is of high quality. Cotton is also grown in parts of Asia and Latin America. Cotton is primarily used for clothing and the demand for cotton is rising among the developing countries.

Citrus and Orange Juice

Citrus is one of the major fruits traded on the commodity exchanges; it constitutes for roughly one-quarter of all fruit volume. The biggest citrus producers are Brazil, USA, China and Spain. The international citrus market consists from fresh fruit and juice. Juice transformation accounts for about one-third of citrus production. Frozen Concentrate of Orange Juice (FCOJ) was first traded in 1947 and FCOJ Futures contracts appeared in 1966.

[19] DEVCIC, J. 2011 : *Sugar: a sweet deal for Investors*, INVESTOPEDIA, [online]. [cit. 2012-03-29]. Available at: http://www.investopedia.com/articles/optioninvestor/investing-in-sugar.asp#axzz1lthyGtIw

Livestock Markets

Livestock markets are more oriented on domestic consumption while exports represents only a small fraction of 10-15% of total use.

Cattle

The USDA reports on supply and demand of cattle in ”cattle on feed“ report. The USDA also reports on monthly bases on the cold storage of beef etc. Annual cattle inventory report is being released in January and describes forthcoming year supply

Hogs

Hogs cycle in comparison to cattle cycle is significantly shorter. Hogs are taken to the market at the age of 6 months. USDA presents quarterly Hogs and Pigs Report, which discloses details on US, hogs supply. The hog Futures contract represents 40000 lb. of carcass.

Pork bellies

Pork bellies are mostly used to make bacon and are flanks and ribs from hogs. The maximal storage period is up to 1 year when frozen. The pork belly contract represents 50000 lb. of frozen bellies.

1.3.2 Metal Markets[20]

Metallurgy and man's ability to control metals have enabled us to develop the civilization in the form we know it today. Metals have been used and exchanged for thousands of years. Metals are traded in standardized ingots[21], which are in nearly pure metal forms. Metals are classified into two main categories: precious metals and base metals. This duo classification is based on metal's resistance to corrosion and oxidation, where precious metals are highly resistant to these and base metals have lower resistance to corrosion. The main precious metals are gold, silver, platinum, palladium etc. The main base metals are copper, tin, lead, zinc, nickel and aluminum.

Precious Metals

Gold[22]

Gold has been for centuries probably the most prestigious metal. Metal was such an important commodity that it developed monetary functions, hence, vast majority of currencies were based on the value of gold. The Bretton Woods Agreement signed in 1944 has underwritten the importance of gold. In 1971 USA left the dollar gold fix exchange rate although many countries still use gold as global currency benchmark. Gold is used for various purposes. Jewelry accounts for over 70 % of total consumption, Electronics mostly because of its ability to efficiently conduct electricity, Dentistry because of gold's ability to resist corrosion and last but not least Monetary – Many central banks hold gold in their reserves and is held in a physical form for investment purposes. Gold is measured in troy ounces (oz) where one troy ounce is 31.10 grams. One metric ton is 32150 troy ounces.

[20] GEMAN, H. 2005: *Commodities and commodity derivatives.* Hoboken: Wiley Publishing, Inc., 396 p. ISBN: 0-470-01218-8 p. 169-200

[21] ''Commodity metal'' is cast or grown electrolytically as cathode, and occasionally forged. There are several forms and the term ''ingot'' is generally used here.

[22] BOUCHENTOUF, A. 2007: *Commodities For Dummies.* Hoboken: Wiley Publishing, Inc., 360 p. ISBN: 978-0-470-04928-0 p. 237

Silver[23]

Silver is used for various purposes from silverware toward to industrial uses, such as conducting electricity, welding. Here are the most important sectors in silver demand: Industrial sector accounts for 45% of total silver consumption, Jewelry and silverware accounts for 27 % of total silver consumption, Photographic industry accounts for 20% of total consumption. The major silver producers are Peru, Mexico, Australia, China, Chile and Russia etc.

Base metals

Base metals are in comparison to precious metals relatively inexpensive and relatively prone to corrosion while exposed to air or moisture. Base metals are very invaluable to the global economy because of their utility and ubiquity.

Steel

Steel was very important in history, as it was responsible for the industrial Revolution in the 19th century as is important now. Steel, which is iron alloyed with other compounds, is still the most widely produced metal in the world today. Steel is measured in Metric Tons (MT). For the global production purposes is used Million Metric Tons (MMT). The biggest producer of steel is China.

Aluminum

Aluminum is a very widely used metal, well known for aluminum soda cans, but also used for construction parts of cars, trucks, trains etc. In fact aluminum is the second-most used metal in the world

[23]BOUCHENTOUF, A. 2007: *Commodities For Dummies*. Hoboken: Wiley Publishing, Inc., 360 p. ISBN: 978-0-470-04928-0 p. 244

Copper

Copper is after steel and aluminum the third most used metal in the world. Copper is used in many sectors and industries including construction, electricity conduction etc. Copper is quite well resistant to corrosion hence is widely soaked after in construction industry.

1.3.3 Energy Markets

Crude Oil[24]

Oil is the biggest commodity market in the world and has transformed from purely physical to sophisticated financial market with huge trading horizons. Oil has attracted various types of participants from investment banks to asset managers or mutual funds, pension funds etc. The importance of crude oil was illustrated in the 1973 Arab oil Embargo, during this year the oil prices have skyrocketed by 400%. The Oil price has acquired a deep influence on global economy and its performance. The largest Oil reserves Physical crude oil markets are highly fluid, global and volatile. West Texas Intermediate (WTI) crude oil is of very high quality and is at refining a larger portion of gasoline. WTI is an onshore crude oil whose price movements essentially reflect extra imports to the U.S.; its relative value versus Brent behaves as an indicator of the shipping costs of supplies across the Atlantic. Brent is one of the older fields of the UK Continental Shelf. Brent Blend is actually a combination of crude oil from fifteen different oil fields located in the North Sea. It is still a "light" crude oil, but not quite as "light" as WTI, and it contains about 0.37 percent of sulfur (making it a "sweet" crude oil, but again slightly less "sweet" than WTI). Crude oil is measured in barrels, while each barrel containing 42 Gallons of oil.

Natural Gas[25]

Natural gas consumption accounts for about 25% of total energy consumed in the USA, hence gas is the second most important energy commodity in the USA after crude oil. Natural gas is a nonrenewable fossil fuel found in large deposits under the ground.

[24]GEMAN, H. 2005: *Commodities and commodity derivatives.* Hoboken: Wiley Publishing, Inc., 396 p. ISBN: 0-470-01218-8 p. 201

[25]CHENTOUF, A. 2007: *Commodities For Dummies.* Hoboken: Wiley Publishing, Inc., 360 p. ISBN: 978-0-470-04928-0 p. 209

Natural gas deposits and crude oil are often found close to each other. The primary Nat gas consumers are industrial sector, residential sector, electric sector, commercial sector and transportation. Nat gas is measured in cubic feet (cf) as well as Liquefied Natural Gas. Nat Gas can be also measured in the amount of energy it produces. This unit is known as British thermal unit (Btu) where 1cf=1027 Btus'.

Coal[26]

Coal was the most important energy commodity in the 19th and in the beginning of 20th century. Coal was often associated with the big industrial revolution. Coal is primarily used for electricity generation and steel manufacturing. Coal is a very popular fossil fuel also because of its big reserves, while USA has the biggest coal reserves in the world. The biggest coal producers are China and USA. The demand for coal is increasing in 21st century, while most of the growth come from emerging and developing countries. In the USA coal is traded in future contracts on the New York Mercantile exchange (NYMEX) and CME.

[26] CHENTOUF, A. 2007: *Commodities For Dummies.* Hoboken: Wiley Publishing, Inc., 360 p. ISBN: 978-0-470-04928-0 p. 209 p.234

2. The Aim and the Methodology of the Thesis

The main subject of observation in my thesis was to analyze the mutual relations between the commodity futures, stock market and bond market. The primary role of this paper is to characterize the selected asset classes comprehensively and theoretically. The paper is designed to fully introduce and cover the problematic of the issues observed. I wanted to explore the mutual relations of selected asset classes and then analyze the main characteristics of each asset class separately. The secondary purpose was to fully cover the market problematic and to find mutual as well different characteristics of each market. The most important parts of my paper are the final chapters, where I undergo the asset classes through various analyses.

The paper analysis the mutual relations of the asset classes of a sample 13 year period- from 1998 to 2011. The paper covers not only the numerical overview but also analyses the data complexly. To achieve the selected objective I have used various sources, which helped me to obtain sufficient overview about the observed matter. The main inspiration for this paper came from the work written by Gary Gordon and K.G. Rouwenhorst, called Facts and Fantasies about Commodity Futures. The information needed for the theoretical part was gathered by reading several books. Sharpe's book "Investments" was also a very important source for the practical part of the. The methodology of my thesis is determined by its structure. I collected theoretical information and needed data, then I analyzed those data. I used correlation to correlate each asset classes together. I also used the geometrical mean instead of arithmetical mean, because the numbers are not independent of each other and the geometric mean is needed to get accurate measurement of average annual returns over the sample period. I also used induction as well as deduction and comparison.

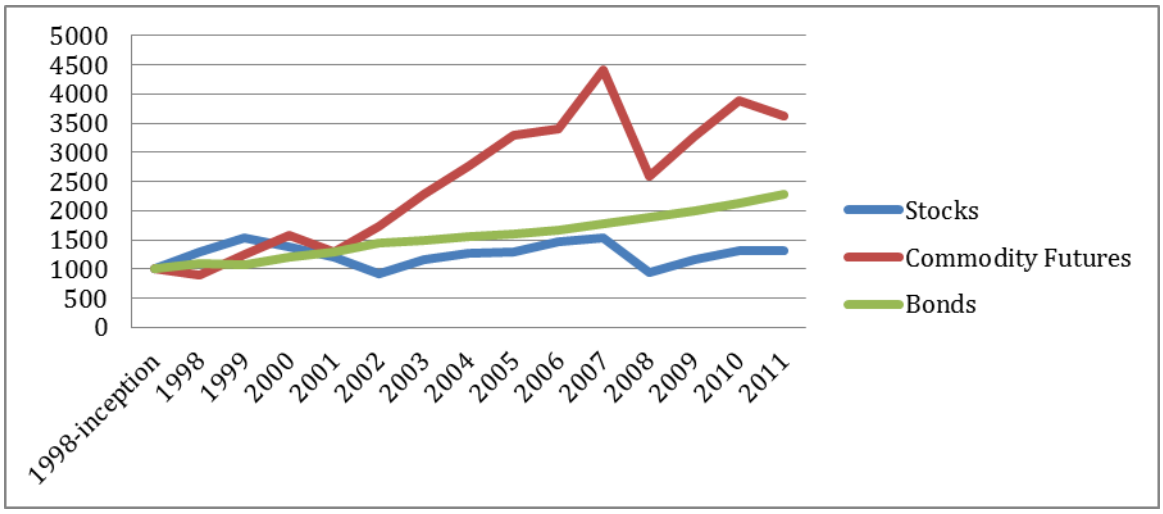
3. Mutual Relations Between Equity, Commodity and Bond Markets

3.1 The Comparison of Return and Risk of Three Asset Classes

The figure 6 compares the cumulative performance of three asset classes. S&P 500 total return index (Stocks), Barclays Aggregate Bond Index (Bonds) and Rogers international commodity index (Commodity Futures). Performance of these asset classes is observed for the period from 1998 to the end of the year 2011. The figure starts in 1998 with initial 1000 USD invested. As the figure shows it is obvious that commodity futures have outperformed other asset classes, even more surprisingly stocks are left behind with the least evaluation of funds invested. This scenario is mostly caused by the length of time period watched, as this finding does not side with long term observation as of (Facts and Fantasies about Commodity futures by G. Gordon) where annualized returns in commodity futures have been comparable to the return on the S&P 500, while both asset classes outperformed corporate bonds.

Commodity futures heavily outperformed other asset classes since 2001 when the total return wide's significantly from others. Stocks and Commodity Futures also experienced higher volatility than Bonds. Stocks outperformed Bonds in 1998, 1999, and then suffered big losses and negative profits. This happened mainly because of the dot com bubble burst.

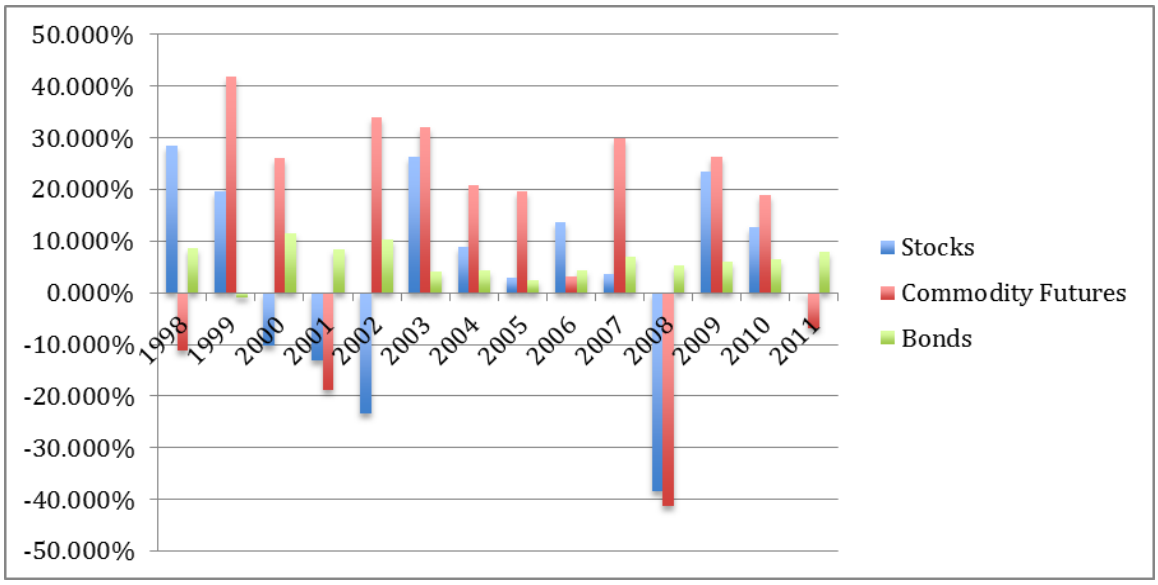
Figure 1- Stocks, Bonds and Commodity Futures performance 1998-2011



Source: Own processing, Data available at: http://finance.yahoo.com/ , http://www.callan.com/research/papers/

Figure 7 represents annualized returns of Commodity Futures, Stocks and Bonds. The other finding that we can conclude from the figure is that Bonds tend show smallest returns on investment, but on the other hand seem to be the least volatile. Commodities outperformed Stocks in almost every year except the year 1998. Figure 7 also shows that commodities behave much more volatile than other asset classes.

Figure 2- Annualized return of Commodity Futures, Stocks and Bonds



Source: Own processing, Data available at: http://finance.yahoo.com/ , http://www.callan.com/research/papers/

Table 8 sumirizes historical risk premiums and other quality measurments for all three asset classes. We have confirmed our above observations from the chart through various statistical methods. Commodities were the most profitable asset class among the others with CAGR of 9,64%, The Compound annual growth rate is basically the geometric mean in the financial sector. If we would make an investment decision only based on CAGR then Commodity futures would be the clear choice. However we cannot base our investment decision only on the growth rate, but we as well have to include as well risk measurements to our decision making process. We used Standard deviation[27] to evaluate riskiness of the investment. We can testify that Bonds are the least volatile based on the

[27] A measure of the dispersion of a set of data from its mean. The more spread apart the data, the higher the deviation.

observation of standard deviation. The most volatile asset class are Commodity futures with the largest standard deviation.

To calculate the standard deviation we have used standardized Sharpe's model. The commodity futures were the most profitable asset class over the observed period but on the other hand were also the most volatile and the riskiest. I have also calculated risk premium over the risk free investment. As the risk free investment was determined by the 3 month US Treasury bills with 1,96% CAGR over the watched period. The biggest risk premium generated commodity futures.

We have also calculated the Sharpe ratio[28] to measure a risk-adjusted performance. The Sharpe ratio tells us whether a portfolio's returns are due to smart investment decisions or a result of excess of risk, the biggest Sharpe ratio has earned Bonds followed by Commodities and Stocks. Over the 13 years long period 93 % of all years bonds ended with positive returns in contrast with only 71% for Commodity Futures and 57% for Stocks.

These analysis lead us to a surprising conclusion that Bonds stand out in comparison with other asset classes with the most return on investment in respect to the additional risk taken.

Table 1- Risk premium, Returns of Commodity Futures, Stocks, Bonds

	Bonds	Commodity Futures	Stocks
CAGR	6,09%	9,64%	1,97%
Standard Deviation	3,06954529	24,64424953	20,87290853
Sharpe Ratio	0,758169685	0,149439916	0,036027454
Risk Premium	3,47%	7,02%	-0,65%
%Returns >0	92,86%	71,43%	57,14%

Source: Own processing, Data avaliable at http://finance.yahoo.com/ , http://www.callan.com/research/papers/

[28] A ratio developed by Nobel laureate William F. Sharpe to measure risk-adjusted performance.

3.1.1 Mutual Correlation Between Specified Asset Classes

I have examined the correlation of stocks returns with commodity future returns and bonds on annual basis. The correlation is calculated on yearly basis so the outcome may reveal patterns in the data that are obscured by short-term price fluctuations but on the other hand do not capture short term patterns and price changes that might be essential for short term or medium term investors. As we can see from the Table 9 Bonds are negatively correlated with Stocks as well Commodity Futures, however we can see a negative correlation it is not very strong and significant value. Stocks and commodity futures are positively correlated as shown in the Table 9. According to my calculations we cannot testify the statement by authors of Facts and Fantasies about Commodity Futures[29], that commodities are negatively correlated with Stocks and therefore are effective in diversifying equity and bond portfolios.

Table 2- Correlation of Commodity Futures, Stocks and Bonds

	Bonds	**Stocks**	**Commodity Futures**
Bonds	1	-37,99%	-20,49%
Stocks		1	44,18%
Commodity Futures			1

Source: Own processing, Data available at http://finance.yahoo.com/ , http://www.callan.com/research/papers/

[29] Facts and Fantaasies about Commodity Futures, Gary Gordon, The Wharton School, University of Pennsylvania and NBER , K. Geert Rouwenhorst Yale School of Management, Yale University

3.1.2 Correlation on Inflation

Table 3- Correlation on Inflation of Commodity Futures, Stocks and Bonds

	Inflation
Bonds	-9,449%
Stocks	-49,628%
Commodity Futures	-36,844%

Source: Own processing, Data available at http://finance.yahoo.com/ , http://www.callan.com/research/papers/

Investors definitely care about the real purchasing power of their assets and in this case ultimately of their returns. This means that inflation is a potential threat for the future value of investors' returns and assets. Many asset classes are not a very good hedge against inflation, at least over shorter time frames.

Bonds are nominally denominated assets, and the yield policy is set to expect and compensate investors for expected inflation over the entire life of the bond. In case of unexpected events that force the inflation to higher levels than expected investors returns fall short of expectations.

In theory equities generally provide a better hedge against the inflation than bonds. Stocks represent the claims against real assets in the companies such as equipment and inventories, whose value is expected to hold pace with the general price level changes. On the other hand companies also hold contracts with labor force and suppliers of inputs for instance, which are fixed on terms and hence tend to act very alike bonds. „Unexpected inflation is associated with negative shocks in economy that negatively influences aggregate output that is not good news for equities and especially for the equity prices."[30]

Commodity futures represent a bet on commodity prices, which are directly linked to components of inflations. Commodity seem to have some advantage over other asset classes because futures prices already include information about expected trends in commodity prices and they tend to move with unexpected components of inflation.

[30] GORTON, G., ROUWENHORST, K.G., 2005: *Facts And Fantasies About Commodity Futures*, Yale School of Management, Yale University, Yale ICF Working Paper No. 04-20, 40 p.

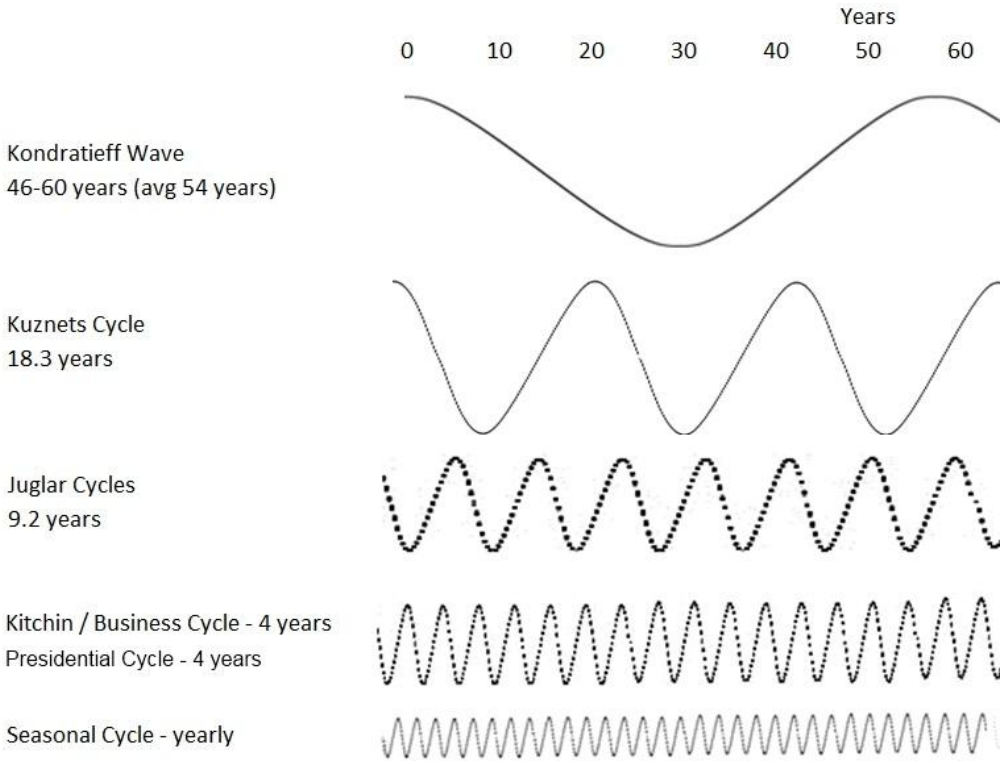
According to my calculations all asset classes are negatively correlated on the yearly basis with inflation. This finding is in contrast with Facts and Fantaasies about Commodity Futures where commodities were positively correlated with inflations and stocks and bonds negatively. Based on this finding that commodities are positively correlated with inflation authors of Facts and Fantasies about Commodity Futures expected that commodities are a better hedge against inflation than Bonds and Stocks. Stocks and Bonds can be sensitive to unexpected inflation. Inflation is running over time that means unexpected inflation often cause market to already account it to their estimates of future expected inflation.

My calculations have verified that all asset classes are relatively volatile to inflation and longer-term correlations better capture the inflation properties of all asset classes. Stocks and Commodities are relatively highly negatively correlated to inflation in comparison with Bonds. This figure made Bonds in comparison with Stocks and Commodity Futures the best hedge against inflation during the watched period. Negative correlation means that when inflation raises profits falls and vice versa in case of positive correlation. I have come up with different observations on inflation correlation than authors of Facts and Fantasies about Commodity Futures and this I think is mainly caused by the different length of periods being observed.

3.1.3 Business Cycle and Asset Classes

Over the history a lot has been written about cycles. Some of this is useful only on the theoretical base and some on the other hand is very useful in practical way. Cycles are ubiquitous in our everyday life; we can see them in nature as well as in the economy. Some investors believe natural cycles have an effect on the market and I can confirm that they do. For instance weather cycles could affect crop or wheat production, which will affect commodity prices that will affect the stock prices of companies' dependent on commodities. The most used and watched cycles are shown in Figure 8[31]

Figure 3- The most recognized types of cycles



Source: MOORE, B. D., 2011: *The Liberated Stock Trader*, Worden Brother inc. 2011, 248 p. ISBN 9781460956021 p. 82

Joseph Schumpeter, an Austro-Hungarian economist of the early 20th century, and an author of the two-volume book *Business Cycles* (1939) was one of the most important persons who introduced his study based on cycles and presented theoretical model of how

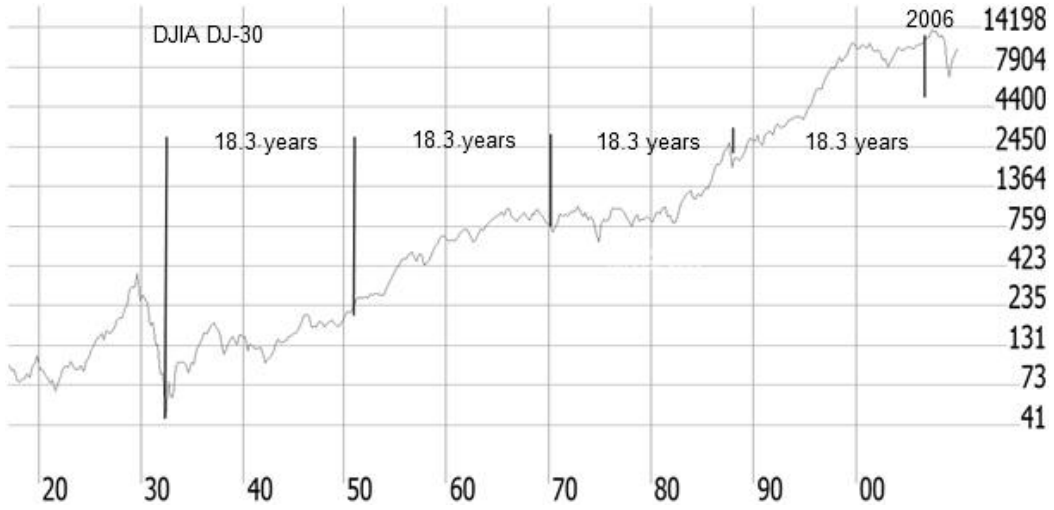
[31] MOORE, B. D., 2011: *The Liberated Stock Trader*, Worden Brother inc. 2011, 248 p. ISBN 9781460956021 p. 65-80

all the various cycles fit together. He also presented the Kondratieff long wave as a larger scale consisting of smaller cycles.

The Kondratieff cycle[32] measures between 46 to 60 years. This wave is based on wholesale prices in the US and has been watched since 1800 until today. The last trough was in 1940 and according to the assumption the next trough was predicted to be in the year 2000. This prediction seem to be correct, however we cannot prove this cycle theory because another trough should happen in the next 40 years.

The shorter cycle is named after Simon Kuznets, as Kuznets cycle. Kuznets should last for about 18,3 years. The Kuznets cycle seems to work very well, if we make the low point of the 1930's- the low in 1934 then continues the start of the price rally in the 1950's, the market crash of 1987 and the consequent establishment of the big bull market that lasted until 2000, however its timing seems to be slightly off in 2008, as it predicted a new phase from 2006 onwards[33]. This Kuznets cycle can be seen in the figure 9 where the cycles are plotted onto Dow Jones Industrial Average.

Figure 4- The Kuznets cycles ploted on Dow Jones Industrialo Average Index



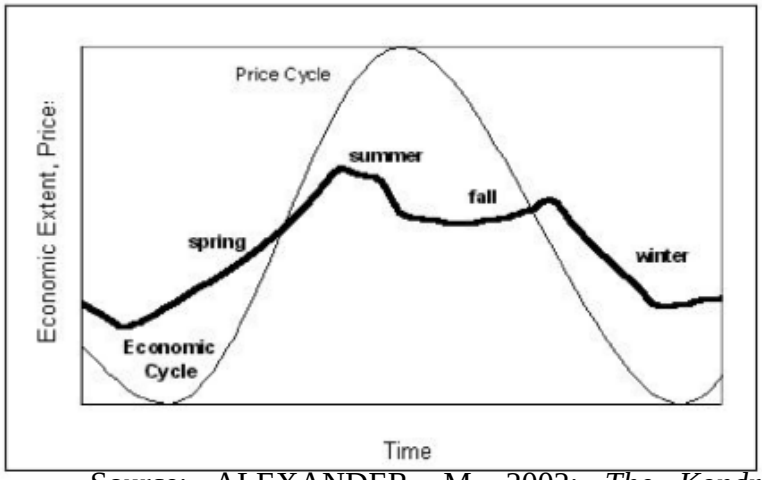
Source: MOORE, B. D., 2011: *The Liberated Stock Trader*, Worden Brother inc. 2011, 248 p. ISBN 9781460956021 p.87

[32] K-cycle could be defined by :a)population stress model-fluctuations in population relative to food production.b)financial model-accumulation of debt,much o fit to finance wars, produces alternating periods of inflationary boom and deflationary bust-each roughly a generation in lenght.c)Schumpeter-Dent model, proposes that inovations drive the cycle. Source: ALEXANDER, M. 2002: *The Kondratiev Cycle: A generational interpretation,* p.38

[33] MOORE, B. D., 2011: *The Liberated Stock Trader*, Worden Brother inc. 2011, 248 p. ISBN 9781460956021 p. 65-80

Schumpeter's model of how all the shorter scale cycles worked together to produce long waves included Kitchin cycles (3-5 years) and Juglar cycles (7-11 years) with three Kitchin waves into one Juglar wave. Schumpeter's model presented 18 business cycles (Kitchin cycles) in a regular long wave (56 years-Kondratieff wave). More recently P.Q. Wall[34] came up with a conclusion that the long wave consists only from 16 Kitchin market cycles, due to the more sophisticated market analysis and charting systems. Market cycles are not the same as business cycles, because we can identify them on the index chart not necessarily in the economic data as we can identify business cycle. They are often highly correlated. The 16 Kitchin cycles ideally last 42 months, but this rarely and ideal scenario, as they often fluctuate around Fibonacci ratios[35] of their ideal length time. Wall proposed that the long waves are created by four seasons of development, very alike the natural seasons of the year: spring, summer, fall, winter (according to P.Q. Wall- years of dawn, years of noon, years of sunset and years of midnight). Each season consists from four Kitchin cycles together making total 16 business cycles in every long wave.[36] „Schumpeter model, proposes that innovations drive the cycle in such a way as to produce two boom/bust economic cycles per K-cycle."[37]

Figure 5: The comparison of Economic cycle with Kondratiev price cycle



Source: ALEXANDER, M. 2002: *The Kondratiev Cycle: A generational interpretation*, p.38

[34] WALL, P.Q. 2007: *Dealing with the human motives, economics needs, symbolic, analogical thinking,* [online]. [cit. 2012-03-29]. Available at: http://www.pqwall.com/wp-content/uploads/2010/04/cyclewebsummary1.pdf

[35] In technical analysis, the Fibbonachi ratio is typically translated into three percentages: – 38.2%, 50% and 61.8%. However, more multiples can be used when needed, such as 23.6%, 161.8%, 423% and so on.

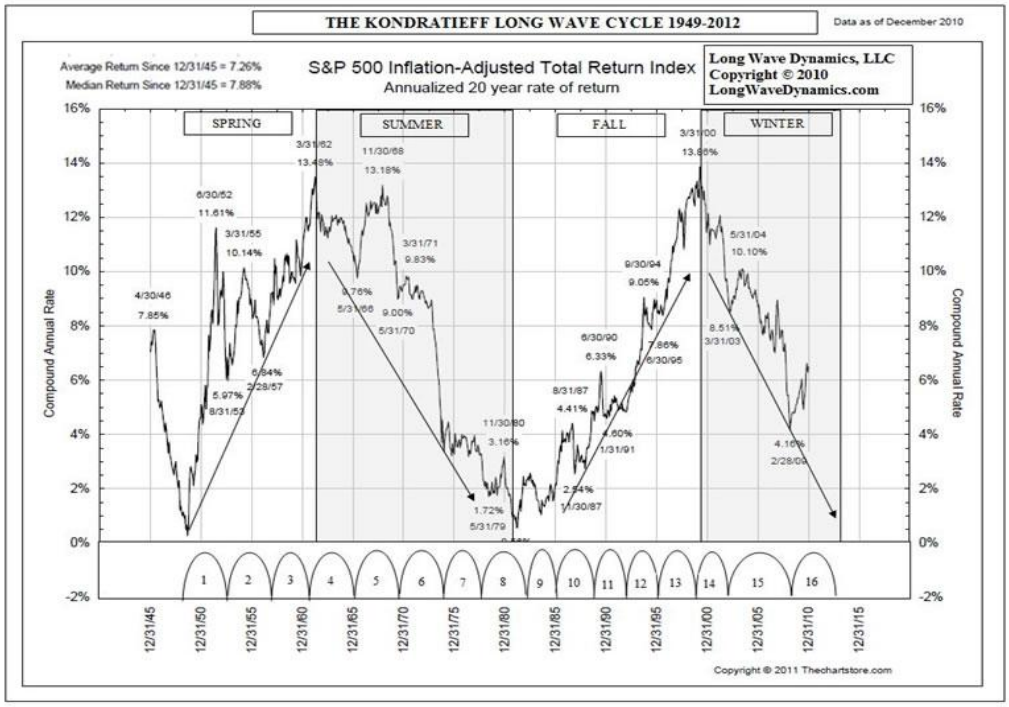
[36] BARKER, D.K. 2011: *Schumpeter vs Wall and the Business cycle count in the long wave,* [online]. [cit. 2012-03-29]. Available at: http://www.safehaven.com/article/19815/schumpeter-vs-wall-and-the-business-cycle-count-in-the-long-wave

[37] ALEXANDER, M. 2002: *The Kondratiev Cycle: A generational interpretation,* iUniverse inc. ISBN: 0595217117,p.39

Below is a chart that shows an inflation adjusted 20-period moving average of returns in the S&P 500. The moving average is used to smooth out the noise produced by the fiscal and monetary policy interventions, which are specifically aimed to alter or eliminate the business cycle. We can clearly see that the four-season approach of Kondratieff cycle below on Chart 11. As we can see on the below chart the global stock market is in the midst of winter season that will surely wane. This figure could also be an answer to not so good results of stock market in my researched period, which is completely in the winter season and ongoing downturn. It is obvious that my 13 years period ended in the very bottom of chart below, while the period being observed by the Yale University professors ended near the peak of the previous uptrend. The figure 11 clearly shows downside direction of current stock market development, which might influence the stock market results. The spring and fall seasons are characterized by the corporate efficiency, which positively influences corporate profits and the whole stock market.[38]

The two other seasons, summer and winter, are on the other hand seasons of the corporate inefficiency and are producing more debt and lower corporate profits as well weaker market gains.

Figure 6-The Kondratieff long wave cycle 1949-2012



Source: www.longwavedynamics.com

[38] BARKER, D.K. 2011: *Schumpeter vs Wall and the Business cycle count in the long wave*, [online]. [cit. 2012-03-29]. Available at: http://www.safehaven.com/article/19815/schumpeter-vs-wall-and-the-business-cycle-count-in-the-long-wave

The typical business cycle does not have a regular length as it often fluctuates within a range, Kithchin himself believed they averaged 40 months. Business cycles are nowadays running longer than they would naturally last because the central banks and governments began to alter the natural cycles for their purposes. This fact is important for any dynamic analysis of the business cycles. Since this Kondratieff wave began in 1949[39] the Kitchin cycles have averaged almost exactly 48 months. The four-year election cycle has clearly produced a gravitation pull on the business cycle since politicians try to postpone or strengthen the cycle especially in election years. In 2008 the politicians clearly lost their control over the business cycle and the economy started to focus mostly on the long wave Kondratieff cycles. The global economy is now in the final years of the winter season of the long wave that began in the 1949 and with an expected bottom in this year.[40]

[39] 1949 U.S. Stocks, U.S. GDP start of spring season according to ALEXANDER, M. *The Kondratiev Cycle: A generational interpretation* ,p. 65

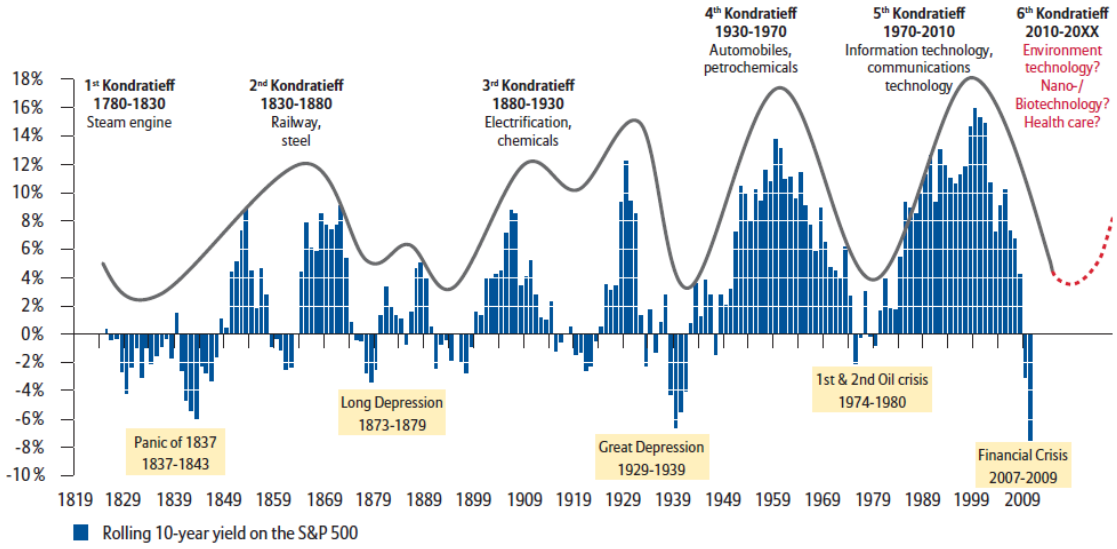
[40] BARKER, D.K. 2009: *JUBILEE on Wall Street* .Long Wave dynamics 2009, 390 p. ISBN: 978 0982 5283 10 p. 126

As the figure 12 below indicates we might be at the frontiers of a new Kondratieff cycle, the beginning of new cycle requires considerable amount of capital to buy the steam engine. Kondratieff marked main characteristics of changes that lead to a new Kondratieff cycle:

a) Potential for further exploitation of an old basic innovation is exhausted approximately 40 to 60 years
b) High amount of excess financial capital against physical capital
c) Period of severe recession or period of radical economic change
d) Social and institutional transformations

It seems that the current economic cycle has already hit the bottom or will hit the bottom in near future and from now on the new Kondratieff cycle will begin. Work is now underway on the creation of a new global financial regulatory architecture that is intended to form the basis for a sustainable economic and financial system for the future.[41]

Figure 7- Kondratieff cycles – long waves of prosperity. Rolling 10-year yield on the S&P 500 1814-2009 (in %, p. a.)



Source: *The sixth Kondratieff- long waves of prosperity*, Available at: http://www.allianzglobalinvestors.de/cms-out/kapitalmarktanalyse/docs/pdf-eng/analysis-and-trends-kondratieff.pdf

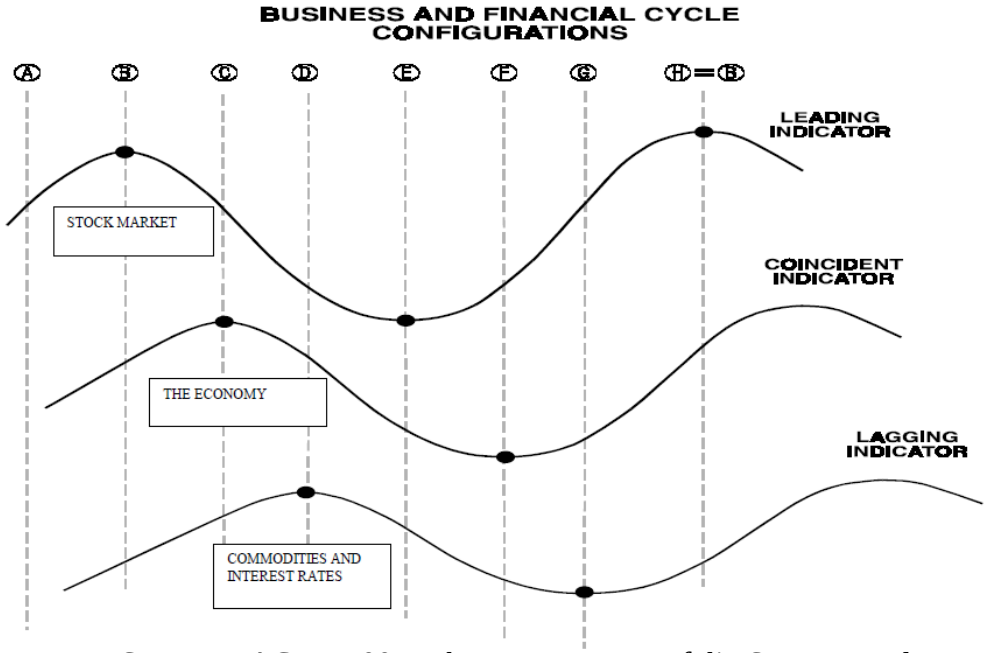
[41] Allianz Global Investors, 2010 : *The sixth Kondratieff- long waves of prosperity*, [online]. [cit. 2012-03-29]. Available at: http://www.allianzglobalinvestors.de/cms-out/kapitalmarktanalyse/docs/pdf-eng/analysis-and-trends-kondratieff.pdf

Asset returns consist from two basic types systematic component and nonsystematic component. As we know from the theory a well diversified portfolio of many different securities can suppress nonsystematic component of return. The systematic component is bound to the whole market movements and is viewed as non-diversifiable. The part of risk that is characterized as non-diversifiable, is also characterized by Sharpe in his Capital Asset Pricing Model as beta, is associated with nonsystematic component as business cycle since business cycle risk is non-diversifiable

Commodity futures possess a very unique feature in comparison to the other asset classes and unlike stocks, commodity futures have power to diversify systematic component of risk.

Authors of Facts and Fantasies about Commodity Futures report that commodity futures returns vary with the stage of the business cycle.[42] Generally, commodity futures perform well in the early stages of a recession, a time when stock returns generally disappoint. In later stages of recessions, commodity returns fall off, but this is generally a very good time for equities. Stock and bond returns are negative in (the early phase of) recessions, in particular.

Figure 8-Business and financial cycle configurations



Source: DAG, P. 2001: *The Peter Dag Portfolio Strategy and Management,* Available at: http://www.peterdag.com/s_files/Qe8OmINy55BS.pdf

[42] GORTON, G., ROUWENHORST, K.G., 2005: *Facts And Fantasies About Commodity Futures,* Yale School of Management, Yale University, Yale ICF Working Paper No. 04-20, 40 p.

As the figure above signalizes we can recognize the three types of indicators when considering a business cycle.

Leading indicators are usually the stock market returns; where the word leading suggests that the changes usually happen before the economy changes. Stock market declines before the economy and as usual recover before the economy. Leading indicators could in some point predict the future of the economy. Some of the most important leading indicators are the growth of the money supply, stock prices and slope of the yield curve, bond yield quality spreads, and the dollar

Coincident indicator simply moves with the economy, for instance the gross domestic product.

Lagging indicators are typically lagged few quarters after the economy. Employment rate could be used as a good example because it typically improves after 2 quarters of economic growth. Other important lagging indicators are the growth in consumer credit, interest rate changes, growth in wages and unit labour costs, and growth in inventories and backlogs.[43]

Gross domestic product is popular indicator of the business cycle. Generally two consecutive quarters of negative GDP growth indicates a recession. GDP is a quick and easy indicator of an economic cycle. However, the National Bureau of Economic Research (NBER) considers GDP relatively low as the primary business cycle indicator, because it is released only on quarterly basis and is often an object of revisions. The National Bureau of Economic Research primarily relies on personal income, industrial production and employment.

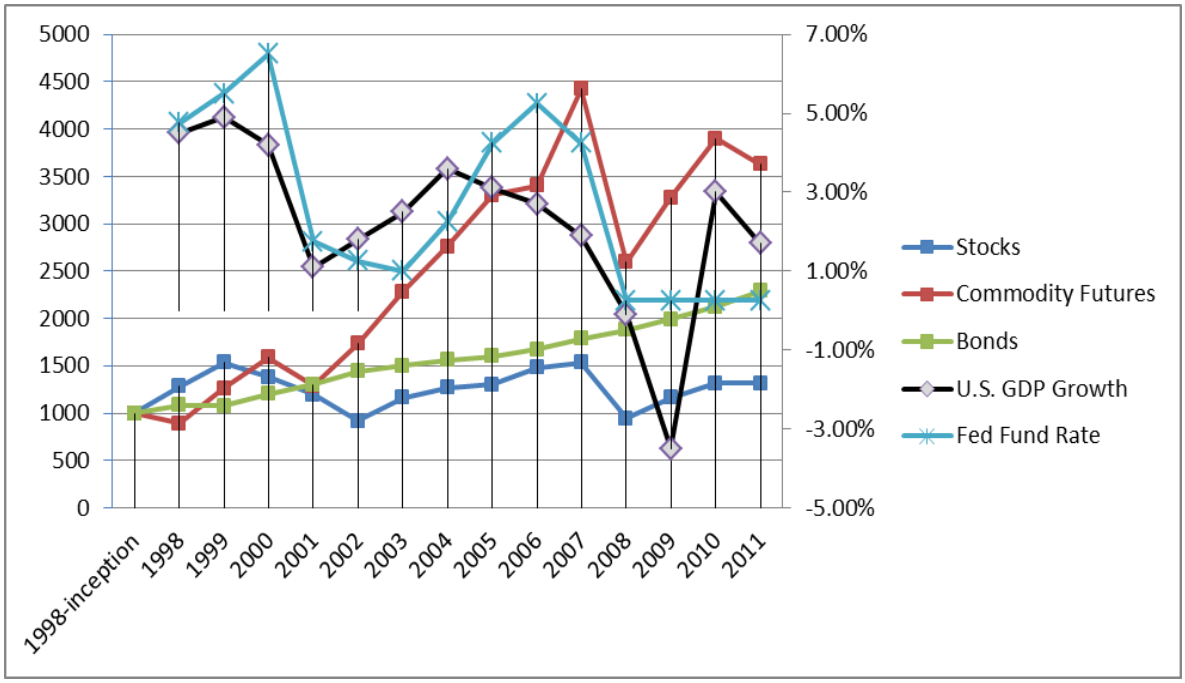
[43] DAG, P. 2001: *The Peter Dag Portfolio Strategy and Management,* [online]. [cit. 2012-03-29]. Available at: http://www.peterdag.com/s_files/Qe8OmINy55BS.pdf

According to the NBER database we can clearly distinguish two business cycle peaks and troughs during my observed period. The first peak followed after 120 months from last trough in March 1991 and this was the longest uninterrupted economic rally in 20th century. The economy peaked in March 2001 followed by the very soon trough just eight months from the peak, in November 2001. This peak was mostly caused by Technologic revolution in the end of 20th century and respective technologic bubble accompanied by the enormous growth in price of stocks of technologic companies. We can testify that this peak was the completion of 120 months of an economic rally. The dot-com bubble peaked on March 10, 2000, with the NASDAQ composite index[44] peaking at 5132.52 in intraday trading. A series of troughs ranging from late 2000 to 2001, 2002 followed shortly after its peak. As stated above, the stock market returns are one of the leading factors of the economic cycle and we can confirm this definition by the following example. The stock market reached the though in the year 2002. As we can see on chart below, commodity futures have lost some of its return gained in the year 2001, but unlike stocks already soared in 2002. The Bonds stayed seemingly untouched by the ongoing market conditions. According to the NBER database, the next business cycle was in development after the last one gone. As we can see on the figure 14 below the U.S. GDP Growth rate was steady over 3 percent until 2001, then it dropped to approximately 1 percent point which is under the 2,2 percent point mean during the observed 13 years period. The figure 14 shows us as well the short term benchmark Fed Fund rates which were growing until the year 2000 when it fell to 1,75 percent point. Since 2000 the fed lowered the rates to 1,25 percent point in 2001 and to 1 percent point in 2000. The low yield policy was aimed to boost the economy. The 9/11 terrorist attacks on New York‘s World Trade Center in 2001 definitely influenced the economy development in a bad way.

The U.S. real GDP growth is highly correlated with the FED’s fund rate; the mutual correlation is 65 percent.

[44] The Nasdaq Composite Index represents all the stocks that trade on the Nasdaq stock market. The Nasdaq Composite is a capitalization weighted index, with each company weighting being proportionate to its market value. Contains all of the companies that trade on the Nasdaq. Most are technology and Internet-related, but there are financial, consumer, bio-tech and industrial companies as well.

Figure 9- Commodity Futures, Stocks, Bonds performance and U.S. GDP Growth rate, Effective Fed Fund Rates annually



Source: Own Processing, Data available at http://research.stlouisfed.org/fred2/series/FEDFUNDS , http://finance.yahoo.com/, http://www.callan.com/research/papers/

The NBER identifies yet a second peak in the 21th century. The economy peaked in December 2007, after six years of rally. As we can see on the figure 14, the GDP growth steadily has grown since 2001 with the highest growth in year 2004. Fed kept interest rates since 2000 on very low levels and after 2002 started to increase the rates until the year 2006 when the rates peaked on 5,25 percent points. The economy already started already slowing down after the 2004 peak and recorded 2 years with a negative growth 2008,2009. The fed again step up to lowering yields to 0,25 percent points and according to the Federal Open Market Committee (FOMC) will keep the rates near the 0 until late 2013. We can confirm from the figure 14 that the interest rates are indeed lagged below the GDP growth, GDP growth started to fall since the year 2004 while interest rates were yet still on rise. The business cycle peak in December 2007 is identical to the Commodity Futures peak and Stock market peak. As the chart suggest GDP growth return rate peaked first in 2004, followed by the 2006 interest rate peak and finally followed by Commodity futures and Stock market peak. 73 months of market rally preceded the peak in December 2007. The business cycle reached its trough in June 2009. On October 9 2007, the Dow Jones

Industrial Average set a record by closing at 14 047 points, just one year later the DJIA was above 8000 points. From the macroeconomic point of view the collapse of U.S. housing market triggered the financial crisis that began in 2008. High-risk loans like subprime mortgages given to people with troubled credit, in fact fueled the growth of the U.S. economy from the late 1990s into the mid-2000s through the real estate boom and respective jobs growth in the construction sector. Year 2009 was not a positive year for the U.S. economy; U.S. GDP growth recorded the highest negative volume in the 21th century. The Commodity futures have rebounded in 2008 and continued in their previous rally. The Stock market rebounded from the 2008 trough as well but did not have as sharp growth as commodity futures. The Bonds stayed very solid through the whole observed period and really seem as good hedge against business cycles.

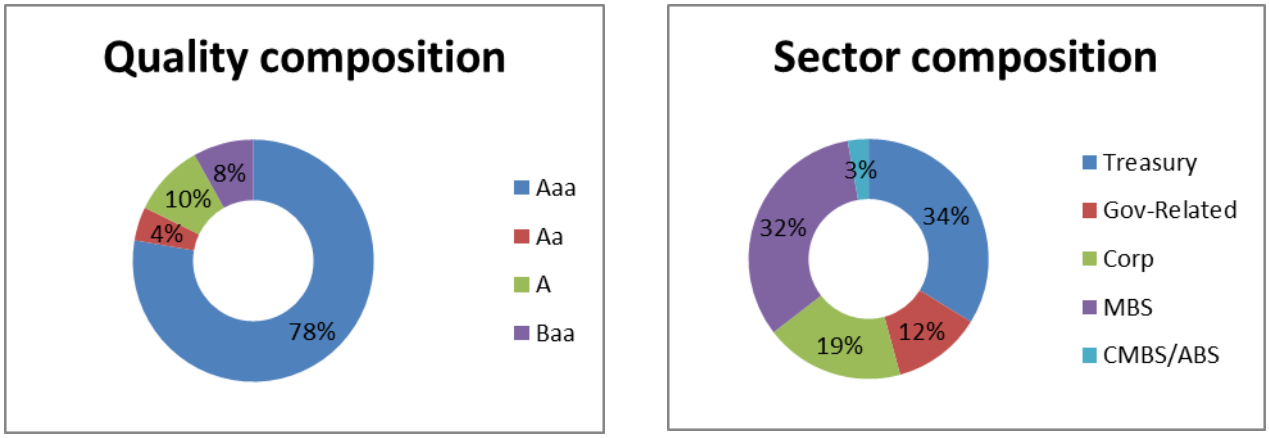
4. The Individual Markets Analysis

4.1 The Bond Market

4.1.1 Barclays U.S. Aggregate Bond Index[45]

The Barclays US Aggregate is one of the most important broad based benchmark indices that measures variety of the U.S. dollar denominated fixed-rate taxable securities, including Treasuries, government-related and corporate securities, MBS, ABS, CMBS. The U.S. Aggregate index was created in 1986, with index history backfilled to January 1, 1976.

Figure 10- Quality composition and Sector composition



Source: Own processing, Data available at: https://ecommerce.barcap.com/indices/index.dxml

There are particular requirements for the inclusion of securities. Treasury, government related and corporate securities have to cover 250milion USD minimum par amount outstanding. For the MBS securities 500milion USD minimum deal size and 250milion USD tranche size for specific ABS issuers.

[45] *U.S. Aggregate Bond Index Factsheet*.[online]. [cit. 2012-03-29]. Available at: https://ecommerce.barcap.com/indices/index.dxml

CMBS securities need 500 million USD minimum original deal size and at least 300 million USD outstanding remaining in the deal while the minimal tranche size is 250 million USD.

The Quality is based by the Moody's, S&P, and Fitch ratings, after dropping the highest and lowest available ratings. If there is available rating from only two agencies, then the lower "more conservative" rating is used. In case of only one rating being available, this one is used to determine the index eligibility.

Only Bonds with at least one year until final maturity, regardless of optionality, are suitable for index inclusion. For securities with coupon that converts from fixed to floating rate have to be at least one year until the conversion date. MBS must have weighted average maturity of at least 1 year. CMBS and ABS must have remaining average life of at least 1 year. Fixed-to-floating perpetual securities are included in the index. These are included until one year before their first call date, providing they meet all other index criteria.

Only fully taxable securities are eligible, including taxable municipal securities. Dividend received deduction and Qualified Dividend income eligible securities are excluded.

Coupon must be fixed- rate. Step-up coupons and also those that change according to a predetermined schedule are included as well. Capital securities with convertible fixed to floating rate coupons are index eligible. Fixed to floating rate perpetual capital securities that do not have coupon rate step-ups[46] on their first call date will remain index eligible for their fixed-rate term, provided that they meet all other inclusion rules and exit the index one year prior to their conversion to floating-coupon securities. Hybrid ARMs are index eligible during their fixed term but have to exit the index one year prior to their conversion to adjustable rate.

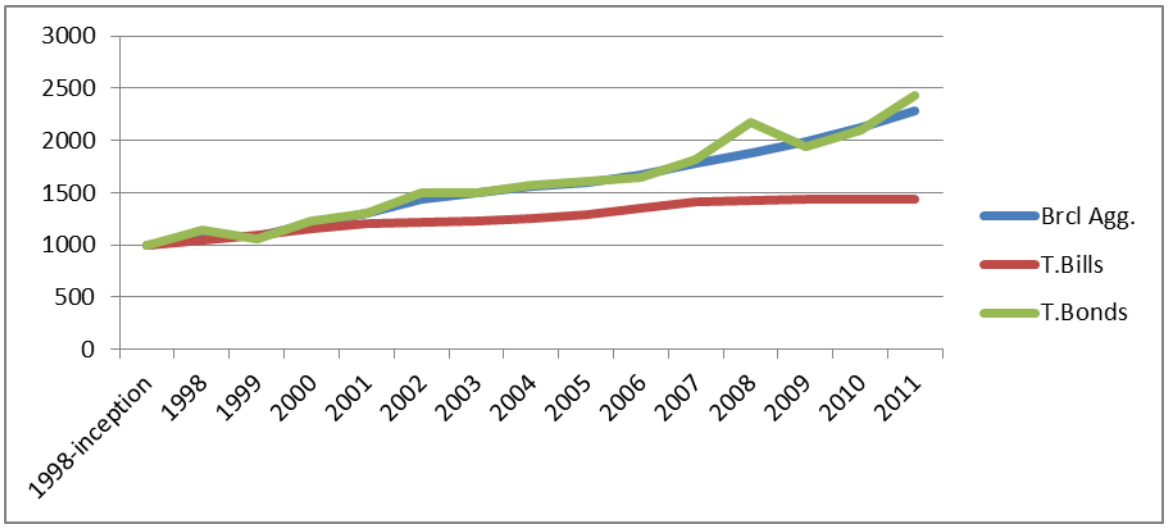
All securities principals and coupons must be denominated in USD.

SEC registered securities are index eligible; securities with global market of issuance are included.

[46] A bond that pays an initial coupon rate for the first period, and then a higher coupon rate for the following periods.

4.1.2 The Bond Market Analysis

Figure 11- Barclays Aggregate Index, Treasury Bills, Treasury Bonds Performance 1998-2011



Source: Own processing, Data available at:http://www.callan.com/research/papers/, http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/histret.html

Figure 2 is aiming to show the performance of Treasury Bills, Treasury Bonds and Barclays Aggregate Bond Index. The Treasury bill rate is a 3-month rate and the Treasury bond is the constant maturity 10-year bond, but the Treasury bond return includes coupon and price appreciation. The returns are based on information obtained from the Federal Reserve database in St. Louis (FRED). The third component described above is the Barclays Aggregate Bond index, a broad market benchmark bond index. As the figure indicates Barclays Aggregate Bond index is fairly correlated with the 10-year treasury bonds. The Treasury Bills have performed worse than the Treasury Bonds as well as the Barclay's aggregate; this scenario is quite expectable because of their shortest maturity. The Barclays Aggregate Bond Index earned approximately 1128 USD over the 13 year period in comparison with 1143 USD from Treasury Bonds and only 435 USD from Treasury Bills. The Barclays Aggregate Bond Index stays at the second place in terms of appreciation of invested funds.

The Table 1 below shows few statistical metrics. Compound annual growth rate confirms the findings observed from visual perspective; hence Treasury Bonds grew the most among the other two instruments in average. Standard deviation measures the volatility and riskiness of the instrument. Treasury bonds recorded the highest standard deviation, which mean that Treasury Bonds are also the riskiest instruments among the other fixed income assets. We can raise a question here: Is the small premium in returns a good trade off for the much more risky instrument? This dilemma is resulted by the Sharpe ratio which shows that the Barclays Aggregate Bond Index is however not so profitable, but on the other hand much safer than the Treasury Bonds. The Barclay's Aggregate Bond Index also recorded more positive years of returns than Treasury Bonds. Barclay's aggregate index would be the best choice for the investor during the 13 years period.

Table 4- Risk Premium, Returns of Barclays Aggregate Bond index, Treasury Bills, Treasury Bonds

	Brcl Agg.	T-Bills	T-Bonds
CAGR	6,09%	2,62%	6,5632%
Standard deviation	3,069545	1,969446	9,005551
Sharpe Ratio	0,75817	0,507757	0,27846
Risk Premium	3,47%	0,00%	3,9460%
%Returns >0	92,86%	100,00%	85,71%

Source: Own processing, Data available at:http://www.callan.com/research/papers/, http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/histret.html

The Table 2 analyzes the mutual correlation between the three instruments. As the chart well estimates the Treasury Bonds are highly correlated with the Barclays Aggregate Bond index. Treasury Bills are almost none correlated with the other two fixed income instruments.

Table 5- Correlation of Barclays Aggregate Bond Index, Treasury Bills and Treasury Bonds

	Brcl Agg.	T.Bills	T.Bonds
Brcl Agg.	1	7,56%	66,53%
T.Bills		1	8,81%
T.Bonds			1

Source: Own processing, Data available at: http://www.callan.com/research/papers/, http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/histret.html

4.2 The Commodity Market

4.2.1 Rogers International Commodity Index[47]

The Rogers international Commodity Index, an acronym RICI is the U.S. dollar based, composite total return index designed by a commodity trader James B. Rogers Jr. in the late 1990s. RICI is formed as broad based international vehicle, representing variety of commodities consumed in the global economy ranging from agricultural to energy and metal products. RICI consists of 38 different exchange-traded physical commodities tracked via future contracts, quoted in five different currencies, listed on twelve exchanges in five countries. If a commodity contract trades on more than one exchange, then generally the most liquid, in terms of volume and open interest combined, is selected for inclusion in the index.

The Rogers International Commodity Indices are maintained and reviewed by the members of the RICI Committee. Mr. J. B. Rogers as the founder of the RICI chairs the Committee and is the final arbiter of its decisions. The RICI Committee consists of eight members. They usually meet once per year, during the month of December. They might assemble an additional meeting on any other day of the year to deal with exceptional circumstances, though.

RICI Committee recognizes 12 international exchanges:

1. Chicago Mercantile Exchange (USA)
2. Chicago Board of Trade (USA)
3. ICE Futures US (USA)
4. NYMEX (USA)
5. ICE Futures Canada (Canada)
6. ICE Futures Europe (UK)
7. London Metal Exchange (UK)
8. COMEX (USA)
9. The Tokyo Commodity Exchange (Japan)
10. Tokyo Grain Exchange (Japan)

[47] Rogers International Commodity Index, 2012: *The RICI Handbook*, [online]. [cit. 2012-03-29]. Available at: http://beelandinterests.com/PDF/RICI%20Hndbk_Final_01.24.12.pdf

11. NYSE Liffe (EU - Paris market)

12. Kansas City Board of Trade (USA)

Table 6- Rogers international Commodity Index composition

Contract	Exchange	Currency	Initial Weight
Crude Oil	NYMEX	USD	21.00%
Brent	ICE1EU	USD	14.00%
Wheat	CBOT	USD	4.75%
Corn	CBOT	USD	4.75%
Cotton	ICE US	USD	4.20%
Aluminum	LME2	USD	4.00%
Copper	LME	USD	4.00%
Soybeans	CBOT	USD	3.35%
Gold	COMEX	USD	3.00%
Natural Gas	NYMEX	USD	3.00%
RBOB Gasoline	NYMEX	USD	3.00%
Soybean Oil	CBOT	USD	2.00%
Coffee	ICE US	USD	2.00%
Lead	LME	USD	2.00%
Live Cattle	CME	USD	2.00%
Silver	COMEX	USD	2.00%
Sugar	ICE US	USD	2.00%
Zinc	LME	USD	2.00%
Heating Oil	NYMEX	USD	1.80%
Platinum	NYMEX	USD	1.80%
Gas Oil	ICE EU	USD	1.20%
Cocoa	ICE US	USD	1.00%
Lean Hogs	CME	USD	1.00%
Lumber	CME	USD	1.00%
Milling Wheat	NYSE Liffe	EUR	1.00%
Nickel	LME	USD	1.00%
Rubber	TOCOM	JPY	1.00%
Tin	LME	USD	1.00%
Wheat	KCBT	USD	1.00%
Rice	CBOT	USD	0.75%
Canola	ICE CA	CAD	0.75%
Soybean Meal	CBOT	USD	0.75%
Orange Juice	ICE US	USD	0.60%
Oats	CBOT	USD	0.50%
Palladium	NYMEX	USD	0.30%
Rapeseed	NYSE Liffe	EUR	0.25%
Azuki Beans	TGE	JPY	0.15%
Milk Class III	CME	USD	0.10%

Source: Avaliable at: http://www.rogersrawmaterials.com

The RICI Committee members are actively monitoring the commodities and thoroughly analyzing them throughout the year. To obtain the most accurate picture of

international commodities consumption, a wide range of sources on commodities demand and supply is consulted.

The findings of this complex research undertaking are then condensed into the different commodities contracts weights of the RICI. The RICI Committee screens the international exchanges to find out if the specific commodity contract is investable. If a specific commodity futures contract is traded on more than one exchange, usually the most liquid contract globally, in terms of volume and open interest combined, is then aimed to be selected for inclusion in the index. Besides liquidity, the RICI Committee is dedicated search for the highest quality grade contract of a specific commodity.

Further the RICI can be divided into sub-indices:

The Rogers International Commodity Index® - Agriculture (RICI- A) is a composite total return index and is a sub-index of the Rogers International Commodity Index. The RICI Agriculture index represents the value of a basket of 22 agricultural futures contracts for commodities consumed in the global economy. The RICI Agriculture is based in the U.S. dollars, while the non U.S. dollars components are not hedged when calculating the Index in the U.S. Dollars. The RICI Committee is picking the individual components on the basis of liquidity and weighting in their respective underlying worldwide consumption.

If a commodity contract is traded on more than one exchange, then usually the most liquid, in terms of volume and open interest combined, is selected for inclusion in the index.

The Rogers International Commodity Index® - Energy (RICI - E) is a composite total return index and is a sub-index of the Rogers International Commodity Index. The RICI Energy index represents the value of a basket of six energy commodities consumed in the global economy.

The RICI Energy index is based in the U.S. Dollars. The non-USD components of the Index are not hedged when calculating the Index in USD.

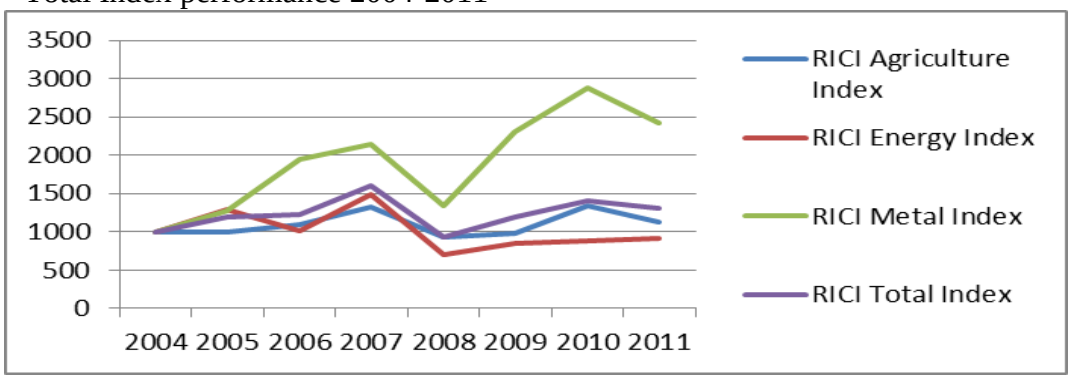
The RICI Energy index includes six commodity futures contracts. Individual commodity futures are assigned to the index on the basis of liquidity and weighting in their respective underlying worldwide consumption. These commodities are Brent, Crude Oil, Gas Oil, Heating Oil, Natural Gas, RBOB Gasoline.

The Rogers International Commodity Index® - Metals (RICI - M) is a composite total return index and is a sub-index of the Rogers International Commodity Index. The RICI Metal index represents the value of a basket of ten metals commodities consumed in the global economy.

The RICI Metal index is based in U.S. Dollars. The non-USD components of the Index are not hedged when calculating the Index in USD. The RICI Metal index is based on 10 commodity futures contracts. Individual components qualify for inclusion to the index as well as other 2 sub- indices on the basis of liquidity and weighting in their respective underlying worldwide consumption as well as legal and trading constraints. These Commodities are Aluminum, Copper, Gold, Lead, Nickel, Palladium, Platinum, Silver, Tin, and Zinc.

4.2.2 The Commodity Market Analysis

Figure 12 –RICI Agriculture Index, RICI Energy Index, RICI Metal Index, RICI Total Index performance 2004-2011



Source: Own procession, Data available at: http://www.rogersrawmaterials.com

The Figure 3 compares three sectors of the commodity market and the total commodity market with each other. I have chosen the Rogers commodity index as the underlying instrument and respective Rogers International Commodity Index's sub-indices. The three sub-indices are focused on the most important sectors of commodity market. These sectors are Agriculture sector, Energy sector and Metal sector. The most profitable was the Metal sector, which earned its investors approximately 1418 USD over the 7 years period. The Metal index seems to be very much correlated with the Total index from the visual site. The least profitable index over the 7 years period was surprisingly the

Energy index, which recorded even negative return for his investors nevertheless that the gasoline prices skyrocketed.

The table 4 below confirms the findings reached by observing the chart mentioned earlier. The most profitable Index was indeed Metal index and the least profitable was the Energy index, exactly as the chart shows. The Energy Index was not only the least profitable, but also the most volatile with the highest standard deviation among others. Sharpe ratio clearly confirms that the Metal index would have been the best choice to invest.

Table 7- Risk Premium, Returns of RICI Agriculture Index, RICI Energy Index, RICI Metal Index, RICI Total Index

	Agriculture	Energy	Metal	Total
CAGR	1,57%	-1,08%	11,67%	3,47%
Standard deviation	22,4583891	38,58221	35,24032	27,84995
Sharpe Ratio	0,02679155	-0,01066	0,126532	0,047569
Risk Premium	-0,01042455	-0,03694	0,09053	0,008501
%Returns >0	57,14%	71,43%	71,43%	71,43%

Source: Own processing, Data available at: http://www.rogersrawmaterials.com

The Table analyzes the mutual correlation between the sub-indices and the Total index. The Total index is highly correlated with each of the sub-indices and the most with the Energy index. The agriculture index is highly correlated with each of the indices. Energy index is the least correlated with the Metal index, which confirms the good return results of the Metal index and not so good return of the Energy index. High correlation tells us that these instruments could not be used to diversify the risk in combined portfolio.

Table 8- Correlation of RICI Agriculture Index, RICI Energy Index, RICI Metal Index, RICI Total Index

	Agriculture	Energy	Metal	Total
Agriculture	1	54,32%	59,00%	80,44%
Energy		1	41,21%	89,66%
Metal			1	71,80%
Total				1

Source: Own processing, Data available at: http://www.rogersrawmaterials.com

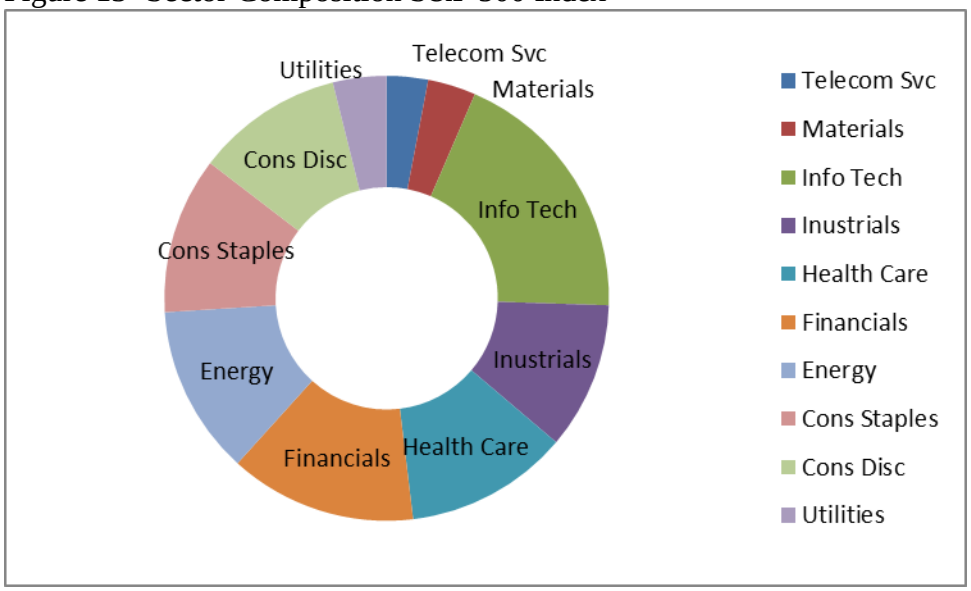
4.3 The Stock Market

4.3.1 Standard and Poor's 500 Index[48]

Standard and Poor's 500 index - (S&P 500) The index was published the first time in 1957. Over 4.8 trillion USD is benchmarked to the S&P 500. This index is honored as the best single gauge of the U.S. equities market; this world-renowned index includes 500 leading companies in important industries of the U.S. economy. Although, the S&P 500 is composed mostly by large cap stock companies, with approximately 75% coverage of the U.S. equities, it is as well ideal proxy for the total U.S. market. The S&P 500 index is maintained and reviewed by the S&P Index Committee, a team of Standard & Poor's analysts and economists, who meet on regular basis. The S&P Committee screens the risk and return characteristics of the broader large cap universe on regular basis and to ensure that S&P 500 Index remains the leading indicator of U.S. equity market. The S&P Committee also monitors liquidity to ensure efficient portfolio trading. All companies included into the Index are U.S. companies, while the determining factors include location of the company's assets and revenues, corporate structure and SEC filling type. Companies added to the index have to have a market capitalization of at least of 4 USD billion. This condition is reviewed by the S&P Committee from time to time to ensure consistency with the market conditions. In terms of public floatation, there must be the public float of at least 50%. Companies included in the index should have at least 4 consecutive quarters of positive (as reported) earnings. The ratio of annual dollar value traded to float adjusted market capitalization for the company should be 1.0 or higher. Very low stock prices can affect a stocks' liquidity. Companies included into the S&P 500 Index contribute to the sector balance that is in balance with sector composition. Common stocks eligible for inclusion consist of companies listed on the NYSE, NASDAQ stock market, REITs(excluding mortgage REITs) and business development companies are also eligible for the inclusion. Companies could be removed from the Index if they violate one or more of the inclusion criteria and if they are subject of merger or acquisition or significant restructuring such they no longer meet the inclusion criteria.

[48] S&P INDICES, 2012: *S&P 500 Index*, [online]. [cit. 2012-03-29]. Available at: http://www.standardandpoors.com/indices/sp-500/en/eu/?indexId=spusa-500-usduf--p-us-l--

Figure 13- Sector Composition S&P 500 Index



Source : Own processing, Data available at: www.spindices.com

4.3.2 Russell 2000 Index

Russell 2000 index is a market-value-weighted index that measures the performance of small capitalization U.S. stocks, traded on three exchanges NYSE, AMEX and NASDAQ. The Russell 2000 Index is constructed to provide a comprehensive and unbiased small-cap barometer and is completely reconstituted annually to ensure larger stocks do not distort the performance and characteristics of the true small-cap opportunity set.[49]

[49] Russell Investments, 2012: *Russell 2000 Index*, [online].
[cit. 2012-03-29]. Available at: http://www.russell.com/indexes/data/fact_sheets/us/russell_2000_index.asp

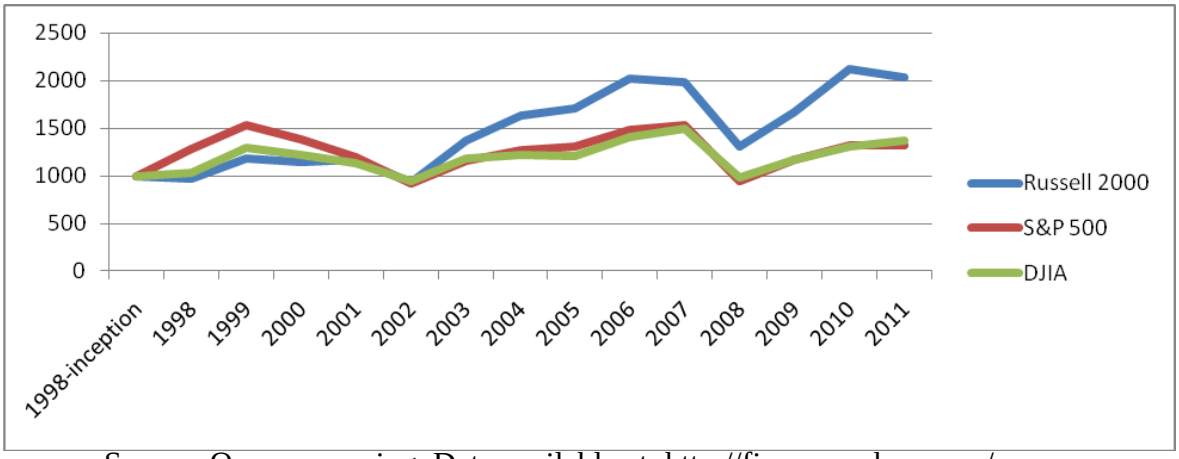
4.3.3 Dow Jones Industrial Average Index[50]

Dow Jones Industrial Average index acronym DJIA was founded in 1896 by Charles Dow. Thirty big publicly traded large cap companies based in the United States form the DJIA. The Dow Jones index is, among others benchmark indices, one of the most closely watched index in the U.S.

The 30 stocks forming the Dow Jones Industrial Average are all major corporations in their industries, and their stocks are widely held by individuals and institutional investors. As of December 31, 2008, The DJIA represented 27% of the float-adjusted market capitalization of the Dow Jones U.S. TSM Index, which provides near complete coverage of the U.S. stock market.

4.3.4 The Stock Market Analysis

Figure 14- Russell 2000 Index, S&P 500 Index, Dow Jones Industrial Average Index Performance 1998-2011



Source: Own processing, Data available at: http://finance.yahoo.com/, http://www.callan.com/research/papers/

Indices chosen for the analyze are Standard and Poor's 500 Index which is considered as the top benchmark index for the U.S. equities, Russell 2000 which is constructed to provide a comprehensive and unbiased small-cap barometer and the DJIA is

[50] Dow Jones Indexes, 2012: *Dow Jones Industrial Average Index*, , [online]. [cit. 2012-03-29]. Available at: http://www.djaverages.com/?go=industrial-overview

a benchmark index composed of thirty large cap publicly traded companies. The chart indicates that the small cap index clearly outperformed the other two indices. Small cap companies are in comparison to large cap companies riskier but carry bigger potential return- this statement was confirmed during the 13-year period. All the indices seem to be highly correlated, while the DJIA and S&P 500 records almost identical movements.

The Table 6 confirms the visual observations. The Russell 2000 clearly outperformed the other 2 indices with compound annual growth rate of approximately 5%. Russell 2000 recorded the second highest standard deviation after the S&P 500 Index. Sharpe ratio also confirmed that Russell 2000 index was the best choice for the investor in the 13 years period.

Table 9- Risk Premium, Returns of S&P 500 index, Dow Jones Industrial Average Index and Russell 2000 Index

	S&P 500	DJIA	Russell 2000
CAGR	1,97%	2,30%	5,18%
Standard deviation	20,87290853	17,1047978	20,58862299
Sharpe Ratio	0,036027454	0,05143399	0,09618608
Risk Premium	-0,65%	-0,31%	2,57%
%Returns >0	57,14%	64,29%	57,14%

Source: Own processing, Data available at: http://finance.yahoo.com/, http://www.callan.com/research/papers/

The Table 7 shows the mutual correlation of three equity indices; all these indices are highly correlated which means they move much like each other. This observation provides us with the conclusion that adding one index to mutual portfolio of these three indices would not have any diversification effect.

Table 10- Correlation of S&P 500, Dow Jones Industrial Average and Russell 2000 index

	S&P 500	DJIA	Russell 2000
S&P 500	1	90,89%	82,09%
DJIA		1	89,61%
Russell 2000			1

Source: Own processing, Data available at: http://finance.yahoo.com/, http://www.callan.com/research/papers/

Conclusion

This thesis provides a complex outlook on the three asset classes and its mutual relations. I have compared the asset classes during the medium-term period. I have analyzed theoretical relations as well as empirical. This paper clearly shows the difference between investing in Commodity Futures, Stocks and Bonds. During the sample period the Commodity Futures appeared as the most profitable asset class, based on the calculations taken. Surprisingly, The Stock Market gained the least returns over the sample period. The Commodity Futures earned 7% risk premium over the risk free investment. As the risk free investment was chosen the 3-month U.S. Treasury bills with 1,96% CAGR during the sample period. The Commodity Futures exceeded the risk premium of Bonds and also of Stocks. The positive risk premium to a long position in Commodity futures is consistent with the theory of normal backwardation. Backwardation is the market condition where the price of a futures contract is trading below the expected spot price at contract maturity. The Commodity Futures earned the highest risk premium, and also the highest CAGR, but on the other hand Commodity Futures were also the most volatile over the sample period. The volatility of Commodity Futures was calculated through the calculation of standard deviation. The Commodity Futures earned the highest standard deviation. The Bonds have earned 6% CAGR and the least standard deviation from the three asset classes at a time. The Bonds also earned the highest Sharpe ratio, which means that Bonds earned the highest risk-adjusted performance over the sample period. This analysis lead us to a surprising conclusion that Bonds stand out in comparison with other asset classes with the most return on investment in respect to the additional risk taken. Later, I examined mutual correlation of all three asset classes. The Bond market was negatively correlated with both other asset classes, but the negative correlation was not very significant. The Stocks were positively correlated with the Commodity futures. This figure means that neither Commodity futures nor Stocks are not an effective instrument in diversifying combined portfolio of these assets; however I must say that the positive correlation is on the frontier level of significance.

Next, I examined the correlation of all three asset classes with inflation. According to my calculations, all asset classes are negatively correlated with inflation, while stocks and bonds were relatively highly negatively correlated to inflation in comparison with Bonds. Negative correlation means, that when inflation raises then profits falls and vice versa in case of positive correlation. Bonds are relatively independent in terms of inflation

effects, because bond payments are fixed at retirement. However, bond payments do not receive any cost of living increases, which are really an inflation offset. Inflation that rises after the purchase of a bond means an immediate loss of market value of the Bond. Hence the U.S. Treasury has issued an inflation offset, called Treasury Inflation Protected Securities (TIPS). All asset classes are relatively volatile to inflation. Commodity futures represent a bet on commodity prices, which are directly linked to components of inflation. I have come up with very interesting and unusual findings, where Bonds stand out as the best option for investor during the sample period and equities are the worst. I tried to search for the cause of these unusual results. I came up with an opinion that the unusual and very different results from the normal period are caused by the prevailing part of business cycle. I have done the literature search and found out that the Kondratieff long wave that appeared in the year 1949 and last until present. The Kondratieff waves are created by four seasons of development, very alike the natural seasons of the year: spring, summer, fall and winter. The prevailing season is the winter. Winter Season is characterized by the corporate inefficiency and is producing more debt and lower corporate profits as well weaker market gains.

According to the National Bureau of Economic Research (NBER) database we can clearly distinguish two cycle peaks and troughs during the sample period. The first peak followed after 120 months from last trough in March 1991 and this was the longest uninterrupted economic rally in 20th century. The economy peaked in March 2001 followed by the very soon trough just eight months from the peak, in November 2001. The NBER identifies yet a second peak in the 21th century. The economy peaked in December 2007, after six years of rally.

The part "Bond market analysis" is focused on the performance of the Treasury Bills, Treasury Bonds and Barclay's Aggregate Bond Index. The Treasury Bonds grew on average the most compared to the other two instruments in average. The Treasury bonds also recorded the highest standard deviation, which means that the Treasury Bonds are as well the riskiest instrument among the other fixed income Instruments. The Barclays Aggregate Bond Index is however not as much profitable, but on the other hand is much safer than the Treasury Bonds. Barclay's Aggregate Index would be the best choice for the investor during the sample period. The Treasury Bonds are highly correlated with the Barclays Aggregate Bond index. Treasury Bills are almost non-correlated with the other two fixed income instruments.

The part “Commodity Market” was focused on comparison of the three commodity sub-indices: Agriculture, Energy, Metal and the Total Index. The most profitable Index was the Metal index and the least profitable was the Energy index. Energy index was also the most volatile with the highest standard deviation among others. Sharpe ratio clearly confirms that the Metal index would have been the best choice to invest. Energy index is the least correlated with the Metal index, which confirms the good return results of the Metal index and not so good return of the Energy index.

The part Stock market analysis was focused on complex analysis of the Stock market. Indices chosen for the analysis were Standard and Poor’s 500 Index which is considered the top benchmark index for the U.S. equities, Russell 2000 which is constructed to provide a comprehensive and unbiased small-cap barometer and the DJIA a benchmark index composed of thirty large cap publicly traded companies. The Russell 2000 clearly outperformed the other two indices. Standard and Poor’s 500 Index was the most volatile index with the highest standard deviation over the sample period. The Sharp ratio confirmed that the Russell 2000 index was the best option for the investors during the sample period.

Resumé

Cieľom mojej záverečnej práce bolo teoretické vymedzenie komoditného trhu, akciového trhu, dlhopisového trhu a skúmanie ich vzájomných vzťahov. Prácu som rozdelil do 4 kapitol, obsahuje 14 grafov, 10 tabuliek.

Prvá kapitola je venovaná teoretickému vymedzeniu jednotlivých finančných aktív. Prvá podkapitola je zameraná na akciový trh. Túto podkapitolu som rozdelil na 2 časti. Hlavný dôraz som prikladal kmeňovým akciám, kde ich definujem a ďalej rozdeľujem. Definoval som dividendu podľa typov, ďalej som rozdelil kmeňové akcie podľa veľkosti a typu. Druhá časť je venovaná prioritným akciám. Druhá podkapitola je venovaná dlhopisom. Dlhopisy som rozdelil podľa typov na korporátne dlhopisy, štátne dlhopisy, cenné papiere kryté hypotékami a medzinárodné dlhopisy. Všetky typy som definoval individuálne a ďalej rozdelil podľa danej štruktúry. Tretia podkapitola je venovaná komoditnému trhu. V tejto časti definujem komoditný trh a rozdeľujem ho do patričných podkategórii. Komoditný trh som rozdelil podľa sektorov na poľnohospodársky komoditný trh, komoditný trh kovov a energetický komoditný trh.

Druhá kapitola je cieľ a metodika práce. Hlavným cieľom mojej práce bolo skúmať spoločné ako aj rozdielne znaky vybraných druhov finančných aktív. V diplomovej práci som sa zameral na 13 - ročné obdobie od roku 1998 do roku 2011. Počas tohto obdobia som najskôr analyzoval spoločne, dané druhy finančný aktív a následne som analyzoval jednotlivé druhy aktív individuálne. Hlavnou inšpiráciou pri tvorbe tejto práce mi bola publikácia napísaná Gary Gordon a K.G. Rouwenhorst, nazývaná "Facts and Fantasies about Commodity Futures".

Tretia kapitola je zameraná na skúmanie vzájomných vzťahov medzi vybranými druhmi finančných aktív. Táto práca ukazuje zjavný rozdiel medzi investovaním do komodít, akcíi a dlhopisov. Počas môjho skúmaného obdobia sa komodity javili ako aktívum, ktoré prináša najväčšie výnosy. Prekvapujúco akcie získali najnižšie zhodnotenie pre investora. Komodity získali skoro 10 - percentnú mieru rastu hodnoty prostriedkov do nich vložených. Investor investujúci do komodít získal 7 - percentný bonus oproti bezrizikovému aktívu. Ako bezrizikové aktívum som si zvolil 3 - mesačné americké štátne pokladničné poukážky. Investor investujúci do dlhopisov získal takmer 8 - percentné ročné zhodnotenie vložených prostriedkov. Komodity boli síce najviac ziskové aktívum, ale na druhej strane aj najrizikovejšie. Preto sa nestačí pozerať len na zhodnotenie prostriedkov, ale aj na dodatočné riziko ktoré dané zhodnotenie v sebe nesie. Z toho dôvodu som počítal

aj štandardnú odchýlku, ktorá je merítkom rizikovosti a merala volatilitu skúmaných aktív. Sharpe ratio mi pomohlo zistiť, ktorý druh aktív je najvýhodnejší pre investora, a to nielen zo strany výnosov, ale aj pri akceptovaní dodatočného rizika. Ako najvhodnejšie aktívum mi prekvapujúco vyšli dlhopisy a najmenej výhodné aktívum akcie. Počas štandardných podmienok by mal byť výsledok opačný. Moje zistenie tak isto nekorešpondovalo ani so zisteniami Gary Gordon a K.G. Rouwenhorst v ich publikácii "Facts and Fantasies about Commodity Futures". Preto som sa snažil hľadať dôvody tohto úkazu a netradičného zistenia. Ako možný dôvod nezvyčajných údajov som identifikoval Kondratieffov cyklus. Kondratieffov cyklus je tvorený 4 obdobiami: jar, leto, jeseň zima. Jar a jeseň sú obdobia efektívnosti a rastu a leto a zima sú obdobiami neefektívnosti a nižších trhových výnosov. Moje skúmané obdobie sa nachádzalo celé v zimnom období, preto sa zrejme správali dané finančné aktíva inak ako za bežných podmienok.

V poslednej kapitole som rozoberal jednotlivé finančné aktíva individuálne a trhy s nimi súvisiace. Dlhopisový trh bol charakterizovaný silnou koreláciou skúmaných druhov aktív. Porovnával som dva typy štátnych dlhopisov a Barclay‘s Agregate Bond Index .Ako najlepšia voľba pre investora vyšiel Barclays Agregate Bond Index. V časti o akciovom trhu som analyzoval výnosy Standard and Poor's 500 Index, Russell 2000 a Dow Jones Industrial Average index. Ako najlepšia voľba pre investora bol Russell 2000 index, čo je index zameraný na malé americké spoločnosti. V poslednej časti som analyzoval komoditný trh, kde som sa zameral na analýzu celkového RICI Total Commodity index s jednotlivými sektormi. Najziskovejší sektor počas skúmaného obdobia sa ukázal sektor kovov.

References

FAERBER, E. 2008: *All About Stocks Third Edition.* New York: McGRAW-HILL, 2008. 310 p. ISBN: 978-0-07-149455-7

THAU, A. 2011: *The Bond Book.* New York: McGRAW-HILL, 2011. 429 p. ISBN: 978-0-07-171309-2

FAERBER, E. 2000: *All About Bonds And Mutual Funds.* New York: McGRAW-HILL, 342 p. ISBN: 978-0-07-154427-6

GEMAN, H. 2005: *Commodities and commodity derivatives.* Hoboken: Wiley Publishing, Inc., 396 p. ISBN: 0-470-01218-8

ALEXANDER, M. 2002: *The Kondratiev Cycle: A generational interpretation,* iUniverse inc. , 290 p. ISBN: 0595217117

BOUCHENTOUF, A. 2007: *Commodities For Dummies.* Hoboken: Wiley Publishing, Inc., 360 p. ISBN: 978-0-470-04928-0

GORTON, G., ROUWENHORST, K.G., 2005: *Facts And Fantasies About Commodity Futures,* Yale School of Management, Yale University, Yale ICF Working Paper No. 04-20, 40 p.

MOORE, B. D., 2011: *The Liberated Stock Trader*, Worden Brother inc. 2011, 248 p. ISBN 9781460956021

SHARPE, F.W., 1999: *Investments,* Prentice Hall inc. 1999, 992 p. ISBN 0130101303

BARKER, D.K. 2009: *JUBILEE on Wall Street* .Long Wave dynamics 2009, 390 p. ISBN: 978 0982 5283 10

WALL, P.Q. 2007: *Dealing with the human motives, economics needs, symbolic, analogical thinking,* [online]. [cit. 2012-03-29]. Available at: http://www.pqwall.com/wp-content/uploads/2010/04/cyclewebsummary1.pdf

BARKER, D.K. 2011: *Schumpeter vs Wall and the Business cycle count in the long wave,* [online]. [cit. 2012-03-29]. Available at: http://www.safehaven.com/article/19815/schumpeter-vs-wall-and-the-business-cycle-count-in-the-long-wave

Allianz Global Investors, 2010 : *The sixth Kondratieff- long waves of prosperity,* [online]. [cit. 2012-03-29]. Available at: http://www.allianzglobalinvestors.de/cms-out/kapitalmarktanalyse/docs/pdf-eng/analysis-and-trends-kondratieff.pdf

U.S. Aggregate Bond Index Factsheet.[online]. [cit. 2012-03-29]. Available at: https://ecommerce.barcap.com/indices/index.dxml

Damodaran, A. 2012: *Annual Returns on Stock, T.Bonds and T.Bills: 1928 – Current,* [online]. [cit. 2012-03-29]. Available at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/histret.html

Rogers International Commodity Index, 2012: *The RICI Handbook,* [online]. [cit. 2012-03-29]. Available at: http://beelandinterests.com/PDF/RICI%20Hndbk_Final_01.24.12.pdf

S&P INDICES, 2012: *S&P 500 Index,* [online]. [cit. 2012-03-29]. Available at: http://www.standardandpoors.com/indices/sp-500/en/eu/?indexId=spusa-500-usduf--p-us-l--

Russell Investments, 2012: *Russell 2000 Index,* [online]. [cit. 2012-03-29]. Available at: http://www.russell.com/indexes/data/fact_sheets/us/russell_2000_index.asp

Dow Jones Indexes, 2012: *Dow Jones Industrial Average Index, ,* [online]. [cit. 2012-03-29]. Available at: http://www.djaverages.com/?go=industrial-overview

Yahoo Finance, 2012, [online]. [cit. 2012-03-29]. Available at: http://finance.yahoo.com/

CALLAN, 2011: *The Callan Periodic Table of Investment Returns,* [online]. [cit. 2012-03-29]. Available at: http://www.callan.com/research/papers/

Kondratieff wave, 2011 , [online]. [cit. 2012-03-29]. Available at: http://www.kondratieffwavecycle.com/kondratieff-wave/

LongWave Dynamics, LLC, 2012: *The Kondratieff "K" wave cycle,* [online]. [cit. 2012-03-29]. Available at: https://longwavedynamics.com/?page_id=35

LongWave Dynamics, LLC, 2012: *The Kondratieff K winter*, [online]. [cit. 2012-03-29]. Available at: https://longwavedynamics.com/?page_id=37

DAG, P. 2001: *The Peter Dag Portfolio Strategy and Management,* [online]. [cit. 2012-03-29]. Available at: http://www.peterdag.com/s_files/Qe8OmINy55BS.pdf

THE NATIONAL BUREAU OF ECONOMIC RESEARCH, 2012: *US Business Cycle Expansions and Contractions,* [online]. [cit. 2012-03-29]. Available at: http://www.nber.org/cycles/cyclesmain.html#navDiv=4

THE WORLD BANK,2012: *GDP growth,* [online]. [cit. 2012-03-29]. Available at: http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG

FRED, 2012: *Effective Federal Funds Rate,* [online]. [cit. 2012-03-29]. Available at: http://research.stlouisfed.org/fred2/series/FEDFUNDS

DEVCIC, J. 2011 : *Sugar: a sweet deal for Investors*, INVESTOPEDIA, [online]. [cit. 2012-03-29]. Available at: http://www.investopedia.com/articles/optioninvestor/investing-in-sugar.asp#axzz1lthyGtIw