THE RELEVANCE OF COMMODITIES IN THE INVESTMENT STRATEGIES OF A PORTFOLIO

ELIANA ANGELINI

"G. D'Annunzio" University of Pescara, Department of Economics.
E-mail: e.angelini@unich.it

Abstract- In recent years, investor interest in commodities has grown substantially. After the drop in price occurring between late 2008 and early 2009, there has been upward pressure due to several factors including increased demand from China, India and other emerging markets that require oil, steel and other commodities to support their manufacturing industries and infrastructure development. The ability to obtain interesting performance is perhaps the most obvious reason for the increased interest shown by investors, but it is not the only one. Commodities may also offer other significant advantages, including improved portfolio diversification and a hedge against inflation. Diversification and protection from inflationary phenomena are two fundamental objectives when creating a portfolio. In this respect, commodities have always been appreciated for their low correlation with traditional asset classes (typically, stocks and bonds) and their structural appreciation in periods of a generalised increase in prices. Thanks to these features, commodities continue to be an essential component when creating the portfolios of both institutional and retail investors. The results of this study confirm the importance of investing in commodities when choosing an investment portfolio. The investment in commodities is therefore an excellent solution for the use of one's capital and is thus increasingly popular among investors, especially in times of crisis and instability. Indeed, commodities have the advantage of preserving value long-term and, given that they react differently to changes in economic fundamentals, they are able to provide investors with significant earning potential and the benefits of a diversified portfolio. Consequently, incorporating commodity indices into investment portfolios can effectively reduce investment portfolio risk.
JEL classification: G11; G14; G15.

Keywords- Commodities; Gold Market; Portfolio Diversification; ETC; ETF; Derivatives.

I. INTRODUCTION

In recent years, investor interest in commodities has grown substantially. After the drop in price occurring between late 2008 and early 2009, there has been upward pressure due to several factors including increased demand from China, India and other emerging markets that require oil, steel and other commodities to support their manufacturing industries and infrastructure development. The ability to obtain interesting performance is perhaps the most obvious reason for the increased interest shown by investors, but it is not the only one. Commodities may also offer other significant advantages, including improved portfolio diversification and a hedge against inflation. Unlike stocks and bonds, which are financial assets, commodities are real assets, so they tend to react to changes in economic fundamentals in different ways. For example, they tend to benefit from rising inflation: as demand increases so the price of goods and services increases, and the same happens to the prices of the raw materials used to produce them.

Since normally the prices of raw materials increase in line with inflation, investment commodities can hedge portfolios against this inflation. Stocks and bonds tend to register a more positive performance when the inflation rate is stable or declining given that an increase of inflation will reduce the value of future payments from stocks and bonds because the same cash flow will buy a relatively smaller quantity of goods and services.

Diversification and protection of capital from inflationary phenomena are two fundamental objectives when creating a portfolio. In this respect, commodities have always been appreciated for their low correlation with traditional asset classes (typically, stocks and bonds) and their structural appreciation in periods of a generalised increase in prices. Thanks to these features, commodities continue to be an essential component when creating the portfolios of both institutional and retail investors. Academic theories support the hypothesis that commodities play a key role in the overall context of the interrelationships between markets. The major contribution of the analysis of these interrelationships is the indication of the importance of the relationship between commodities and the bond market. By establishing this relationship, which is the hub of the whole system, the commodities enter into a relationship with the currency market and the stock market. The analysis of each market is incomplete if it ignores the examination of the trends in the prices of commodities, because of their inflationary impact. In fact, the generally negative correlation between the trends of commodities and those of stocks and bonds, enables this sector to assume the role of a specific category of asset that can be used to effect a more efficient spread of the portfolio.

The primary purpose of this study is to examine the correlation between commodity markets, bond markets and stock markets, over a sufficiently significant period. Specifically, the empirical analysis

examines the correlations between markets in the period between January 2006 and the end of August 2014. The stock market chosen was the S&P500 Index, which tracks the performance of a stock basket from the top 500 US companies by market cap. For the bonds, I analysed the Dow Jones Corporate Bond Index, which reflects the US corporate bond market, while for the commodity market I considered the Dow Jones UBS Commodity Index, a broadly diversified US index that currently comprises 22 futures encompassing seven sectors. Data was processed by Bloomberg. This study also tests whether the addition of investments in commodities to a portfolio of stocks and bonds, improves the profile of the efficient frontier, and hence limits the portfolio risk during periods of stress.

II. THE BENEFITS OF COMMODITIES: THEORETICAL CONSIDERATIONS

Commodities are an asset class in their own right. An asset class comprises assets that show a similar risk-return profile with high internal correlation, and a risk-return profile that is heterogeneous to other asset classes, i.e. with a low external correlation. The "behaviour" of commodities has been addressed in the literature by an increasingly large group of scholars; in particular, Hamilton (1983); Hillier D., Draper P. and Faff R. (2006); Baur D.G. and Lucey B.M. (2010); Belousova J., Dorfleitner G. (2012); Yu-Ming W., Chia Fei L. and Yu-Hsien L. (2013) and Jothiprakash R. (2013). The main benefits of investing in commodities are obtained when they are considered for inclusion as part of a portfolio. Indeed, the literature regarding this area usually agrees that the addition of investments in commodities in a portfolio firstly enables you to improve the profile of the efficient frontier and, secondly, to limit the down side risk of the portfolio during periods of stress. This provides opportunities to diversify effectively a portfolio, due to the low correlation with traditional asset classes. Commodities, therefore, are included among the so-called alternative investments, i.e. investments that should have a value that is quite independent of the performance of stock markets, as well as representing a haven in periods of turbulence. When creating a portfolio, there are two fundamental aspects that must be taken into account: return and risk. A portfolio is considered optimal when it comprises assets that will maximize its performance and/or minimize risk. Correlation is the essential characteristic: choosing investments that have a low correlation reduces the volatility of a portfolio and therefore its level of risk. With the exception of precious metals (gold, silver, platinum and palladium, characterised by a high intrinsic value) for which material possession is technically possible despite the operational risks (think of storage costs), for the other classes of commodities, such as energy, agricultural and industrial metal, the problems of perishability and storage difficulties do not permit direct physical investment. The exposure to these assets can be obtained only by means of standardized derivatives (futures), that is a contract whereby two parties agree to exchange, at a future date, a certain quantity of a commodity at a predefined price. For these reasons, historically, dealing in commodities has been the exclusive prerogative of institutional investors, these being the only investors having access to international derivatives markets and able to manage positions in futures. In fact, this management requires high minimum lots and the maintenance of margins and rolling.

Until the advent of tools such as ETFs / ETCs therefore, retail investors had no access to the commodities market. Exchange traded funds (ETFs) are passive investment funds whose main objective is to replicate the performance of the benchmark index to which they refer, allowing investors immediate exposure to the goods market and providing clear awareness of the risk return profile of their investment and the securities portfolio to which they are exposed. Given that their price is updated in real time in accordance with the index tracked, investors may know at any time the value of their investment, thanks also to the daily publication of the official value of the ETF. Simplicity, transparency, flexibility, cost reduction and issuer risk are the key features of ETFs that are thus attractive to both institutional and retail investors. Moreover, the fact that the minimum trading lot is equal to one share enables investors to take a position on indices around the world even when investing small amounts. Furthermore, as they are financial instruments that do not expire they enable investors to vary an investment horizon that can range from very short-term to medium-term, as for investments for social security purposes, depending on their objectives. The policy of passive management of all ETFs and their listing on the stock exchange make it possible to avoid the costs typically associated with active management and those related to distribution, providing the interested parties access to markets and investment strategies that would otherwise be unavailable at such low management fees (Kothari A., Kudal P. (2012). A benefit of such funds is that by law their equity is the exclusive property of the holders of shares of the ETF; consequently, even in the event of insolvency of the companies involved in the management, administration and promotion of the fund, the assets of the ETF are not affected. Exchange Traded Commodities (ETCs) are financial instruments issued when backed by investment of a SPV or directly on the physical goods, in the latter case defined as physically-backed ETCs, or on commodity derivatives. Like the ETFs, they fall within the family of Exchange Traded Products, but unlike ETFs they are not funds and regard only commodities. The mechanism for the listing and trading of ETCs is the same as that of any other equity security, hence its

price is not published daily as for mutual funds, but varies throughout the course of a trading session. The investment in physical ETCs guarantees the end investor, both simply and rapidly, the same result as a direct investment in the goods without having to face the problems arising from actually holding them and with the advantage of avoiding the risks and costs related to their management. These instruments have none of the entry and exit fees associated with mutual funds; the only fees incurred are those charged by the trading bank, as for any other purchase or sale of a security. For this reason, they can be bought and sold intraday, or even within a few days, without the cost of the fees significantly affecting the actual yield of the operation. The first listing of an ETC dates back to March 2003 when the Australian Stock Exchange began the first trading of Gold Bullion Securities. Gold is a significant asset in the commodity market. Compared to most commodities and many stock indices, gold is significantly less volatile, has less abrupt price fluctuations and helps to manage risk more effectively. Several studies have examined the usefulness of gold as a hedge against inflation. In particular, in the long term and through the succession of cycles in the market, gold has consistently maintained its purchasing power during both inflationary and deflationary periods [Yang L., Hamori S. (2014); Reboredo J. C. (2013); Blose (2010)].

The factors that most affect developments in the gold market are:

- transactions carried out by central Banks, including the purchase and sale of bullion, and ETF/ETC and futures trading;
- the interest rates charged by banks: high interest rates increase the opportunity cost of investing in gold, while low interest rates enhance it;
- inflation: a variable that affects people's purchasing power and thus their views regarding their own consumption and savings; this has a strong impact on demand for gold. In fact, in times of economic recession, purchasing power is reduced, the economy slows and markets become fearful and jumpy. Consequently, the demand for gold decreases;
- tail risk or "risk exposure" is usually caused by a severe economic or financial crisis, which creates an unforeseen systemic shock that can lead quickly to panic in the markets, triggering a downward spiral that affects many categories of investments. Such situations lead investors to very liquid asset classes that are less exposed to these risks. In particular, gold bullion has shown resistance during these phases of turbulence;
- availability: the central Banks and the International Monetary Fund that hold large amounts of gold as an official reserve play a key role in availability, but the role of the mining companies is equally important as a drastic reduction of gold mining will significantly affect the quotes for gold.

III. METHODOLOGY OF ANALYSIS

Commodities play a key role in the overall context of the interrelationships between markets. The major contribution of the analysis of these interrelationships is the indication of the importance of the relationship between commodities and the bond market. By establishing this link, the commodities enter into a relationship with the currency market and the stock market. The analysis of each market is incomplete if it ignores the examination of the trends in the prices of commodities, because of their inflationary impact. In fact, the generally negative correlation between the trends of commodities and those of stocks and bonds, enables this sector to assume the role of a specific category of asset that can be used to effect a more efficient spread of the portfolio (in terms of effective diversification). The low correlation with other asset classes is demonstrated by the fact that an increase in the prices of commodities contributes to the growth of inflation with the result of an increase in interest rates and bond yields that produce an immediate bearish turn in bond prices, which in turn contribute to a decline in the stock market. On the contrary, in the early stages of economic contraction the commodity prices tend to fall, contributing to a decline in inflation that causes a bearish policy on interest rates, resulting in a fall in bond yields, with clear and immediate bullish implications on bond and stock prices.

The primary tool of analysis chosen was correlation, which is a statistical measure of how two variables affect each other. In fact, correlation expresses the relationship between two statistical variables so that for each value of the first variable there will be a certain regularity in the corresponding value of the second. This is not necessarily a relationship of cause and effect, but simply the tendency of one size to vary as a function of another. By using indices of correlation, it is possible to understand the degree of correlation that exists between two quantities. The indices have values between - 1 when the variables considered are inversely related and + 1, where there is absolute correlation, i.e. that is when a change in one variable corresponds to a rigidly dependent variation in the other. Obviously, a correlation index of zero indicates an absence of correlation. Two independent variables will definitely have a correlation index equal to 0; however, a value of 0 does not necessarily imply that the two variables are independent. The correlation coefficients are derived from the correlation indices while taking into account the magnitudes of the deviations from the mean. In particular, the correlation coefficient of Pearson-Bravais, denoted by the letter r, is calculated as the ratio of the covariance of the two variables and the

product of their standard deviations. Consequently, it is necessary to apply the following formula:

$$r = \frac{\mathrm{COV}_{XY}}{\sigma_X \sigma_Y}$$

By means of covariance, it is possible to find the intensity of the functional relationship that exists between the two phenomena observed. Hence, if the covariance has a positive value this means that as one variable varies, the other one will vary in the same direction; vice versa, if the covariance has a negative value then the variation of the first will coincide with a variation of the second in the opposite direction. The covariance can be calculated using the following formula:

$$\mathrm{cov}_{XY} = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{N-1}$$

in which:
$\sum$ XY is the sum of the products XY
$\sum$ X is the sum of the values of X
$\sum$ Y is the sum of the values of Y
N is the number of variables taken into account.

Standard deviation is an index of dispersion, namely an estimate of the variability of a random variable. In the financial field, it represents the degree of fluctuation of an investment, that is, the volatility of a market or a share. This indicator is calculated by applying the following formula:

$$\sigma = \sqrt{\frac{1}{(N-1)} \sum_{i=1}^{N} (x_i - \bar{x})^2}$$

where:
$\bar{x}$ expresses the average of the values of X.

Another analysis tool is the Sharpe Ratio index that indicates the performance in percentage terms for each unit of investment risk. Mathematically, it reflects the return of a portfolio of securities, net of the non-risk returns, i.e. the risk-free rate (normally understood as the rate of interest on government loans in the short term) in relation to risk, i.e. the standard deviation of the portfolio. If r_p is the portfolio return, σ_p its standard deviation or volatility and r_f denotes the risk-free rate, then the Sharpe index of the portfolio is equal to:

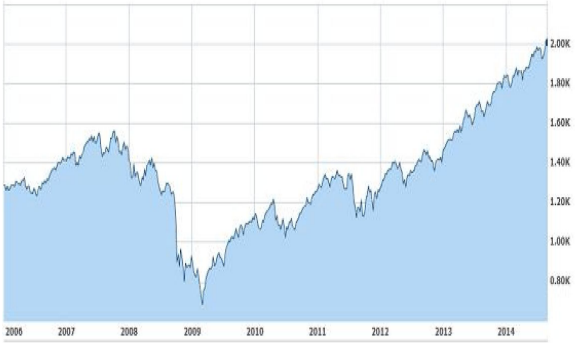
$$SR = \frac{r_P - r_f}{\sigma_P}$$

The index will be higher in proportion to the extent to which a higher return in a given period is obtained with less risk. In order to illustrate the benefits arising from the inclusion of commodities in the investment policies, a portfolio was created that initially comprised only stocks and bonds in equal proportions (50%). Commodities were then added to the same portfolio at a percentage of 33% and the proportion of stocks and bonds were each brought down to 33.5%.

The empirical analysis examines the correlation between the commodity market, the bond market and the stock market during the period between January 2006 and the end of August 2014. The stock market chosen was the S & P 500 Index, which tracks the performance of a stock basket from the 500 US companies with the highest capitalization. For the bonds, I analysed the Dow Jones Corporate Bond Index, which reflects the US corporate bond market, while for the commodity market I considered the Dow Jones UBS Commodity Index, a broadly diversified US index that currently comprises 22 futures encompassing seven sectors. Specifically:

- The S&P 500 index is widely regarded as the best indicator of the US stocks traded on Wall Street and underlies an incredibly wide range of derivative products such as futures, options and certificates. The shares of leading companies traded on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX) and NASDAQ are included in this basket. Although most of these stocks are related to American companies, the geographical criterion is not discriminating. There are currently 11 foreign companies included in the index. Originally, the weights of the index's components depended solely on the capitalization of the companies, but in 2005 the principle of free-float market capitalization was introduced (Fig.1).

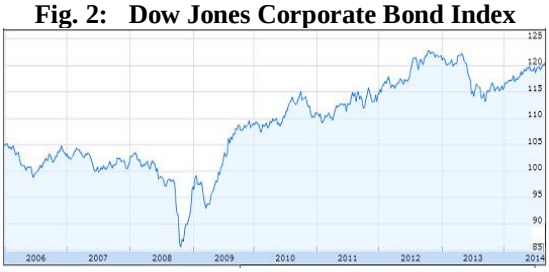
Fig.1: S&P 500 Index



Source: Own calculations on Bloomberg data

- The Dow Jones Corporate Bond Index reflects the US corporate bond market, on a total return basis. The index is designed to minimize the problems of liquidity and prices associated with most indices of corporate bonds. The basket includes 96 investment-grade corporate bonds. The bonds come from three sectors: utility, financial and industrial sectors: the utility sector includes gas, electric utilities and water companies; the financials include banks, insurance companies and financial services companies; lastly, the industrial sector encompasses companies in all other sectors. The index always contains 48 corporate bonds, 36 financial bonds and 12 utilities, for a total of 96 equally-weighted bonds. This means that each bond has the same effect on the price index (Fig.2).

Fig. 2: Dow Jones Corporate Bond Index



Source: Own calculations on Bloomberg data

- The Dow Jones UBS Commodity Index (DJ-UBSCI) was renamed on 1 July 2014 to the Bloomberg Commodity Index, BCOM. It is a broadly diversified index that allows investors to track commodity futures through a single, simple and transparent measure. The BCOM is composed of futures contracts on physical commodities and has been designed to minimize the concentration in a given product or sector. It currently comprises 22 commodity futures in seven sectors: energy, precious metals, industrial metals, livestock and agriculture. The index is designed to be a highly liquid and diversified benchmark for commodity investment. A disproportionate weighting of a particular commodity or sector may increase volatility and negate the concept of a broad-based commodity index. So, to ensure that no single commodity dominates the sector, the DJ-UBSCI is based on several diversification rules. These rules include: no related group of commodities, e.g. energy, precious metals, livestock or grains, may constitute more than 33% of the index; no single commodity may constitute less than 2% of the index. The diversification rules are applied every year when the DJ-UBSCI is re-weighted and rebalanced on a price-percentage. In addition, the weights for each commodity included in the BCOM are calculated in accordance with the rules, which ensure that the relative proportion of each of the underlying individual commodities reflects its global economic significance and market liquidity. Rebalancing is an important characteristic for an index of commodity futures because it helps to avoid over-concentration in any one commodity or group of products over time (Figure 3).

Fig. 3: DJ UBS Commodity Index



Source: Own calculations on Bloomberg data

3.2 Results

The main benefits of investing in commodities are obtained when these form part of a portfolio. The inclusion of investments in commodities in a financial portfolio improves the profile of the efficient frontier due to their low correlation with traditional asset classes. As the following table illustrates, the correlations between commodity indices and the stock and bond indices are very low (Table 1).

Table1: Correlations between commodities, stocks and bonds

Jan.2006-Aug.2014	*S&P 500*	*DJ Corporate Bond*	*DJ UBS Commodity*
S&P 500	*1*	*0.5069*	*-0.2264*
DJ Corporate Bond	*.5069*	*1*	*-0.2402.*
DJUBS Commodity	*-0.2264*	*-0.2402.*	*1*

Source: Own calculations on Bloomberg data

Table 1 shows the correlations between the markets analysed from January 2006 to August 2014. The correlation between the stock market, described by the S & P 500 Index, and the bond market, represented by the Dow Jones Corporate Bond Index is positive at 0.5069. The correlation coefficient between stocks represented by the S & P 500 and commodities indicated by the DJ UBS Commodity Index shows a negative result of -0.2264. The same trend is shown by the correlation between bonds and commodities, respectively represented by the Dow Jones Corporate Bond Index and by the S & P GCSI Commodity Index, which is -0.2402.

A simple division of the portfolio between stocks and bonds may be inefficient, especially during periods of stress, such as the crisis in the global market that occurred in 2011. A good interrelationship between the tools present in any portfolio is necessary to reduce significantly its volatility; you must consider not only the expected return for a given tool, but also its relationship to the others contained in the portfolio. The fact that a particular asset has a very low expected return of investment, as may occur in the commodity market, does not mean it should not be properly included in a diversified portfolio, because even though it may leave overall returns unaltered or diminished it may decrease the instability of the portfolio.

In order to illustrate the benefits of including commodities in investment policies, I created a portfolio consisting of stocks from the S & P 500 index and bonds from the Dow Jones Corporate Bond index in equal proportions of 50%. The Sharpe Ratio index was 0.7250 (I considered the 5-year US Treasury Yields with a risk free rate of 1.53%). I then added commodities, described in the Dow Jones UBS Commodity Index, to the same portfolio at a percentage of 33% and the proportion of stocks and

bonds were each brought down to 33.5%. The Sharpe index in the latter case is higher, at 0.7522 (Table 2).

Table 2: Impact of the commodities on a portfolio

Portfolio Jan. 2006-Aug. 2014	*Mean*	*Standard Deviation*	*Risk free*	*Sharpe ratio*
Portfolio without commodities	*18.02%*	*22.73%*	*1.53%*	*0.72509*
Portfolio with 33% commodities	*13.28%*	*15.62%*	*1.53%*	*0.7522*

Source: Own calculations on Bloomberg data

The Sharpe Ratio index, which enables you to know which assets have achieved the best return for the same risk incurred over a given period of time, increased from 0.72 to 0.75. This highlights the benefits that commodities offer in a portfolio, especially in times of crisis and instability.

In conclusion, results confirm the importance of investing in commodities when creating an investment portfolio. The investment in commodities is therefore an excellent solution for the use of one's capital and is thus increasingly popular among investors, especially in times of crisis and instability. Indeed, commodities have the advantage of preserving value long-term and, given that they react differently to changes in economic fundamentals, they are able to provide investors with significant earning potential and the benefits of a diversified portfolio. Consequently, incorporating commodity indices into investment portfolios can effectively reduce investment portfolio risk.

REFERENCES

[1] Baur, D. G. and Lucey, B. M. 2010. "Is Gold a Hedge or a Safe Haven?. An Analysis of Stocks, Bonds and Gold", *The Financial Review*, pp. 217-229.

[2] Belousova J., Dorfleitner G. 2012. "On the Diversification Benefits of Commodities from the Perspective of Euro Investors" in Journal of Banking and Finance, Vol. 36, pp. 2455-72.

[3] Bernd S. 2005. "Commodity as an asset class: Testing for mean variance Spanning under Arbitrary Constraints", Deutsche Bank, in An Investors' Guide to Commodities, pp. 35-42.

[4] Blose L. E. 2010. "Gold Prices, Cost of Carry, and Expected Inflation" in Journal of Economics and Business, Vol. 62, pp. 35-47.

[5] Ciner, C. Gurdgiev, C. and Lucey, B. M. 2010. "Hedges and Safe Havens – An Examination of Stocks, Bonds, Oil, Gold and the Dollar", *IIIS Discussion Paper*, University of North Carolina, University of Dublin and University of Dublin.

[6] Coudert, V. and Raymond, H. 2010. "Gold and Financial Assets: Are There any Safe Havens in Bear Markets?"‖ *CEPII research center, Working Papers*, Paris University and Paris University.

[7] Hamilton, J. D. 1983. "Oil and the Macroeconomy since World War II", *Journal of Political Economy*, pp. 228-248.

[8] Hillier, D., Draper, P. and Faff, R. 2006. "Do Precious Metals Shine? An Investment Perspective", *Financial Analysts Journal*, pp. 98-106.

[9] Hunjra, A. I., Azam M., Niazi G. S. K., Butt, B. Z., Rehman, K. U. and Azam, R.I. 2011. "Risk and Return Relationship in Stock Market and Commodity Prices: A Comprehensive Study of Pakistani Markets", *World Applied Sciences Journal*, 13 (3), pp. 470-481.

[10] Iyer-Ahrestani S. 2011. "Stockpiling Commodities" in Investment Advisor, Vol. 31, pp. 54-60. Investing, Hoboken, Wiley.

[11] Jothiprakash R. 2013. "Portfolio Diversification" in Asia Pacific Journal of Research in Business Management, Vol. 4.

[12] Kothari A., Kudal P. 2012. "Commodity ETF: An Alternative Investment Option" in Amity Management Review, Vol. 2, pp. 19-25.

[13] Marston R. 2011. "Real Assets-Commodities" in Portfolio Design: A Modern Approach to Asset Allocation, Hoboken, Wiley.

[14] Reboredo J. C. 2013. "Is Gold a Safe Haven or a Hedge for the US Dollar? Implications for Risk Management" in Journal of Banking and Finance, Vol. 37, pp. 2665-2676.

[15] Sumner, S., Johnson, R., Soenen, L. 2010. "Spillover Effects between Gold, Stocks, and Bonds", *Journal of CENTRUM Cathedra*, pp. 106-120.

[16] Wang, M. L., Wang, C. P. and Huang, T. Y. 2010. "Relationships among Oil Price, Gold Price, Exchange Rate and International Stock Markets", *International Research Journal of Finance and Economics*, pp. 82-91.

[17] Yang L., Hamori S. 2014. "Gold prices and exchange rates: a time-varying copula analysis" in Applied Financial Economics, Vol. 24, pp. 41-50.

★★★