“Mutual influence of exchange assets: analysis and estimation”

AUTHORS	Serhiy Kozmenko https://orcid.org/0000-0001-7710-4842 Oleksiy Plastun https://orcid.org/0000-0001-8208-7135

ARTICLE INFO	Serhiy Kozmenko and Oleksiy Plastun (2011). Mutual influence of exchange assets: analysis and estimation. *Banks and Bank Systems*, *6*(2)
RELEASED ON	Friday, 08 July 2011
JOURNAL	"Banks and Bank Systems"
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
0	0	0

© The author(s) 2024. This publication is an open access article.

Serhiy Kozmenko (Ukraine), Oleksiy Plastun (Ukraine)

Mutual influence of exchange assets: analysis and estimation

Abstract

This paper examines the dynamic of prices for different exchange assets in relation to the dynamics of other exchange instruments. The analysis shows that in certain periods there exists a strong connection between the exchange assets (direct or indirect) but it is rather unstable.

The understanding of such dependencies allows to predict the market price changes. The coefficient of correlation can act as a measure of convergence or divergence of two "equal" assets. For example, a strong positive correlation between the two exchange assets lead to conclusion that in the case of a big movement in one asset we can wait for equivalent changes in other exchange asset.

Keywords: exchange assets, correlation analysis, forecast, price dynamic analysis, prediction, market "focus".
JEL Classification: G10, G12.

Introduction

This paper examines the dynamic of prices for different exchange assets in relation to other exchange instruments. The analysis shows that in certain periods of time there exists a strong connection between exchange instruments (direct or indirect) but it is rather unstable. The knowledge of such dependencies makes it possible to predict the market price changes.

The paper is divided into 3 sections. The first one "Correlation analysis as an instrument of markets interaction" gives a description of general approaches to the problem. The exchange markets always interact with each other. It is important to evaluate this interaction to understand the forces which exist on exchange markets. The knowledge of trends and especially the strength of markets interaction give an important information for market analytics. We will use the correlation analysis as an instrument of evaluation. The size of correlation coefficient points not only to the type of connection (direct or indirect) but to its strength too.

The second section "Market focuses" reviews market "focuses", which exist on exchange markets in certain periods of time. As an example of exchange market we choose FOREX. As exchange assets we analyze currency pairs (majors – EUR/USD, USD/JPY and trade currencies – USD/CAD, AUD/USD). As potential "focuses" we use prices for oil, gold, the dynamic of Dow Jones index, US treasury's yield and interest rates in the USA. We calculate the correlation coefficients for each pair of exchange assets and market "focus" to make a quantitative estimation of the connections between different exchange assets and market instruments.

The third section "Market focuses and prediction" is devoted to practical aspects of the use of market "focuses". We offer the approaches of using the information about the market "focuses" to predict the price dynamics for linked assets.

© Serhiy Kozmenko, Oleksiy Plastun, 2011.

1. Correlation analysis as an instrument of markets interaction

Despite the fact that many books were written about the exchange prices forecasting, some unsolved problems still remain. In particular, the problem of markets variability and mutual influence of exchange assets. To confirm the hypothesis about the connections between different exchange assets, we will estimate their level and significance and offer the ways for the practical use of this information.

The prediction of exchange assets prices refers to two areas of scientific activity: technical analysis and fundamental analysis.

The key provisions of the technical analysis ignore any outside influence on the dynamics of exchange prices, assuming that the current value and price of an exchange asset has already taken into account all the factors. Since technical analysis is dealing only with "material" aspects (last prices) of the exchange asset, the impact of other factors is completely ignored or given to the fundamental analysis, which is "responsible" for economic, political, force-majeure and other factors.

However, we can highlight some fundamental factors which can be analyzed by the technical analysis, or at least can become one of the areas of technical analysis. For example, there were times when the dynamics of oil prices could easily and accurately be assessed by the dynamics of the Russian stock market: the price of oil went up, the RTS index increased and vice versa. A similar pattern is observed in other exchange markets, where the reference point (focus) of the market is not only oil but gold, treasury bonds yield, stock exchange indexes and more.

The database (quotes) on each of these potential market focus is available and, therefore, it is possible not only to analyze each of them separately, but evaluate the impact of one exchange instrument on another.

And it is possible to assess the impact not only post factum, but also in dynamics. The last thing is very important, because "focuses" are in constant movement. Today, the market can be focused on oil, in a year – on gold, 2 years later – on the stock market and so on. As a visual illustration of the proposed hypotheses, we will show the daily chart of oil and EUR/USD in 2008 (Figures 1 and 2) [3].

Fig. 1. The daily chart of EUR/USD quotes in 2008

Fig. 2. The daily chart of prices for oil in 2008

As we can see, the charts are almost identical, though the exchange instruments we analyzed are very different – currency pair and the commodity asset – oil.

However, the comparison of the same exchange instruments, in the year of 2005 gives a completely different picture (Figures 3 and 4) [3].

Fig. 3. The daily chart of EUR/USD quotes in 2005

Fig. 4. The daily chart of prices for oil in 2005

As we see, the focuses of the market are not constant and shift from time to time. As an analysis tool we will use the pair correlation analysis, because it is better and more objective than a simple comparison of two charts of instruments, and allows to appraise in figures this "focus" of the market, figuratively speaking – the force of market's concentration on something.

2. Market focuses

We will analyze the connections between the main exchange assets in the last 5 years, and their changes during this period. As a forecasting tool we choose FOREX (foreign exchange market). Its choice is due to the fact that today, by using the services of dealing centers you are free to trade different currency pairs. Also this type of exchange market has the biggest liquidity among the others.

From all the variety of currency pairs we have selected EUR/USD, USD/JPY, USD/CAD, AUD/USD – the world's main currency players plus basic commodity currencies because of the specificity of their dynamics.

As potential market "focuses" we have chosen gold, oil, Dow-Jones index (as a representative of stock market), interest rates in the USA and the U.S. Treasury bonds yield.

We begin with the analysis of the three "focuses" – oil, gold, stock market. The data for the analysis was taken from the archive of quotations of the trading platform MetaTrader 4, provided by MetaQuotes. Quotes from MetaQuotes fully meet the current quotes from the world's leading exchanges.

The analysis for the currency pair EUR/USD for the period of 2004-2008 is presented in Table 1.

Table 1. Analysis of the market focuses for the currency pair EUR/USD for the period of 2004-2008

Market focus	2004	2005	2006	2007	2008	Average for five years
Oil	0.24	-0.66	0.13	0.96	0.82	0.77
Gold	0.85	-0.63	0.74	0.94	0.27	0.83
Stock market (Dow Jones)	0.54	-0.13	0.65	0.57	0.11	0.71

On average, for five years the fluctuations in the pair EUR/USD positively correlated with oil, gold and Dow Jones. Though in this period the connections in for separate years were extremely unstable – from the total absence of connections to a very strong connection which from year to year were changing from the direct to reverse.

The results for the currency pair USD/JPY for the period of 2004-2008 is presented in Table 2.

Table 2. Analysis of the market focuses for the currency pair USD/JPY for the period of 2004-2008

Market focus	2004	2005	2006	2007	2008	Average for five years
Oil	0.05	0.62	-0.57	-0.75	-0.55	0.06
Gold	-0.83	0.83	-0.53	-0.8	-0.49	0.16
Stock market (Dow Jones)	-0.64	0.26	0.31	-0.05	0.32	0.45

The analysis of correlations for the currency pair USD/JPY showed that on average for 5 years this tool has not been linked to the dynamics of oil, gold or the Dow Jones index. But this is not the absence of connections as such, it is explained by the fact that every year they changed the direction and strength and as a result it led to the final "independence" of the currency pair.

The analysis for the currency pair USD/CAD for the period of 2004-2008 is presented in Table 3.

Table 3. Analysis of the market focuses for the currency pair USD/CAD for the period of 2004-2008

Market focus	2004	2005	2006	2007	2008	Average for five years
Oil	-0.61	-0.68	-0.44	-0.93	0.04	-0.91
Gold	-0.92	-0.86	-0.56	-0.8	-0.53	-0.9
Stock market (Dow Jones)	-0.23	-0.35	0.03	-0.8	0.1	-0.82

The analysis of connections and their directions for the currency pair USD/CAD and other exchange instruments selected by us showed that during the analyzed period there was a stable and strong negative correlation with gold. Dow Jones index, despite the considerable average (-0.82) during separate years, showed rather weak and unstable relationship with the dynamics of USD/CAD. Oil and USD/CAD on average for five years showed a very strong negative correlation, though in 2008 the connection between these instruments was absent.

The results for the currency pair AUD/USD for the period of 2004-2008 are presented in Table 4

Table 4. Analysis of the market focuses for the currency pair AUD/USD for the period of 2004-2008

Market focus	2004	2005	2006	2007	2008	Average for five years
Oil	-0,18	-0,37	-0,09	0,88	0,84	0,8
Gold	0,68	-0,56	0,6	0,77	0,39	0,84
Stock market (Dow Jones)	0,65	-0,11	0,65	0,78	0,15	0,78

On average, the currency pair AUD/USD is strongly connected with the selected exchange instruments (correlation coefficient is about 0,8). However, for each of the tools the picture was different. A strong positive correlation with oil is provided by the price dynamics in 2007-2008, though in other years the connection was negative, although it was not strong. A strong positive connection with gold was observed during most periods, except in 2005, when it was negative. Generally, it should be noted that 2005 was specific to AUD/USD in terms of correlations.

The analysis of correlations between the currency pairs and selected exchange instruments showed that the relationship is usually strong enough, but is unstable. In one year the dependence can be strongly positive and in the other year it can be strongly negative. On the one hand, it confirms the hypothesis that exchange assets influence each other, on the other – it underscores the need of the current connections data update because of their constant changes.

As an alternative for selected exchange instruments (gold, oil, Dow Jones index) to make the analysis complete, we will analyze the presence or absence of connections between the US dollar exchange rate and the monetary policy of the Fed (interest rates dynamics) and also the yields of U.S. Treasuries. The results are presented in Table 5.

Table 5. Analysis of the connections between EUR/USD exchange rate and U.S. interest rates

Year	Rate	The direction of change	Correlation
2004	2%-3.25%	Up	0,70
2005	3.25%-5.25%	Up	-0,89
2006	5.25%-6.25%	Up	0,84
2007	6.25%-4.75%	Down	-0,89
2008	4.75%-2.25%	Down	-0,80

The relationship between fluctuations in the currency pair EUR/USD and U.S. interest rates is very significant and confirms the interaction between these instruments. The only exception is the year of 2005, when the direction of connection was uncharacteristic.

The analysis for the currency pair EUR/USD and U.S. Treasuries yield is shown in Table 6.

Table 6. Analysis of the connections between EUR/USD course and U.S. Treasuries yield

Year	1-month	3-month	6-month	Annual	10-year	20-year
2004	0.65	0.64	0.55	0.44	-0.34	-0.50
2005	-0.85	-0.87	-0.85	-0.84	-0.11	0.27
2006	0.71	0.77	0.72	0.62	0.18	0.20
2007	-0.80	-0.88	-0.90	-0.90	-0.68	-0.59
2008	-0.84	-0.85	-0.78	-0.72	-0.33	0.00
Total	-0.03	-0.05	-0.07	-0.12	-0.36	-0.36

The figures show that short-term treasury bonds are strongly connected with the EUR/USD dynamic, although this connection is rather changeable in terms of direction. In case of long-term bonds (maturity over one year) the connections were inessential.

As a part of an additional analysis, we estimate the connections between the U.S. Treasury yield and interest rates of the Fed. The results of the calculation are presented in Table 7.

Table 7. Analysis of the connection between U.S. Treasuries yield and U.S. interest rates

Year	1-month	3-month	6-month	Annual	10-year	20-year
2004	0.96	0.96	0.93	0.83	-0.21	-0.43
2005	0.94	0.98	0.98	0.97	0.37	-0.03
2006	0.87	0.95	0.92	0.83	0.31	0.29
2007	0.86	0.93	0.95	0.96	0.80	0.71
2008	0.89	0.89	0.88	0.80	0.22	-0.19
Total	0.98	0.98	0.98	0.97	0.64	0.09

According to classical macroeconomic theories, the raising interest rates should stimulate the growth of profitability, otherwise investors will start looking for more interesting alternatives for investment. However, in practice there were opposite and just neutral situations. So, for short-term bonds (maturity up to one year) macroeconomics principles work almost 100 per cent (the correlation is almost 1), while long-term bonds (maturity over one year) don't show any clear connections.

3. Market focuses and prediction

Of course, it is difficult to say whether the "focuses" of the market are the driving factors. But the figures clearly show that connections between the markets (represented, as we did, by one or another currency pair) and a certain "focus" exist. Knowing this and defining the current market focus and the type of connection, we can make various decisions about transactions, i.e., devise rules of the trading strategy.

Markets are always moving. Sometimes they move synchronously, sometimes not. In this article we use the terms "divergence" and "convergence". As a normal state of market we take convergence, i.e., markets are synchronized. But there are states of markets which deviate from the norm, we call them divergence. The analysis of market "focuses" lets us (with the help of correlation coefficient), firstly, determine what is a normal state of the market and the size of divergence, i.e., the level of deviation. As long as the normal state of the market is convergence, in case of divergence the market will try to reach its normal state. So, the determination of divergence gives opportunities for speculative earnings.

To explain these states (divergence and convergence), we use the correlation coefficient, i.e., the practical use of the previous analysis and methods for future analysis. If the correlation coefficient is more than 0,7-0,8 and is positive, it means that between the market instruments there exists a strong connection and it is positive (direct). In this case the normal state of the market can be characterized in the following way: the growth of one dependable exchange asset's prices will happen parallel to the growth of the other linked asset's prices. And vice-versa, the drop in prices of one dependable asset will follow the fall of prices of the other linked asset.

The divergence takes place when one asset is growing and the other isn't or even dropping. In this case the market will try to restore the balance. To achieve this balance the first asset should decrease and the second one should not be changing or should even grow. Or the second asset will grow and the first one will not be growing actively or even will drop.

From the practical point it means that in case of divergence, described above, it is recommended to sell the first asset and buy the second. The restoration of the balance will cause speculative earnings.

The coefficient of correlation can act as a measure of convergence or divergence of two "equal" assets. For example, a strong positive correlation between two exchange assets makes it possible for us to make a conclusion that in the case of a big movement in one asset we can wait for equivalent changes in the other exchange asset.

The main problem in terms of the practical implementation of the provisions proposed by us is the search of points where the focuses are changing, i.e., when the market changes the accent from one factor to another. As a signal of a focus changing, in our view, it is appropriate to consider a systematic drop in the correlation coefficient.

Summary and conclusions

The analysis carried out in the paper shows that exchange assets actively interact with each other, making mutual influence. The quantifying of these connections indicates that they are quite significant. However, the connections between instruments are very unstable from almost 100% of direct dependence to total independence or even strong dependence but in reverse direction.

The conclusions formulated in this work open the possibilities for improving the quality of forecasting of prices for exchange assets and, accordingly, the possibility of earnings on speculative fluctuations of exchange assets.

References

1. Archive of quotations MetaQuotes, available at http://www.metaquotes.net.
2. Douglas M. (2001). Trading in the Zone, Prentice Hall Press, January 2, 240 pages.
3. Douglas, M (1990). The Disciplined Trader, New York Institute of Finance.
4. Miner, R (2008). High Probability Trading Strategies, Wiley; Har/Cdr edition, October 20, 288 pages.
5. J. Welles Wilder (1978). New Concepts in Technical Trading Systems, Trend Research.
6. Edwin Lefèvre (1994). Reminiscences of a Stock Operator, John Wiley & Sons Inc.
7. Schwager, J. (1999). Getting Started in Technical Analysis, Wiley, February 4, 352 pages.
8. Martin J. Pring (2002). Technical Analysis Explained: The Successful Investor's Guide to Spotting Investment Trends and Turning Points, McGraw Hill.
9. Robert D. Edwards, John Magee, W.H.C. Bassetti (Editor) (2007). Technical Analysis of Stock Trends, 9th Edition (Hardcover), American Management Association.

10. John J. Murphy (1999). Technical Analysis of the Financial Markets, New York Institute of Finance.
11. Technical Analysis: The Complete Resource for Financial Market Technicians, Kirkpatrick/Dahlquist, 2007.
12. J.M. Hurst (1972). The Profit Magic of Stock Transaction Timing, Prentice-Hall.
13. Thomas R. DeMark (1994). The New Science of Technical Analysis, New York: John Wiley & Sons.
14. Trade Terminal Company ALPARI, available at http://www.alpari.org.
15. Williams, B. (1998). New Trading Dimensions, Wiley, October 1, 288 pages.
16. Williams, B. (2004). Trading Chaos, Wiley, 2 edition, February, 256 pages.