Testing the Effect of Capital Flow on Stock Market Return: Empirical Evidence from A Study of United States of America

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Abstract

This research is to analyze the effect of capital flow's path on the return of the stock market in the United States. First, eight variables are tested using Pearson Correlations to explore the relationships between stock market return and Standard Multiple Regression is conducted to investigate the prediction ability. Second, Pearson Correlations are repeated to find out whether the eight variables and stock market return have lead-lag relationships and run a regression again. Third, the data set is divided into two panels representing different investment environments. Panel A is when the growth rate of M1 greater than the growth rate of M2 while Panel B is when the growth rate of M2 greater than the growth rate of M1. The findings of this research show that six out of eight variables have lead-lag relationships with the stock market return. When dividing into two panels, most of the eight variables have a more slightly correlated relation with the stock market return and the prediction ability of the variables is stronger than the original data set.

Keywords: Capital flow, Lead-lag relation, Stock market return

Introduction

The stock is a fundraising tool for listed companies and is also an investment instrument for investors. Investing in stocks is often to have expectations on the economic outlook or the individual company's outlook. Apart from this, it is well known that the change of the stock market and capital flows are closely correlated. When a great amount of capital (sometimes hot money) rushes into the stock market, the upward movements of share prices are often driven due to actively buying. Oppositely, when capital leaves the market, share prices often fall due to actively selling. The judgment process of capital flows is relatively complex and not easy to grasp. However, it has an important role to analyze the trend of the stock market. (Gerig 2007)

Not surprisingly, the worldwide stock markets were also benefited from the quantitative easing policies. For example, the US Federal Reserve implemented three rounds of quantitative easing since 2008 while the Dow rose from the lowest level 6626 to around 15000 points until now. (Culver 2010) Experienced in a wave after wave of falling price, investors are increasingly pessimistic about the stock market and withdraw their investments. Thus, whether from the perspective of enterprises or investors, when M2 outstrips significantly M1 which is in a low-cost investment environment, sufficient capital will slowly push forward the economy and this could be a signal that the bear market is bottomed out. (Alshogeathri 2011).Oppositely, when capital outflows from the market which lowers the share prices, the exchange rate often depreciates. (Tas 2008) The Federal Reserve uses open market operations such as buying and selling government bonds in the market to influence the supply of money so as to encourage or discourage the lending from the bank. (Yin 2007) The sufficiency of short-term capital would generally have an impact on the stock market. Basically, there is a positive relationship between them.

Like the international financial crisis in 2008, the stock market crashed while the bond prices appreciated a lot in this year. Intuitively, the relationship between the two markets described as "seesaw", that is, they have an inverse relationship because of the asset allocation effect. It was, therefore, conclude this experience: if you buy stocks or equity mutual funds when the market is bull and if you buy bonds or bond mutual funds when the market is bear, then whether it is bull or bear market, you can earn money as well. (Li 2007) The reason is that when the economy is expanding or interest rate is at a low level, bondholders tend to withdraw their investment from the bond market to other assets for earning a higher profit.

At this time, the return of stock market is usually relatively high which makes the few percents of fixed interest becoming dwarf. Some mutual funds will enhance the highest possible stake limits and sometimes even consider borrow funds through the repo market for purchasing new shares and participating non-public issuance and so on. (Oh and Parwada 2007) Therefore, capital will flow from the bond market to the stock market. Bond prices will perform weaker. In turn, when the stock market is bear or interest rate is at a high level, investors will reduce the equity positions of which the withdrawn funds will tend to come to bank deposit and bond markets. Simultaneously, mutual funds will push their proportion of bond holdings to the highest limit. Because of the expansion of demand, the bond price will appreciate. Capital will flow from the stock market to bond market. However, this logic is assumed that the amount of funds in the market does not change. Stock and bond markets may have a more complex relationship if the total funds increase or decrease. Capital may inflow to or outflow from the bond and stock markets simultaneously which both bond and stock prices will appreciate or depreciate. In fact, there did not find a consistent conclusion referring to the literature in the past. (Li 2007).When the economy expands, people have more capital and more willing to buy property whatever for investment or private use. Property prices will appreciate because of the higher demand. If the economy shrinks, people may tend to sell the property for cash or unwilling to buy. Property price will depreciate because of lower demand. (Beracha 2007)

Another investment tool which usually considered as a hedge is gold. (Capie et. al. 2005) The gold standard used to be a monetary policy in many countries before. In the past, gold started to act as a medium of exchange because of its rarity. With the widespread monetary function for trading, it became the most suitable choice for the world's currency. Various countries' currency system linked to it and therefore the gold standard was established. However, most countries with huge war debts left the gold standard after World War I. Since then gold was widely supplanted by fiat currency and finally collapsed. Nowadays, gold continues to be regarded as a "quasi-currency" which is accepted internationally. Similar to the foreign exchange reserves and government bonds, gold reserves have an important position in the fiscal reserves of various countries. Not only it protects the currency of one's country but also hedges losses caused by the depreciation of US dollar. It still has a wide range of application and regards as a way of storing wealth. For investors, gold is regarded as a hedge against inflation or other economic disruption. From the past, it has appeared that when the economy shrinks, the stock market decline while gold price will appreciate. (Coudert and Raymond 2012)

Apart from the above, another investment market is the commodity market. Stevenson (2004) suggested that the commodity and stock market have an inverse relation. The rising and falling time were not completely accurate, but an inverse trend could be seen. The reason is that when the purchasing power of money declines, commodity prices will rise. At this time, the operating costs of enterprises increase and thereby lower the enterprises' profitability which likely causes the shrink of share prices. On the other hand, if the purchasing power of money rises up, commodity prices will fall. The operating cost of enterprises reduces this time and profitability will be increased which likely favor the rise of share prices.

Literature Review

The flowing of capital in investment market plays an important role in analyzing the trend of the stock market. Capital can flow from one country to another, between money supply M1 and M2, in and out of the banking system and from one asset to another. Hashemzadeh and Taylor (1988) using the weekly data to investigate the relationship between S&P 500, the return of US Treasury bills and money supply (M1). The results of Granger-Sims's causality tests showed that there was a feedback relationship between the S&P 500 and M1 but the relationship between US Treasury bill and S&P 500 was not conclusive. Malliaris and Urrutia (1991) studied the causal relationship between S&P 500, M1 and Industrial production. They collected monthly data from Jan 1970 to June 1989 for their study. The result of the Granger causality test indicated that M1 led the S&P 500. Darrat and Dickens (1999) used the same data set as Malliaris and Urrutia (1991). They further found that the three variables had causal interrelationship and were integrated. The results implicated that stock market lead economic activity and monetary policy. Abdullah and Hayworth (1993) examined the relationships between seven variables and the fluctuations of the US stock market's monthly return using impulse response analysis, vector Autoregressions and Granger causality tests. One of the results indicated that M1 was positively correlated with S&P 500. The similar result was also examined by Dhakai, Kandil, and Sharma (1993). They investigated the linkage of five US macroeconomic variables in the stock market over the period 1973 to 1991. The VAR results showed that the stock market return was significantly impacted by the change of money supply. Thornton (1993) investigated the lead-lag linkage between the UK stock market and GDP, money supply M0 and M5. He used quarterly data from 1963 to 1990. The results suggested that stock prices in FTSE100 tend to lead M5.

Besides, M0 and M5 volatility and stock price volatility had feedback effects. Ibrahim (1999) observed data from the period January 1977 to June 1996 to test the dynamic relationships between monthly Malaysian stock prices and seven macroeconomic variables such as M1, M2, domestic credit, and exchange rate. The cointegration and Granger tests results indicated that domestic credits were inefficient with stock prices. M2 were cointegrated with stock prices while M1 did not have a long-run relationship with stock prices.

For the study of the exchange rate, Ratanapakorn and Sharma (2007) studied the long and short run relationships between six variables and the S&P 500. The research collected monthly data from January 1975 to April 1999. The findings showed that the money supply and exchange rate were positively correlated with the stock prices. Wenshwo (2002) used a GARCH model to access whether the stock returns and volatilities were affected by the depreciation of the currency in Hong Kong, Thailand, Taiwan, South Korea and Singapore. The study evidenced that exchange rate depreciation influenced stock return during the Asian crisis (1997-1999). However, the study of Patra and Poshakwale (2006) had a different result. They investigated whether there had long and short-run relationships between the monthly Greek stock price index and several macroeconomic indicators such as the exchange rate and money supply. They collected data from 1990 to 1999. The results of vector error correction models, Johansen cointegration tests, and Granger causality tests indicated that only the exchange rate did not have the relationship with stock prices.

For the literature about bank credit, Kim and Moreno (1994) studied the effect of bank lending on Japan's stock prices from January 1970 to May 1993. They found that bank credit and stock prices had a positive correlation in two sub-periods. Also, the volatility of bank credit influenced significantly to the volatility of Japan's stock prices. Ibrahim (2006) explored the relationship between quarterly Malaysia stock prices with bank loans. The data were collected from January 1978 to February 1998 and were analyzed by VAR tests. The results showed that bank loans were positively influenced by stock prices but stock prices were not influenced by stock prices.

The relationship between bond and stock is a hot topic for researchers. Their relationship is important for asset allocation. Downing et al. (2006) used a VAR model to explore the contemporaneous correlation between bond and stock returns but could not find any lead-lag relation between them. Another research using weekly data was studied by Li (2007). The research used the ADCC model to examine the time-varying correlations between bond and stock returns. The results provided evidence that the stock had an average negative correlation with bond but it was weak. Their correlation was affected by some key economic factors such as oil price shock and the yield spread. Two phenomena "flight to quality" and "flight from quality" were discovered by Hartmann et al. (2001). "Flight to quality" is that investors would move their investments from stocks to bonds when the stock market is bear. In contrast, "flight from quality" is that investors would move their investments back to stocks from bonds when the stock market is bull. Baur and Lucey (2006), Connolly et al. (2005) and Gulko (2002) agreed the phenomena that the two flights affect the correlation of stock and bond.

Beracha (2007) investigated the relationship between stock market return and the performance of home price. The findings implicated that the price and trading volume of stocks were affected by the change in home prices. The return of stocks and bonds were positively correlated with the change of real-estates' prices. Sutton (2002) examined the effect of consumer's spending and investing behaviors on house prices. The research analyzed quarterly data from 1970 to 2002 in six countries by the VAR model. The findings indicated that the volatility of house price was caused by the volatility of national income, interest rate and stock prices.

Milunovich et al. (2011) explored the linkage between the Australian stock market and international commodity prices. They used constructed returns and found that the commodity prices had a significant effect on the stock market. Hondroyiannis and Papapetrou (2001) examined the dynamic relationship between the return of Greek stock market and macroeconomic variables such as exchange rate and real oil price by a multivariate vector autoregressive VAR model. The data were collected monthly from January 1984 to September 1999. They found that the stock price changes can be explained by the price of oil. Lombardi and Ravazzolo (2013) accessed whether the correlation between commodity prices and stock prices at an increase. Various correlation tests were conducted. They suggested that the higher correlation had implication for portfolio setting. Commodity could act as a hedge.

Li (2013) studied the linkage between gold, US dollar, and stock market return. The study used data from 2001 to 2012 and was analyzed by ADCC-CARCH model. The findings showed that the gold price was negatively correlated with stock returns during the financial tsunami and European sovereign debt crisis. However, the overall correlation between them was positive. Another study examined whether gold was a hedge against stocks in emerging and developed countries. Baur and Mcdermott (2010) gathered 30 years of data from 1979 to 2009. The results provided evidence that gold acted as a safe haven for US and European stocks but not for Japan, Canada, Australia, and BRIC. Hillier et al (2006) analyzed the daily data from 1976 to 2004 for three metals including gold. Results suggested that gold had a low correlation with the return of stocks. It had some diversification benefits for portfolio settings.

Data Collection

This research uses data which are the historical closed prices or values released on a particular day of each week except that gold price uses the fixing price 10:30 AM (London time). I use a weekly frequency time-series data set from Jan 2005 to June 2013, a time period that the investment market experienced up and down, to explore the relationship between stock market and capital flow in the investment market. Within the time, the investment market moved especially dramatic when the expansion of the financial tsunami in 2008 and the implementation of quantitative easing policies by major countries' central bank. I use the return of Standard and Poor's 500 index (S&P500) as a proxy for the US stock market's return. It is a US stock market index based on the market capitalizations of 500 large companies having common stocks listed on the New York Stock Exchange (NYSE) or National Association Securities Dealers Automated Quotations (NASDAQ).

Capital except for flows between investment markets, it also flows between different assets. Bond is another commonly used investment instruments among them. The return of Vanguard Total Bond Market Index Fund is used as a proxy for the US bond return. The investment seeks the performance of a broad, market-weighted bond index. The fund employs an indexing investment approach designed to track the performance of the Barclays U.S. Aggregate Float Adjusted Index. This Index represents a wide spectrum of public, investment-grade, taxable, fixed income securities in the United States-including government, corporate, and international dollar-denominated bonds, as well as mortgage-backed and asset-backed securities-all with maturities of more than 1 year. The Fund invests by sampling the index, meaning that is held a broadly diversified collection of securities that, in the aggregate, approximates the full index in terms of key risk factors and other characteristics. All of the Fund's investments will be selected through the sampling process, and at least 80% of the fund's assets will be invested in bonds held in the index. The Fund maintains a dollar-weighted average maturity consistent with that of the index, which generally ranges between 5 and 10 years. For the return of property, the prices of Inland Real Estate Corporation are used. Inland Real Estate Corporation currently is a Real Estate Investment Trust ("REIT") based in Oak Brook, Illinois. It acquires, owns and manages neighborhood and community retail centers located primarily in the United States. It owns interests in and manages 161 properties, with an approximate 15 million square feet of real estate totaling nearly $2 billion in asset acquisition value. With regard to the return of commodity, the prices of Thomson Reuters / Jefferies CRB Index are used. It is the most widely recognized measure of global commodities markets. As a benchmark, the Index is designed to provide timely and accurate representation of a long-only, broadly diversified investment in commodities through a transparent and disciplined calculation methodology. It currently is made up of 19 commodities as quoted on the NYMEX, CBOT, LME, CME and COMEX exchanges. These are sorted into 4 groups, each with different weightings. These groups are:

•Petroleum-based products (based on their importance to global trade, always makeup 33% of the weightings)
•Liquid assets
•Highly liquid assets
•Diverse commodities.

The index comprises 19 commodities: Aluminum, Cocoa, Coffee, Copper, Corn, Cotton, Crude Oil, Gold, Heating Oil, Lean Hogs, Live Cattle, Natural Gas, Nickel, Orange Juice, Silver, Soybeans, Sugar, Unleaded Gas, and Wheat. As for the availability of data, S&P 500, M1, M2, Loans and Leases in Bank credit: All Commercial Bank, trade-weighted US Dollar Index and gold are gathered from historical prices or values at http://research.stlouisfed.org. The historical prices of Vanguard Total Bond Market Index Fund and Inland Real Estate Corporation are gathered at http:// finance.yahoo.com. The historical prices of Thomson Reuters / Jefferies CRB Index are downloaded at http://jefferies.com.

Method of Data Analysis

To analyze the effects of capital flow on the stock market, stock market return acts as the dependent variable while the others act as the independent variables. Firstly, I would use Pearson correlation tests to test whether each independent variable exists a linear correlation (ρ) with the stock return. A t-test is conducted to verify the significance of correlation. And then the Pearson correlations will be repeated to find out whether the time-lead or time-lag of each independent variable may have a more robust correlation with the stock market return. Secondly, to explore how well the independent variables predict the return of SP500, I will be using a standard multiple regression to fit a line through a set of observations. It is a "least square" method that all set of independent variables will be entered into the equation at once. The equation is as follow:

$$SP500\_return = \beta_0 + \beta_1 M1change + \beta_2 M2change + \beta_3 USdollar\_change + \beta_4 Bank\_credit\_change +$$
$$\beta_5 Bond\_index\_change + \beta_6 Property\_return + \beta_7 Commodity\_return + \beta_8 Gold\_return + \varepsilon$$

An F-test is used to test the validity of the regression and t-tests are used to verify the significance of each variable. Finally, I will divide the data into two panels to explore the correlations with the stock market return and run regressions again. Panel A is the growth rate of M1 larger than the growth rate of M2 while Panel B is the opposite. I will expect that the predication's ability of the two panels would stronger than the original data set because one constant coefficient correlation over the whole period in the original data set is misleading which may weaken the prediction.

Results

Pearson's correlations are used to explore the linear relationship between the continuous variables. According to the guidelines suggested by Cohen (1988), the correlation of two variables is small if the coefficient is between 0.1 to 0.29 or -0.1 to -0.29, is intermediate if the coefficient is between 0.3 to 0.49 or -0.3 to -0.49 and is large if the coefficient is between 0.5 to 1 or -0.5 to -1. Thus there is intermediate, negative correlation between the US dollar_change and the SP500_return (r=-0.422, n=443, p<0.05), there is intermediate, positive correlation between the Commodity_return and the SP500_return (r=0.471, n=443, p<0.05) and there is small, positive correlation between the Bond_index_return and the SP500_return (r=-0.141, n=443, p<0.05). Also from the results, the M1change, M2change, and the Gold_return are positively correlated with the SP500_return while Bank_credit_change and property_return are negatively correlated with the SP500_return but they are statistically insignificant.

To investigate how well the independent variables predict the SP500_return, a standard multiple regression will be run. But to avoid the existence of multicollinearity, firstly should check that the correlation between each of the variables is not too high. Tabachnick and Fidell (2001) suggested that if the two variables have a bivariate correlation 0.7 or above, one of the variables may be needed to consider omitting or forming a composite variable from the scores of the two highly correlated variables. The highest correlation between the independent variables is -0.546, which is less than 0.7, therefore all variables will be retained. Moreover, regression analysis based on time series data assumes that the underlying time series is stationary. Thus, the augmented Dickey-Fuller unit root tests are conducted to test whether the time series of variables are stationary. The time series of variables are stationary.

Multicollinearity can be checked from the two values Tolerance and VIF as well. From the result presented in Table 1 labeled Coefficients, the lowest value of Tolerance is 0.606, which is not lower than 0.1 and the highest value of VIF is 1.65, which is not higher than 10. The two values simultaneously support that the multicollinearity does not exist in the regression. Accessing the result of the regression, from the Model Summary box, the R square is 0.314 and Adjusted R Square is 0.301. The model explains 31.4% of the variance in the SP500_return. According to the ANOVA box, the value of Sig is 0.000 representing that the p-value is smaller than 0.05. We will reject the null hypothesis and in favor of the alternative hypothesis meaning that the regression model reaches statistical significance. Assessing the significance of each variable from the Sig column in the Coefficients box, the values of US dollar_change, Bond_index_return, Commodity_return, and Gold_return are less than 0.05 indicating that they are making statistically significant unique contributions to predict the dependent variable while the value of other variables are higher than 0.05 meaning that they are not significant. Therefore, the regression can be written as:

$$SP500\_return = -0.79 USdollar\_change + 0.549 Bond\_index\_return$$

$$+0.417 Commodity\_return - 0.216 Gold\_return$$

Table 1 Multiple Regression Result

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.560[a]	.314	.301	.023442900

a. Predictors: (Constant), Gold_return, M1change, Property_return, Bank_credit_change, Bond_index_return, M2change, Commodity_return, USdollar_change
b. Dependent Variable: SP500_return

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.109	8	.014	24.813	.000[b]
	Residual	.239	434	.001		
	Total	.348	442			

a. Dependent Variable: SP500_return

b. Predictors: (Constant), Gold_return, M1change, Property_return, Bank_credit_change, Bond_index_return, M2change, Commodity_return, USdollar_change

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.001	.001		1.067	.286		
	M1change	.015	.112	.006	.132	.895	.894	1.118
	M2change	-.153	.516	-.013	-.296	.767	.868	1.152
	USdollar_change	-.790	.133	-.303	-5.927	.000	.606	1.650
	Bond_index_return	.549	.210	.106	2.612	.009	.967	1.034
	Bank_credit_change	-.350	.240	-.058	-1.457	.146	.982	1.019
	Property_return	-.035	.025	-.055	-1.376	.170	.984	1.017
	Commodity_return	.417	.052	.388	8.030	.000	.675	1.481
	Gold_return	-.216	.045	-.224	-4.788	.000	.725	1.380

a. Dependent Variable: SP500_return

However, the above analyses do not consider the lead-lag relationships between the independent variables and the dependent variable. To find out whether has a more robust correlation with the SP500_return, Table 2 repeats the Pearson Correlations using the time-lead or time-lag of each variables. Each variable will be tested time lead 1 to 13 weeks and time lag 1 to 13 weeks which will refer back to the week of 4/10/2004 and extend to 23/9/2013. For examples, M1change_lead 1 means that the change of M1 lead the return of SP500 1 week, M1change_lag 1 means that the change of M1 lag the return of SP500 1 week and so on. From the results of Table 2, all tested variables have 443 samples. For each category of variables, M1change_lag 10 (r = -0.109, Sig (2-tailed) = 0.022), M2change_lead 1 (r = -0.163, Sig (2-tailed) = 0.001), US dollar_change (r = -0.422, Sig (2-tailed) = 0.000), Bond_lead 1 (r = -0.17, Sig (2-

tailed) = 0.000), Bank_credit_lead 4 (r = -0.16, Sig (2-tailed) = 0.001), Property_lead 1 (r = 0.447, Sig (2-tailed) = 0.000), Commodity_return (r = 0.471, Sig (2-tailed) = 0.000) and Gold_lag 3 (r = 0.173, Sig (2-tailed) = 0.000) have the most robust correlations with SP500_return. Next, the ADF tests are conducted to check whether the time series of lead-lag variables are stationery. The variables USdollar_change and Commodity_return have been tested by the ADF test on the above. The time series of all lead-lag variables are stationery.

Table 3 shows the result. From the heading Collinearity Statistics in the Coefficients box, the highest Tolerance value and the lowest VIF are 0.65 and 1.539 which are not lower than 0.1 and higher than 10 respectively. Multicollinearity is not existence in the regression. In the Model Summary box, the R Square is 0.443 and Adjusted R Square is 0.433. 44.3% of the variances in the SP500_return can be predicted by the variables. The explanation of the model is better than the first model. In the ANOVA box, the value of Sig is 0.000 which is less than 0.05. This is sufficient to conclude that there is a significant relationship between the variables and SP500_return. Assessing the significance of individual parameters, all of them are significant (Sig <0.05). Therefore, the regression equation can be written as

$$SP500\_return = 0.003 - 0.272M1change\_lag\ 10 - 1.133M2change\_lead1$$
$$-0.587USdollar\_change - 0.627Bond\_lead1 - 0.641Bank\_credit\_lead4$$
$$+0.205Property\_lead1 + 0.266Commodity\_return + 0.125Gold\_lag\ 3$$

Table 2 Correlation between lead/lag variables and SP500_return

		SP500_return		SP500_return		SP500_return		SP500_return		SP500_return		SP500_return		SP500_return		SP500_return
Pearson Correlation	M1change	.063	M2change	.031	USdollar_change	-.422**	Bond_index_return	.141**	Bank_credit_change	-.086	Property_return	-.030	Commodity_return	.471**	Gold_return	.082
Sig. (2-tailed)		.184		.521		.000		.003		.071		.524		.000		.086
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lead1	-.004	M2change_lead1	-.163**	USdollar_lead1	.018	Bond_lead1	-.170**	Bank_credit_lead1	.002	Property_lead1	.447**	Commodity_lead1	-.043	Gold_lead1	-.075
Sig. (2-tailed)		.933		.001		.701		.000		.963		.000		.369		.113
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lead2	-.054	M2change_lead2	.048	USdollar_lead2	.076	Bond_lead2	.060	Bank_credit_lead2	-.036	Property_lead2	.016	Commodity_lead2	.005	Gold_lead2	-.107*
Sig. (2-tailed)		.258		.316		.109		.209		.450		.739		.914		.025
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lead3	-.012	M2change_lead3	-.003	USdollar_lead3	-.099*	Bond_lead3	.044	Bank_credit_lead3	-.022	Property_lead3	.024	Commodity_lead3	.005	Gold_lead3	.018
Sig. (2-tailed)		.805		.955		.037		.355		.645		.613		.924		.698
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lead4	-.022	M2change_lead4	-.015	USdollar_lead4	.061	Bond_lead4	-.082	Bank_credit_lead4	-.160**	Property_lead4	.031	Commodity_lead4	-.025	Gold_lead4	-.053
Sig. (2-tailed)		.637		.746		.201		.085		.001		.521		.602		.263
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lead5	.030	M2change_lead5	-.140**	USdollar_lead5	-.029	Bond_lead5	.169**	Bank_credit_lead5	.097*	Property_lead5	-.101*	Commodity_lead5	-.004	Gold_lead5	-.021
Sig. (2-tailed)		.528		.003		.539		.000		.041		.034		.937		.655
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lead6	.104*	M2change_lead6	.047	USdollar_lead6	.000	Bond_lead6	.054	Bank_credit_lead6	-.116*	Property_lead6	.146**	Commodity_lead6	.048	Gold_lead6	.050
Sig. (2-tailed)		.029		.324		.999		.255		.014		.002		.313		.293
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1chnage_lead7	-.077	M2change_lead7	.023	USdollar_lead7	-.088	Bond_lead7	-.088	Bank_credit_lead7	-.077	Property_lead7	-.030	Commodity_lead7	.039	Gold_lead7	.058
Sig. (2-tailed)		.108		.632		.064		.064		.104		.528		.411		.224
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lead8	.006	M2change_lead8	-.030	USdollar_lead8	-.030	Bond_lead8	.040	Bank_credit_lead8	-.091	Property_lead8	.039	Commodity_lead8	.131**	Gold_lead8	.004
Sig. (2-tailed)		.907		.532		.524		.399		.057		.417		.006		.928
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lead9	-.029	M2chnage_lead9	-.108*	USdollar_lead9	.106*	Bond_lead9	-.117*	Bank_credit_lead9	.008	Property_lead9	-.027	Commodity_lead9	-.142**	Gold_lead9	-.062
Sig. (2-tailed)		.539		.023		.026		.014		.869		.569		.003		.193
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lead10	.006	M2change_lead10	.028	USdollar_lead10	.070	Bond_lead10	.052	Bank_credit_lead10	-.023	Property_lead10	-.084	Commodity_lead10	.020	Gold_lead10	.062
Sig. (2-tailed)		.905		.550		.143		.278		.629		.078		.671		.194
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lead11	-.042	M2change_lead11	.120*	USdollar_lead11	-.065	Bond_lead11	-.009	Bank_credit_lead11	-.020	Property_lead11	-.098*	Commodity_lead11	.157**	Gold_lead11	.014
Sig. (2-tailed)		.374		.011		.170		.846		.674		.038		.001		.765
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lead12	-.097*	M2change_lead12	-.038	USdollar_lead12	-.014	Bond_lead12	-.070	Bank_credit_lead12	-.003	Property_lead12	-.060	Commodity_lead12	-.006	Gold_lead12	.035
Sig. (2-tailed)		.041		.424		.773		.140		.951		.208		.897		.458
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lead13	.013	M2change_lead13	-.034	USdollar_lead13	-.030	Bond_lead13	-.021	Bank_credit_lead13	-.041	Property_lead13	-.070	Commodity_lead13	.021	Gold_lead13	.033
Sig. (2-tailed)		.786		.475		.526		.663		.387		.139		.662		.489
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag1	-.081	M2change_lag1	-.083	USdollar_lag1	-.033	Bond_lag1	.051	Bank_credit_lag1	-.002	Property_lag1	.124**	Commodity_lag1	-.003	Gold_lag1	.027
Sig. (2-tailed)		.087		.082		.485		.287		.971		.009		.945		.568
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag2	.026	M2change_lag2	-.121*	USdollar_lag2	.039	Bond_lag2	-.057	Bank_credit_lag2	-.036	Property_lag2	-.024	Commodity_lag2	-.030	Gold_lag2	-.082
Sig. (2-tailed)		.585		.011		.407		.231		.448		.614		.527		.087
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag3	-.002	M2change_lag3	-.038	USdollar_lag3	-.080	Bond_lag3	.079	Bank_credit_	.084	Property_lag3	.063	Commodity_lag3	.153**	Gold_lag3	.173**

Sig. (2-tailed)		.969		.420		.093		.098	lag3	.078		.184		.001		.000
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag4	-.034	M2change_lag4	.060	USdollar_lag4	.044	Bond_lag4	-.045	Bank_credit_lag4	.015	Property_lag4	-.067	Commodity_lag4	.042	Gold_lag4	-.082
Sig. (2-tailed)		.475		.211		.351		.342		.757		.156		.377		.085
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag5	.014	M2change_lag5	-.045	USdollar_lag5	-.052	Bond_lag5	-.045	Bank_credit_lag5	.036	Property_lag5	-.036	Commodity_lag5	-.055	Gold_lag5	-.017
Sig. (2-tailed)		.770		.343		.274		.350		.448		.449		.250		.715
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag6	-.080	M2change_lag6	.011	USdollar_lag6	-.034	Bond_lag6	-.029	Bank_credit_lag6	.036	Property_lag6	-.046	Commodity_lag6	.074	Gold_lag6	.023
Sig. (2-tailed)		.094		.821		.473		.546		.449		.330		.122		.625
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag7	-.012	M2change_lag7	-.015	USdollar_lag7	-.041	Bond_lag7	-.090	Bank_credit_lag7	-.036	Property_lag7	-.039	Commodity_lag7	.037	Gold_lag7	.105*
Sig. (2-tailed)		.798		.747		.389		.058		.452		.409		.442		.027
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag8	-.022	M2chnage_lag8	-.106*	USdollar_lag8	-.007	Bond_lag8	-.043	Bank_credit_lag8	-.081	Property_lag8	-.056	Commodity_lag8	.068	Gold_lag8	-.038
Sig. (2-tailed)		.652		.025		.878		.372		.088		.238		.150		.423
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag9	.058	M2change_lag9	.000	USdollar_lag9	.050	Bond_lag9	.014	Bank_credit_lag9	-.031	Property_lag9	-.031	Commodity_lag9	.079	Gold_lag9	-.015
Sig. (2-tailed)		.225		.993		.293		.774		.522		.514		.096		.752
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag10	-.109*	M2chnage_lag10	-.051	USdollar_lag10	.088	Bond_lag10	-.090	Bank_credit_lag10	-.037	Property_lag10	.007	Commodity_lag10	-.125**	Gold_lag10	-.033
Sig. (2-tailed)		.022		.287		.064		.059		.435		.886		.008		.492
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag11	-.016	M2change_lag11	-.048	USdollar_lag11	.008	Bond_lag11	-.085	Bank_credit_lag11	-.013	Property_lag11	.056	Commodity_lag11	.036	Gold_lag11	.007
Sig. (2-tailed)		.740		.312		.863		.072		.780		.242		.447		.877
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag12	.007	M2change_lag12	-.032	USdollar_lag12	.061	Bond_lag12	.036	Bank_credit_lag12	-.027	Property_lag12	-.007	Commodity_lag12	.038	Gold_lag12	.003
Sig. (2-tailed)		.883		.501		.203		.445		.569		.878		.423		.957
N		443		443		443		443		443		443		443		443
Pearson Correlation	M1change_lag13	.053	M2change_lag13	-.050	USdollar_lag13	.027	Bond_lag13	-.003	Bank_credit lag13	.015	Property_lag13	.042	Commodity_lag13	-.083	Gold_lag13	-.146**
Sig. (2-tailed)		.269		.296		.571		.958		.760		.376		.081		.002
N		443		443		443		443		443		443		443		443

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3 Multiple Regression Result with lead / lag dependent variables

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		Durbin-Watson
					R Square Change	F Change	
1	.666[a]	.443	.433	.021121178	.443	43.150	2.331

a. Predictors: (Constant), M1change_lag10, USdollar_change, M2change_lead1, Bank_credit_lead4, Gold_lag3, Bond_lead1, Property_lead1, Commodity_return

b. Dependent Variable: SP500_return

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.154	8	.019	43.150	.000[b]
	Residual	.194	434	.000		
	Total	.348	442			

a. Dependent Variable: SP500_return

b. Predictors: (Constant), M1change_lag10, USdollar_change, M2change_lead1, Bank_credit_lead4, Gold_lag3, Bond_lead1, Property_lead1, Commodity_return

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.003	.001		2.552	.011		
	USdollar_change	-.587	.115	-.225	-5.086	.000	.655	1.527
	Commodity_return	.266	.048	.247	5.567	.000	.650	1.539
	Bond_lead1	-.627	.193	-.121	-3.251	.001	.933	1.072
	Bank_credit_lead4	-.641	.215	-.108	-2.978	.003	.984	1.017
	Property_lead1	.205	.023	.324	8.741	.000	.933	1.072
	Gold_lag3	.125	.035	.130	3.589	.000	.974	1.026
	M2change_lead1	-1.133	.442	-.093	-2.563	.011	.964	1.037
	M1change_lag10	-.272	.096	-.102	-2.819	.005	.982	1.018

a. Dependent Variable: SP500_return

The sufficiency of funds in the investment market plays an important role in the relationship between independent variables and SP500_return. It can be affected by different points of view from investors, policies adopted by regulators and the availability of fund in different economic circumstances (Li 2007). For examples, the positive views for the economy in the late 1990s encouraged investments, investors were willing to invest and the fund of the market was sufficient, the correlation between assets is somehow positive. But when the stock market crashed in 2008, investors became risk-averse and held more "safety" assets such as gold and bonds, Hartmann et al. (2001) called this phenomenon "flight to quality". On the other hand, when the market recovery, investors may switch their investment to those high return again. This phenomenon is known as "flight from quality". In these two situations, the correlations between the return of the stock market and "safety" assets became negative. Simultaneously, the strength of the correlations between SP500_retrun and independent variables may change or even have conflicts over the whole period. A constant correlation coefficient is misleading. In order to decrease the above effect on the predictions of independent variables, I divide the data into two panels. Panel A is when the growth rate of M1 larger than the growth rate of M2 representing that the fund is sufficient while Panel B is when the growth rate of M2 larger than the growth rate of M1 representing that the fund is not sufficient in the investment market. From the original data set, 236 out of 443 samples are the growth rate of M1 greater than the growth of M2 while the other 207 samples are the growth rate of M2 greater than the growth rate of M1. Thus, Panel A has 236 samples and Panel B has 207 samples. Person correlations are tested for the lead-lag relation of independent variables and SP500_return in the two panels.

The results of Panel A as Table 4 shows, M1change_lead 12 (r=-0.186, Sig (2-tailed) = 0.004), M2change_lead 1 (r=-0.266, Sig (2-tailed) = 0.000), US dollar_change (r=-0.396, Sig (2-tailed) =0.000) Bond_lead 4 (r=-0.205, Sig (2-tailed) =0.000), Bank_credit_lead 4 (r=-0.323, Sig (2-tailed) =0.000), Property_lead 1 (r=0.469, Sig (2-tailed) = 0.000), Commodity_return (r=0.427, Sig (2-tailed) = 0.000) and Gold_lag 3 (r = 0.299, Sig (2-tailed) = 0.000) are the most correlated variables with SP500_return in each category. For the results of Panel B as shown in Table 5, M1change_lead 7 (r=-0.19, Sig (2-tailed) = 0.006), M2change_lag 2 (r=-0.221, Sig (2-tailed) = 0.001), US dollar_change (r=-0.459, Sig (2-tailed) = 0.000), Bond_lead 1 (r=-0.249, Sig (2-tailed) = 0.000), Bank_credit_lead 7 (r=-0.167, Sig (2-tailed) = 0.016), Property_lead 1 (r=0.424, Sig (2-tailed) = 0.000), Commodity_return (r=0.526, Sig (2-tailed) = 0.000) and Gold_lead 2 (r=-0.181, Sig (2-tailed) = 0.009) are the most correlated variables. One point to mention is that the highest coefficient correlation of gold with SP_500 return is positive in Panel A and is negative in Panel B.

Table 4 Correlation between lead/lag variables and SP500_return (Panel A)

		SP500_return		SP500_return		SP500_return		SP500_return		SP500_return		SP500_return		SP500_return		SP500_return
Pearson Correlation	M1change	.122	M2change	.045	USdollar_change	-.396**	Bond_index_return	.148*	Bank_credit_change	-.206**	Property_return	-.128*	Commodity_return	.427**	Gold_return	.091
Sig. (2-tailed)		.061		.493		.000		.023		.001		.049		.000		.165
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lead1	-.090	M2change_lead1	-.266**	USdollar_lead1	.084	Bond_lead1	-.098	Bank_credit_lead1	-.001	Property_lead1	.469**	Commodity_lead1	-.132*	Gold_lead1	-.079
Sig. (2-tailed)		.166		.000		.197		.135		.989		.000		.043		.225
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lead2	-.047	M2change_lead2	.079	USdollar_lead2	-.021	Bond_lead2	.124	Bank_credit_lead2	-.050	Property_lead2	.066	Commodity_lead2	.080	Gold_lead2	-.045
Sig. (2-tailed)		.471		.226		.752		.058		.448		.315		.222		.492
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lead3	.009	M2change_lead3	.077	USdollar_lead3	-.123	Bond_lead3	.045	Bank_credit_lead3	.004	Property_lead3	.076	Commodity_lead3	.025	Gold_lead3	-.022
Sig. (2-tailed)		.888		.241		.060		.496		.957		.246		.704		.741
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lead4	-.014	M2change_lead4	.008	USdollar_lead4	.096	Bond_lead4	-.205**	Bank_credit_lead4	-.323**	Property_lead4	.077	Commodity_lead4	-.052	Gold_lead4	-.068
Sig. (2-tailed)		.830		.897		.140		.002		.000		.236		.422		.301
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lead5	.005	M2change_lead5	-.189**	USdollar_lead5	.088	Bond_lead5	.188**	Bank_credit_lead5	.105	Property_lead5	-.175**	Commodity_lead5	-.193**	Gold_lead5	-.088
Sig. (2-tailed)		.940		.004		.177		.004		.107		.007		.003		.176
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lead6	.082	M2change_lead6	.070	USdollar_lead6	-.034	Bond_lead6	.117	Bank_credit_lead6	-.098	Property_lead6	.179**	Commodity_lead6	.052	Gold_lead6	.098
Sig. (2-tailed)		.209		.285		.608		.072		.132		.006		.425		.134
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1chnage_lead7	-.004	M2change_lead7	.131*	USdollar_lead7	-.107	Bond_lead7	-.062	Bank_credit_lead7	.042	Property_lead7	-.162*	Commodity_lead7	.013	Gold_lead7	.027
Sig. (2-tailed)		.947		.044		.102		.346		.521		.013		.846		.679
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lead8	-.013	M2change_lead8	.010	USdollar_lead8	-.044	Bond_lead8	.037	Bank_credit_lead8	-.139*	Property_lead8	.097	Commodity_lead8	.119	Gold_lead8	.121
Sig. (2-tailed)		.844		.873		.503		.575		.033		.136		.068		.063
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lead9	-.022	M2chnage_lead9	-.131*	USdollar_lead9	.120	Bond_lead9	-.174**	Bank_credit_lead9	.054	Property_lead9	-.121	Commodity_lead9	-.176**	Gold_lead9	-.104
Sig. (2-tailed)		.742		.045		.066		.007		.408		.064		.007		.110
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lead10	.031	M2change_lead10	-.017	USdollar_lead10	.036	Bond_lead10	.070	Bank_credit_lead10	-.006	Property_lead10	-.029	Commodity_lead10	-.026	Gold_lead10	.179**
Sig. (2-tailed)		.639		.800		.582		.287		.922		.654		.694		.006
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lead11	.027	M2change_lead11	.181**	USdollar_lead11	-.008	Bond_lead11	-.028	Bank_credit_lead11	.044	Property_lead11	-.101	Commodity_lead11	.132*	Gold_lead11	-.025
Sig. (2-tailed)		.680		.005		.902		.664		.505		.122		.042		.699
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lead12	-.186**	M2change_lead12	-.051	USdollar_lead12	.062	Bond_lead12	-.023	Bank_credit_lead12	.042	Property_lead12	-.044	Commodity_lead12	-.095	Gold_lead12	.001
Sig. (2-tailed)		.004		.433		.346		.728		.522		.502		.146		.990
N		236		236		236		236		236		236		236		236

Pearson Correlation	M1change_lead13	-.005	M2change_lead13	-.074	USdollar_lead13	.049	Bond_lead13	-.130*	Bank_credit_lead13	-.044	Property_lead13	-.103	Commodity_lead13	-.009	Gold_lead13	-.019
Sig. (2-tailed)		.944		.258		.450		.046		.499		.114		.895		.767
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag1	-.123	M2change_lag1	-.045	USdollar_lag1	.068	Bond_lag1	.085	Bank_credit_lag1	.033	Property_lag1	.079	Commodity_lag1	-.099	Gold_lag1	.089
Sig. (2-tailed)		.059		.494		.295		.192		.610		.226		.129		.171
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag2	.068	M2change_lag2	-.044	USdollar_lag2	.052	Bond_lag2	.008	Bank_credit_lag2	-.041	Property_lag2	-.094	Commodity_lag2	-.074	Gold_lag2	-.173**
Sig. (2-tailed)		.296		.502		.425		.902		.528		.150		.259		.008
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag3	-.010	M2change_lag3	.040	USdollar_lag3	-.139*	Bond_lag3	.067	Bank_credit_lag3	.115	Property_lag3	.151*	Commodity_lag3	.172**	Gold_lag3	.299**
Sig. (2-tailed)		.879		.537		.033		.309		.079		.020		.008		.000
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag4	.051	M2change_lag4	.137*	USdollar_lag4	-.054	Bond_lag4	-.082	Bank_credit_lag4	.004	Property_lag4	-.103	Commodity_lag4	.136*	Gold_lag4	-.065
Sig. (2-tailed)		.440		.035		.407		.207		.948		.114		.037		.318
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag5	.024	M2change_lag5	-.019	USdollar_lag5	-.134*	Bond_lag5	.034	Bank_credit_lag5	-.004	Property_lag5	-.065	Commodity_lag5	-.071	Gold_lag5	.067
Sig. (2-tailed)		.712		.767		.039		.602		.953		.318		.279		.305
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag6	-.091	M2change_lag6	.018	USdollar_lag6	-.028	Bond_lag6	.033	Bank_credit_lag6	.019	Property_lag6	-.036	Commodity_lag6	.099	Gold_lag6	.027
Sig. (2-tailed)		.163		.780		.666		.609		.767		.584		.131		.685
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag7	-.040	M2change_lag7	-.023	USdollar_lag7	.023	Bond_lag7	-.145*	Bank_credit_lag7	-.080	Property_lag7	-.145*	Commodity_lag7	.071	Gold_lag7	.124
Sig. (2-tailed)		.546		.726		.724		.025		.220		.026		.277		.057
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag8	-.006	M2chnage_lag8	-.045	USdollar_lag8	.011	Bond_lag8	-.043	Bank_credit_lag8	-.112	Property_lag8	-.042	Commodity_lag8	.098	Gold_lag8	-.050
Sig. (2-tailed)		.924		.487		.862		.508		.085		.519		.134		.441
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag9	.094	M2change_lag9	.066	USdollar_lag9	.004	Bond_lag9	.029	Bank_credit_lag9	.097	Property_lag9	-.087	Commodity_lag9	.091	Gold_lag9	.015
Sig. (2-tailed)		.148		.316		.953		.658		.139		.183		.162		.817
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag10	-.149*	M2chnage_lag10	-.074	USdollar_lag10	.044	Bond_lag10	-.154*	Bank_credit_lag10	-.064	Property_lag10	.050	Commodity_lag10	-.161*	Gold_lag10	-.003
Sig. (2-tailed)		.022		.255		.500		.018		.326		.449		.013		.969
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag11	-.030	M2change_lag11	-.082	USdollar_lag11	.026	Bond_lag11	-.108	Bank_credit_lag11	-.049	Property_lag11	-.057	Commodity_lag11	.033	Gold_lag11	-.013
Sig. (2-tailed)		.644		.208		.691		.097		.458		.384		.616		.843
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag12	-.009	M2change_lag12	-.097	USdollar_lag12	.061	Bond_lag12	.029	Bank_credit_lag12	-.022	Property_lag12	-.012	Commodity_lag12	.094	Gold_lag12	.005
Sig. (2-tailed)		.894		.136		.351		.658		.734		.856		.149		.945
N		236		236		236		236		236		236		236		236
Pearson Correlation	M1change_lag13	.072	M2change_lag13	-.061	USdollar_lag13	.023	Bond_lag13	-.036	Bank_credit lag13	.015	Property_lag13	.030	Commodity_lag13	-.132*	Gold_lag13	-.171**
Sig. (2-tailed)		.270		.349		.723		.581		.819		.646		.042		.008
N		236		236		236		236		-.206**		236		236		236

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5 Correlation between lead/lag variables and SP500_return (Panel B)

		SP500_return		SP500_return		SP500_return		SP500_return		SP500_return		SP500_return		SP500_return		SP500_return
Pearson Correlation	M1change	.034	M2change	.006	USdollar_change	-.457**	Bond_index_return	.132	Bank_credit_change	.010	Property_return	.113	Commodity_return	.526**	Gold_return	.069
Sig. (2-tailed)		.626		.936		.000		.058		.884		.105		.000		.324
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lead1	.084	M2change_lead1	.005	USdollar_lead1	-.066	Bond_lead1	-.249**	Bank_credit_lead1	.004	Property_lead1	.424**	Commodity_lead1	.067	Gold_lead1	-.069
Sig. (2-tailed)		.228		.944		.348		.000		.950		.000		.338		.320
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lead2	-.064	M2change_lead2	.016	USdollar_lead2	.203**	Bond_lead2	-.011	Bank_credit_lead2	-.013	Property_lead2	-.041	Commodity_lead2	-.081	Gold_lead2	-.181**
Sig. (2-tailed)		.363		.819		.003		.878		.855		.554		.248		.009
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lead3	-.042	M2change_lead3	-.087	USdollar_lead3	-.068	Bond_lead3	.045	Bank_credit_lead3	-.065	Property_lead3	-.043	Commodity_lead3	-.017	Gold_lead3	.065
Sig. (2-tailed)		.546		.215		.329		.520		.354		.534		.803		.349
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lead4	-.033	M2change_lead4	-.036	USdollar_lead4	.015	Bond_lead4	.068	Bank_credit_lead4	-.048	Property_lead4	-.029	Commodity_lead4	.009	Gold_lead4	-.036
Sig. (2-tailed)		.641		.603		.834		.333		.495		.683		.901		.605
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lead5	.064	M2change_lead5	-.073	USdollar_lead5	-.168*	Bond_lead5	.153*	Bank_credit_lead5	.085	Property_lead5	-.017	Commodity_lead5	.237**	Gold_lead5	.074
Sig. (2-tailed)		.363		.297		.016		.028		.223		.809		.001		.292
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lead6	.133	M2change_lead6	.006	USdollar_lead6	.042	Bond_lead6	-.027	Bank_credit_lead6	-.139*	Property_lead6	.104	Commodity_lead6	.043	Gold_lead6	-.015
Sig. (2-tailed)		.057		.926		.549		.699		.047		.137		.539		.832
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1chnage_lead7	-.190**	M2change_lead7	-.099	USdollar_lead7	-.063	Bond_lead7	-.123	Bank_credit_lead7	-.167*	Property_lead7	.126	Commodity_lead7	.075	Gold_lead7	.093
Sig. (2-tailed)		.006		.155		.371		.078		.016		.071		.285		.183
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lead8	.024	M2change_lead8	-.077	USdollar_lead8	-.017	Bond_lead8	.044	Bank_credit_lead8	.001	Property_lead8	-.038	Commodity_lead8	.145*	Gold_lead8	-.110
Sig. (2-tailed)		.726		.269		.806		.528		.987		.582		.037		.114
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lead9	-.040	M2chnage_lead9	-.076	USdollar_lead9	.089	Bond_lead9	-.052	Bank_credit_lead9	-.071	Property_lead9	.093	Commodity_lead9	-.105	Gold_lead9	-.015
Sig. (2-tailed)		.568		.275		.203		.455		.313		.185		.132		.834
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lead10	-.027	M2change_lead10	.070	USdollar_lead10	.113	Bond_lead10	.033	Bank_credit_lead10	-.060	Property_lead10	-.150*	Commodity_lead10	.077	Gold_lead10	-.101
Sig. (2-tailed)		.700		.314		.104		.639		.389		.031		.268		.150
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lead11	-.128	M2change_lead11	.046	USdollar_lead11	-.131	Bond_lead11	.013	Bank_credit_lead11	-.145*	Property_lead11	-.096	Commodity_lead11	.188**	Gold_lead11	.066
Sig. (2-tailed)		.065		.508		.060		.851		.038		.168		.007		.345
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lead12	.006	M2change_lead12	-.021	USdollar_lead12	-.100	Bond_lead12	-.131	Bank_credit_lead12	-.083	Property_lead12	-.081	Commodity_lead12	.111	Gold_lead12	.072
Sig. (2-tailed)		.931		.765		.151		.059		.236		.248		.112		.304
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lead13	.031	M2change_lead13	.011	USdollar_lead13	-.120	Bond_lead13	.112	Bank_credit_lead13	-.037	Property_lead13	-.041	Commodity_lead13	.054	Gold_lead13	.085
Sig. (2-tailed)		.653		.876		.085		.108		.600		.561		.443		.221
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag1	-.020	M2change_lag1	-.146*	USdollar_lag1	-.159*	Bond_lag1	.004	Bank_credit_lag1	-.031	Property_lag1	.180**	Commodity_lag1	.128	Gold_lag1	-.035
Sig. (2-tailed)		.780		.035		.022		.953		.657		.009		.065		.615
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag2	-.043	M2change_lag2	-.221**	USdollar_lag2	.024	Bond_lag2	-.139*	Bank_credit_lag2	-.028	Property_lag2	.050	Commodity_lag2	.025	Gold_lag2	.027
Sig. (2-tailed)		.540		.001		.730		.045		.690		.476		.716		.701
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag3	.009	M2change_lag3	-.138*	USdollar_lag3	.004	Bond_lag3	.095	Bank_credit_	.024	Property_lag3	-.055	Commodity_lag3	.130	Gold_lag3	-.012

Sig. (2-tailed)		.900		.047		.960		.175	lag3	.732		.435		.062		.868
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag4	-.139*	M2change_lag4	-.069	USdollar_lag4	.181**	Bond_lag4	.002	Bank_credit_lag4	.024	Property_lag4	-.015	Commodity_lag4	-.088	Gold_lag4	-.106
Sig. (2-tailed)		.046		.322		.009		.982		.737		.826		.208		.128
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag5	.001	M2change_lag5	-.073	USdollar_lag5	.055	Bond_lag5	-.151*	Bank_credit_lag5	.072	Property_lag5	-.001	Commodity_lag5	-.035	Gold_lag5	-.121
Sig. (2-tailed)		.987		.294		.435		.030		.304		.992		.614		.082
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag6	-.063	M2change_lag6	.003	USdollar_lag6	-.043	Bond_lag6	-.114	Bank_credit_lag6	.067	Property_lag6	-.060	Commodity_lag6	.040	Gold_lag6	.020
Sig. (2-tailed)		.364		.961		.540		.103		.338		.391		.565		.777
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag7	.022	M2change_lag7	-.005	USdollar_lag7	-.126	Bond_lag7	-.018	Bank_credit_lag7	.038	Property_lag7	.089	Commodity_lag7	-.003	Gold_lag7	.077
Sig. (2-tailed)		.753		.945		.072		.793		.584		.202		.963		.268
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag8	-.041	M2chnage_lag8	-.165*	USdollar_lag8	-.031	Bond_lag8	-.042	Bank_credit_lag8	-.059	Property_lag8	-.074	Commodity_lag8	.032	Gold_lag8	-.022
Sig. (2-tailed)		.560		.018		.662		.544		.402		.291		.644		.748
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag9	.013	M2change_lag9	-.113	USdollar_lag9	.117	Bond_lag9	-.008	Bank_credit_lag9	-.110	Property_lag9	.038	Commodity_lag9	.063	Gold_lag9	-.054
Sig. (2-tailed)		.858		.105		.094		.908		.116		.583		.365		.442
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag10	-.055	M2chnage_lag10	-.015	USdollar_lag10	.141*	Bond_lag10	-.007	Bank_credit_lag10	.018	Property_lag10	-.044	Commodity_lag10	-.081	Gold_lag10	-.071
Sig. (2-tailed)		.435		.834		.042		.920		.792		.525		.248		.307
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag11	.006	M2change_lag11	.010	USdollar_lag11	-.013	Bond_lag11	-.055	Bank_credit_lag11	.014	Property_lag11	.205**	Commodity_lag11	.040	Gold_lag11	.033
Sig. (2-tailed)		.935		.881		.856		.433		.842		.003		.563		.639
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag12	.026	M2change_lag12	.074	USdollar_lag12	.060	Bond_lag12	.046	Bank_credit_lag12	-.040	Property_lag12	-.001	Commodity_lag12	-.039	Gold_lag12	-.001
Sig. (2-tailed)		.714		.291		.390		.510		.569		.987		.572		.989
N		207		207		207		207		207		207		207		207
Pearson Correlation	M1change_lag13	.031	M2change_lag13	-.037	USdollar_lag13	.032	Bond_lag13	.041	Bank_credit lag13	.015	Property_lag13	.058	Commodity_lag13	-.023	Gold_lag13	-.112
Sig. (2-tailed)		.661		.593		.650		.553		.832		.409		.744		.107
N		207		207		207		207		207		207		207		207

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Next step is to test the stationarity or non-stationarity of the variables' time series in Panel A and Panel B. The ADF tests are conducted. The time series of all lead-lag variables in two panels are stationary.

Use the above variables as the inputs to run a regression for each panel. Table 6 shows the result of Panel A. From the heading Collinearity Statistics in the Coefficients box, the highest Tolerance value and the lowest VIF are 0.636 and 1.572. Multicollinearity does not exist in the regression. In the Model Summary box, the R Square is 0.507 and Adjusted R Square is 0.49. 50.7% of the variances in the SP500_return can be predicted by the variables. In the ANOVA box, the value of Sig is 0.000, which is less than 0.05.

This is sufficient to conclude that there is a significant relationship between the variables and SP500_return. Assessing the significance of individual parameters, all of them are significant (Sig <0.05) except the Bond_lead 4 (Sig=0.415). Therefore, the regression equation can be written as:

$$SP500\_return = 0.004 - 0.503M1change\_lead12 - 1.448M2change\_lead1$$

$$-0.514USdollar\_change - 1.376Bank\_credit\_lead\ 4 + 0.206Property\_lead1$$

$$+0.212Commodity\_return + 0.237Gold\_lag\ 3$$

Table 7 shows the result of Panel B. The highest Tolerance value and the lowest VIF are 0.621 and 1.609. Multicollinearity does not exist in the regression. The R Square is 0.498 and Adjusted R Square is 0.478. 49.8% of the variances in the SP500_return can be predicted by the variables. In the ANOVA box, the value of Sig is 0.000, which is

less than 0.05. This is sufficient to conclude that there is a significant relationship between the variables and SP500_return. Assessing the significance of individual parameters, M2change_lag 2 (Sig=0.168) and Bank_credit_lead 7 (Sig=0.07) are insignificant while the others are significant (Sig <0.05). The regression equation can be written as

$$SP500\_return = 0.005 - 0.504M1change\_lead7 - 0.544USdollar\_change$$
$$-0.838Bond\_lead1 + 0.178Property\_lead1 + 0.27Commodity\_return$$
$$+0.137Gold\_lead\ 2$$

The two results show that the explanations of the models in Panel A and Panel B are better than the original one. From the result of Table 8, the Chow test also support that the structure of the two panels is different. The relationship between SP500_return and independent variables changes according to different investment environments.

Table 6 Multiple Regression Result of Panel A

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.712[a]	.507	.490	.020829036

a. Predictors: (Constant), gold_lag3, bond_lead4, M1change_lead12, bank_credit_lead4, M2change_lead1, commodity_return, property_lead1, USdollar_change

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.101	8	.013	29.211	.000[b]
	Residual	.098	227	.000		
	Total	.200	235			

a. Dependent Variable: SP500_return

b. Predictors: (Constant), gold_lag3, bond_lead4, M1change_lead12, bank_credit_lead4, M2change_lead1, commodity_return, property_lead1, USdollar_change

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.004	.002		2.170	.031		
	USdollar_change	-.514	.153	-.196	-3.362	.001	.636	1.572
	Commodity_return	.212	.064	.191	3.313	.001	.654	1.530
	M1change_lead12	-.503	.141	-.168	-3.569	.000	.976	1.025
	M2change_lead1	-1.448	.551	-.129	-2.630	.009	.906	1.104
	Bond_lead4	-.219	.269	-.040	-.816	.415	.920	1.087
	Bank_credit_lead4	-1.376	.398	-.167	-3.461	.001	.935	1.070

Property_lead1	.206	.033	.307	6.220	.000	.890	1.124
Gold_lag3	.237	.045	.255	5.333	.000	.949	1.054

a. Dependent Variable: SP500_return

Table 7 Multiple Regression Result of Panel B

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.706[a]	.498	.478	.019344327

a. Predictors: (Constant), gold_lead2, bond_lead1, bank_credit_lead7, property_lead1, M1chnage_lead7, USdollar_change, M2change_lag2, commodity_return

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.074	8	.009	24.598	.000[b]
	Residual	.074	198	.000		
	Total	.148	206			

a. Dependent Variable: SP500_return

b. Predictors: (Constant), gold_lead2, bond_lead1, bank_credit_lead7, property_lead1, M1chnage_lead7, USdollar_change, M2change_lag2, commodity_return

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.005	.002		2.869	.005		
	commodity_return	.270	.066	.262	4.101	.000	.621	1.609
	USdollar_change	-.544	.163	-.209	-3.332	.001	.645	1.549
	M1chnage_lead7	-.504	.158	-.169	-3.192	.002	.904	1.106
	M2change_lag2	-.881	.637	-.075	-1.383	.168	.871	1.149
	bond_lead1	-.838	.248	-.182	-3.380	.001	.869	1.150
	bank_credit_lead7	-.432	.237	-.095	-1.821	.070	.933	1.072
	property_lead1	.178	.031	.302	5.797	.000	.934	1.071
	gold_lead2	-.137	.047	-.151	-2.916	.004	.940	1.064

a. Dependent Variable: SP500_return

Table 8. Chow Test result for Panel A and Panel B

Regression stability test (Chow test)

Score	C.V.	P-Value	Stable?	5.0%
0.000	*1.962*	*0.00%*	FALSE	

Conclusion

In this research, eight variables are applied to evaluate the effect of capital flow on the US stock market return. In the first part, Pearson Correlations and regression analysis are conducted between the dependent variable and independent variables. In the second part, the Pearson Correlations and regression analysis are repeated to explore whether there are lead-lag relationships between them. The findings show that six out of eight variables have the lead-lag relationship with the stock market return. However, one constant coefficient correlation between the dependent variable and independent variables for the whole period is misleading. Therefore, I divide the period into two panels reflecting different investment environments. Panel A is when the growth rate of M1 greater than the growth rate of M2 representing that the market has sufficient funds while Panel B is when the growth rate of M2 greater than the growth rate of M1representing that the market has lesser funds. From the results, most of the eight variables in the two panels have a more slightly correlated relationship with the stock market return. More important is that the highest coefficient correlation of Gold_return with SP_500 return is positive in Panel A and is negative in Panel B. This result is more able to prove that the correlations between the dependent variable and independent variables will change under different investment environments. This also explains why the prediction ability of the variables in the two panels is stronger than the original data set.

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