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Persistence In Commodity ETF Performance

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PERSISTENCE IN COMMODITY ETF PERFORMANCE

by

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Commodities ETFs have became popular investments since first introduced in the market. This type of funds provide investors a simple way to gain exposure to commodities, and these types of funds are considered as an asset class to diversify investment portfolios and as a hedge against economic recessions. With more capital invested in commodities ETFs by investors, argument about the efficiency in commodity ETF market are heated debate by economists. This paper developed a reasonable method to explore persistence in commodity ETFs. 30 commodities ETFs, which ranked high in terms of large assets, are selected during the period of 2008 to 2013. The pair-wised t test results shows neither persistence nor reversal in commodity ETF returns for both short-term and long-term. The correlation indicates in general there exist high correlation among different ranking mix over different periods. We conclude that there is no persistence in commodity ETF performance and the commodity ETF market is efficient.

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CHAPTER I

TOPIC INTRODUCTION

Exchange-traded funds (ETFs) are type of funds which track indices like S&P 500. This kind of fund cannot directly sell individual shares to investors and only issued shares in large blocks. Also, investors normally can not purchase ETFs shares with cash, which require investors first buy a bunch of securities that mirrors the ETF's portfolio instead (NASDAQ.com). For example, when investors buy shares of ETFs, they are buying shares of a portfolio that tracks the return of its native index. After holding a certain amount of shares of ETFs in a portfolio, investors would splits it up and sell the individual shares on a secondary market (Investopedia.com).

For most type of ETFs, they are seeking to achieve the same return as a particular market index. These types of ETFs are similar to index funds in which it will primarily invest in the securities of companies that are included in a selected market index. Investors can also think of ETFs as a form of index fund in terms of they have the same goal, which is to provide investors with a benchmark return at lowest cost. However, there are several important difference between ETFs and index funds. One of the difference is that ETFs don't try to outperform their corresponding index, but simply replicate its performance. They are trying to be the market instead of trying to beat the market. Another important difference is index funds are costly to trade, while ETFs often trade commission-free. ETFs combine the range of a diversified portfolio with the simplicity of trading a single stock. Investors can purchase ETF shares on margin, short sell, or hold for the long term since of it low transactions cost. The third difference is that ETFs apply for passive management and trading strategy. ETFs should be passively invested once the underlying index methodology is in place. The purpose of ETFs is to match a

certain market index, which is known as passive management. Passive management is the chief distinguishing feature of ETFs, and it could benefit investors a lot in index funds. Essentially, passive management refers to the manager makes only minor, periodic adjustments to keep the portfolio in line with its index. This is quite different from an actively managed fund, which the manager continually trades assets in an effort to outperform and beat the market. Because they are tied to a particular index, ETFs tend to cover independent and diversified stocks, as opposed to a mutual fund whose scope of investment is subject to continual change.

In this report paper, we are focus on commodities ETFs or futures-based ETFs. Commodity ETFs are kinds of ETFs that invest in physical commodities such as agricultural products, metals and natural resources (Investopedia.com). This is a great investment vehicles for investors who want to gain exposure to physical goods or need to hedge risk. The components of commodity ETFs are little bit different than other type of ETFs. For example, most ETFs consist of equity related to a particular market index, and general ETFs are a collection securities determined by the criteria of the fund. However, Commodity ETFs are made up of futures or asset-backed contracts. These contracts represent the commodity and will track the performance of that particular product. Most commodity ETFs use derivatives, which can trade quite differently from the day-to-day spot price of commodities. Commodity ETFs may be focused on a single commodity and hold it in physical storage or may invest in futures contracts. Other commodity ETFs look to track the performance of a commodity index. Because many commodity ETFs use leverage through the purchase of derivative contracts, they may have large portions of uninvested cash, which is used to purchase Treasury securities or other nearly risk-free assets.

CHAPTER II

REVIEW OF LITERATURE

A futures contract is an agreement that allows investors to buy or sell an asset at a certain time in the future for a certain price, and the trading process is not simple. Investors need to open a margin account, find the right contracts to purchase in order to hold long or short position, and must avoid physical delivery of the underlying commodity, as well as prepare for suffering potential loss because of high leverage, which exposes investors to volatility risks in the futures price fluctuation. All the features above have made it complex for unsophisticated and unskilled investors to invest commodity futures. Guedj, Li, and McCann (2011) listed several benefits for investors by using futures-based commodities ETFs rather than futures contracts. First, the commodities ETFs could offer investors a simple way to gain exposure to commodities, which are thought of as an asset class suitable for diversification in investment portfolios and as a hedge against economic downturns. Second, by investing in commodities futures, investors could decrease some volatility of a well diversified portfolio without reducing their expected return. However, the return of the futures in the portfolio have deviated significantly from the change in the price of their underlying commodities. Third, ETFs have the similar functions as futures contracts to gain exposure to commodities. By using short-term futures contracts, commodities ETFs are likely to generate returns that deviate significantly for either favorable or unfavorable differ from the changes in both the underlying commodity's spot price and futures price, which could provide investors great opportunity and high risk to achieve expected returns.

Szymanowska, Nijman, and Goorbergh (2012) defined two types of risk premia in commoidiy futures returns: term permia, which is related to changes in basis, and spot premia, which is referred to the risk in the underlying commodities. After sorting portfolio with some variables, such as futures basis, volatility, inflation, return momentum, liquidity, and hedging

pressure, the results showed that term premia between 1% and 3% per annum and spot premia between 5% and 14% per annum. The authors of this article sorted 21 commodities into four portfolios, and for each sort, they consider different maturities like two, four, six, and eight months for short roll return and excess holding returns.

The short roll returns provided a direct estimate only of the spot premia, the resulting spread in the high-minus-low basis portfolios decreases across the holding periods from -8.3% to -14.5%. Sorting on the basis results in both economically and statistically highly significant. The Excess Holding returns isolated the term premia, the resulting spreads for the high-minus-low basis portfolios range from 0.6% to 1.8% per annum. Term premia spreads are significantly different from zero, and the standard deviations of the excess holding returns are modest between 1.0% and 3.2%.

For the internet appendix reports, the authors constructed a sample which started at the same date but end just before the beginning of financial crisis on November 2008. Then they constructed two samples that start at two different earlier dates. The sorting result on basis are similar across the samples.

Dhume (2010), also used sorting. The purpose of this article is to examine the return of buying futures contracts for 35 individual commodities during 50 years between 1959 and 2008. First, the author built a model to test the prediction that assets with higher factor risk have higher returns, the results shown that the model is able to predict the returns to commodities. After confirming the model could successfully estimate commodities returns, the author explore which characteristics of commodities may be driving returns and risk by sorting underlying characteristic. Sorting assets into portfolios made it obviously of the relationship between the underlying sorting characteristic and asset returns. After focus on the basis, the author selected

spot price volatility and return momentum as sorting characteristics for commodities, and to explore whether these characteristics could predictable returns by using standard asset pricing models. The results indicated that high returns to low basis, high momentum, and high volatility commodities are consistent with high durable risk.

Fama and French (1993) identified five general risk factors that impacted the returns on stocks and bonds. Three factors, such as overall market factor, firm size, and book-to-market equity, are related to stock market. Another two factors like maturity and default risk factors are related to bond market. The five factors together explained average returns on stocks and bonds. Fama and French found that beta, which refer to the slope of stocks' return on a market return in a regression, has little information about average returns in combination with other variables or used alone. However, size, which means stock price of a firm times number of shares outstanding, combined with book-to-market equity, which is the ratio of book value of a firm's common stock, played the apparent roles and did a good job explaining the cross-section of average returns. The time-series regression approach was used to explore the factors that could influence average returns. Monthly returns on stocks and bonds were regressed on the returns to a market portfolio of stocks and simulating portfolios for size, book-to-market equity, and term-structure risk factors in returns. The findings were clear. For stocks, portfolio constructed to mimic risk factors related to size and book-to-market equity captured strong common variation in returns, which indicated size and book-to-market equity proxied for sensitivity to common risk factors in stock returns. For bonds market, the simulating portfolios for the two term-structure factors, which are term and default premium, captured most of the variation in the returns on government and corporate bond portfolios, and the term-structure factors also evdienced the average return on bonds.

Roon, Nijman, and Veld (2000) debated the topic that futures risk premium is highly interdepends on systematic risk, which is defined as hedging pressure. Hedging pressure is the risk resulted from market frictions like information asymmetries that hindered transactions. Authors in this article used simple model implies expected returns are deterrmined by hedging pressure and by the covariance of futures return with market return, which means futures risk premium is not only determined by its own hedging pressure but also by cross-hedging pressures or hedging pressure from other market. In order to determine the effect of hedging pressure variables on futures riks premia, the authors analyzed 20 futures markets and divided those markets into four categories such as currency futures, agricultural futures, financial futures, and mineral futures. Findings showed that both own and cross hedging pressure variables within futures own category explained futures returns. Also, those results denied the possibility of price pressure hypothesis, which is temporary price change is an outcome of shock in demand or supply. The price pressure hypothesis is similar with hedging pressure hypothesis, however, hedging pressure effects still significantly present after controlling for price pressure effects, hedging pressure variables affected both futures returns and returns on underlying value of futures contracts, and hedging pressure effects in both spot and futures returns consistented with pricing model predictions but discreted with price pressure hypothesis.

CHAPTER III

DATA AND METHODS

Exchange-traded funds (ETFs) are one of the fastest growing and most popular type of exchange-traded product, and are offshoots of mutual funds that allow investors to trade index portfolios just as they do shares of stock, which means this kind of fund tracks an index but trades on stock exchanges.

This report paper only focus on Commodity ETFs, or Exchange-traded Commodities (CETFs or ETCs) in Table 1, which are kinds of funds invest in commodities futures. Commodity ETFs are investment vehicles that track the performance of an underlying commodity index. Similar to ETFs and traded and settled on their own dedicated segment, commodity ETFs have market maker support with guaranteed liquidity, enabling investors to gain exposure to commodities, on-exchange, during market hours. Almost every commodity ETFs implement the futures trading strategy, which may produce quite different results from owning the commodity. Also commodity ETFs trade like shares, which are simple and efficient and provide exposure to an ever-increasing range of commodities and commodity indices, such as agriculture and energy.

The data for this report paper is collected from some financial websites, such as *ETF Database* and *Yahoo! Finance*. First, the website *ETF Database* is used to do the commodity ETFs' screener. In the process of screening, some sorting criteria, such as futures-based, no leverage, no inverse, and larger assets, are selected. Futures-based means no dividends and the funds are tracks futures index as well as make money in the futures market. No leverage feature is used to keep the main commodity ETFs that do not try to provide a leveraged return. No inverse is used to eliminate commodity ETFs that hold short positions. The large assets criteria is

not important for the futures-based ETF's, it just to help to keep the selected funds have enough trading history records. After first step, commodity ETFs are listed with assets rank from high to low, then we use the *Yahoo! Finance* website for another part of screener, in this part, two sorting criteria are selected, which are monthly close price and inception date before on 01 January 2008. Inception date is used to make sure there is enough time period data for commodity ETFs to do statistic analysis. The total date range is from 01 January 2008 to 31 December 2013. The monthly close price is chosen because it contains all the information published in the market in the past and it already exactly reflected price movement of the interaction between market supply and demand. In the end, 30 out of 106 futures-based ETFs are selected which satisfied all the sorting criteria.

After getting the monthly close price of all the 30 funds, return for each month is calculated. Since it is futures-based ETFs, all the trading process are just like futures market, therefore the monthly return for each month can be calculated as follow:

$$R_t = \ln(\frac{P_t}{P_{t-1}}) * 100$$

Where R_t is monthly return for period *t-1* to *t*. P_t is the monthly price at period *t*. P_{t-1} is the monthly price at period *t-1*.

After we get the data for monthly returns, we can conduct our research and all the research processes are only based on the monthly returns. First we develop four different time segments from long-term to very short-term period, such as 1-year, 6-month, 3-month, and 1-month. For each time segments, then we calculate the average return for each time periods to get new segment returns.

A. Sorting the ranks

Sorting the segment returns gives us different ranks for each funds, which allows us to conduct spearman correlation coefficient and t-statistic. For the processes of conduct statistic, we have degree of freedom equal to 28, and significant level equal to 5%, the results for the four time segments are shown in Table 2.

Number of statistic significant in Table 2 shows that in the very short-term, the sample futures-based ETFs shows very weak evidence for persistence, and in the long-term it shows some reversal performance.

B. Sorting the average return

Sorting the segment returns not only gives us different ranks for each funds, but the return for each funds. Than we can calculate the average return for top 10, middle 10, and button 10 of each time periods. After doing this for all the four time segments, we average all the returns for different time periods in different time segments, then calculate the correlation and pair-wised t test, the results shown in Table 3.

The result of pair-wised t test in Table 3 shows that no significance, which means that there are neither persistence nor reversal in the futures-based ETFs market for long-term and short-term, in other words that means this market works efficient. The correlation shows that in general there exist high correlation among top10, middle 10, and button 10 funds in different time segments, which also indicates the market is efficient.

CHAPTER IV

CONCLUSION

Commodities ETFs have became popular investments since it first introduced in the market. This type of funds provide investors a simply way to gain exposure to commodities, and these types of funds are considered as an asset class to diversify investment portfolios and as a hedge against economic recessions. With more capital invested in commodities ETFs by investors, arguments about the efficiency in commodity ETF market are debated by economists. This paper developed a reasonable method to explore persistence in commodity ETF. Therefore, 30 commodities ETFs, which ranked high in terms of large assets, are selected during the period of 2008 to 2013.

Our purpose is to test if there exist persistence in commodity ETF. Therefore, the null hypothesis is H_0: $Return_{Top\ 10} = Return_{Middle\ 10} = Return_{Bottom\ 10}$, which indicate there is no persistence among commodity ETFs. And the alternative hypothesis are H_a: $Return_{Top\ 10} > Return_{Middle\ 10} > Return_{Bottom\ 10}$, which means there exist persistence among commodity ETFs; or H_a: $Return_{Top\ 10} < Return_{Middle\ 10} < Return_{Bottom\ 10}$, which indicates there is a reversal relationship among commodity ETFs.

The results by sorting the ranks in Table 2 shows that 40% (2 out of 5) observations for 1-year holding time frame reached significant, and both the two observations are negative statistic significant, meanwhile, the average *r* of statistic significance in long-term holding period is negative, which indicate a reversal in commodity ETF performance; the 6-month holding time frame tells us that 27% (3 out of 11) observations reached significant, two are positive statistic significant, and one is negative statistic significant, which indicate there is no persistence in commodity ETF performance. Besides, the average *r* of statistic significant is positive in 6-

month holding time frame is 0.066, which indicate there is very weak persistence in commodity ETF performance; the 3-month holding time frame shows that 17% (4 out of 23) observations reached significance, including two positive statistic significant, and two negative statistic significant, all the four obervations indicates there is no persistence in commodity ETF performance, and spearman's rank corrleation coefficient is 0.005 shows very weak evidence that short-term holding period exist persistence; the 1-month holding time frame shows that 43% (30 out of 70) observations reached significant, including 18 positive statistic significant, and 12 negative statistic significant, which provide weak evidence that exist persistence in commodity ETF performance. Besides, the spearman's rank correlation coefficient is 0.1333 also suggest very weak evdience of persistence in the very short holding periods.

The results of sorting Pair-wised *t*-test and correlation in Table 3 are compared with three categories, which are top 10, middle 10, and bottom 10, by four holding periods. All the *p*-values of pair-wised *t*-test are greater than 5%, which tells us that there is no persistence of performance in different portfolio within different holding time frame. In the correlation part, the top 10 and middle 10 portfolio indicates high correlation within different time frame; the top 10 and bottom 10 portfolio represents high correlation within 3-month and 6-month time frame, and moderate correlation within 1-month and 1-year time frame; the middle 10 and bottom 10 portfolio shows high correlation within 1-month, 3-month, and 6-month time frame, and moderate correlation within 1-year time frame. All the erratic correlations for different portfolio within different holding time frame tells us that there is no persistence in commodity ETF returns.

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APPENDICES

APPENDIX A

RELATED TABLES AND FIGURES

Symbol	Name	Assets ($1,000s)	Volume	2008-2013 Average Annual Returns (%)
DBC	DB Commodity Index Tracking Fund	5,105,408	1,717,342	-0.39
DJP	Dow Jones-UBS Commodity Index TR ETN	1,471,389	264,380	-0.7
DBA	DB Agriculture Fund	1,173,920	533,011	-0.61
GSG	GSCI Commodity-Indexed Trust Fund	1,010,510	293,171	-0.77
RJI	Rogers Intl Commodity ETN	852,118	441,414	-0.49
UNG	United States Natural Gas Fund LP	690,052	6,184,126	-0.95
USO	United States Oil Fund	539,292	3,511,780	-1.11
DBB	DB Base Metals Fund	332,710	313,325	-0.59
GCC	Continuous Commodity Index Fund	330,723	56,809	-0.34
DBE	DB Energy Fund	290,864	92,622	-0.32
DBO	DB Oil Fund	247,050	114,820	-0.33
GSC	GS Connect S&P GSCI Enh Commodity TR ETN	227,521	10,025	-0.49
OIL	S&P GSCI Crude Oil Tot Ret Idx ETN	204,197	199,348	-1.28
RJA	Rogers Intl Commodity Agric ETN	181,538	120,088	-0.55
DBP	DB Precious Metals Fund	171,952	26,052	0.17
DGL	DB Gold Fund	146,736	95,694	0.2
JJG	DJ-UBS Grains Total Return Sub-Index ETN	122,337	113,571	-0.54
GSP	S&P GSCI Total Return Index ETN	92,105	12,775	-0.76
JJC	DJ-UBS Copper Total Return Sub-Index ETN	66,969	23,282	-0.28
JJA	DJ-UBS Agriculture Subindex Total	57,045	15,505	-0.4

	Return ETN			
UGA	United States Gasoline Fund LP	52,944	18,492	0.23
USL	United States 12 Month Oil	51,228	10,475	-0.35
COW	DJ-UBS Livestock Total Return Sub-Index ETN	43,955	25,694	-0.79
RJN	Rogers Intl Commodity Enrgy ETN	33,784	45,592	-0.72
DBS	DB Silver Fund	24,256	7,000	-0.02
GAZ	DJ-UBS Natural Gas Subindex Total Return ETN	23,881	52,983	-4.24
RJZ	Rogers Intl Commodity Metal ETN	16,200	9,720	-0.29
JJM	DJ-UBS Industrial Metals Total Return Sub-Index ETN	13,578	4,995	-0.77
JJN	DJ-UBS Nickel Total Return Sub-Index ETN	11,871	7,897	-1.25
JJE	DJ-UBS Energy Total Return Sub-Index ETN	5,903	3,250	-1.59

Table 1. Commodities ETFs

Note: All the data utilized in constructing the table above is from ETF Database. Annual average returns are calculated by the method mentioned in this paper.

Holding periods

	1-month	3-month	6-month	1-year
Number of observation	70	23	11	5
Number of statistic significant	30	4	3	2
Average r of statistic significant	0.133	0.005	0.066	-0.435
Number of statistic significant (+)	18	2	2	0
Number of statistic significant (-)	12	2	1	2

Table 2. Sorts the Ranks

Note: r is spearman correlation coefficient.

		Holding periods			
		1-month	3-month	6-month	1-year
		---------- p-values ----------			
Pair-wised t test	Top 10 v.s. Middle 10	0.544	0.816	0.345	0. 600
	Top 10 v.s. Button 10	0.372	0.455	0.266	0.420
	Middle 10 v.s. Button 10	0.444	0.107	0.208	0.354
		---------- correlations ----------			
Correlation	Top 10 v.s. Middle 10	0.851	0.935	0.981	0.825
	Top 10 v.s. Button 10	0.639	0.887	0.875	0.452
	Middle 10 v.s. Button 10	0.833	0.943	0.946	0.482

Table 3. Sorts the Pair-wised t test and Correlation

Note: Pair-wised t test and correlation are compared with three categories, which are top 10, middle 10, and button 10, by four different holding periods.

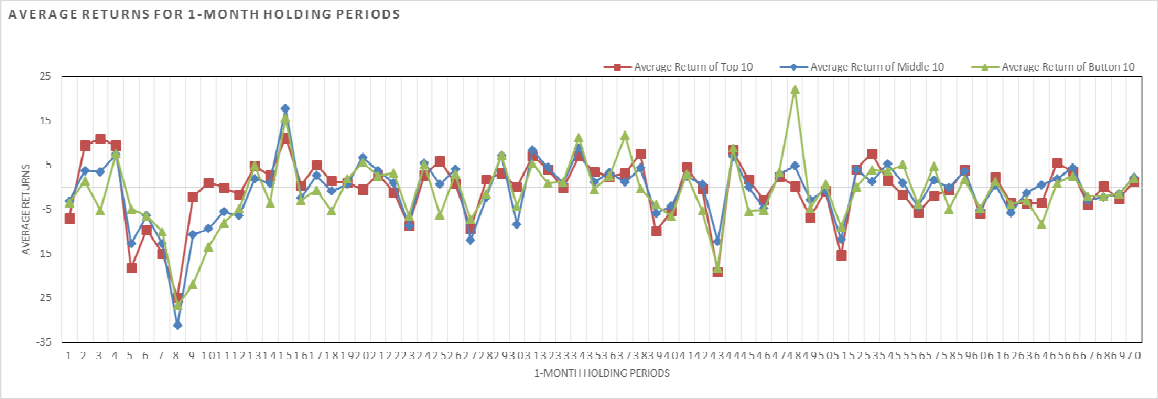

Figure 1. Average Returns of 1-mouth Based Holding Periods from 2008 to 2013

Note: X-axis means monthly based from 2008 to 2013. Y-axis means average returns during that time periods.

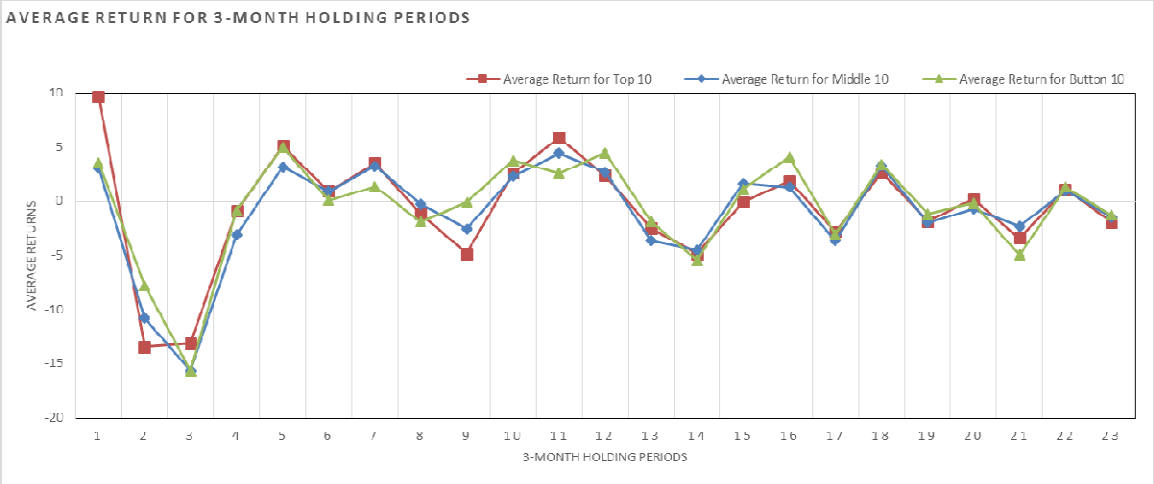

Figure 2. Average Returns for 3-mouth Based Holding Periods from 2008 to 2013

Note: X-axis means quarterly based from 2008 to 2013. Y-axis means average returns during that time periods.

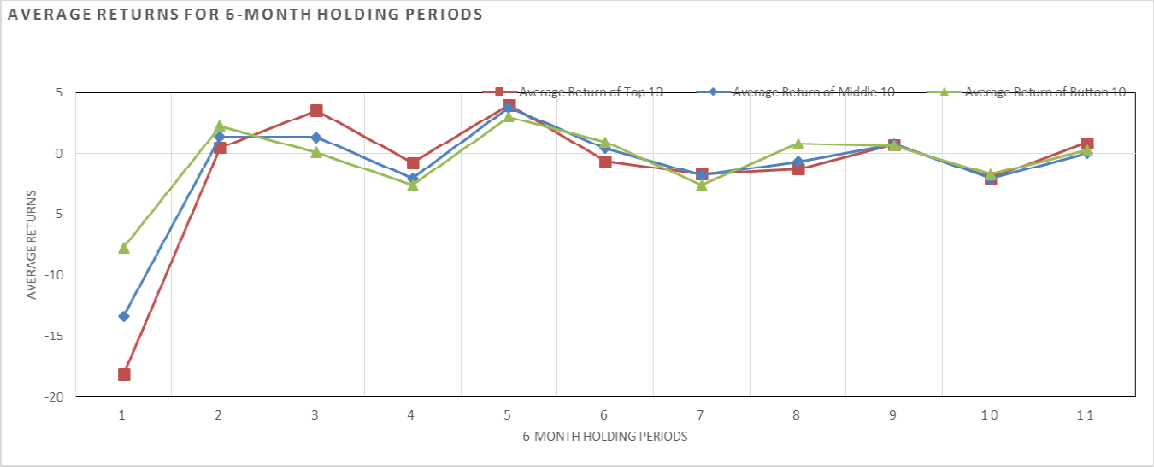

Figure 3. Average Returns for 6-mouth Based Holding Periods from 2008 to 2013

Note: X-axis means 6-month based from 2008 to 2013. Y-axis means average returns during that time periods.

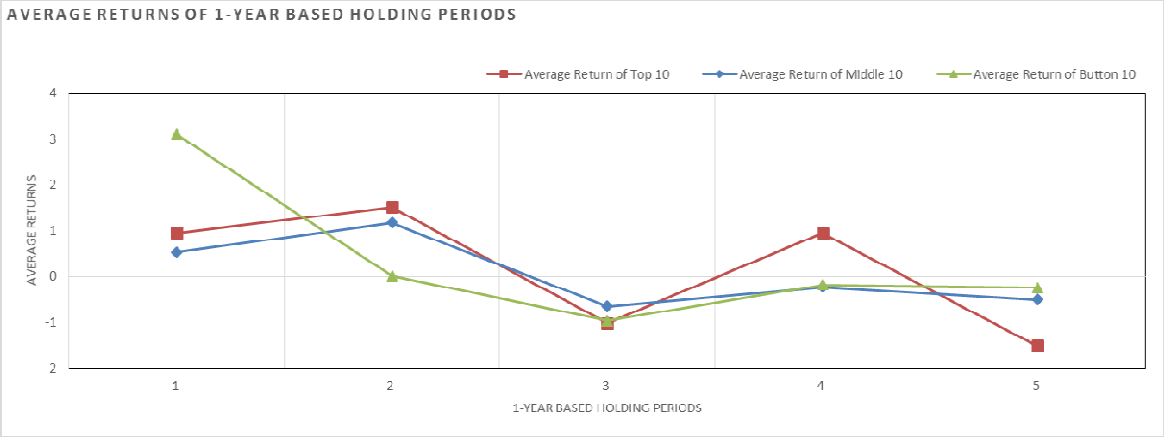

Figure 4. Average Returns of annual Holding Periods from 2008 to 2013

Note: X-axis means yearly based from 2008 to 2013. Y-axis means average returns in percentage during that time periods.

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