

# **529 PLANS DURING THE GLOBAL FINANCIAL CRISIS OF 2008, A CONDENSED STUDY ON RETURNS AND VOLATILITIES OF 529 PLANS**

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## **ABSTRACT**

Global financial crisis of 2007-2009 had deep impact on major financial markets and instruments. Returns in mutual funds market and stock exchanges dropped drastically during the period from September 2008 to March 2009. For instance, Dow Jones Industrial Index fell from 11500 to 6500 during this same period. During this period of financial turmoil, there is a unique opportunity to see the structural changes in the college saving plans. 529 Plans, financial instruments designated for college savings, are known with their low default risk and high regulation. We anticipated a decrease in returns and an increase in volatility of 529 Plans' returns. In our study; we examine if there was a structural change in 529 Plan returns before and after the financial crisis. Additionally, we compare the volatility change in 529 Plans against the volatility change in overall market to see if 529 Plans are really safer compared to the rest of the market.

## **INTRODUCTION**

The start time and the length of the global financial crisis is a long debate. This debate includes which indicators should be accepted as the start date and at what point in time there was a significant change in those indicators. However, this paper neither has a target to define the timing of the financial crisis nor to analyze its reasons. Rather, this paper is intended to measure the changes in "529 Plans" before and after the crisis. It is however widely accepted that the major impact of the financial crisis began just after the collapse of major financial service companies in the late September 2008. February/March 2009 is usually considered as the end of this first wave. After this period stock market started another wave. In this paper, we investigate the effects of the wave from September 2008 till February 2009 on 529 Plans. We aim to find out if 529 Plans are really safer than the rest of the market as they are proposed. We examine the return change, volatility change in returns of 529 Plans and compare the general market volatility against the volatility in 529 Plan returns.

According to Securities and Exchange Commission, a 529 plan is a tax-advantaged savings plan designed to encourage saving for future college costs (SEC). 529 plans, legally known as "qualified tuition plans," are sponsored by states, state agencies, or educational

institutions and are authorized by Section 529 of the Internal Revenue Code. Some of the tax advantages include income tax deduction of plan contribution, tax-deferred interest accumulation, federal and state tax-free withdraws for qualified expenses; and tax deduction if the 529 Plans account value loses its value (SEC). Depending on each plan, qualified expenses include in-state and out-state tuition payments, education supplies, and sometimes room and board. It should be also noticed that investors only choose their 529 Plan, and the rest is managed by professional portfolio managers. Currently all 50 states and the District of Columbia has at least one of 529 Plans.

College saving plans is in fact special type of fund of funds with different regulations and targets. Similar to the Mutual funds, a college saving plan portfolio includes stock mutual funds, bond funds, money market funds and age based funds. College saving plans listed with specific target maturity dates on which the plan ends itself. In the most cases, towards the maturity date, portfolio becomes more risk averse and includes more weight in bond funds and money market funds, which have less default risk and less expected returns. All 529 Plans also penalize the early withdraw and non-purpose use other than higher education. Investors, as a result, are reluctant to make changes and are mostly long term oriented. Thus, in general 529 Plans are considered as one of the most conservative financial instruments in the financial planning industry due to high regulations, type of portfolio holdings and investor type.

### **PURPOSE OF THE STUDY AND HYPOTHESIS TO BE TESTED**

The investor confidence and market performance both decreases during financial crisis. So, when investor confidence is low, it is expected to have a low market performance. Market performance can be observed by a relative change in market indices or returns on portfolio. Following formula shows the general method in calculating the returns:

$$\% \text{ In return in period } t = \left( \frac{\text{Index Value at } (t + t)}{\text{Index Value at } t} - 1 \right) * 100 \quad (1)$$

$$\text{Or} = \left( \frac{\text{Portfolio Value at } (t + t)}{\text{Portfolio Value at } t} - 1 \right) * 100 \quad (2)$$

In September 2008, there was major negative news such as American International Group's (AIG) collapse. In September 2008; AIG's credit ratings were downgraded below "AA" levels which led to the panic in investor confidence. In the following days; AIG's share prices had fallen over 95% of their pre-rating value. Similar loss of confidence occurred in financial firms such as Lehman Brothers, Goldman Sachs, Morgan Stanley and major commercial banks. All of them had showed a significant drop in investor confidence followed by a strong lost in market performance. It is however clear; market performance further deteriorated investor confidence after that first shock.

As there was no previous research on 529 Plans during financial crisis, it is interesting to observe them during the current crisis. However, it is expected to have performance for 529 Plans deteriorated owing to their general portfolio structure which includes both stock funds and bond funds. The previous research in mutual funds also highlights the fact that the plans with higher net assets tend to cope better with financial crisis compared to those with low net assets. So the change of deterioration will be lower for high net asset plans compared to low net asset ones. However, it is important to realize higher net asset plans might have better performance

before the crisis as well. But what we propose is that higher net asset plans will lose less during the crisis

### **Hypothesis 1:**

During the latest wave of the current global financial crisis, lasted from September 2008 to February 2009, there is a significant decrease in market performance for 529 Plans as a whole. 529 Plans with higher net assets significantly have better performance in returns compared the ones with lower net assets.

The second hypothesis is related to the increased volatility in returns during the financial crisis. It is expected to have an increase in return volatility during financial crisis meaning there is much wider difference between returns of similar financial instruments during the same period. Our hypothesis is as follows:

### **Hypothesis 2:**

During the latest wave of the current global financial crisis which lasted from September 2008 to February 2009, there is a significant increase in volatility of returns for 529 Plans as a whole. 529 Plans with higher net assets significantly have less volatility in returns compared the ones with lower net assets.

We lastly test whether 529 Plans are safer in terms of volatility compared to the general market volatility. The null hypothesis is that there is no change in ratio between 529 Plans and market in general in terms of volatility before and after the crisis. A significant lower ratio in volatility for 529 Plans returns compared to general market may lead to conclusion that they are safer instruments compared to the general market. Our hypothesis is as follows:

### **Hypothesis 3:**

During the latest wave of the current global financial crisis which lasted from September 2008 to February 2009, the significant downward shift in investor confidence for financial markets in general at the end of September 2008 led to significant increase in volatility of returns for 529 Plans in specifically and financial markets in general. However, there will be no significant change in difference between 529 Plans return volatility and volatility for financial markets before and after the crisis.

## **METHODS AND RESEARCH DESIGN**

Before and after September 2008, there were a downward spiral of negative news, low investor confidence and poor market performance following each other. However, they were not as shocking as the events occurred at the end of September. The next graph shows the DJI index in May 2007 to May 2009. The impact of September events can be tracked. The major shift occurred end of September and the beginning of October. However the major collapses occurred in September showing that the market followed the events, not vice versa.



Graph 1: Dow Jones Industrial Index during the course of last the two years

For all three hypotheses we introduced, we will employ non-experimental interrupted time series without a control group using t-test comparison. The method we use is similar to the one Schwert, William used in his groundbreaking paper, “Why does stock market volatility change over time” in 1989. For the first hypothesis, we examine if there is significant shift in returns for 529 Plans before and after September 2008. On the second hypothesis, we examine if there is a significant shift in volatility of returns for 529 Plans before and after September 2008. For the last hypothesis, we compare the volatility of returns for market in general and for 529 Plans before and after the start of the current crisis. We start the time series at the beginning of 2008; continuing till February 2009. We start from January 2008 to limit the effect of previous events while to have enough data to see the trend. In February 2009, there is another wave of financial crisis, and adjustment following it. So, we stop on February 2009.

The first two hypotheses also include a mediator; the net asset size. For the net asset size, in order to analyze the effect maximum, we compare the bottom and top 10% in net asset size as usual research practice. Our test model is as follows;

$$Y_t = \text{Constant} + \alpha * t + \beta * Y(t-1) + \lambda * D + \gamma_1 * N1 + \gamma_2 * N2 \quad (3)$$

Where D=0, if the observation is in the pre-treatment group (Jan-Sep 2008)

D=1, if the observation is in the post-treatment group (Oct 2008-Jan 2009)

N1=0, if the net asset size for 529 Plans is not in the top 10%

N1=1, if the net asset size for 529 Plans is in the top 10%

N2=0, if the net asset size for 529 Plans is not in the bottom 10%

N2=1, if the net asset size for 529 Plans is in the bottom 10%

In the model,  $\alpha$  represents the trend and  $\beta$  represents the autocorrelation factor.  $Y_t$  shows the observation result such as volatility or market return in a given month.  $\lambda$  shows the shift factor after September 2008.  $\gamma_1$  and  $\gamma_2$  show the effect of net assets on observations. Our hypotheses is as follows

$$H_0: \lambda = \gamma_1 = \gamma_2 = 0 \quad (4)$$

$$H_1: \lambda \neq \gamma_1 \neq \gamma_2 \neq 0 \quad (5)$$

The first parameter tests the shift in returns, volatility and the remaining ones test the moderator effects. T-test results validate or invalidate our hypothesis. The typical alpha level 0.05 will be used to test the hypothesis. In the first hypothesis observations there are market performance values for 529 Plans, in the second one there are the volatility measures in 529 Plans and the last one they are the ratio of volatility in 529 Plans and the volatility of general market. In the last hypothesis, there will be no moderator factor. If there is a significant change between 529 Plan volatility and market volatility during the financial crisis, this ratio should also change.

The one important aspect of observations is that, we need to consider seasonality. For instance, one month of a year constantly might have higher volatility than other months. Therefore, in our paper, data is always de-seasonalized using the moving average smoothing techniques in testing first two hypotheses. We use standard methods available in the most statistical packages.

In the last hypothesis where we compare market volatility against 529 Plans' return volatility, there is no need to de-seasonalize the data. We expect similar seasonality effect in market volatility and 529 Plans' return volatility. Since our measure is the ratio between these two volatility measures, seasonality is eliminated by itself. However, we can relax this assumption in future research. Our testing model becomes as follows:

$$Y_t = \text{Constant} + \alpha * t + \beta * Y_{(t-1)} + \lambda * D \quad (6)$$

Where  $Y_t = \text{St. devlation of 529 Plans' returns/Market Volatility}$  (7)

Our null hypothesis is:

$$H_0: \lambda = 0 \quad (8)$$

## I- Measures

For market performance in 529 Plans, an average return is used. It is a well accepted statistics used extensively in the literature. Weighted returns can be also used; however, we simply missed asset data for multiple months. For volatility in 529 Plans, standard deviation of returns will be used. Standard deviation is also well-accepted statistic for volatility in financial markets. Lastly Chicago Board Options Exchange Volatility Index (VIX) is used to measure market volatility in general. There is quite enough research about Volatility Index. Its calculations are based on financial options traded in Chicago Exchange.

## II- Data

VIX data comes from publicly available on the financial data servers such as Yahoo Finance. For 529 Plans data, we have the complete universe from January 2008 to January 2009 from Morningstar Inc, an international investment research company. It is important to notice that, we will use log returns instead of regular returns. It is very common to use log return in financial research due to increased normality of returns. Since we have the entire universe for 529 Plans, we are not making any sampling. There are around 2800 options

available from 529 Plans. Each option for instance has a designed maturity date and specific portfolio characteristics. Some of the characteristics of 529 Plans' data are as follow:

<b>Months</b>	<b>Standard Deviation</b>	<b>Moving Avg. Std Dev.</b>	<b>Average</b>	<b>Moving Ave. Means</b>
2008,1	0.035186559	0.0153293	-3.73%	0.02%
2008,2	0.013566229	0.015538998	-1.54%	-0.09%
2008,3	0.011214599	0.015881449	-0.81%	-0.22%
2008,4	0.021899549	0.01657012	3.16%	-0.15%
2008,5	0.013076351	0.016360663	1.19%	-0.22%
2008,6	0.033190633	0.018362046	-5.14%	-0.57%
2008,7	0.013902475	0.017898899	-1.13%	-0.53%
2008,8	0.013202081	0.018243416	0.13%	-0.57%
2008,9	0.046467311	0.020733714	-7.06%	-1.37%
2008,10	0.082432447	0.02643436	-12.69%	-2.56%
2008,11	0.045581171	0.028162982	-5.51%	-2.80%
2008,12	0.019796322	0.029126311	2.94%	-2.52%
2009,1	0.040148966	0.029539845	-4.54%	-2.58%

Table 1: Representative Statistics for 529 Plans' returns

From the table, standard deviation after September 2008 is higher while returns are lower. The second table is the comparison of Standard deviations of 529 Plans against VIX.

<b>Months</b>	<b>Standard Deviation</b>	<b>VIX</b>	<b>Ratio*1000</b>
2008,1	0.035186559	26.2	1.342998
2008,2	0.013566229	26.54	0.511162
2008,3	0.011214599	25.61	0.437899
2008,4	0.021899549	20.79	1.053369
2008,5	0.013076351	17.83	0.73339
2008,6	0.033190633	23.95	1.38583
2008,7	0.013902475	22.94	0.606036
2008,8	0.013202081	20.65	0.639326
2008,9	0.046467311	39.39	1.179673
2008,10	0.082432447	59.89	1.376398
2008,11	0.045581171	55.28	0.824551
2008,12	0.019796322	40	0.494908
2009,1	0.040148966	44.84	0.895383

Table 2: 529 Plans' return volatility against VIX

## RESULTS

### a. Hypothesis 1

First hypothesis was related to the return comparison between pre and post August 2008. We expect to see a significant decrease after August 2008. We also test whether the size of net asset has any effect on returns. The following table shows the t-test results for the first hypothesis.

Predictor	Coef	SE Coef	T	P
<b>Constant</b>	-0.000342	0.002624	-0.13	0.899
$\alpha$	-0.0003867	0.0005387	-0.72	0.493
$\beta$	0.4273	0.1671	2.56	0.034
$\lambda$	-0.010683	0.002978	-3.59	0.007
$\gamma_1$	-0.000083	0.001778	-0.05	0.963
$\gamma_2$	-0.000869	0.001856	-0.47	0.643

S = 0.00253198 R-Sq = 96.2% R-Sq(adj) = 94.8%

Table 3: T-table for Returns of 529 Plans

$\alpha$  represents the trend,  $\beta$  represents the autocorrelation,  $\lambda$  represents the crisis effect,  $\gamma_1$  represents whether Plan is in the higher 10 % based on net Assets,  $\gamma_2$  represents lower 10%. It is interesting to see  $\alpha$  is not significant at 5%, so we cannot conclude there is a trend.  $\beta$  show significant autocorrelation. This means previous months return has a significant positive effect on next month's returns.  $\lambda$  is also very significant. This shows that after the events occurred in September 2008, there is a change in return behavior in next 5 months. So our hypothesis was valid. However, both  $\gamma_1$  and  $\gamma_2$  are not significant. Our hypothesis was not validated about net asset size. There is no net asset effect on returns. So either market did not appreciate the net asset sizes and did not consider the plans with higher net assets as safer than the ones with net asset size; or there was an investor panic. Our model is not capable of telling this information.

### b. Hypothesis 2

The second hypothesis was related to volatility change in 529 Plan returns before and after August 2008. The following table shows the t-test results for the second hypothesis.

Predictor	Coef	SE Coef	T	P
<b>Constant</b>	0.006985	0.001107	6.31	0
$\alpha$	0.0003254	0.000128	2.54	0.016
$\beta$	0.50554	0.08551	5.91	0
$\lambda$	0.0038195	0.0006708	5.69	0
$\gamma_2$	-0.0003549	0.0004049	-0.88	0.388
$\gamma_1$	0.0004842	0.0004076	1.19	0.244

S = 0.000983045 R-Sq = 97.2% R-Sq(adj) = 96.7%

Table 4: T-table for Volatility of 529 Plan Returns

$\alpha$  represents the trend,  $\beta$  represents the autocorrelation,  $\lambda$  represents the effect of the crisis,  $\gamma_1$  represents whether Plan is in the higher 10 % based on net assets,  $\gamma_2$  represents lower 10%.  $\alpha$  is significant; hence, we can conclude there is a positive trend in volatility. Since,  $\lambda$  is very significant, our hypothesis about volatility of 529 Plans' returns was correct. 529 Plans also have higher volatility. The second part of the hypothesis was about the net asset size. Currently both  $\gamma_1$  and  $\gamma_2$  are not significant. Therefore, we cannot conclude that net asset size had any effect on return volatility during the crisis. However, the signs of two coefficients are different,  $\gamma_1$  is positive and  $\gamma_2$  is negative. This is surprising, higher net asset ones should have less volatility. However, again we cannot conclude that net assets have any effect on volatility in crisis. We need to look on much longer period to conclude that.

**c. Hypothesis 3:**

In the third hypothesis, we compared ratio of the volatility of 529 Plans and general market volatility before and after the start of the current crisis. Here are the t-test results;

Predictor	Coef	SE Coef	T	P
Constant	0.9658	0.4481	2.16	0.063
$\alpha$	-0.01366	0.06065	-0.23	0.827
$\beta$	-0.1508	0.3084	-0.49	0.638
$\lambda$	0.2748	0.4252	0.65	0.536
S = 0.371680 R-Sq = 11.2% R-Sq(adj) = 0.0%				

**Table 5:** T-test for volatility comparison

On this hypothesis, we take standard deviation of 529 Plans divided by VIX. The predictors are the same as before. The most important one  $\lambda$  represents the change during the crisis. But it is clearly not significant. We cannot conclude ratio of VIX and 529 volatilities are different from before and after the crisis. So, we fail to reach a conclusion for hypothesis 3. This means, 529 Plans are not necessarily safer than the general market.

**DISCUSSION, LIMITATIONS AND FUTURE RESEARCH**

From our study, we expected that returns of 529 Plans show significant decrease in returns and their volatility also increases. Also, we expected ratio of volatility of 529 plans return compared to general market was to change. In the mean time; we expect to see higher net asset plans have also higher returns and lower volatility compared to lower net asset plans. However we can only conclude that there is significant change in 529 Plans' returns and volatility of returns.

There will be theoretical and practical results of our study. On the theoretical side, we show that 529 plans with all their characteristics such as low default risk and high regulations still show the similar results with the rest of the market. Current financial crisis with its high magnitude affects the 529 Plans as well. So the safety assumption for 529 plans needs to be questioned again.



The most important limitation is related to a general problem in financial research. Even though, we clearly showed that collapses of major financial firms in September led to market turmoil; there is a negative feedback loop between investor confidence and market performance and volatility. After September, it is possible to have poor market performance leading to a much lower investor confidence, and that results again in much poorer market performance. So our hypothesis that investor confidence, for instance, led to a poor market performance for 529 plans might be questioned. However, by using a trend analysis, we somewhat eliminated this. A future research might include this negative feedback loop in analysis.

We can conclude that 529 Plans show similar trends with the rest of market during financial crisis in terms of volatility increase and return decrease. For net asset size is not a significant contributor during financial crisis for 529 Plans. This analysis shows 529 Plans are not supposedly safer than the rest of the market. However, a longer term observations is necessary for further considerations.

### CITATION

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