



# Compare Stock Returns in China and the United States

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**Abstract.** In the post-epidemic era, how to protect their assets from the impact of the financial crisis and the turbulent international situation has become a matter of concern to many people. Especially between the world's two largest economies, China and the United States, stock market yields are watched around the world. This paper compares the differences of stock returns between China and the United States by studying the relationship between short-term Treasury bonds, long-term Treasury bonds, long-term corporate bonds and innovation index and stock returns. It can be concluded that innovation and Rcb only have an impact on the American market. Among them, the regression analysis coefficient of Rcb is negative, while innovation is positive. This means that Rcb has a negative impact on the US market, while Innovation has a positive impact. In contrast, none of the data shows a significant impact on the Chinese market, whether positive or negative.

**Keywords:** Return on stock · Treasury bonds · Corporate bonds · Innovation Index

## 1 Introduction

In the post-pandemic era, financial conditions around the world have been greatly impacted. In the whole world financial environment is not stable, how to be minimizing the investment risk has become the most important factor for people to ensure that assets will not shrink. As the world's two largest economies, investment in China and the U.S. tends to get the most attention from investors. Therefore, identifying the factors that affect stock returns is a good way for investors to build their portfolios.

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Stocks and bonds are the most common varieties in a portfolio, and how to allocate the proportion and types of stocks and bonds is a matter of routine for investment fund managers.

As for the related research on the stock market and bond market, the early literature mainly aims at verifying the correlation degree between the two markets from different angles. For example, Bossaerts found that there was a cointegration relationship between the two when he studied the investment portfolio [1]. Shiller & Beltratti used the rational expectations model to test the relationship between stock price changes and long-term interest rate changes and found that there was a minimal positive correlation between stock and bond yields in theory [2]. And so on. However, early studies failed to reach a consistent conclusion, which may be due to different samples or limited market development at that time, resulting in different market data at different times. In recent years, literature basically agrees that the correlation coefficients of the two markets are time-varying, and the focus of the research turns to further analyzing the reasons for the change in the correlation coefficients. For example, Ilmanen studied the correlation coefficients of American stocks and bonds and found that the correlation coefficients were not only time-varying but also might be opposite in different periods [3]. Cappiello, Engle, et al. found that changes in market structure would also lead to changes in correlation coefficients. By using the Asymmetric Generalized Dynamic Conditional Correlation model (AG-DCC), they found that the correlation between stock and bond markets in several European countries had obvious structural changes after the establishment of the European Union [4]. Andersson, Krylova, et al. found that the correlation between stock and bond prices changed with the economic cycle, and moved in the same direction in the period of high inflation expectation, while the return rates of the two were negatively correlated in the period of low inflation expectation [5]. Lu X.W. found the stock market and the bond market will be impacted by the information in the market, which leads to the bond market and the stock market in the same direction fluctuations. In addition to the impact of the same information, the bond market and the stock market also face the impact of opposite information, which means that the impact of positive information on one market is negative information on the other market [6]. Chan, Stefan, and Pikki found that there is at least one non-static factor driving the fluctuation of stock and bond prices through the study of the bond market and the stock market, and their prices will deviate with the change of time [7]. Kwan showed that there was a positive correlation between bond prices and stock prices of the same company, and the information that affected bond prices and stock prices was mainly related to the average value of the company but had nothing to do with the information of corporate earnings volatility [8]. Campbell and Taksler found that the behavior of the American corporate bond market was very different from that of the stock market. Stock prices rose while bond prices fell [9].

Our study classifies the collected data and then conducts regression analysis to analyze the impact of  $R_f$ ,  $R_{cb}$ ,  $R_{gb}$ , and innovation on the stock investment rate. And then we get the result.

In Sect. 2, since the stock market will be influenced by many different factors, and China's financial market started late, there are many limitations in finding useful data for us. Overall, we use monthly historical data of the S&P500 and the Shanghai Stock Exchange from January 2000 to December 2021 to calculate the stock investment rates of the TWO countries. What's more, we also analyzed the movements of stock prices in particular time periods, for example, China had a bull market from 2006 to 2007 in the Chinese stock market and Apple became the leader of the S&P 500 in 2012 in the American stock market.

In Sect. 3, we analyze the dependent variable of stock returns and independent variables of  $R_{f,t,i}$ ,  $R_{GB,t,i}$ ,  $R_{CB,t,i}$  in regression to compare the difference in stock return rates between America and China.

In Sect. 4, after three different sets of regression analysis, it can be concluded that innovation and Rcb only have an impact on the American market. Among them, the regression analysis coefficient of Rcb is negative, while innovation is positive. This means that Rcb has a negative impact on the US market, while Innovation has a positive impact. In contrast, none of the data shows a significant impact on the Chinese market, whether positive or negative. There could be many reasons for this. The government's influence on markets could be one.

In Sect. 5, we briefly review our conclusions and suggest directions for future research.

## 2 Data

Stock returns are affected by many different factors. And because China's financial market started relatively late. There were a lot of limitations in finding the data. Among the existing records, only the yields of three-month Treasury bonds and 10-year Treasury bonds can be found in the earliest Records of The Chinese market after 2002. The 10-year corporate bond yield is available only from March 2006 onwards. And because the global Innovation Index is a decade old data. Therefore, the earliest global innovation index can only be found in 2011. Monthly historical data of the S&P500 and the Shanghai Stock Exchange from January 2000 to December 2021 were used to calculate the stock investment rates of the TWO countries.

Through statistical analysis of the original data, their maximum, minimum and average values can be obtained in the Table 1 and Table 2 respectively.

Through the visual analysis from Fig. 1 to Fig. 10, it can be found that the trend of Rcb and Rgb in The Chinese market is very similar, and the trend of the whole market has been growing, while the curves of Rf, Rcb and Rgb in the American market are different, and even from the historical data, their fluctuations are very strong. The trend of Rcb is always up and the trend of Rgb is always down. What is common is that innovation indices in both countries continue to rise.

Based on the different time span of data, data are divided into three portfolios when studying the impact of different data on stock return rates. The first set of data from March 2006 to December 2021 includes the 3-month Treasury yield, 10-year Treasury yield and 10-year corporate bond yield. The regression analysis obtained is as Table 3 and Table 6,

**Table 1.** Descriptive statistics of Variables in US market

	return of stock	Innovation	RF	RGB	RCB
Average (2006–2021)	0.692		1.030	2.652	4.320
(2011–2021)	1.009	4.095	0.549	2.107	3.520
Max (2006–2021)	11.942		5.163	5.110	9.280
(2011–2021)	11.942	4.123	2.454	3.576	4.810
Min (2006–2021)	-18.564		0.011	0.623	1.890
(2011–2021)	-13.367	4.035	0.011	0.624	1.890

**Table 2.** Descriptive statistics of Variables in Chinese Market

	return of stock	Innovation	RF	RGB	RCB
Average (2006–2021)	0.666		2.439	3.482	4.730
(2011–2021)	0.224	3.909	2.639	3.445	4.740
Max (2006–2021)	24.615		4.601	4.562	6.360
(2011–2021)	17.654	4.009	4.601	4.562	6.360
Min (2006–2021)	-28.147		0.823	2.542	3.390
(2011–2021)	-27.007	3.799	0.998	2.542	3.390

The second set of data includes only the innovation index from 2011 to 2021. The results obtained through regression analysis are as Table 4 and Table 7,

To analyze all data together, the time span of the third group of data is specially set from January 2011 to December 2021, including the yield of 3-month Treasury bonds, 10-year Treasury bonds, corporate bonds and innovation index. The regression analysis results obtained are in Table 5 and Table 8,

The first group of US market regression data analysis shows that Multiple R is 0.248, which indicates that  $R_f$ ,  $R_{GB}$  and  $R_{CB}$  are positively correlated with stock return rate, while R Square is 0.061. Regression data analysis of Chinese market shows Multiple R at 0.197 and R Square at 0.039.

The regression analysis of the American Innovation Index in the second group shows Multiple R of 0.099 and R Square of 0.010. The Multiple R of China's Innovation index is 0.008 and R Square is  $6.419E-05$ .

In the third group, the Multiple R for the US market is 0.162 and R Square is 0.026. The Multiple R of Chinese market is 0.158, while R Square is 0.025.

### 3 Method

In our paper, the dependent variable of stock returns and independent variables of  $R_{f,t,i}$ ,  $R_{GB,t,i}$ ,  $R_{CB,t,i}$  are analyzed in regression to compare the difference in stock return rates between America and China.

We get the logarithmic rate of return from the closing price first, where  $R_{S,t,i}$  denotes the logarithmic rate of return on stock  $i$  in month  $t$ , the closing price in month  $t$  is denoted as,  $rt_i$ , is magnified 100 times for easy observation; this  $rt_i$ , is magnified 100 times for easy observation; this can be expressed as

$$R_{S,t,i} = (\ln P_{t,i} - \ln P_{t,i-1}) \times 100 \tag{1}$$

and then the regression model we established is expressed as

$$R_{S,t,i} = \beta_1 R_{f,t,i} + \beta_2 R_{GB,t,i} + \beta_3 R_{CB,t,i} + \epsilon_{t,i} \tag{2}$$

where quantities are defined as follows:

- $R_{f,t,i}$ : the three-month treasury bond interest rate  $i$  in month  $t$ ,
- $R_{GB,t,i}$ : the return on ten-year government bonds  $i$  in month  $t$ , and
- $R_{CB,t,i}$ : the return on ten-year corporate bonds  $i$  in month  $t$ .

We also consider the impact of innovation index on the rate of stock return, but since only annual data of national innovation index can be found in public data, we establish regression of stock return rate and innovation index separately, this can be expressed as

$$R_{S,t,i} = \beta_1 I_{t,i} + \epsilon_{t,i} \tag{3}$$

where quantity is defined as follows:

- $I_{t,i}$  : the innovation index  $i$  in month  $t$

The annual date of the innovation index is extended to the monthly date, and the four variables mentioned in (2) and (3) are combined into one regression formula, as follows

$$R_{S,t,i} = \beta_1 R_{f,t,i} + \beta_2 R_{GB,t,i} + \beta_3 R_{CB,t,i} + \beta_4 I_{t,i} + \epsilon_{t,i} \tag{4}$$

## 4 Results Analysis

### 4.1 Shanghai Stock Exchange

From the regression analysis Table 3, 4, 5, 6, 7 and 8, it can be seen that the stock return of Shanghai Stock Exchange from March 2006 to December 2021 has a weak positive correlation with RF, RGB and RCB, the degree of the fitting is very low, the significance is not very high, and the standard error is large. The stock return from January 2011 to December 2021 has a lower positive correlation with the innovation, the degree of the fitting is very low, the significance is also very low, and the standard error is very large. From January 2011 to December 2021, the stock return and innovation, RF, RGB and RCB are also positively correlated, but the correlation is also low, the degree of the fitting is also low, the significance is also not high, and the standard error is large. That is, innovation, RF, RGB and RCB have no impact on China’s stock return.

It can be seen from Fig. 3 that the overall fluctuation of RF is large. It began to decline at the beginning of 2002, rose at the end of 2002, reached a high point in October 2004, and then continued to decline and rise in a four-year cycle. It reached the lowest point in 2009 and the highest point in 2013. Figure 4 shows that the overall fluctuation of RGB is

**Table 3.** Regression result from 2006 to 2021 in US Market

Regression Statistics	
Multiple R	0.248
R Square	0.061
Adjusted R Square	0.046
Standard Error	4.275
Observation	189

		Coefficients	Standard Error	t Stat	P-value
	Intercept	3.253	1.020	3.190	0.002
Rf	0.059	-0.187	0.311	-0.601	0.549
Rgb	1.465	0.864	0.651	1.328	0.186
Rcb	2.460	-1.082	0.361	-3.000	0.003

small, with three highs in 2004, 2007 and 2013 respectively, and some small fluctuations near the average in other times. As can be seen from Fig. 5, RCB fluctuated greatly from 2006 to 2018, reaching a relatively high point in 2008, 2012 and 2013 respectively. From 2018 to 2021, RCB showed a downward trend as a whole.

As can be seen from the Fig. 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10, the Shanghai Stock Exchange index had a huge growth from 2006 to 2007, rising from about 120 to about 800. There are four reasons for this result. The first is the rapid development of the national economy. The stock market reflects the national economy, and the changes of economic factors will first be reflected in the stock market. After consulting the data, it can be found that in 2006 and 2007, China's GDP growth rate exceeded 10%. The second reason is that before 2006, China's stock market had experienced a bear market from 2001 to 2005. This has also fully adjusted the stock market. Due to the low share price in the bear market, a large number of funds poured into the stock market, which also laid the foundation for the bull market from 2006 to 2007. The third reason is that the state has formulated corresponding policies. In 2005, China's State Council approved the China Securities Regulatory Commission to issue the notice on issues related to the pilot of non tradable shares of listed companies, which also provided an opportunity. This share reform makes the whole stock market have the expectation of moving towards full circulation. Through full circulation, the same shares have the same rights and interests, which greatly stimulates the desire of non tradable shareholders to raise the stock price and hope to sell it at a high price when the ban is lifted, which provides an opportunity for the emergence of the bull market. The fourth reason is the impact on the world economy.

It can also be seen from Fig. 1 that from 2007 to 2008, the Shanghai Stock Exchange Index fell sharply again, from 800 to about 250. External reasons include the subprime mortgage crisis in the United States, the turmoil in the financial market, and the impact on the global economic situation. The internal reason is that due to the appreciation of RMB, foreign hot money poured into the Chinese market one after another. The state adopted a tight monetary policy and froze a lot of working capital in the stock market. A sharp fall in the stock market is inevitable.

The second-largest growth point in Fig. 1 occurred from 2014 to 2015. The main reason is the promotion of national policies. At the end of 2013, after the Third Plenary

**Table 4.** Regression result from 2011 to 2021 in US Market (Innovation only)

Regression Statistics	
Multiple R	0.100
R Square	0.010
Adjusted R Square	0.002
Standard Error	3.845
Observation	131

Coefficients		Standard Error	t Stat	P-value
Intercept	-56.566	50.847	-1.112	0.268
Innovation	4.116	12.416	1.132	0.260

**Table 5.** Regression result from 2011 to 2021 in US Market

Regression Statistics	
Multiple R	0.162
R Square	0.026
Adjusted R Square	-0.005
Standard Error	3.859
Observation	131

	Coefficients	Standard Error	t Stat	P-value
Intercept	-53.769	69.907	-0.769	0.443
Innovation	4.116	16.761	0.824	0.411
Rf	0.059	0.520	-0.937	0.351
Rgb	1.465	1.040	0.299	0.765
Rcb	2.460	1.051	-0.592	0.555



**Table 6.** Regression result from 2006 to 2021 in Chinese Market

Regression Statistics					
Multiple R	0.197				
R Square	0.039				
Adjusted R Square	0.023				
Standard Error	7.955				
Observation	189				

		Coefficients	Standard Error	t Stat	P-value
	Intercept	7.272	4.534	1.604	0.110
Rf	2.299	-0.954	1.096	-0.871	0.385
Rgb	2.833	3.558	3.074	1.157	0.249
Rcb	3.707	-3.525	2.091	-1.686	0.094

**Table 7.** Regression result from 2011 to 2021 in Chinese Market (Innovation only)

Regression Statistics					
Multiple R	0.008				
R Square	6.419E-05				
Adjusted R Square	-0.008				
Standard Error	6.29				
Observation	131				

		Coefficients	Standard Error	t Stat	P-value
	Intercept	-2.377	28.422	-0.084	0.933
Innovation	4.004	0.662	7.271	0.091	0.927

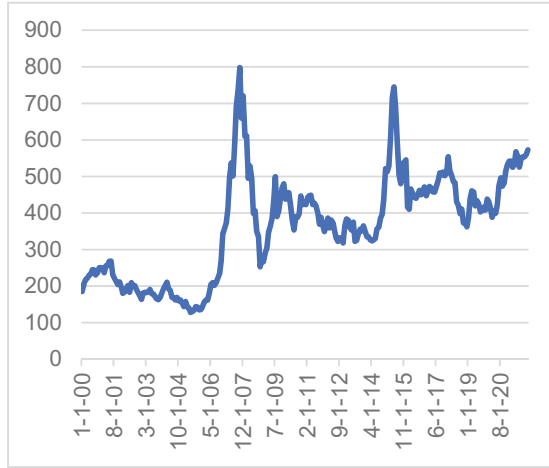
**Table 8.** Regression result from 2011 to 2021 in Chinese Market

Regression Statistics					
Multiple R	0.158				
R Square	0.025				
Adjusted R Square	-0.006				
Standard Error	6.284				
Observation	131				

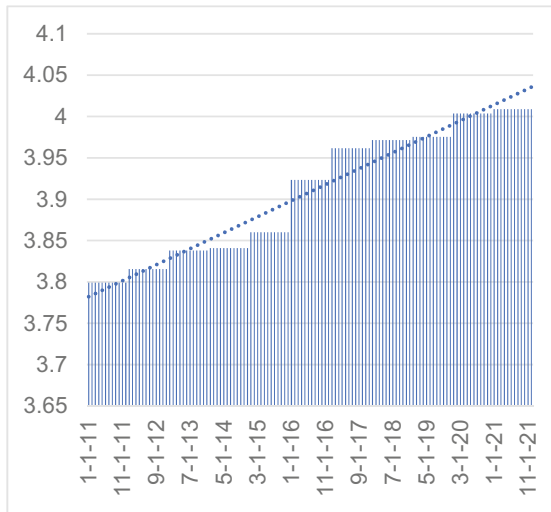
  

		Coefficients	Standard Error	t Stat	P-value
	Intercept	3.090	41.347	0.075	0.941
Innovation	4.004	0.157	9.900	0.016	0.987
Rf	2.299	2.823	1.615	1.748	0.083
Rgb	2.833	-1.499	4.539	-0.330	0.742
Rcb	3.707	-1.218	2.907	-0.419	0.676

Session of the 18th CPC Central Committee, the State Council issued several opinions of the State Council on further promoting the healthy development of the capital market. It has improved the enthusiasm of investors and laid a foundation for the growth of the stock market.



**Fig. 1.** Monthly Price of Shanghai Stock Exchange (\$M)



**Fig. 2.** Chinese Innovation index

**4.2 S&P 500**

Based on the regression analysis table related to SP500 Stock Exchange stock returns, from January 2011 to December 2021, there is a relatively strong positive correlation between stock returns and RCB and also innovation index with a high degree of fitting, a high significance figure, and also a very high standard error figure. For RF and RGB measurement, there is a converse situation of weaker positive correlation with stock returns. The degree of the fitting is lower, the significant figure is lower, and the standard

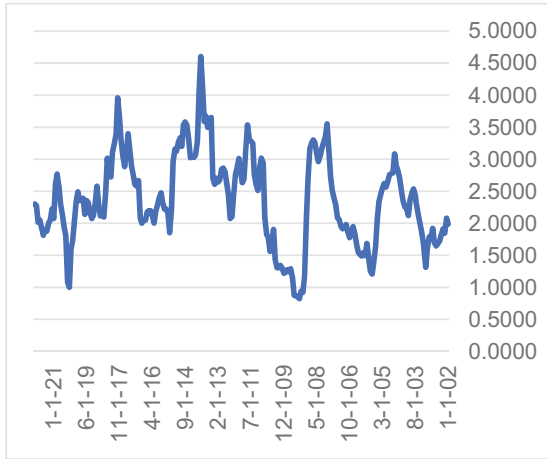


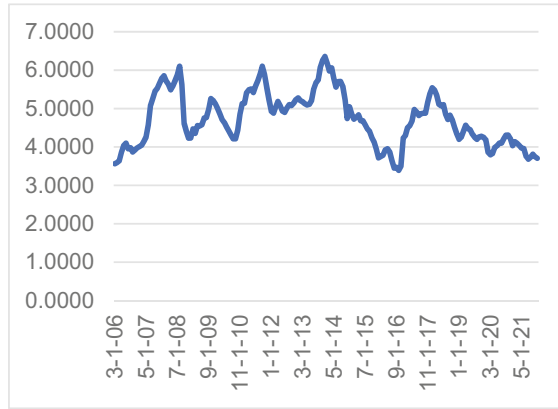
Fig. 3. The return of three months China treasury bond



Fig. 4. The return of ten years Chinese government bond

error is lower compared to RCB and innovation. To sum up, there is an obvious impact of RCB and innovation on American stock returns while RF and RGB do not.

It can be seen that based on Fig. 6 which represents the year-end closing values of the S&P 500 composite index from 2000 to 2021, during the year 2000, the American Stock Exchange Index ended at around 1,500 which was mainly driven by a positive attitude of relatively stabilized financial markets after the historical financial crisis in Asia. Meanwhile, the high price of the 2000 S&P 500 happened during the dot-com period when there was a massive growth in internet use, leading to excessive speculation of internet-based corporations. After the fluctuations for several years, in 2008, the S&P 500 plunged with a big percentage loss. The statement of Skeel D. claims the possible reason behind this which is the bankruptcy of Lehman Brothers happened on September



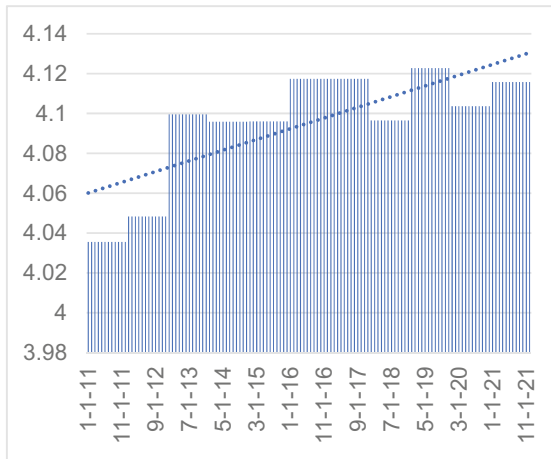
**Fig. 5.** The return of ten years Chinese corporate bond



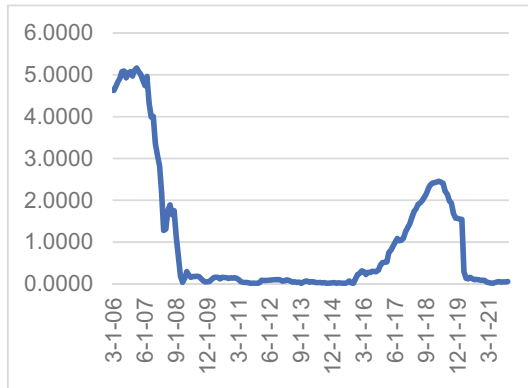
**Fig. 6.** Monthly Price of S&P 500 (\$M)

15, 2008 [10]. Its collapse had a significant effect on the markets and consequently triggered the following distress including the drop in S&P 500 index. Despite this, some analysts believe that Lehman Brothers solely is not the primary cause of the following crisis based on the similar response of its collapse to stock markets and that to the American International Group bailout.

After several years, one interesting event needed to be mentioned is that in 2012, Apple became the biggest company by competing with ExxonMobil and took the dominant role in American markets as a leader in S&P 500. In the following year 2013, the price index ended at around 1,500 again when there was optimism toward American economic recovery from investors as many firms showed a tendency of rising earnings even though the existing financial crisis both in America and overseas. After two years in 2015, Caplinger D. maintains an opinion that a large group of investors was disappointed by the weakness in commodities [11]. Although the index has a fairly good performance, the sudden descending prices of energy and materials discourage investors to invest. For example, the decreasing price of crude oil increased the pressure on the existing natural



**Fig. 7.** US Innovation index

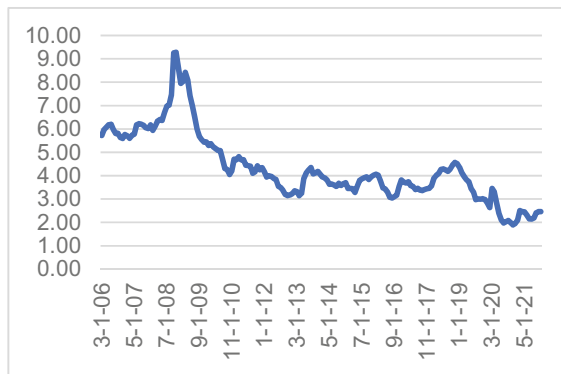


**Fig. 8.** The return of three months US treasury bond

gas market and caused a huge loss. The same situation also applied to other industries such as consumer staples which negatively affected the firms included in the S&P 500, especially those of small size. In 2018, however, it had a bad performance since the financial crisis year. The price of the S&P 500 decreased by a relatively big percentage after slightly increasing from last year and declining in the prior two years. Besides, as shown in Fig. 7 indicates the bar chart of firm innovation performance, there can be concluded a relatively ascending trend of innovation performance, from an index of 4.04 to 4.12.



**Fig. 9.** The return of ten years US government bond



**Fig. 10.** The return of ten years US corporate bond

## 5 Conclusion

As things stand, the world is trying to come to terms with the effects of the pandemic. When how to survive in the economic winter has become a difficult problem in front of the investors all over the world. For investors, yields in China and the U.S. are of particular concern. Therefore, identifying the factors that affect stock returns can help investors construct their own portfolios. This study classifies the collected data and then conducts regression analysis to analyze the impact of  $R_f$ ,  $R_{cb}$ ,  $R_{gb}$  and innovation on the stock investment rate. And then we get the result.

After three different sets of regression analysis, it can be concluded that innovation and  $R_{cb}$  only have an impact on the American market. Among them, the regression analysis coefficient of  $R_{cb}$  is negative, while innovation is positive. This means that  $R_{cb}$  has a negative impact on the US market, while Innovation has a positive impact. In contrast, none of the data shows a significant impact on the Chinese market, whether

positive or negative. There could be many reasons for this. The government's influence on markets could be one.

It can be seen from the conclusions obtained that the data used in the study did not draw very effective conclusions. This has a lot to do with the incomplete data collected. In future research, improving the diversity of information will be one of the important directions. At the same time, it is important to choose a method of calculation that gives better results.

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