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How U.S. Bond Yield Curve Invert Relate to the Upcoming Financial Crisis

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Abstract: This passage is mainly based on the current global economic situation as well as the association with historical events to discuss the formation of an inverted yield curve in U.S. bonds and being an indicator of a financial crisis, how the inverted yield curve of the U.S. bonds can relate to the upcoming financial crisis. By analyzing the current economic performance and the public's psychological health after the epidemic era, a disappointing conclusion can be induced: a financial crisis may happen in the short future. Such a guess is based on the central bank's action of consistently increasing interest rates and the public's unoptimistic outlook on the macroeconomic circumstances, which is also the reason that causes the occurrence of the phenomenon of the inverted yield curve of the US bonds. Associating with the rising stock market in the US, it is obvious that a huge financial bubble already formed. The government chooses the strategy of "Minsky Moment" to deal with the coming problems. The current situation is challenged by multi-factors and if the government cannot adjust its policies to deal with these multi-factors properly, the whole financial bubble will collapse and bring a catastrophe that is bigger than ever.

Keywords: US bond yield curve inverted, financial bubble, increased interest rate

1. Introduction

In April 2022, the phenomenon of the US bond yield curve inverted happened. It was not the first time such an event had taken place, in fact, such a phenomenon is not rare in history. Bond, a financial product that can provide investors with a relatively low risk to invest in and a stable return, plays a crucial role in the world of economics. The central banks publish bonds as an effective way to intervene in the market, speculators invest in bonds to gain a great amount of profit, and the public is willing to buy bonds because their relatively high-interest rate enables them to store their wealth when facing inflation. The relatively high interest rate provided by the central bank is a crucial characteristic of bonds that attract the public to invest.

Normally, because of the extremely low possibility of predicting future economic trends, a longer-term bond will provide with higher interest rate than a short-term bond. However, when the interest rate of a short-term bond exceeds the one of the long-term one, an inverted phenomenon happens. Usually, when talking about the inverted phenomenon is mainly about the happen of such a relationship between the US-2-year bonds and the US-10-year bonds.

Looking through the recent history of economics, every time the phenomenon of the US bond invert happened will was followed by a financial crisis and brought in countless economic losses to

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the public. This is the reason why such a phenomenon can receive so much attention from global areas—warning investors of the potential storm that is coming.

What is interesting is, that even with the happening of such a warning signal, the stock market of the US keeps on activating. This disobeys the common sense that when an anticipated economic recession happens the public will decrease their investment activities to deal with the coming economic problems. An illusion, the macro-economic performance is still rising, is being introduced to the public's sight and a capital trap has been set. Such an illusion is dangerous because human being's greed is unlimited, the more people want, the greater loss they will receive.

2. Relation

Since 1980, the phenomenon of the US bond yield curve inverted happened a total of five times. Surprisingly, each such phenomenon will be followed by a financial crisis. In December 1988, the US bond yield curve inverted and lasted for 15 months, and the saving and loan crisis broke out 2 years later; In 1998, such an inverted yield happened again, and the Asia financial crisis happened; the internet bubble collapsed in 2000; and subprime crisis in 2008. It seems that a positive correlation exists between the inverted yield of US bonds and the financial crisis. The US bond yield curve invert has already been seen as a reliable indicator of economic recession.

2.1. Why the US Bond Invert Phenomenon Happened

To understand why there is such a correlation, it is crucial to figure out the reason that causes the US bond yield curve to invert. One principal reason is probably that the public is holding a negative view of market performance. Therefore, the investors choose not to invest in the short term and transfer their investment points to long-term, low-risk products which can also bring them with some returns. The long-term US Bonds, because of their high credibility and relatively ideal interest rate, become the first choice for investors. Since it is nearly impossible for the public to anticipate the economic performance in the very long term, a ten-year US bond will be the investors' first choice to avoid the risk. Therefore, people choose to hold more 10-year US bonds. Different from loans, bonds are financial assets that can be sold and purchased in the secondary market. Here, we can regard bonds as a commodity that is made up of supply and demand. Since the demand for long-term government bonds increased, its demand curve will intersect with the supply curve at a point with a lower price (Figure 1).

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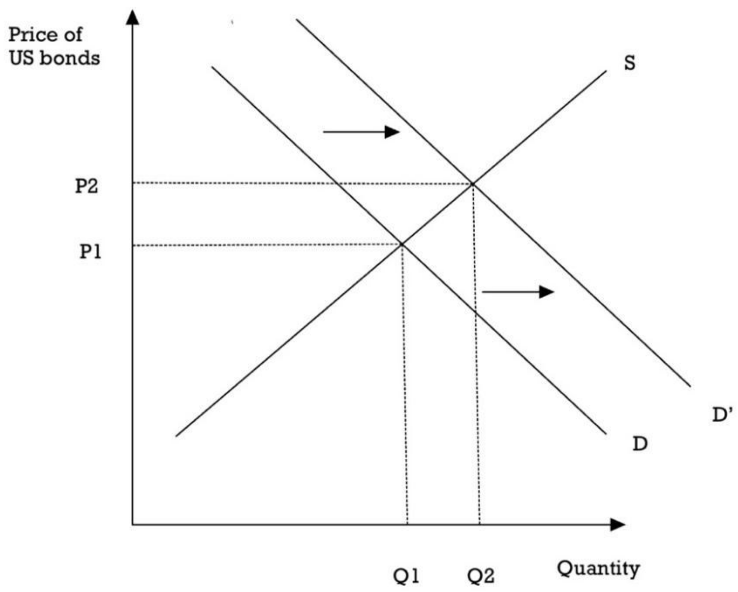

Figure 1: Supply & Demand Relationship of US bonds

It is important to know that the price of a bond has an inverse relationship with its yield-to-maturity rate, which means as the price of a bond increases, its yield-to-maturity will decrease [1]. The principle behind this is that when the bond's price increases, potential investors will be less likely to buy it since the bond's interest rate is constant. With a constant interest rate and increasing price, the investors will gain less profit from the bond, therefore its yield will fall and vice versa.

Besides, the price of stock often moves in the opposite of the interest rate. This is also linked with the returns brought to the investors. If the central bank chooses to increase the interest rate, less return will be brought on the investors due to an increase in opportunity cost. As a result, the short-term bond demand will decrease and lead to a lower price. Because the public can't anticipate the long future, long-term bonds will receive far less effect. The decrease in the short-term bond price will further lead to an increase in its YTM (yield to maturity). Thus, an inverted phenomenon happened.

2.2. How Invert Phenomenon Correlates With Economic Recession

The fundamental factor that connects the inverted yield curve with an economic recession is people's negative outlook on the economic situation. Just as mentioned in the previous paragraphs, the negative anticipation of the economic performance will drive people to shift their investments to long-term low-risk financial assets. Such action will significantly decrease the amount of money flow in the market and decrease market invigoration. The company expansion will be restricted due to this factor. Less money floating in the market will cause a decrease in inflation. According to the short-run Philips Curve, a decrease in inflation will usually be followed by an increase in unemployment, which further develops into an economic recession.

Either the inverted yield of US bonds or the following financial crisis is just the explicit phenomenon. What is behind them is the action of the central bank. The central bank's decision about increasing or decreasing interest rates will affect the public's attitude and directly influence the firms. When the central bank chooses to increase the interest rate, it raises the firms' financial costs. Bank loans play a crucial role in the expansion of a company. The increase in interest rate will cause the

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company to earn less profit because they must pay more interest to the banks. The market will cool down as a result of a shrink in the company's expansion. Furthermore, the increase in interest rates also signals to the public that the economy will go down shortly, resulting in people carefully investing in financial products. A financial bubble, on the other hand, according to the definition, is a time of uncontrollable expansion during which the price of an asset rises at an accelerating rate via a succession of accelerating phases of corrections and rebounds. Technically speaking, the price grows at a rate faster than an exponential power law, frequently accompanied by oscillations with a logarithmic period [2]. This means to maintain a financial bubble will need the support of a huge amount of excess money. If there is not enough money flow on the market to maintain the expansion of such a financial bubble, then it will collapse, and a financial crisis begin. The central bank's action will effectively cool the market down and reduce the amount of money flowing on the market, which will lead to the phenomenon of the bond yield curve inverting and a financial crisis.

However, it doesn't mean that each time the central bank chooses to increase interest rates will cause an economic recession. The central bank chooses to adjust interest rates based on the current economic situation to regulate macroeconomic performance. Only when multi-factors gather will evolve into an influential financial crisis, for instance, in the sub-prime crisis, its people's blind optimism and investment institution's bottomless profit-seeking behavior forged the bubble. Before the bank increases its interest rate, a landmine has already formed. The central bank's motion is just the last straw that broke the camel's back, triggering the breakdown of a whole series of risks already formed.

2.3. Current Situation

Let's drive our view to the current situation. People's bad attitudes as a result of the last epidemic can be identified as the fundamental cause of this invert. The research below is done by Shukla A. about people's psychological performance during COVID-19 [3]. According to the data, among 1871 participants who responded to the public's psychological status during the epidemic lockdown, two-fifths were shown to exhibit anxiety and 10.5% of the participants seemed to have depression. The psychological influence brought by the epidemic results in the investors' unwillingness to keep on investing in the market.

Data provided by research done in 2020 by Shukla A.; Table 1 perceives stress, anxiety, depression, and mental well-being during the lockdown and compares these variables between healthcare workers and non-healthcare workers.

Table 1: Public's psychological health during the epidemic (Shukla A., 2020)

Variables	Whole sample (n=1685) Mean (SD)/frequency(%)	Non-HCWs (n=891), n(%)	HCWs (n=794), n(%)	T-test/MeanWhitney U-value/C hi-square test (P)
Mean PSS-10 score, range (median)	16.56 (5.60), 0-37 (17.0)	16.61 (5.40)	16.51 (5.81)	0.356 (0.722)
Security of Stress				
Low stress (0-13)	437 (25.9)	225 (25.3)	212 (26.7)	1.351 (0.509)
Moderate stress (14-26)	1181 (70.1)	634 (71.2)	547 (68.9)	

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Table 1: (continued).

Severe stress (>27)	67 (4.0)	32 (3.6)	35 (4.4)	
Mean GAD-7 score, range	4.41 (4.84), 0-21 (3.0)	4.61 (4.93)	4.19 (4.73)	U=334575.0 (0.052)
Severity of anxiety				
Normal (0-4)	1042 (61.8)	535 (60.0)	507 (63.9)	5.612 (0.132)
Mild (5-9)	400 (23.7)	216 (24.2)	184 (23.2)	
Moderate (10-14)	147 (8.7)	79 (8.9)	68 (8.6)	
Severe (≧15)	96 (5.7)	61 (6.8)	35 (4.4)	
Mean PHQ-9 score, range (median)	3.62 (4.81), 0-27 (2.0)	3.90 (4.93)	3.33 (4.66)	U=328912.5 (0.011)
Severity of depression				
Minimal (1-4)	1197 (71.0)	613 (68.8)	584 (73.6)	10.275 (0.036)
Mild (5-9)	311 (18.5)	173 (19.4)	138 (17.4)	
Moderate (10-14)	98 (5.8)	55 (6.2)	43 (5.4)	
Moderate severe (15-19)	50 (3.0)	36 (4.0)	14 (1.8)	
Severe (⩾20)	29 (1.7)	14 (1.6)	15 (1.9)	
Mean mental well-being score, range (median)	43.9 (8.8), 14-56 (45.0)	43.42 (8.94)	44.48 (8.60)	-2.465 (0.014)
Number of participants with WEMWBS score ⩽ 40	1208 (71.7)	617 (69.2)	591 (74.4)	5.562 (0.018)
Overall prevalence				
Percentage of responders reporting GAD score ⩾ 5	643 (38.16)	356 (40.0)	287 (36.1)	2.581 (0.108)
Percentage of responders reporting PHQ-9 score ⩾ 10	177 (10.5)	105 (11.8)	72 (9.1)	3.296 (0.069)

Table 1: (continued).

Percentage of responders reporting only GAD score ⩾5 but PHQ-9 score < 10	506 (30.0)	275 (30.9)	231 (29.1)	0.627 (0.429)
Percentage of responders reporting PHQ-9 score > 110 but GAD-7 <5	40 (2.4)	24 (2.7)	16 (2.0)	0.834 (0.361)
Percentage of responders reporting both GAD score ⩾ 5 + PHQ-9 score > 10	137 (8.1)	81 (9.1)	56 (7.1)	2.335 (0.127)

The epidemic not only brings people with psychological influence. By estimate, COVID brought more than $1 trillion in loss to the world's economy [4]. Consumers' willingness to consume, exports/imports trade, and investment, all of which are important factors that influence the Aggregate Demand, decreased dramatically at that time. The global economy unavoidably encounters a recession. During this huge recession, the unemployment rate in the US rose dramatically from around 4% natural unemployment rate to nearly 16% in 2020 (Figure 2).

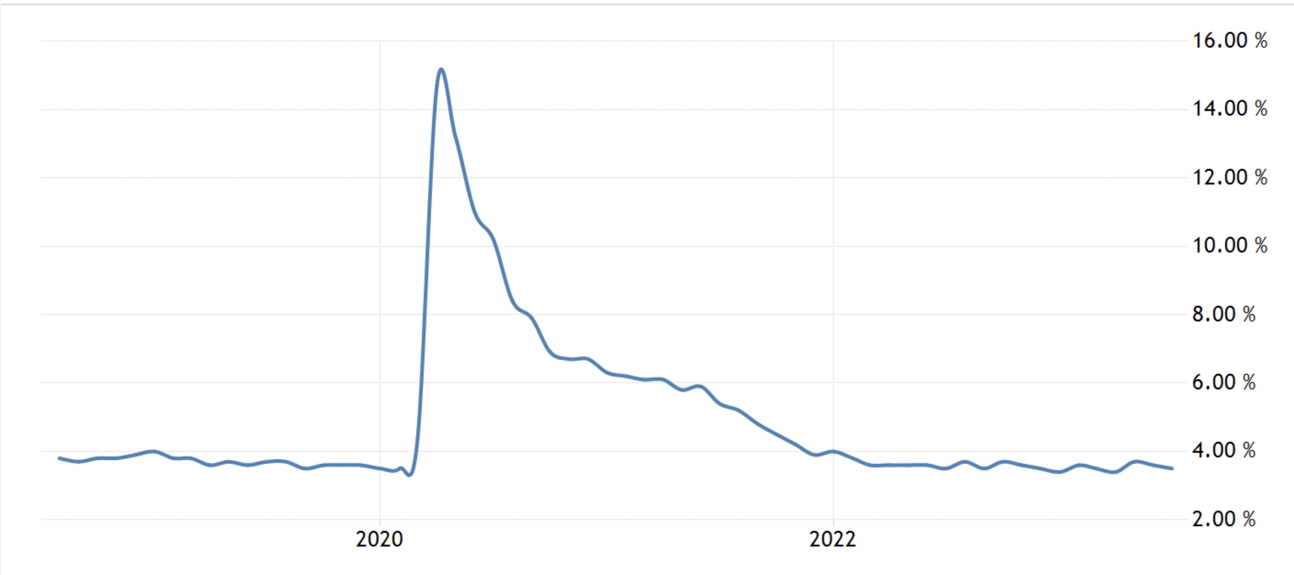

Figure 2: The unemployment rate in the U.S. from 2019 to 2023 (tradeeconomics.com, 2023)

To reduce the extreme unemployment, brought by the epidemic, the government chooses to increase citizens' money supply (MS) through the way of social welfare. Although it provides the citizens with enough money to solve the dilemma, it also has drawbacks. The country's inflation rate has risen consistently since 2020, reaching its highest point of approximately 8% in 2022. To against the high inflation, the government chooses the strategy of increasing interest rates to achieve the goal. Since March 2022, the federal bank has raised interest rates 11 times. Since it was established, such

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a great measure is rarely seen in the federal bank's history. Table 2 below shows the timetable of the Federal Bank's action of increasing interest rates.

Table 2: The Federal bank rate increase schedule (federalbank.co.in, 2023)

FOMC MEETING DATE	RATE CHANGE	FEDERAL FUNDS RATE
July 26, 2023	+ 25 bps	5.25% to 5.50%
May 3, 2023	+ 25 bps	5.00% to 5.25%
March 22, 2023	+ 25 bps	4.75% to 5.00%
Feb 1, 2023	+ 25 bps	4.50% to 4.75%
Dec 14, 2022	+ 50 bps	4.25% to 4.75%
Nov 2, 2022	+75 bps	3.75% to 4.00%
Sept 21, 2022	+75 bps	3.00% to 3.25%
July 27, 2022	+75 bps	2.25% to 2.5%
June 16, 2022	+75 bps	1.50% to 1.75%
May 5, 2022	+ 50 bps	0.75% to 1.00%
March 17, 2022	+ 25 bps	0.25% to 0.5%

The consistently increasing interest rate results in the price for two-year US bonds decreasing and YTM increasing as mentioned previously. Also, the consistently increasing interest rate transmits the message to the market that the economy will still go down. Therefore, the investors will increase their purchase of the 10-year US bonds to avoid the risk. With the rising demand of US-10-year, its price will increase, and YTM increase. The inverted yield phenomenon happened. Figure 3 below shows the overall logic of how the inverted yield phenomenon happened.

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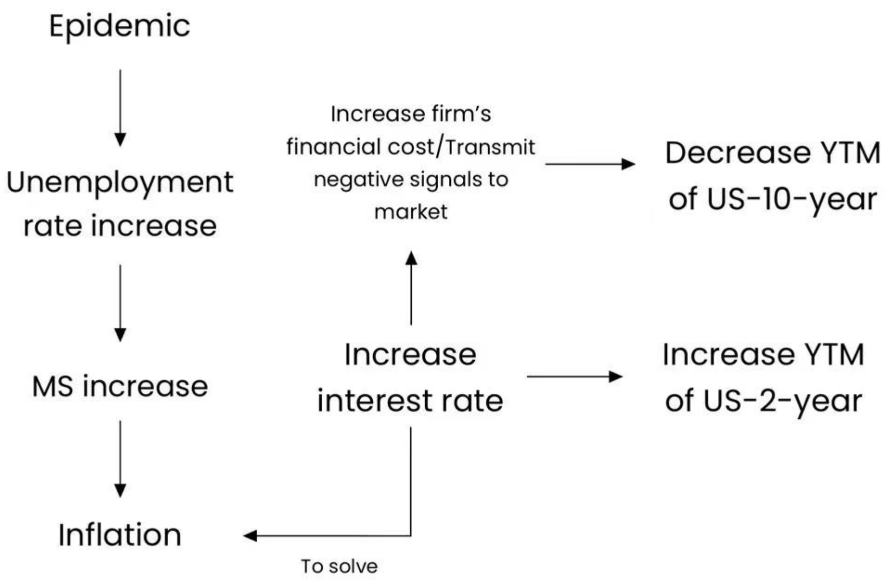

Figure 3: The basic logic of the 2022 US bond invert.

Throughout history, every time the phenomenon of the US bond yield curve inverts will follow a financial crisis, and there is a great possibility that the same history will happen again. The inverted yield of US bonds showcases that less money is flowing on the investment market. According to the data provided by the Federal Reserve, The M1 index (Figure 4) formed a consistent decrease after April 2022, which coincides with the phenomenon of bond invert. With less hot money being floated on the investment market, some bubbles will finally collapse.

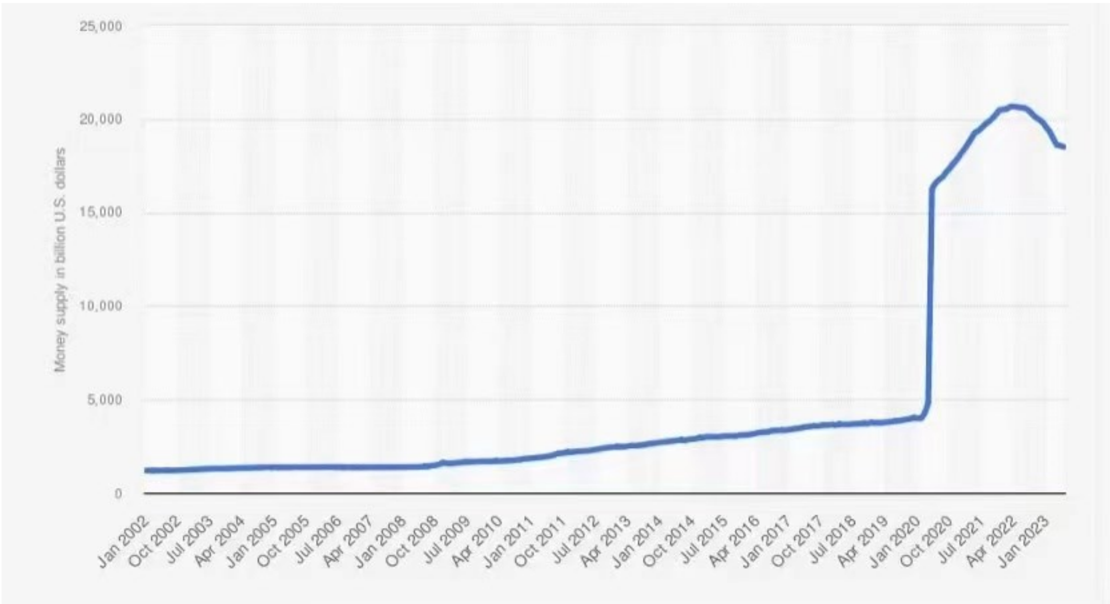

Figure 4: The M1 Index from 2002 to 2023 in the US; Data provided by (federalreserve.gov, 2023)

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3. Discussion

The primary reason why the inverted curve of the US bond can receive such great attention is not because the public wants to learn such a concept and burry this knowledge deep in one's mind, instead, the crucial reason why the public studies such a phenomenon is that want to use it to predict the future. This is why academic study exists—use the experience of past events and convenient the future life. As mentioned, the invert phenomenon of the US bond is a reliable indicator of the financial crisis. However, the formation of a financial crisis needs the prerequisite of multiple factors. This leads to a question: Will a financial crisis happen this time?

3.1. Financial Bubble

To solve the problem, it is first important to know what kind of bubble exists in the nowadays global market. Economists would describe a bubble as an instance in which the price of an asset exceeds its "fundamental" value [5]. In other words, the formation of a financial bubble is based on the public's frequent speculation activities and injects excess money and passion into the virtual development of the industry but ignores the investment in the industry itself. With the lack of investment in the real world, the industry is not able to produce enough output that can match the public's expectations, thus a bubble forms and it will collapse if there is no excess money to get in.

According to the data (Figure 5) released by the World Bank, the GDP of the United States in 2023 is about $25 trillion. This is indeed a huge amount, and the U.S. is worth the title of the largest economy in the world. However, when comparing the country's GDP with the country's stock market value, it really is puny. By estimate, the value of the US stock market is about $46,199,811.4 million, which is twice the US's GDP. It is obvious that a bubble indeed exists and may be greater than ever. Compared to this time, the subprime crisis is negligible.

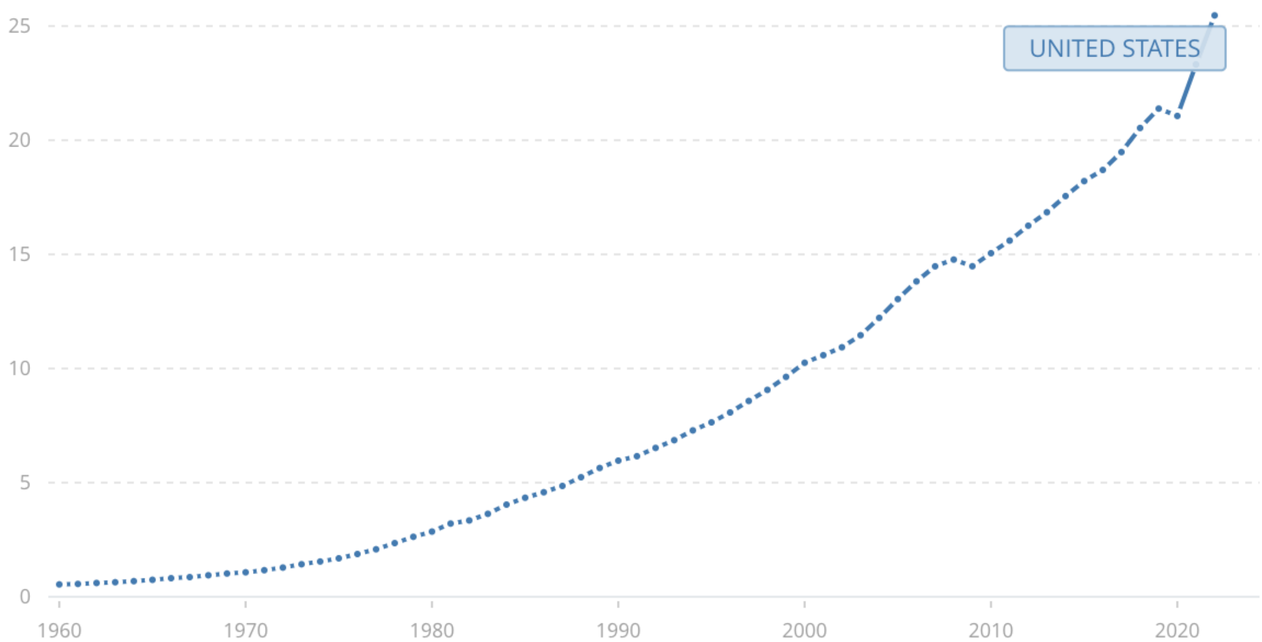

Figure 5: the GDP (in trillion) of the US from 1960 to 2022 (worldbank.org, 2023)

The government also noticed the existence of the great financial bubble. Two totally different attitude was applied to the treatment of this bubble—The Minsky moment and the Volcker moment.

By adding interest rates, restricting economic growth, and actively pricking the bubble, such an action is called the Volcker moment [6]. The coming Volcker moment means people give up the short-term hypocritical prospers to embrace an economic recession and blow the bubble again. Minsky moment, by contrast, refers to the action of continuing to blow up the bubble and capturing others' resources and assets to consolidate their own bubble [7].

Being a state founded on finance, the United States has already finished the process of deindustrialization, which, in other words, the United States gave up those basic industries and mainly focused on financial trading. Such action will absolutely bring the country rapid economic growth; however, drawbacks are also introduced. The country's whole economic system will be based on the country's national power. Once the country's global influence decreases, its economic system will collapse within the time of a blink. During the subprime crisis, the United States forced big firms to come back to produce, and this even led to the stock market value increase over that time, which was an extremely abnormal phenomenon during the financial crisis. No one likes the calm after clearing because humankind is greedy and wants to gain more every second.

However, this time, not only the United States, but nearly all the countries in the world choose the same method. The situation the world faced is more complex than in 2008. After the beginning of the epidemic, to stabilize the national situation, the Central Bank of the U.S. decreased its interest rate to an extremely low point and raised it again to due inflation. Each economy is trying its best to delay the coming crisis and wait for the others to fall and divide up their bodies. No one likes the calm after clearing because humankind is greedy and wants to gain more every second. The Minsky moment is not a moment, but an era [8, 9].

It is surprising that after encountering such a long-term economic downturn, the US stock market is consistently growing. Nasdaq, Dow Jones (Figure 6), and S&P 500 indexes (Figure 7) seemed not to be influenced by the epidemic, continually rising over the years. Such a phenomenon indicates that every economy is still trying its best to blow the bubble up. The larger the bubble is, the more catastrophic it will collapse.

Figure 6: Dow Jones index from 2019 to 2023 (sg.finance.yahoo.com, 2023).

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Figure 7: the S&P 500 index from 2014 to 2023 (spglobal.com, 2023).

3.2. How to Detonate/Solve the Financial Bubble

Go back to the relationship between the inverted yield curve of US bonds and the upcoming financial crisis. As discussed in the previous text, the inverted yield of the U.S. bond is due to the public's negative attitude toward investing and the increase in interest rates. The unwillingness to invest exacerbates the gap between the real asset and the capital market, which makes the bubble more vulnerable. And the increasing interest rate is a needle that is closer and closer to the bubble. Now, it will need nothing else but a trigger, a motivation to destroy everything.

This motivation is deeply related to debt [10]. For example, if George, a real estate developer, develops a project with a total fund of $ 1 billion. Among this one billion, $100 million is his own money and he borrows the rest $900 million from the bank. George will have to pay $60 million in interest to the bank each year. Imagine, if the current economic situation performs badly and George is not able to sell the houses, and also not able to decrease the selling price of the house, the only way left for George is to announce broke. This is what happening now, the reasons that cause the inverted yield of US bonds are a decrease in investment and an increase in interest rate. These two factors will restrict the consumers' purchasing power as well as increase the firm's financial cost. Such reactions will absolutely cause lots of firms in the market to earn a negative profit and break. This is the reason why a financial crisis has an extremely strong correlation with the inverted yield of US bonds—the reason that causes the formation of the inverted phenomenon is exactly the same as the financial crisis.

Let's make it vivid, the whole situation is like a grenade. The insurance is whether the government can deal with the high inflation; the gunpowder is the increasing interest rate; and the trigger is the debt. If the government is able to solve the high inflation—to close the insurance before the trigger hits the gunpowder—this financial crisis can be avoided. Once solve the inflation, the government will be able to process another round of quantitative policies to stimulate the economy. But this is truly a high gambling.

4. Conclusion

The happening of the 2022 US bond yield curve invert phenomenon can be concluded as the result of multi-factors composition. During the epidemic, the US government gave out a tremendous number of social welfare and consistently decreased the interest rate to stimulate economic recovery. Such an action caused extreme inflation. To stabilize inflation, the government chose the strategy of decreasing interest rates, an action that will transmit negative signals to investors and increase the company's costs. Current bad economic performance leads the public to hold a negative view of the market and begin to seek risk-free financial products. The increasing interest rate also increases the YTM of US-2-year bonds. Therefore, a bond-inverted phenomenon took place.

A bond yield inverted phenomenon can be correlated with a financial crisis because they share the same formation factors—increasing interest rates. By increasing interest rates, companies will be less active than they were before because increased interest rates mean they have to pay more when asking for loans. Some firms may even earn a negative revenue for this reason. Increasing in interest rates will significantly slow down economic growth. Together with the macro situation of extreme inflation, less money can be invested. Without support from extra money, financial bubbles will be hard to exist and eventually collapse, this is what so called a financial crisis.

The phenomenon of the US bond yield curve invert shows the inevitably coming economic recession. The federal bank's actions, the public's attitude, and human beings' greed, together, these factors forged an unprecedented bubble that is rarely seen in history. Long before the eruption of the epidemic, this giant bubble had already been formed. Now, with the association of multiple factors, this bubble becomes so inflated and vulnerable, that once it collapses, unimaginable damage will bring to the society. The government could choose the Volker method instead of waiting for the Minsky Moment's coming. However, it was people's greed that finally blinded their eyes.

References

[1] *Malkiel, Burton G. "Expectations, Bond Prices, and the Term Structure of Interest Rates." The Quarterly Journal of Economics, vol. 76, no. 2, 1962, p. 197, https://doi.org/10.2307/1880816.*

[2] *Sornette, Didier, and Peter Cauwels. "Financial Bubbles: Mechanisms and Diagnostics." SSRN Electronic Journal, 2014, https://doi.org/10.2139/ssrn.2423790.*

[3] *Shukla, A. (2020). Psychological impact of COVID-19 lockdown: An online survey from India: Few concerns. Indian Journal of Psychiatry, 62(5), 591. https://doi.org/10.4103/psychiatry.indianjpsychiatry_1012_20*

[4] *Kabir, Mahvish, et al. "Covid-19 Pandemic and Economic Cost; Impact on. Forcibly Displaced People." Travel Medicine and Infectious Disease, vol. 35, 2020, p. 101661, https://doi.org/10.1016/j.tmaid.2020.101661.*

[5] *Allen, F., et al. "Finite bubbles with short sale constraints and asymmetric information." Journal of Economic Theory, vol. 61, no. 2, 1993, pp. 206–229, https://doi.org/10.1006/jeth.1993.1067.*

[6] *Griggs, Ryan, and Robert Murphy. "The inverted yield curve, Austrian business cycle theory, and the true money supply." Quarterly Journal of Austrian Economics, vol. 24, no. 4, 2021, pp. 523–541, https://doi.org/10.35297/qjae.010113.*

[7] *Volcker, Paul A. "Keynote address by Paul A. Volcker: The Financial Crisis in Perspective." New Directions in Financial Services Regulation, 2011, pp. 201–216, https://doi.org/10.7551/mitpress/8861.003.0022.*

[8] *M. June Flanders. "It's not a Minsky Moment, It's a Minsky Era, Or: Inevitable Instability." Econ Journal Watch, 12 (1), 2015, 84-105, https://journaltalk.net/articles/5869*

[9] *Wang, Chenxi. "Asset bubbles and frictional intermediation." Economic Theory, 2022, https://doi.org/10.1007/s00199-022-01482-w.*

[10] *Young Im Lee. "Forecasting US stock market volatility with macroeconomic variables." KUKJE KYUNGJE YONGU, vol. 23, no. 2, 2017, pp. 67–81, https://doi.org/10.17298/kky.2017.23.2.003.*