

The Traditional Hedging Method in Times of Crisis and the New Tool: Cryptocurrency

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ABSTRACT

This paper gives a clear definition of the crisis and summarizes the hedging methods used to apply risk in times of crisis. The results show that active hedging strategies are more effective than passive hedging strategies when the economy is at its worst. Then, it proposes a new type of hedging method that may be used in the future – cryptocurrency, illustrating its model, operation principle, hedging effect, and feasibility. The results show that cryptocurrencies such as Bitcoin have a significant impact on hedging against the dollar in the short term and can be used to supplement traditional hedging methods such as gold and momentum.

Keywords: Crisis, Hedge, Time-series-momentum, Long Puts, Cryptocurrency

1. INTRODUCTION

In the process of human development, the economy has been developing, and society has been progressing. Authorities in various countries and worldwide organizations such as the World Bank have faced nine economic downturns in the past 40 years, from Black Monday in 1987 to COVID-19 in 2020. Each of them is fading away with the time passed reminded colossal damage to the economy. For years, many researchers have wanted to figure out the best method when hedging during the wrong time. Harvey et al. pointed out in their paper in 2019 that the best approach to hedge the risk during the worst time was depended on the market itself.[1] For example, the long put method was better in hedging because the underlying process was close to the buy and sold in the stock market. Still, in general, active ways were effective than passive strategies.

In addition to the traditional hedge strategies, some investors use cryptocurrency, such as bitcoins, to hedge the risk because it has the similarity of gold when used as the hedge method. The paper also illustrates the feasibility of cryptocurrency.

In section 2, this paper will mainly focus on the passive hedge method and the traditional dynamic method. In section 3, this paper demonstrates a new technique that describes its underlying principle and how

it can be used in the hedged field with the feasibility analysis.

2. CRISIS AND HEDGE METHODS IN THE WORST TIME

A *crisis* is usually defined as something terrible that happens suddenly; Crises are interpreted differently in different professions. For example, in political science, a crisis may be defined as the instability of a country or security. In economics, a crisis is usually defined as the economic downturn that occurs during the reproduction of capitalism. This kind of crisis is usually caused by the overstocking of any goods caused by the economic depression, the sharp decline in production, the total decrease in consumption, and the closure of enterprises. Further speaking, it is a severe breakdown of the relationship between supply and demand in society because the causes of the financial crisis are mainly as follows: (1) the political decisions of the country or society are wrong; (2) the shortage of raw materials affects domestic supply and imports, further damaging the international trade balance; for example, the oil crisis; (3) natural disasters; Such as, the Chilean tsunami; (4) consequences of economic globalization; For example, after the stock market bubble burst in 2000, the U.S. government adopted stimulus policies with low-interest rates, contributing to the 2008 financial crisis.

However, it should be noted that the economic downturn does not represent a financial crisis, such as COVID-19 in 2020. The impact on the economy is entirely exogenous. The closure of many physical stores and the decline of tourism led to the deterioration of the local economy. Factors that caused the financial crisis, in essence, are endogenous, and they should come from the investors to the growing market, adopt a tight fiscal policy. A shrinking exposure to risk aversion leads to market liquidity significantly reduced—the collapse of the financial system that is the true definition of the financial crisis.

2.1. Passive hedge methods

Long strategies typically profit when a company's market value rises; Hedging methods exist to make money when firm values fall. In their paper, Cook et al. point out that a rolling long put option strategy may be the most direct way of crisis hedging because it is very effective in preventing the risk of A sudden drop in the stock market [2]. As price increases, buy a put option with a higher strike price and sell a put option with a lower strike price. In addition, other derivatives included in Long Strategies also have excellent hedging effects, such as variance and volatility swap, which is based on the negative correlation between stock return and standard deviation. Similarly, investors can buy shares of competing companies to hedge against a decline in the value of their holdings, etc. Cook et al. Evaluated the performance of Long puts in seven crisis times and regular times, studied the CBOE S&P500 Put Write Index, and adjusted the Index returns to reflect the gains from buying put options correctly. The Long puts did very well in all seven crises. When it comes to Long credit protection strategies, as the spread between corporate bonds and Treasury bond yields expands with the development of society, the returns of such hedging strategies become more and more significant. However, in practice, shorting large numbers of corporate bonds is nearly impossible in a crisis. 2007-2009 was a credit crisis, short credit risk had a return rate of 127%, but in the sample, credit only produced a small positive return [2]. By contrast, holding a put option is more reliable than shorting credit risk, possibly because it is more closely correlated with the value of the equity being hedged.

Government bonds and gold are often seen as safe-haven assets by investors, who view government bonds of developed economies as protective securities and a hedge against risk in times of crisis, just as long-term Treasury rates are widely defined as risk-free. After 2000, when stock prices fell, the national debt rose [3]. Could this be a basis for government bonds as a stable hedge? The answer is not. Harvey et al. Described the correlation between government bonds and stocks over

the past 100 years. The results showed that only after 2000 did bonds and stocks show a continuous negative correlation [3]. In the past 100 years, government bonds and stocks had a long-term positive correlation. This suggests that long-term Treasury bonds are not yet a reliable hedge against falling equity prices.

Gold has long been regarded as one of the most stable havens among investors and even by national authorities, which explains a correlation between the amount of money that countries print and the amount of gold they hold. In addition, gold has another important characteristic: its price tends to rise as risk aversion in markets increases. However, because gold is linked to currencies, its price is subject to inflation to a degree. Unless investors become disillusioned with a country's currency, gold is likely to become something of a long-term hedge. Furthermore, political factors can also affect the effectiveness of gold as a haven asset to some extent. For example, strikes caused by the exploitation of labor in mining areas and political instability in mining areas will make gold more or less hedging instability.

2.2. Time-series Momentum

Time-series Momentum typically works by going long on stocks that have risen in previous cycles and going short on stocks that have fallen in previous cycles. Therefore, the use of time-series Momentum as a hedge against crisis risk may have been consistently long or consistently short over a long period. Harvey et al. proposed an expression for time-series Momentum driven by the compound return rate adjusted by Volatility with a maturity of N days [3].

$$mom_{t-1}^k(N) = \frac{\prod_{i=1}^N (1 + R_{t-i}^k) - 1}{\sigma_{t-1}^k \sqrt{N}} \quad (1)$$

Where, R_{t-1}^k is the daily rate of return of a security K at time t-1; σ_{t-1}^k is the standard deviation of the return of security K on the 100 trading days before time t-1. In the expression of time-series Momentum, N=22, N=65, N=261, taking into account short-term, medium-term, and long-term Momentum strategies, to represent 1-month time-series Momentum, 3-month time-series Momentum, and 12-month time-series Momentum. Among them, N≠30, 90, 365 is because Harvey et al. consider the days when markets are closed, only Monday through Friday of the week are defined as a trading day.

The combined performance of each momentum is defined as:

$$performance_t(N) = \sum_k G_{t-1}^k \frac{mom_{t-1}^k}{\sigma_{t-1}^k} R_t^k \quad (2)$$

Table 1. Performance of traditional risk hedging in financial crises in the past 40 years [3]

	Black Monday	Gulf war	Asian crisis	Tech burst	Financial crisis	Euro crisis I	Euro crisis II	2018Q4	COVID-19	Drawdown (14%)	Normal (86%)	All (100%)	Hit rate
Peak day	25-Aug-87	16-Jul-90	17-Jul-98	1-Sep-00	9-Oct-07	23-Apr-10	29-Apr-11	20-Sep-18	19-Feb-20	-	-	-	-
Trough day	19-Oct-87	11-Oct-90	31-Aug-98	9-Oct-02	9-Mar-09	2-Jul-10	3-Oct-11	24-Dec-18	23-Mar-20	-	-	-	-
Weekdays count	3900.0%	63	31	548	369	50	111	67	23	-	-	-	-
Peak=HWM?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	-	-	-
<u>Strategy</u>	<u>Total return</u>									<u>Annualized return</u>			<u>%</u>
S&P 500 (funded)	-32.9%	-19.2%	-19.2%	-47.4%	-55.2%	-15.6%	-18.6%	-19.4%	-33.8%	-48.2%	25.3%	10.6%	n,a,
S&P 500 (excess)	-33.5%	-20.7%	-19.7%	-51.0%	-56.3%	-15.7%	-18.6%	-19.8%	-33.9%	-49.6%	21.3%	7.1%	n,a,
Long puts (excess)	38.0%	12.4%	15.5%	44.7%	40.5%	15.8%	13.4%	18.0%	328.0%	49.8%	-14.3%	-6.9%	100%
Short credit risk(excess)	7.6%	3.3%	12.1%	17,0%	127.7%	11.7%	26.1%	9.5%	101.6%	59.8%	-10.8%	-2.7%	100%
Long bonds (excess)	-8.3%	-2.7%	3.0%	24.2%	20.4%	5.7%	10.1%	2.5%	5.5%	11.6%	3.2%	4.3%	78%
Long gold (excess)	4.4%	5.5%	-6.9%	7.5%	18.9%	4.6%	6.3%	4.5%	-2.7%	8.2%	0.1%	1.2%	78%
1m MOM unconstrained	5.6%	19.3%	9.0%	31.3%	28.6%	2.7%	4.9%	8.1%	40.8%	30.8%	5.7%	8.9%	100%6
1m MOM EQ position cap	9.5%	22.8%	12.5%	37.4%	34.3%	4.8%	8.4%	9.7%	45.3%	38.4%	2.6%	7.0%	100%
3m MOM unconstrained	10.3%	10.5%	9.3%	50.7%	32.6%	0.5%	10.9%	0.8%	24.1%	30.1%	5.8%	8.9%	100%
3m MOM EQ position cap	15.4%	18.7%	14.4%	61.3%	41.4%	4.7%	13.7%	2.7%	32.2%	42.2%	3.0%	7.8%	100%
12m MOM unconstrained	0.4%	12.2%	7.7%	52.3%	17.3%	-4.0%	-4.1%	-2.8%	9.2%	16.3%	11.0%	11.8%	67%
12m MOM EQ position cap	8.3%	18.7%	16.2%	71.7%	23.7%	2.1%	0.2%	-0.9%	18.2%	30.8%	8.1%	11.0%	89%
Profitability,dollar-neutral	-1.6%	-2.1%	3.0%	161.9%	33.9%	10.5%	10.9%	4.5%	9.5%	37.5%	0.9%	5.4%	78%
Profitability,beta-neutral	2.3%	2.9%	9.1%	160.7%	21.2%	2.4%	3.3%	1.7%	3.7%	32.4%	1.6%	5.4%	100%
Payout,dollarneutral	0.1%	6.3%	9.1%	178.6%	20.5%	7.0%	5.0%	7.6%	-1.3%	36.2%	0.0%	4.5%	89%
Payout,beta-neutral	-2.8%	8.0%	11.9%	196.1%	13.1%	1.2%	1.2%	5.1%	-2.6%	32.9%	3.0%	6.7%	78%
Growth,dollar-neutral		-6.6%	-9.6%	-8.6%	9.0%	10.8%	9.8%	-1.3%	12.3%	2.6%	1.8%	1.9%	50%
Growthbeta-neutral		-3.0%	-5.7%	-16.2%	12.4%	3.1%	2.8%	1.4%	10.7%	0.5%	0.3%	0.4%	63%

Safety,dollar-neutral	5.0%	9.5%	9.1%	90.7%	12.2%	7.9%	13.6%	9.9%	0.9%	29.7%	-4.1%	0.1%	100%
Safety,beta-neutral	-3.5%	4.8%	0.8%	96.9%	-9.1%	1.8%	4.2%	1.9%	-13.9%	11.2%	4.9%	5.8%	67%
QualityAll,dollar-neutral	4.3%	7.3%	8.2%	142.9%	26.3%	10.2%	15.2%	4.5%	5.6%	39.2%	-1.4%	3.6%	100%
QualityAll,beta-neutral	-3.3%	7.0%	6.6%	164.9%	9.6%	2.4%	4.6%	1.7%	-4.1%	27.4%	5.2%	8.1%	78%

That is, the aggregate performance of momentum is summed up by dividing the momentum signal (mom_{t-1}^k) by the standard deviation of the return on security K at the t-1 stage (σ_{t-1}^k), multiplying the Gearing factor and the return on security at the time t (R_t^k).

As expected, all short - and medium-term (1m, 3m) time-series Momentum did well in financial crises after 1985 but underperformed in the long run. This is consistent with the definition of time-series Momentum. In times of crisis, most investors will accelerate the pace of asset sales. TSM's hedging strategy is based on the previous performance of a particular asset, so naturally, it will have a better prediction effect in the short and medium-term, and more accommodating of a faster pace of selling; TSM with EQ position of the same duration can provide better hedging during the worst economic times, because the addition of stock position limits enables the portfolio to be more accurately long/short in times of crisis. In general, the addition of EQ position reduces the overall performance but can improve the return of the portfolio in the crisis period.

At the end of a bull market, quality stocks tend to be undervalued and do well when the market recedes or retreats. Quality stocks are an analysis strategy that focuses on stock factors. It is a kind of risk hedging method that has been widely used in the last decade, and its maturity mainly benefits from the Fama-French model. Using the Gordon growth model, the P/B ratio can be written as:

$$\frac{P}{B} = \frac{\text{Profitability} \times \text{payout ratio}}{\text{Required return} - \text{Growth}} \quad (3)$$

On the right side of the formula are some indicators measured by the stock index, which can be very intuitively obtained in the company's financial statements. Previous literature shows that the measurement of the stock index on the right side of the formula can predict the cross-sectional returns of stocks to a certain extent, which can provide certain help for risk hedging in the crisis period.

3. BLOCKCHAIN TECHNOLOGY CRYPTOCURRENCY

Blockchain technology is widely used in the financial sector. Its core technology is to map all information to bitcoin according to specific rules by analyzing different data. There is a block in a bitcoin transaction. The model includes three steps: first, the original key and electronic signature are managed; Then use the password authentication to realize the encryption operation and record the corresponding information; Finally, the password identification system is used to complete storage, authentication, and exchange operations, and can also be classified and queried according to different user identities, which facilitates subsequent processing and analysis, as well as data sharing and exchange. Blockchain Technology Cryptocurrency refers to recording the original data information and corresponding algorithm to achieve security and confidentiality. There are clear rules in Bitcoin for electronic signatures and so on.

Blockchain technology refers to analyzing the data on the blockchain and corresponding algorithms to achieve its password management. In practice, each transaction requires a node as the core security. For a single enterprise, it needs to use multiple platforms to complete information transmission and information sharing. Individuals are mainly responsible for data encryption and decryption to protect their privacy and identity security. Blockchain technology encryption explicitly includes two aspects: one is data analysis, and the other is password verification. When analyzing information, you need to start from the following two parts. The first is the secret key used in the process of data acquisition and storage. Secondly, from the mass information transmission and exchange mode perspective, we consider whether the corresponding algorithm is adopted to protect its security and confidentiality. Due to the high security and low transaction cost of Bitcoin, all encryption algorithms in blockchain technology need to be improved accordingly to ensure the security of transactions. The key of blockchain technology lies in combining the encryption process and decryption process organically to realize the protection of information security and avoid the data leakage and leakage caused

by the redundancy of cryptography algorithm in a bitcoin transaction.

3.1. Cryptocurrencies' run logic and operation principle modeling

In blockchain technology, each transaction needs to be completed through a different node, and each node is a separate and independent entity. So there can be a lot of uncertainty about a single transaction. Firstly, all participants are authenticated. Secondly, according to the user role and password authentication method for data exchange (such as encryption, decryption, etc.) and confirm whether it is a legal holder or valid user; Finally, in each transaction, it is necessary to ensure that the information transmission and stored process are safe, reliable and reliable. In cryptocurrency transactions with blockchain technology, each kind must ensure the security of information transmission and storage. Only when all participants can trust and use the node can they operate. Therefore, any single and independent individual must ensure that their identity, password, and key are not charged and can not be disclosed. The operation principle model of cryptocurrency based on blockchain technology is shown in Figure x. When conducting bitcoin transactions, the information of all participants (including data, keys, and transmission paths) needs to be verified to a certain extent. Secondly, the encryption algorithm separates these original nodes from other participant information, and ciphertext is generated and stored in the block as a record. Finally, determine the operation rights and rights of different roles to use this node. Each transaction can only be carried out after a multi-party link, so the integrity of information must be guaranteed during the whole transaction process to avoid leakage and fraud.

The application of cryptocurrency technology continues to expand, and there are many ways to encrypt it. The most common of these is through password authentication and information confirmation. However, due to the need to use different keys for data transmission in the encryption process and the complexity of related operations, some defects and loopholes seriously affect the confidentiality, security, and maintainability of the technology, so how to ensure the safe and smooth completion of a bitcoin transaction is one of the critical contents to be solved in this paper. In this paper, the primary methods are as follows: 1) A complete and stable system is formed based on blockchain algorithm to control the entire network information flow; (2) Through the use of password authentication technology for key management, to ensure the security and efficiency of the whole transaction process; (3) Use blockchain algorithm to form a complete and stable data system to ensure its safety in transmission, storage and exchange.

3.2. The general idea of how cryptocurrency works

After practicing cryptocurrency transactions with blockchain technology, we can find that its core principle is to store, manage and analyze the information reflected in data. For information data, it needs to be processed by corresponding algorithms. The first is based on bitcoin and other digital electronic money as virtual goods. The product has a certain degree of high-security factor and easy to obtain passwords and protect user privacy; Secondly, a large amount of cash flow will be generated in the transaction process, but due to its confidentiality technology is still to be improved, it is necessary to process these data through relevant encryption algorithms to ensure its security and confidentiality. Finally, a lot of information is generated after the transaction is completed. Blockchain technology is a kind of digital currency such as bitcoin that exists independently of the network and does not depend on the traditional financial system. Since information storage, management and analysis are provided by a blockchain, and we can process these data through corresponding algorithms to ensure the smooth operation of the encryption process and achieve its security and confidentiality. As for information, data is processed by relevant algorithms, and encryption technology, to a certain extent, enables these data to achieve security and privacy in the process of transmission.

3.3. Hedge with cryptocurrencies and its feasibility analysis

In traditional currency measurement, people are used to encrypting it with physical methods, but for blockchain technology, a non-contact cryptographic algorithm is used to achieve. However, due to this technology's limitations and security problems, it is not easy to be widely used and promoted. In the traditional model, digital signatures, keys, and other information divide bitcoin transaction parties into mutual distrust. In its application, data is usually manipulated during encryption, but information leakage and tampering are easy to occur due to the different levels of trust between the two parties. The asymmetric ciphertext encryption algorithm is the same or corresponds to the symmetric encryption key algorithm. In this technology, if a bitcoin transaction will have a plaintext number as a secret source for decryption operation, it needs to be converted into a public key; To realize the key exchange, the private key must be used to complete a series of complicated processes such as data modification, deletion, and transmission. Therefore, the asymmetric encryption key algorithm is widely used in applications. Compared with bitcoin-based on symmetric cryptography, its advantages are as follows: this method can effectively avoid information leakage and tampering; It uses a ciphertext encoding based encryption processing and then the

plaintext number as a secret source without any impact on the data content or modify, delete or transfer operations; And through some technical means to ensure the critical sharing, to achieve a good key management and security performance. Compared with bitcoin with symmetric encryption technology, it has the following disadvantages: it requires specific keys to decrypt the ciphertext; Secondly, this method needs to use a large number of encryption algorithms to meet the security requirements of particular users.

Bitcoin can be used as a hedge like gold because it has many similarities. For example, the principal value comes from the scarce supply. Supply is not controlled by the government but by independent agents, the prices of both assets are volatile, and the total supply is limited [14]. Dyhrberg pointed out in his paper that Bitcoin has a relatively prominent hedging ability against FTSE IDEX, so this paper believes that bitcoin and other cryptocurrencies can be used together with gold to eliminate or minimize market risk [14]. Secondly, Dyhrberg's article points out the correlation between bitcoin and other hedging instruments such as gold. Using Bitcoin to hedge risk in the short term is more reliable than hedging risk in a long time [14]. This may be thanks to bitcoin's high-frequency trading and no holiday. As for the feasibility of cryptocurrency, this paper believes that it has more robust confidentiality and applicability than traditional tools. In conventional cryptography, information is generally stored in ciphertext on electronic media such as Bitcoin. Because this method has certain limitations and insecurity, people can not use, operate, and accept it. In addition, some criminals may use the technology encryption system to steal user data, tamper with the program, destroy the regular operation of the computer, or even cause significant losses or hidden security risks. Blockchain technology The storage mode of cryptocurrency information is to establish data buffers on different nodes and store them in electronic media such as bitcoin to maintain data confidentiality. Therefore, it can be said that it not only has high security and applicability. But also has a solid operation. Blockchain technology The privacy and security of cryptocurrencies can be reflected in traditional cryptography, but its disadvantages are apparent: first, it is uncertain. The second is an unpredictable risk. Third, the confidentiality and security of cryptocurrencies are determined by several factors, the most important of which are user authentication, password management policies, and data integrity.

4. CONCLUSION

This paper explores the definition of crisis and the main ways to hedge risk during significant downturns in the past. The results show that active hedging strategies tend to be more effective, stable, and cheaper than passive hedging methods. For example, the use of gold as

a hedging tool needs to consider the instability of mining policy and the changing attitude of countries towards gold holdings. Active strategies such as TSM have performed well in several downturns since 1987. Short-term and medium-term TSM provides the most excellent feedback on risk aversion, mainly attributed to the accelerating frequency of asset selling during the crisis period.

In addition, new methods such as cryptocurrencies are now used in less chance of risk hedge industry. The main reason is that people are not familiar with it and its technology is not very mature and stable. Cryptocurrencies such as Bitcoin have some of the unique properties of gold and can be a good hedge against indices such as FTSE [14]. Like TSM, cryptocurrencies have an excellent short-term hedging effect, which the paper argues is negatively correlated with the rate at which people sell assets in times of crisis.

REFERENCES

- [1] Harvey, C., Hoyle, E., Rattray, S., Sargaison, M., Taylor, D., & van Hemert, O. (2019). The Best of Strategies for the Worst of Times: Can Portfolios be Crisis Proofed?. SSRN Electronic Journal.
- [2] Cook, M., Sargaison, M., & Van Hemert, O. (2017). The Best Strategies for the Worst Crises. SSRN Electronic Journal.
- [3] Harvey, C., Hoyle, E., Rattray, S., & van Hemert, O. (2020). Strategic Risk Management: Out-of-Sample Evidence from the COVID-19 Equity Selloff. SSRN Electronic Journal.
- [4] Ben Khelifa, S., Guesmi, K., & Urom, C. (2021). Exploring the relationship between cryptocurrencies and hedge funds during COVID-19 crisis. *International Review Of Financial Analysis*, 76, 101777.
- [5] Stafylas, D., & Andrikopoulos, A. (2020). Determinants of hedge fund performance during 'good' and 'bad' economic periods. *Research In International Business And Finance*, 52, 101130.
- [6] Tran, Q. (2020). Financial crisis, shareholder protection and cash holdings. *Research In International Business And Finance*, 52, 101131.
- [7] Diniz-Maganini, N., Diniz, E., & Rasheed, A. (2021). Bitcoin's price efficiency and safe haven properties during the COVID-19 pandemic: A comparison. *Research In International Business And Finance*, 58, 101472.
- [8] Corbet, S., Hou, Y., Hu, Y., & Oxley, L. (2021). The influence of the COVID-19 pandemic on the hedging functionality of Chinese financial

markets. *Research In International Business And Finance*, 59, 101510.

- [9] Dunbar, K. (2021). Impact of the COVID-19 event on U.S. banks' financial soundness. *Research In International Business And Finance*, 59, 101520.
- [10] Tarchella, S., & Dhaoui, A. (2021). Chinese jigsaw: Solving the equity market response to the COVID-19 crisis: Do alternative asset provide effective hedging performance?. *Research In International Business And Finance*, 58, 101499.
- [11] Neville, H., Draaisma, T., Funnell, B., Harvey, C., & van Hemert, O. (2021). The Best Strategies for Inflationary Times. *SSRN Electronic Journal*.
- [12] Faber, M. (2010). Relative Strength Strategies for Investing. *SSRN Electronic Journal*.
- [13] Metzger, N., & Shenai, V. (2019). Hedge Fund Performance during and after the Crisis: A Comparative Analysis of Strategies 2007–2017. *International Journal Of Financial Studies*, 7(1), 15.
- [14] Dyhrberg, A. (2016). Hedging capabilities of bitcoin. Is it the virtual gold?. *Finance Research Letters*, 16, 139-144.