Precious Metals Or Crypto, Where Should I Invest?*

A Historical Analysis of the Two Major Asset Categories 2017-Present

Yi Fei Pang

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Abstract

This paper utilizes and compares datasets of the two most held precious metals and the two most held cryptocurrencies. A few simple price analyses were implemented to determine which assets were more profitable along with range formulas to determine volatility. Observations show that in the recent years, crypto has been a much more profitable investment. However, precious metals are much less volatile and consistent. The importance of this analysis can be very beneficial today due to the economic turmoil and investors asking: Do I want an asset that's profitable, consistent, or both?

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*Code and data supporting this analysis is available at: https://github.com/apang00/investment-comparison

1 Introduction

Throughout history, human currency has always been evolving alongside our civilization. From the archaic days of the bartering systems where people traded raw materials, coins and precious metals emerged, then came paper money. As humans evolved even further, electronic banking with credit card emerged and now finally, crytpocurrencies. At every stage of society, humans have tied a value on an economic instrument as a way of wealth storage and wealth exchange.

Gold and silver has been an asset since the ancient civilizations of Egyptians and Incas. Both metals are malleable and therefore can easily be stamped into coins or molded into jewelry. Furthermore, pure gold and silver does not corrode or tarnish, thus making them timeless assets (Michael Bromerg 2023). Thousands of years later, in our modern era, gold and silver still remain as solid assets because of their durability, liquidity, and stability.Through economic turmoil, precious metals have proven to be an asset that not only holds it's value but has been significantly outperforming the stock markets since the turn of the millennium (Brian Domitrovic 2023).In the recent decade, a new category of asset has emerged and performed tremendously well.That is the cryptocurrency. Originally developed as a method of making untraceable transactions and used almost exclusively by the Dark Web crowd, this technology has quickly gained popularity and has transformed into more of an investment rather than to obfuscate transactions. Cryptocurrencies such as Bitcoin and Ethereum has seen growths of ~20,000% and ~35,000% respectively at their peaks.

Since both precious metals and cryptocurrencies have been performing exceptionally well, this paper will analyse asset is a better hold depending on the goal of the investor. I will not only focus on the trends for the separate assets through price charts, but also evaluate correlations between the different category of assets through regression. Moreover, ranges will be calculated as a method to assess risk and volatility and compared between the two asset categories. Overall, it was evident precious metals tend to grow consistently over the year without being significantly affected by the economy or the introduction of other assets. In contrast, cryptocurrencies are much more volatile, seeing massive price ranges. However, cryptocurrencies tend to grow at much higher rates. Over the past decade, both precious metals and cryptocurrencies have been phenomenal assets and looks to continue to rise in value in the foreseeable future.

In the data section of the paper, there will be an introduction regarding where the data came from, and for what period the data was extracted. Furthermore, the data cleaning and visualization process will be detailed for creating the price, volatility, and regression charts. Next, the model section will explore the linear models used, why they were used, and how they represent the correlations. Following that, the results will be discussed includes elements such as the R-square values and p-values. To conclude, we will figure out potential weaknesses of the analysis along with the next steps and improvements.

2 Data

2.1 Data Description

This paper uses four separated datasets from two different sources. The gold (Markets Insider 2024a) and silver (Markets Insider 2024b) raw datasets were sourced from a subsidiary of Business Insider, Market Insider. These two datasets include detailed financial information regarding gold and silver data starting from late 2017 until present. The other two cryptocurrency datasets for Ethereum (yahoo! finance 2024b) and Bitcoin (yahoo! finance 2024a) come from Yahoo Finance also ranging from late 2017 until present. All four datasets include details such as daily open and closing prices as well as high/lows and volume data. In addition, all data is marked in US dollars. The data is sourced from live charts for the daily open, close, and volume recorded on exchanges and recorded at the end of every day. The cleaning, modelling, and analysis of these four datasets will be carried out using the statistical programming language `R` (R Core Team 2023), using the packages `tidyverse`(Wickham et al. 2019), `here`(Müller 2020), `rstanarm`(Goodrich et al. 2022), `dplyr` (Wickham et al. 2021), and `ggplot2`(Wickham 2016).

2.2 Price Data

The crypto prices and metals prices cleaned datasets feature the closing price points of the two cryptocurrencies eth_Close, btc_Close, along with the respective close prices for the metals gold_Close and silver_Close. In addition, there is a date column for the closing prices. These datasets range from November 12, 2017 until the date they were fetched, April 4th, 2024. Though there is data for every single day of the year, within the aforementioned range, the cleaned dataset only takes into account the closing balance of the crytpocurrency/precious metal every 15 days, or the 1st and 15th of every month. The purpose of that is to reduce noise and filters out short term volatility and gives the data a more long term perspective. In addition to the date adjustment, there are also adjustments made to the closing prices. For readability in graphs, all assets were readjusted to have a present value of in the range of 1 Bitcoin. The adjustments made were 20x Ethereum, 30x Gold (oz.), and 2500x Silver (oz.).

Table 1: A summary table for crypto price data

Date	eth_Close	btc_Close
2017-11-15	6667	7316
2017-12-01	9331	10976
2017-12-15	13689	17707
2018-01-01	15453	13657
2018-01-15	25838	13820

2.3 Volatility Data

The volatility data was separated much like the prices datasets. One dataset for crypto volatility and one for metals volatility. In both datasets, volatility was calculated by using a normalized average true range.

First, the true range was calculated with:

TR = Max [(H - L), |H - Cp|, |L - Cp|]

Where: H = Today's high L = Today's low Cp = Yesterday's closing price Max = Highest value of the three terms Source: (Adam Hayes 2023)

Then the average true range was calculated with and represented by (asset)_ATR in Table 2:

(1/n) * Σ(TRi)

Where: TRi = Particular true range for each period (e.g., first day's TR, second day's TR, etc.) Σ = Summation symbol (summing up all the individual TRi values) n = Number of periods (15 in the data to match the price data) Source: (Adam Hayes 2023)

The normalized average true range was calculated by normalizing the ATR value with the closing price of the asset and represented by (asset)_ATR_norm in Table 2:

ATR/Cp

Where: ATR = The ATR of the asset Cp = Current day's closing price

Table 2: A summary table for crypto volatility

Date	eth_ATR	eth_ATR_norm	btc_ATR	btc_ATR_norm
2017-12-08	32.62167	0.0713259	716.7222	0.0618472
2017-12-23	62.75333	0.0913289	1882.5984	0.1130804
2018-01-07	90.06708	0.1091760	1834.8662	0.1223562
2018-01-22	143.25615	0.1261782	1536.6278	0.1195239
2018-02-06	141.36905	0.1428423	1249.3017	0.1263772

3 Model

The goal of our modelling strategy is twofold. Firstly,…

Here we briefly describe the Bayesian analysis model used to investigate… Background details and diagnostics are included in Appendix B.

3.1 Model set-up

The model will be linear where:

Define y as the number of seconds that the plane remained aloft. Then β_i is the wing width and γ_i is the wing length, both measured in millimeters.

$$y_i|\mu_i, \sigma \sim \text{Normal}(\mu_i, \sigma) \tag{1}$$
$$\mu_i = \alpha + \beta_i + \gamma_i \tag{2}$$
$$\alpha \sim \text{Normal}(0, 2.5) \tag{3}$$
$$\beta \sim \text{Normal}(0, 2.5) \tag{4}$$
$$\gamma \sim \text{Normal}(0, 2.5) \tag{5}$$
$$\sigma \sim \text{Exponential}(1) \tag{6}$$

We run the model in R (R Core Team 2023) using the `rstanarm` package of Goodrich et al. (2022). We use the default priors from `rstanarm`.

3.1.1 Model justification

We expect a positive relationship between the size of the wings and time spent aloft. In particular…

We can use maths by including latex between dollar signs, for instance θ.

4 Results

Our results are summarized in **?@tbl-modelresults**.

5 Discussion

5.1

If my paper were 10 pages, then should be be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.

5.2 Second discussion point

5.3 Biases and Weaknesses

One of the greatest weaknesses stems from the limited historical data of cryptocurrencies. The value of precious metals can be trace back centuries and has solidified itself as a solid holding asset while cryptocurrencies such as Ethereum was only introduced in the late 2016s. Therefore, the only results and conclusion that can be made…

5.4 Next Steps

Some next steps I can take for future devlopments can be to continue to monitor the price of crypto over the next few decades and see how it reacts to different economic coniditions and how that compares to precious metals.

Appendix

A Additional data details

B Model details

B.1 Posterior predictive check

In **?@fig-ppcheckandposteriorvsprior-1** we implement a posterior predictive check. This shows…

In **?@fig-ppcheckandposteriorvsprior-2** we compare the posterior with the prior. This shows…

B.2 Diagnostics

?@fig-stanareyouokay-1 is a trace plot. It shows… This suggests…

?@fig-stanareyouokay-2 is a Rhat plot. It shows… This suggests…

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