HOW TO USE CORRELATION COEFFICIENTS FOR HIGH PROBABILITY POSITION TRADING

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Overview

- Understanding Correlation
  - Types
  - Asset Correlation
  - Market Correlation
- Correlation Coefficients
  - Identifying Correlation
  - Scatterplot and Linear Regression
  - Correlation Matrix
- Practical Applications
- Case Study
- Q&A

Understanding Correlation

Definition: A statistic that measures the degrees to which two variables move in relation to each other.

Studying whether two assets have a discoverable correlation and what the relationship is can help investors manage a portfolio, traders understand how assets move with other assets for trade ideas, and analysts measure the movement of an asset compared to a benchmark.

In order to analyze correlation and use it for trading, we need to understand:

- Types
- Measurement
- Reason
- Modeling

Types

Three Main Types of Correlation:

- Positive Correlation – Relationship between two variables in which both move in the same direction; when one variable increases or decreases, so does the other.
- Negative Correlation – Relationship between two variables in which they move in opposite directions; an increase in one variable is associated with a decrease in the other and vice versa.
- Zero Correlation – No relationship between two variables; the variables move independently from one another.

Real-Life Examples

- Height and Weight (Positive)
- Temperature and Ice Cream Sales (Negative)
- Daily Caffeine Consumption and IQ Level (Zero)

Asset Correlation

Knowing the correlation between different assets and combining categories that have low correlation can help diversify a portfolio of various holdings along with lower the portfolio's volatility risk.

By optimizing the portfolio, the manager can invest more aggressively into higher risk/reward investments given they accept the portfolio's projected volatility.

A good portfolio will cycle through assets based on the need to reduce any correlation risk.

Market Correlation

In certain periods of time, the sectors and industry groups that compose a benchmark index can become highly positively correlated to the index itself. During these times, picking sectors and stocks that can outperform the benchmark is difficult. Diversification also becomes challenging, leading investors to look at other asset classes to manage portfolio risk.

On a short-term basis, new correlations begin to form.

- During 2022, intraday and daily clusters of performance were mostly positively correlated across sectors of the S&P; however, declining sessions would have the Energy Sector advancing, essentially breaking the correlation to the benchmark index.

Traders can use this to their advantage by trading with the benchmark index when correlations are high and by hedging using other asset classes or negatively correlated sectors.

Correlation Coefficients

In order to determine the strength of the relationship between two variables, we need a way to quantify the correlation into a value.

Correlation coefficients (*r)* are the approach for linear relationships as it measures the degree to which the movement of two different variables are associated.

- Range of Value: -1.0 (Perfect Negative Correlation) to 1.0 (Perfect Positive Correlation)
- Positive correlation relationships have a positive correlation coefficient.
- Negative correlation relationships have a negative correlation coefficient.
- A value of zero indicates no relationship between the variables.

The Math Parts

1	2	3	4	5	6	7
Gather data for your "x-variable" and "y variable.	Find the mean for the x-variable and find the mean for the y-variable.	Subtract the mean of the x-variable from each value of the x-variable. Repeat this step for the y-variable.	Multiply each difference between the x-variable mean and x-variable value by the corresponding difference related to the y-variable.	Square each of these differences and add the results.	Determine the square root of the value obtained in Step 5.	Divide the value in Step 4 by the value obtained in Step 6.

$$r = \frac{n \times \left(\sum (X, Y) - \left(\sum (X) \times \sum (Y)\right)\right)}{\sqrt{\left(n \times \sum (X^2) - \sum (X)^2\right) \times \left(n \times \sum (Y^2) - \sum (Y)^2\right)}}$$

where:

$r = $ Correlation coefficient

$n = $ Number of observations

Example Data

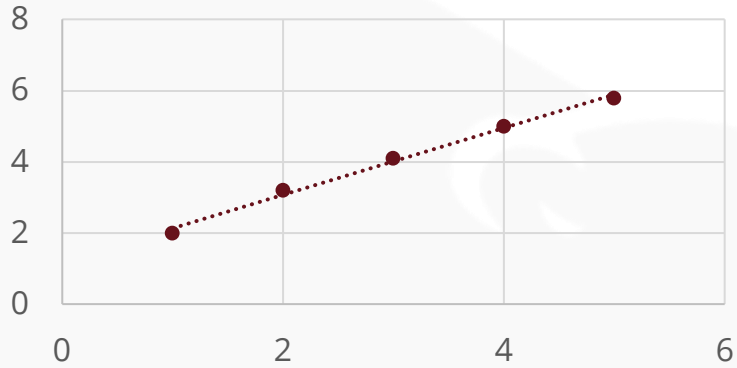| Date	SPY	AAPL		Correlation Coefficient
9/1/2022	396.42	157.96		0.823630643
9/2/2022	392.24	155.81		Formula: =CORREL(B2:B22, C2:C22)
9/6/2022	390.76	154.53		
9/7/2022	397.76	155.96		
9/8/2022	400.38	154.46		
9/9/2022	406.6	157.37		
9/12/2022	410.97	163.43		
9/13/2022	393.1	153.84		
9/14/2022	394.6	155.31		
9/15/2022	390.12	152.37		
9/16/2022	385.56	150.7		
9/19/2022	388.55	154.48		
9/20/2022	384.09	156.9		
9/21/2022	377.39	153.72		
9/22/2022	374.22	152.74		
9/23/2022	367.95	150.43		
9/26/2022	364.31	150.77		
9/27/2022	363.38	151.76		
9/28/2022	370.53	149.84		
9/29/2022	362.79	142.48		
9/30/2022	357.18	138.2		

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Scatterplot Data

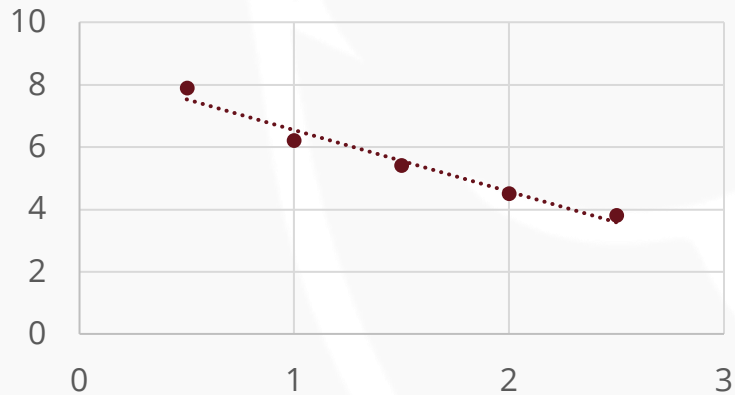SPY/AAPL Scatter

Scatterplots Exercise
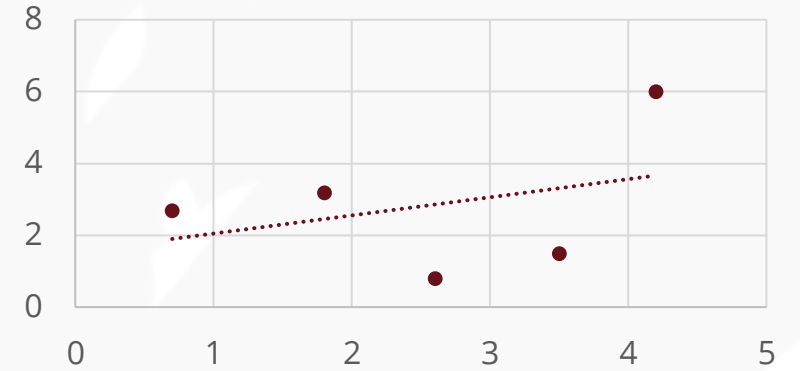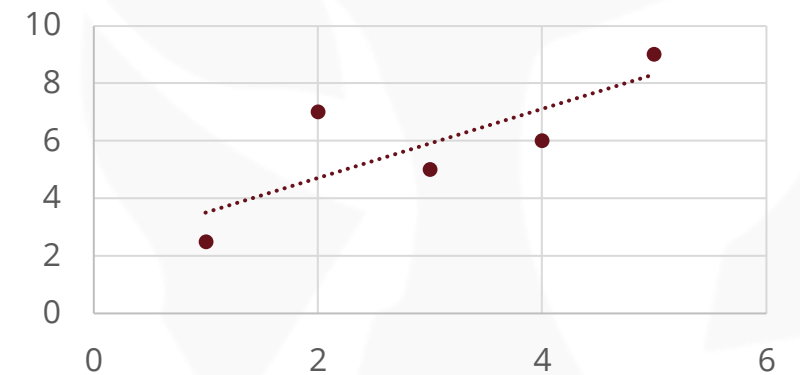
Plot A

Plot C

1. r = .345
2. r = .787
3. r = -.983
4. r = .997

Plot B

Plot D

Correlation Matrix

Tool to visualize and map out correlation coefficients across multiple assets in one view.

Useful for:
- Portfolio Holdings
- Asset Relationships
- Risk Management

	XLK	XLV	XLY	XLF	XLC	XLI	XLP	XLE	XLU	XLRE	
XLK		0.9	0.94	0.91	0.98	0.96	0.96	-0.13	0.81	0.96	XLK
XLV	0.9		0.81	0.88	0.92	0.88	0.87	-0.03	0.63	0.85	XLV
XLY	0.94	0.81		0.92	0.92	0.92	0.93	-0.14	0.93	0.95	XLY
XLF	0.91	0.88	0.92		0.93	0.97	0.92	0.14	0.83	0.9	XLF
XLC	0.98	0.92	0.92	0.93		0.95	0.96	-0.1	0.8	0.96	XLC
XLI	0.96	0.88	0.92	0.97	0.95		0.95	0.12	0.81	0.92	XLI
XLP	0.96	0.87	0.93	0.92	0.96	0.95		-0.08	0.86	0.96	XLP
XLE	-0.13	-0.03	-0.14	0.14	-0.1	0.12	-0.08		-0.15	-0.19	XLE
XLU	0.81	0.63	0.93	0.83	0.8	0.81	0.86	-0.15		0.91	XLU
XLRE	0.96	0.85	0.95	0.9	0.96	0.92	0.96	-0.19	0.91		XLRE
	XLK	XLV	XLY	XLF	XLC	XLI	XLP	XLE	XLU	XLRE	

Using Correlations in Investing

Investors can use tools like Correlation Matrices in order to evaluate all the correlation coefficients for each holding. They can make decisions based on whether positions need to be adjusted if they see risk in the markets and they expect the correlations to draw down in tandem.

Conversely, an investor with a portfolio of high correlation assets can choose to add new asset classes or negatively correlated assets to better diversify their holdings and reduce drawdown.

Examples:
- Hedged Positions
- Option Trades
    - Protective Puts
    - Delta Hedging
- Negatively Correlated Assets to the Holdings

Using Correlations in Trading

Once a strong correlation is observed, whether positive or negative, the objective of a trader is to use other analysis methods (technical, fundamental, option data) to determine the best methods of approach.

Correlation affects trade positions like relative strength/weakness trades, pairs/ratio trades, and hedges.

Note to Remember:
- The magnitude of the moves can't be determined by the correlation, only that the two assets move together in 'waves'.
- Determining whether the correlation shows earlier in one asset over another as a leading indicator can allow a trader to set up apposition for the eventual alignment of the lagging asset.
- Following trends in correlation assets is preferred, but reversals and pullbacks can also be targeted with good risk management.
- Have an understanding of other forces on the assets being traded as the correlation coefficient can both change and break over time.
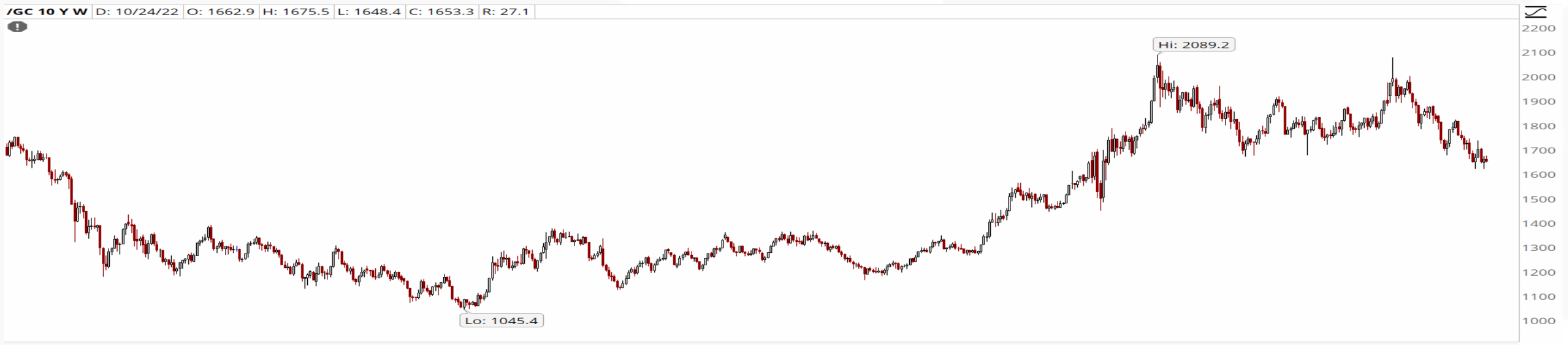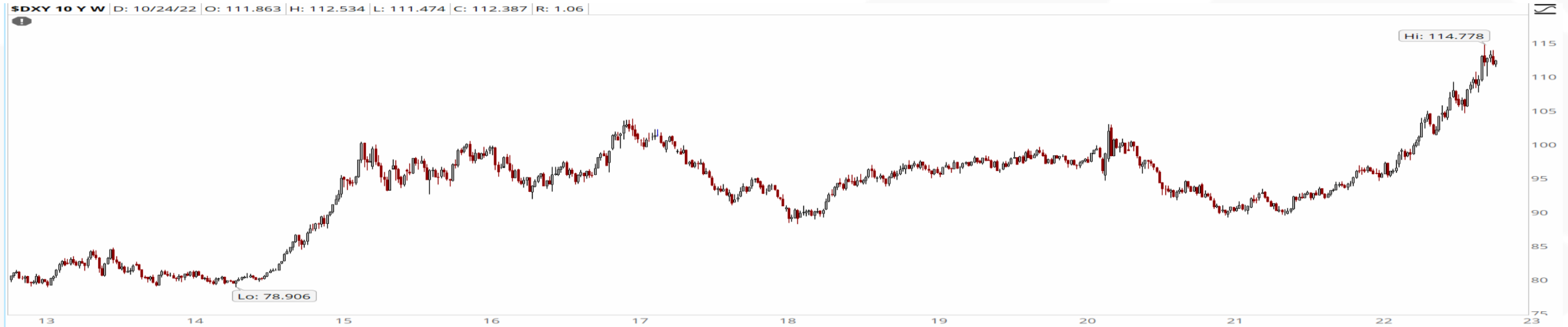
Interest Rates and Stock Price/Earnings

One well-known correlation relation we've seen in 2022 is the strong negative correlation between interest rates and equity prices.

Assuming all else being equal, if an investor has a choice to own stocks vs bonds and the risk-free rate of return from those bonds is going up, they are less inclined to bid up stock prices due to the value of future earnings looking less attractive. The risk model assumes that as bond yields increase, equity prices decrease.

The most sensitive area of equities affected are those with high price-to-earnings multiples, which often include growth companies, technology, and those with little to no revenue. As the risk-free rates rise, the cost of borrowing also increases and the price risk investors are willing to take becomes reduced.

Case Study: Gold and the U.S. Dollar

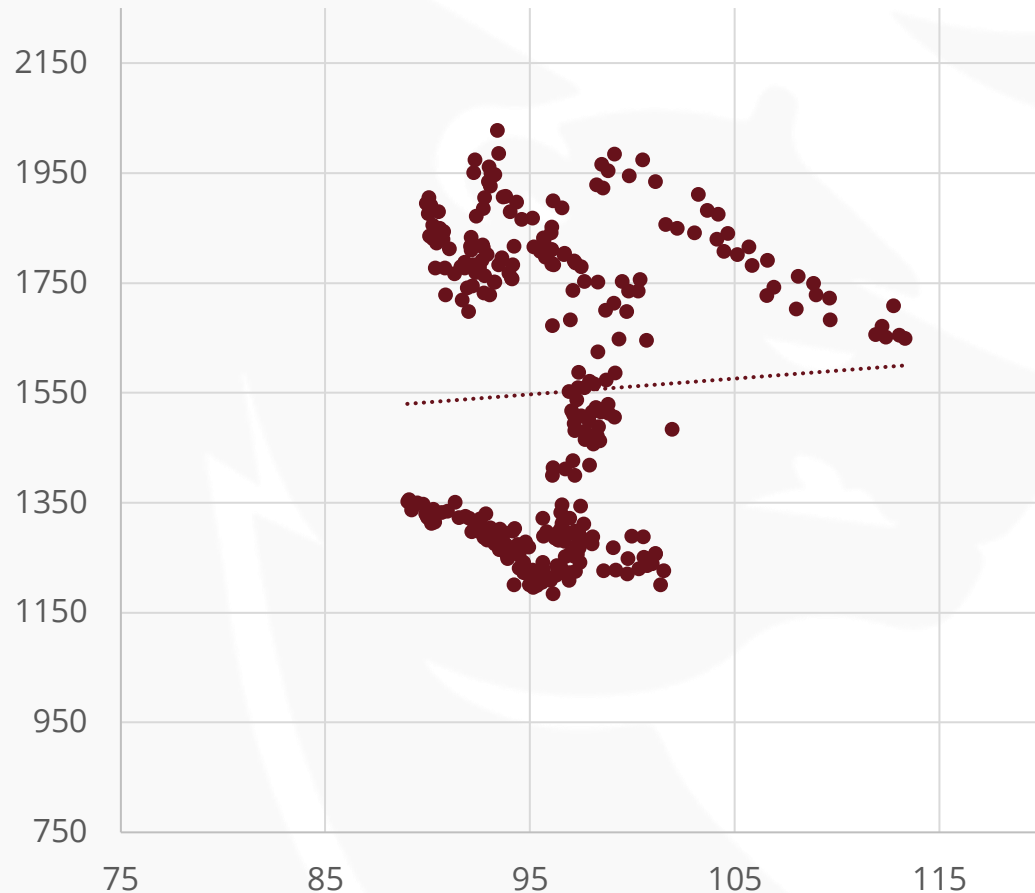# Asset Drivers

Drivers for Gold Price

- Value of the U.S. Dollar
- Central Bank Reserves
- Jewelry and Industrial Demand
- Wealth Protection
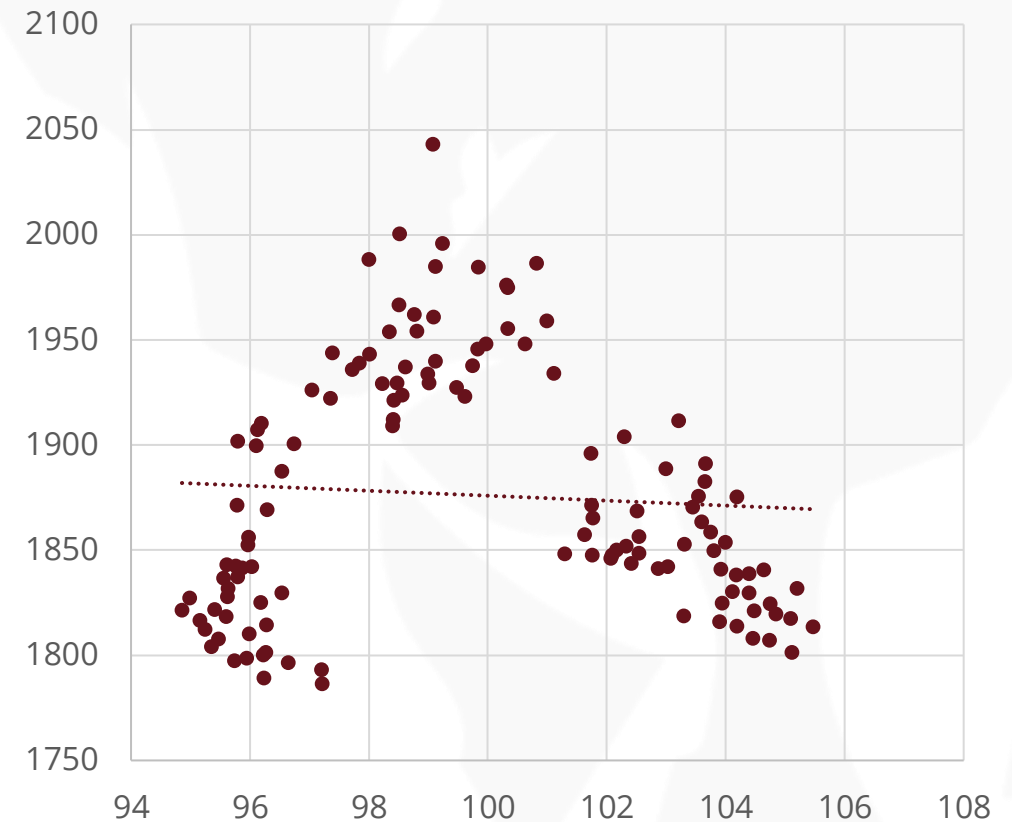- Investment Demand

Drivers for Dollar Price

- Demand
- Inflation Rates
- Trade Deficits
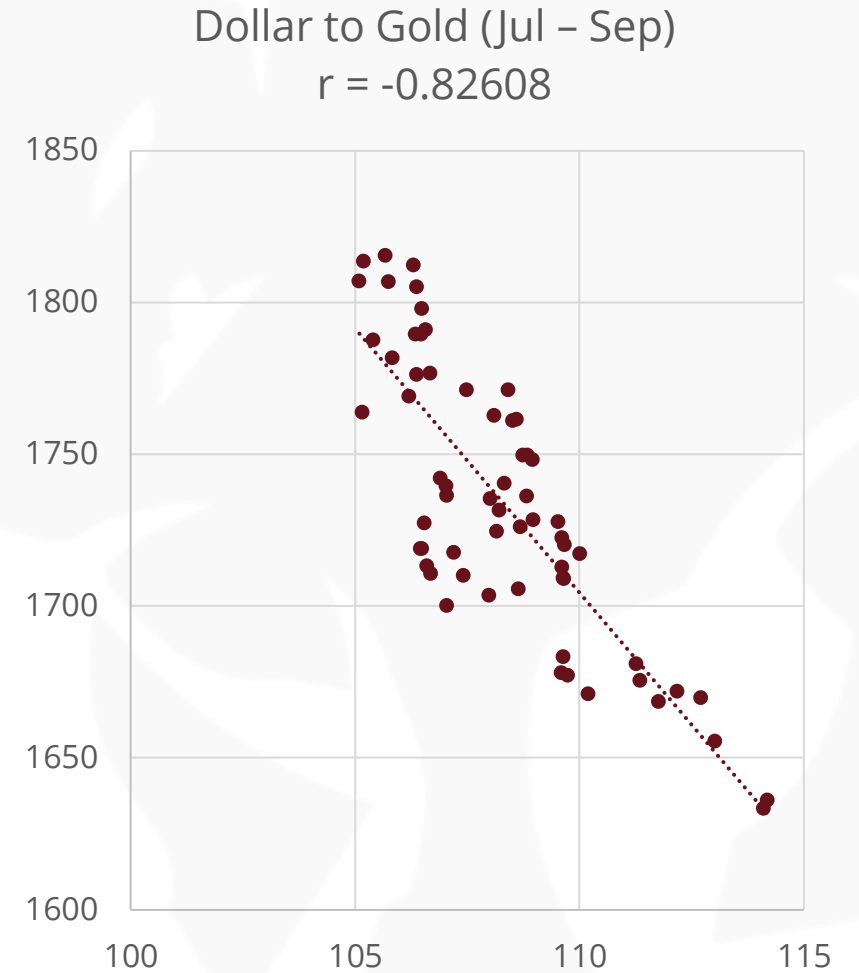- Political Stability
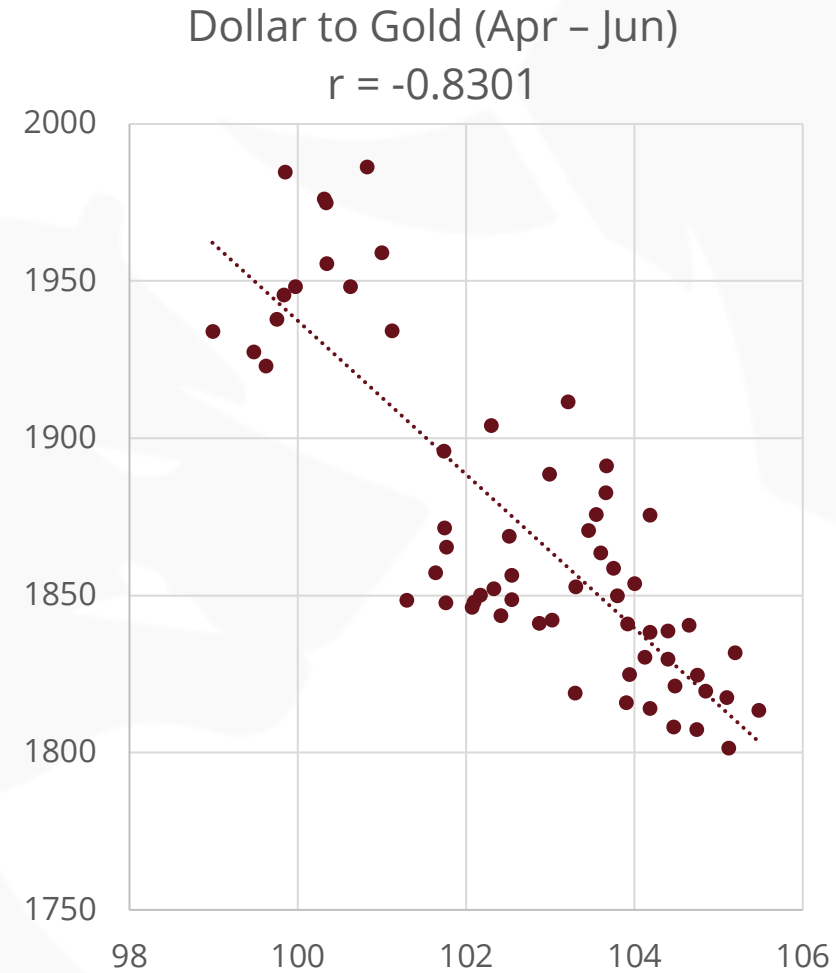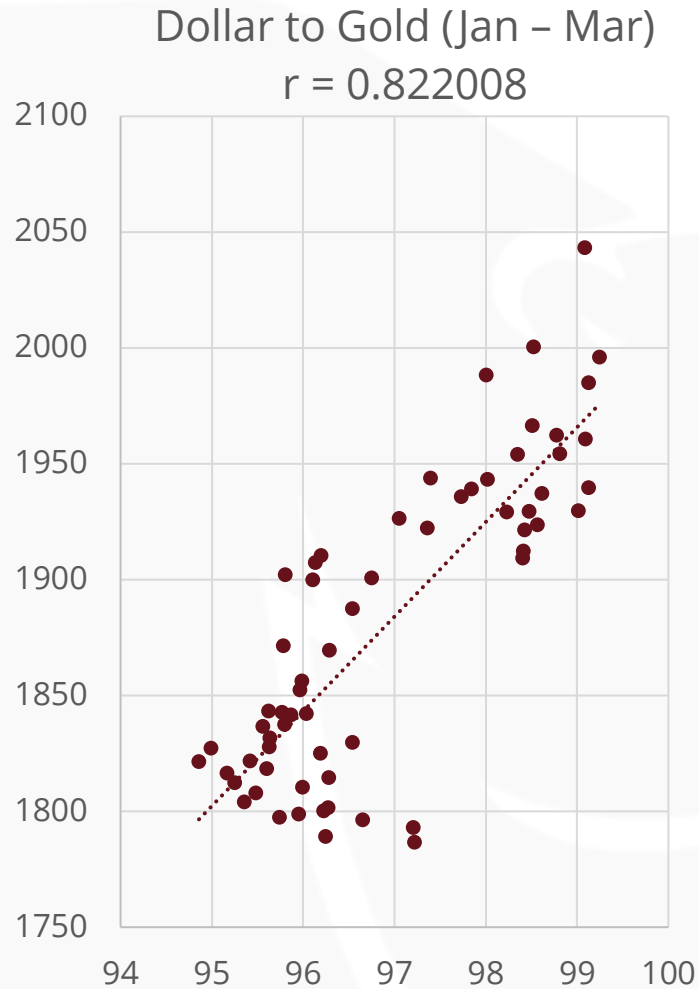
Long and Intermediate Term Scatterplots

Dollar to Gold (10 Years)

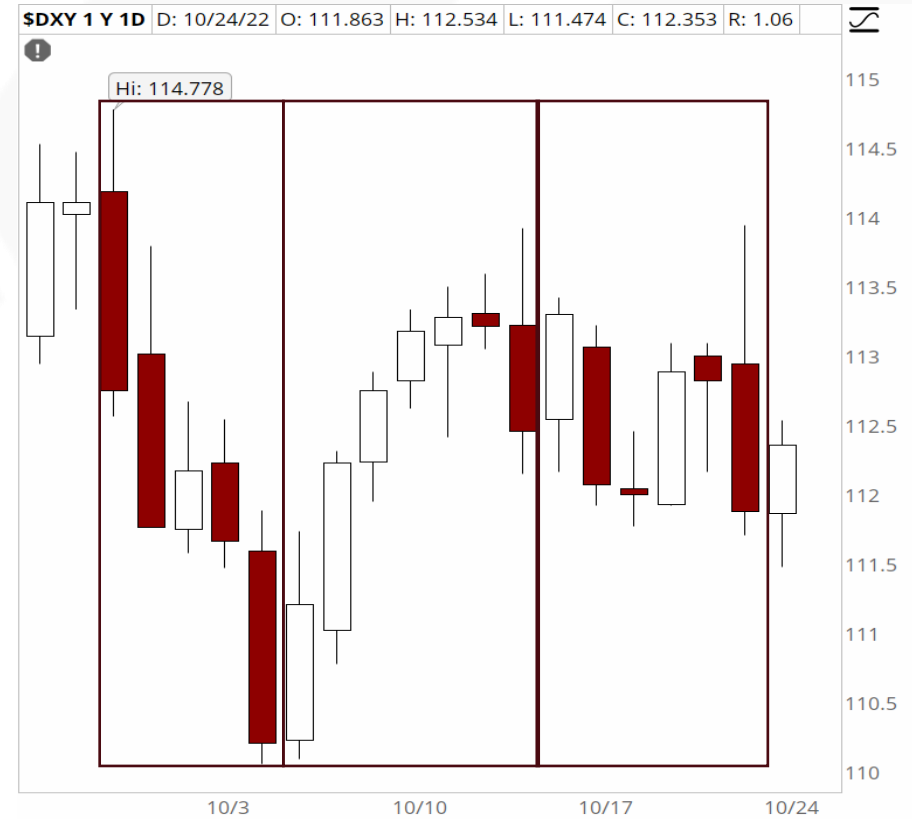Dollar to Gold (First Six Months of 2022)
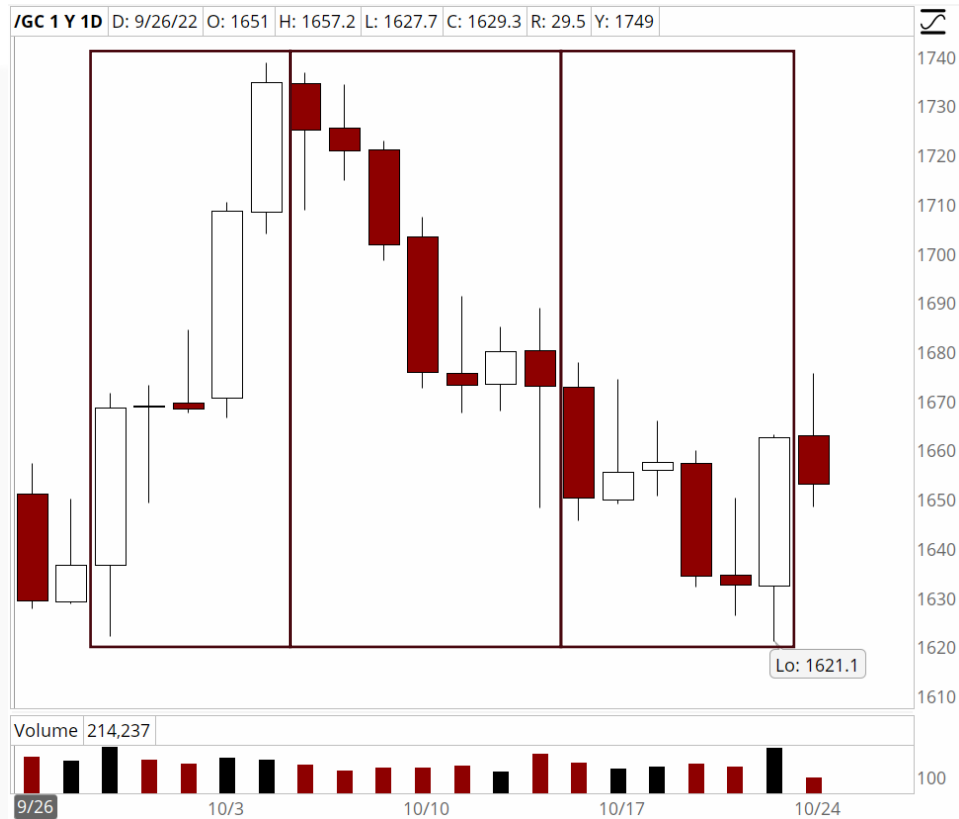
Correlation Coefficients over Quarters

Dollar to Gold (Jan – Mar)
r = 0.822008

Dollar to Gold (Apr – Jun)
r = -0.8301

Dollar to Gold (Jul – Sep)
r = -0.82608

Correlation gets Stronger

Using Correlations in October

Date Range	Gold	Dollar
9/28 – 10/04	+7.2%	-4.1%
10/05 - 10/13	-5.1%	+3.5%
10/14 – 10/21	-1.1%	-1.1%

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Resources

Portfolio Visualizer:

- https://www.portfoliovisualizer.com/asset-correlations

Correlation Matrix Builder:

- https://www.macroaxis.com/invest/marketCorrelation

Useful icons

Trilogy of Trading Success

Technology

Mondays

Strategy

Tuesdays

Psychology

Wednesdays

Mentorship

Thursdays

Edge of Your Trading

Technology

Strategy

Psychology