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Remember: Any group members who did **not contribute to the project should be given all zero (0) points for the collaboration grade on the GWP submission page.*

Statement of integrity: By typing the names of all group members in the text boxes below, you confirm that the assignment submitted is original work produced by the group (excluding any non-contributing members identified with an “X” above).

Team member 1	Mfou'ou Medjo Stanly
Team member 2	Vikas Deswal
Team member 3	

Use the box below to explain any attempts to reach out to a non-contributing member. Type (N/A) if all members contributed.

Note: You may be required to provide proof of your outreach to non-contributing members upon request.

All the team members got in touch and discussed using the discussion group provided by the University platform, but **Omkar Desai** has never replied to any of the messages.

Task 1

Step 1: Statistical Analysis

For this task, the group analyzed 4 stocks and 3 bonds. As the group consisted of only 2 members, we didn't pick cryptocurrencies. The details of assets considered for analysis are provided below.

Equity Assets: Analysis done by Mfou'ou Medjo Stanly

#	Asset Names	Ticker/ID	Asset Type	Exchange/OTC	Data Frequency	Data Range	Data Source
S1	Chevron Corp	CVX	Stock	NYSE	Daily	3-May-20221 to 2-May-2024	Investing.com
S2	Coca-Cola Co	KO	Stock	NYSE	Daily	3-May-20221 to 2-May-2024	Investing.com
S3	Pfizer Inc	PFE	Stock	NYSE	Daily	3-May-20221 to 2-May-2024	Investing.com
S4	AT&T Inc	T	Stock	NYSE	Daily	3-May-20221 to 2-May-2024	Investing.com

Bond Assets: Analysis done by Vikas Deswal

#	Asset Names	Ticker/ID	Asset Type	Exchange/OTC	Data Frequency	Data Range	Data Source
B1	Apple Inc AAPL 3.85% 04-May-2043	037833AL4=	Corporate Bond	OTC	Daily	3-May-20221 to 2-May-2024	Investing.com
B2	Microsoft Corp MSFT 5.2% 01-Jun-2039	594918AD6=	Corporate Bond	OTC	Daily	3-May-20221 to 2-May-2024	Investing.com
B3	United States Treasury Note 0% Aug 15, 2041	912803DT7=	Sovereign Bond	OTC	Daily	3-May-20221 to 2-May-2024	Investing.com

Data: In case of missing prices, the previous good price was considered. Weekends and days on which none of the prices were available were not considered for the analysis. In total 756 daily returns data points, spanning 3 years (03-May-2021 to 02-May-2024) were used in the analysis. All 4 stocks are listed on NYSE and bonds are OTC traded. Data was downloaded from investing.com

Calculations

Return series for each of the assets were calculated using the downloaded price series, which in turn, were used to calculate the statistics such as averages, volatility etc. Please find the results in the table below.

Analysis of Equity returns (Mfou'ou Medjo Stanly)

Results and Discussion

Statistics	S1	S2	S3	S4
Average Daily Returns	0.1%	0.0%	0.0%	0.0%
Annualized Returns	18.3%	5.9%	-7.6%	-8.4%
Standard Deviation	1.7%	1.0%	1.7%	1.6%
Volatility (Annualized)	26.4%	15.7%	26.4%	25.2%
Skewness	-0.156	-0.642	0.606	-0.106
Excess Kurtosis	2.176	5.096	3.422	7.552

Average Return: Daily return is almost 0 for all the stocks. This agrees with the usual assumption made for daily stock returns in most pricing frameworks. Annual returns, which are calculated by multiplying the daily returns by the no. of trading days in a year (252 in our case), ranged from 18.3% for Chevron (S1) to -8.4% for AT&T (S4).

Volatility: Daily standard deviation is in the range of 1% to 1.7% for all four stocks. Volatility, calculated as annualized standard deviation by multiplying with square root of 252, is in the range of 15.7% to 26.4%.

Skewness: All stock returns are slightly negatively skewed, suggesting more negative returns than positive returns. The exception is Pfizer Inc which has significant positive skewness. This is supported by a large number of positive returns over the observation period with comparatively frequent small losses.

Excess Kurtosis: All four stocks have significantly positive excess kurtosis, suggesting extreme returns as compared to the ones suggested by normal distribution.

Correlations:

Stocks have slightly positive correlations with each other ranging between 0.14 to 0.35. In a portfolio composed just of equities, one can expect diversification benefits.



Covariances:

Annualized Covariance Matrix for stocks

	S1	S2	S3	S4
S1	0.0698864936	0.0081416256	0.0099216240	0.0142763926
S2	0.0081416256	0.0247859465	0.0104562382	0.0138569048
S3	0.0099216240	0.0104562382	0.0698864936	0.0132565890
S4	0.0142763926	0.0138569048	0.0132565890	0.0634681954

Covariance between assets is dependent on standard deviations of assets and correlation between them. In case of stocks the variance is comparatively on the higher side while for bonds the correlation is high.

Analysis of Bond returns (Vikas Deswal)

Results and Discussion

Statistics	B1	B2	B3
Average Daily Returns	0.0%	0.0%	0.0%
Annualized Returns	-9.9%	-8.5%	-10.7%
Standard Deviation	1.0%	0.8%	1.2%
Volatility (Annualized)	15.7%	12.8%	18.4%
Skewness	0.196	0.036	0.162
Excess Kurtosis	0.402	0.882	0.086

Average Return: Daily return is almost 0 for all the bonds. Annual returns, which are calculated by multiplying the daily returns by the no. of trading days in a year (252 in our case), ranged from -8.5% to -10.7%. All bonds including two corporate bonds and one treasury note provided negative returns during the observation period.

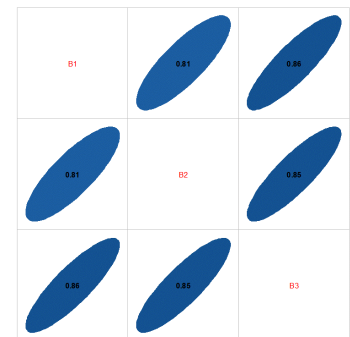
Volatility: Daily standard deviation is in the range of 0.8% to 1.2% for all bonds. Volatility, calculated as annualized standard deviation by multiplying with square root of 252, is in the range of 12.8% to 18.4%. Treasury note (B3) was uncharacteristically volatile due to price declines witnessed over the observation period.

Skewness: All 3 bonds' returns are moderately positively skewed, suggesting small numbers of large returns with frequent small losses.

Excess Kurtosis: Excess kurtosis for all 3 bonds is moderately positive, suggesting returns with slightly higher magnitude (both positive and negative) as compared to the ones suggested by normal distribution.

Correlations:

All 3 bonds are highly correlated with each other, with correlation ranging from 0.81 to 0.86. A portfolio composed of just these bonds, thus would not offer that much diversification benefits.



Covariances:

Annualized Covariance Matrix for bonds

	B1	B2	B3
B1	0.024577	0.016331	0.024613
B2	0.016331	0.016457	0.020065
B3	0.024613	0.020065	0.024577

Covariance between assets is dependent on standard deviations of assets and correlation between them. Covariance has been annualized by multiplying the daily covariances by 252.

Portfolio of stocks and Bonds

As part of analysis we also constructed a true portfolio using all 7 assets (4 stocks, 2 corporate bonds and treasury note). The portfolio composition as on close of 30-APR-2021 is shown below. The number of stocks and bonds are bought in such a way to have approximately equal exposure to each individual asset.

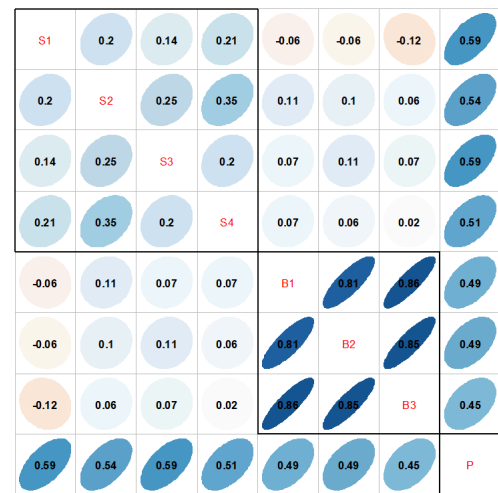
#	Portfolio Constituents	Price (in USD, as on 30-Apr-24 COB)	No. of stocks/bonds purchased	Market Value (in USD, as on 30-Apr-24 COB)	Weight
S1	Chevron Corp (CVX)	103.07	95	9791.65	14.1%
S2	Coca-Cola Co (KO)	53.98	185	9986.30	14.4%
S3	Pfizer Inc (PFE)	38.65	250	9662.50	14.0%
S4	AT&T Inc (T)	23.72	420	9962.40	14.4%
B1	Apple Inc AAPL 3.85% 04-May-2043	114.818	85	9759.53	14.1%
B2	Microsoft Corp MSFT 5.2% 01-Jun-2039	135.357	75	10151.78	14.7%
B3	United States Treasury Note 0% Aug 15, 2041	63.82	155	9892.10	14.3%
Initial Market Value				69206.26	100.0%

Returns were calculated and statistics were calculated for the portfolio. Results are shown below and a discussion follows.

	S1	S2	S3	S4	B1	B2	B3	P
Average Daily Returns	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Annualized Returns	18.3%	5.9%	-7.6%	-8.4%	-10.0%	-8.6%	-10.8%	-3.3%
Standard Deviation	1.7%	1.0%	1.7%	1.6%	1.0%	0.8%	1.2%	0.7%
Volatility (Annualized)	26.4%	15.7%	26.4%	25.2%	15.7%	12.8%	18.4%	11.2%
Skewness	-0.16	-0.64	0.61	-0.11	0.20	0.04	0.16	-0.04
Excess Kurtosis	2.18	5.10	3.42	7.55	0.40	0.88	0.08	1.37

The correlations between different assets and portfolio as a whole are provided in the graph on the right.

We observe that while correlations between bonds are quite high and between stocks are moderately high, the correlations between stocks and bonds is close to 0 and even negative in the case of Chevron (S1). This provides more diversification benefits to the portfolio. This is evident from the fact that the portfolio has a lower amount of risk (vol.) than all individual assets. The return distribution is also almost symmetric, with negative skewness of equities benign offset by positive skewness of bond returns. Resulting portfolio has moderate excess kurtosis.



Step 2: Shorting and Credit Risk**Can the portfolio be shorted?**

Technically, yes. Portfolio consists of equities and bonds. Both could be borrowed from the brokers, subject to availability. Stocks are more easily available through security lending channels. For bonds, one has to find someone who is ready to lend the bonds in the portfolio.

However, practically, stocks are much more often shorted than bonds.

Once available to short, we will have to pay a fee for the period we have borrowed the securities. If the prices go down within the timeframe, we buy them from the secondary market at a lower price and return them to the lender/broker.

Does this portfolio have credit risk?

The portfolio has credit risk due to the two corporate bonds. A very small amount of credit risk is due to the treasury note (sovereign risk).

For corporate bonds, the credit risk is due to the possibility of the corporation to renege on their promise of returning the borrowed amount. The drop in credit worthiness of the corporation also contributes to the credit risk. For the sovereign bond, the remote possibility of the US government failing to pay back the borrowed amount is the source of credit risk. However, this is practically insignificant due to the government guarantee.

Task 2

Journalist: Welcome once more to Tuesday Finance, today we will be talking about the new crypto regulation that has been put in place. And to answer our questions, we have Mr Technical and Mr Non-Technical joining us in the studio.

Journalist: We've all heard about the new regulation for crypto assets. What is this regulation all about?

Non-Technical: The new regulation has its main aim to prevent fraud, reduce market manipulation, force more disclosures from crypto-asset service providers, and to overall increase transparency in the space. The regulation is backed by 18 recommendations (OICU-IOSCO 2023), and they cover governance to retail distribution of crypto assets.

Journalist: That's good, but can you explain how this regulation will work, starting from the company level to the national level? As we all know, FTX was based in the Bahamas, which helped it escape certain regulations, specifically in the US and EU. How will this regulation bring such safe havens in the ambit?

Technical: This regulation is an outcome of internationally coordinated efforts. Respective national regulators have committed timelines for implementation in their jurisdiction. Financial centers such as Bahamas have already agreed on enhanced reporting standards and more transparency in financial trading. There are more discussions going on and is one of the primary focus areas for the task force on regulating Crypto assets.

This will work by reducing leverage and increasing risk management within the companies. Also, the EU and the US have also introduced specific reforms for crypto currencies. In the US the SEC has ruled that all crypto currencies which meet the criteria of investment i.e. Howey Test (Hayes 2024), are required to be registered as investment. While in the EU the parliament approved a legislation for certain crypto service providers to seek under operating licensing. This legislation will enable regulators to track crypto currency used in money laundering and other malware attacks ("Crypto-assets: Green Light to New Rules for Tracing Transfers in the EU.").

Journalist: One contentious clause in the regulation is related to 'Organization Governance', which wants to stop a crypto asset service provider from using the assets that it has for various services it provides. How do you see it?

Technical: The clause that you are referring to is meant to manage the conflict of interest. If you recall, this is precisely what happened in the FTX case. The regulation intends to stop a Crypto asset service provider from using the assets parked with it in risky ventures without proper disclosures and explicit agreements with the asset owners. The service provider does not own these assets, they are merely custodian of them. There should be explicit agreement with proper disclosure of risks involved for these assets to be used in other activities.

Journalist: That's all nice, but will the regulation be effective?

Technical: Yes, I think they will be. Of course, there will be challenges because Crypto is a fundamentally distinct asset class. Regulations are designed based on the characteristics of the Crypto asset. In cryptocurrencies like bitcoin, Bitcoin would have regulations focusing on its use as a currency or a

commodity. For NFTs, regulations would have to do with requiring provenance verification, intellectual property rights, and classification as securities.

Journalist: Regulations have their own proponents and detractors. In this case, there is an often-heard argument that Crypto, being a niche and evolving area, should not be shackled by regulations. How do you think the proposed regulation might affect the industry? Won't the regulations hamper the growth of Crypto products and the technological advances that this growth brings?

Non-Technical: Well, regulations will bring some friction as they would result in overheads related to setting up and running the required infrastructure. However, the positives would outweigh the negatives. The governance controls required by the regulations will help the service provider take a well-calibrated approach in doing business. The objective of the regulations is to make the service provider take calculated and intended risks, with full disclosure to all related stakeholders. The crypto space was infamous for being the haven for drug trafficking and all sorts of illegal activities. Addition of regulation will give more transparency in the space making the investment more accessible to everyone and reducing fraud. This will spur growth and facilitate technological innovation.

Journalist: Talking about Sam Bankman-Fried, he was recently sentenced to 25 years in prison. Do you think he was the prime cause that motivated the regulation?

Technical: Yes, the case of FTX was an instigating factor in global efforts to roll out new regulation for the crypto currencies. In the investigations that followed the fall of FTX, it was found that Alameda Research was able to wire millions from FTX, which were quoted as fraudulent transactions. All these transactions were facilitated by the fact that Sam Bankman-Fried had major shareholding in all these companies. He owned 90% of Alameda Research, 67% of FTX ventures, 53% of FTX US and 75% of FTX Global (KPMG 2022). The management of FTX was typically non-existent and there were no independent directors. All these reasons prompted regulators to improve the regulations issues in the crypto space.

Journalist: How do we make sure the service providers follow these regulations?

Technical: There would be penalties in case of non-adherence. Starting with financial penalties, the penalties could go up to ceasing the operations. E.g., exchanges that do not put internal governance structure in place will not be able to facilitate trading.

Journalist: To wrap up, do you think introducing ethical training can be useful in this case?

Non-Technical: That is a good idea. A regular certification exercise can be set up in which employees and decision makers in these firms attest to their actions in regard to their responsibilities and best practices. Similar mechanisms exist in other financial areas as well and I believe this will be a good step in the right direction.

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