Porfolio Management in SQL

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Abstract

This paper attempts to provide risk and return analysis for a High Net Worth Client - Paul Bistre's portfolio. The recommendation will take into consideration the risk and returns of the current portfolio and rebalance it to minimize risk and maximize returns. The entire analysis and the output thereof is carried out in mySQL using the Instructor's Online Server and the queries are available as part of the appendix

Introduction

Paul's portfolio is invested in a mix of asset classes such as Equity, Fixed Income, Real Alternatives, and Commodities with a Total Market Value of ~$3.5 million as on 09 September 2022. The portfolio summary is presented below:

Asset Class	# of Assets	Sum of Weights	Market Value	Avg. Investment / Asset
Equity	21	52.7%	1,830,685	87,175
Fixed income	17	24.1%	837,064	49,239
Alternatives	17	11.8%	409,141	24,067
Commodities	12	11.5%	399,474	33,290
Grand Total	**67**	**100.0%**	**3,476,364**	**51,886**

Analysis

The portfolio comprises of 52.7% in Equity, 24.1% in Fixed Income, 11.8% in Alternatives, and 11.5% in Commodities. The average amount invested in Equity assets is ~1.7x of the amount invested in Fixed Income (second highest asset class in the portfolio). The count of assets under the alternative class is higher than commodities, however, the average investment in each asset is higher for commodities (out of 11.5% of total portfolio, GLD alone is 7.8% as of total portfolio) as compared to alternatives. The portfolio seems to have a good mix of asset classes but over diversified.

By diving deeper into the investments in each asset class, it is evident that the top 10 assets account for ~48% of the total portfolio. The ticker that Paul is most invested in is PANW (equity) with a market value of $343,380 followed by GLD (commodities) with a market value of $269,297.

The portfolio performance for the last 12M was -4.69%, which was better than the market when compared to the S&P 500 12M return of -15.47%[1] (as of September 30, 2022). The

portfolio earned 3.61% and 8.06% for 18M and 24M period ending 09 September, 2022, respectively.

The table below shows the most recent Annualized Returns, Average Daily Returns, Average Annual Returns, 12M sigma and the Risk Adjusted Return for each security:

Portfolio - Paul Bistre					Annualized Retruns			Average Daily	Average Annual	Risk	Risk Adjusted
Sr. No	Tickers	Market Value	Asset Class	Weights	12M Returns	18M Returns	24M Returns	Return	Return	12M Sigma	Return
1	PANW	343,380	equity	9.88%	18.62%	40.26%	50.88%	0.14%	36%	0.33	1.08
2	GLD	269,297	commodities	7.75%	-13.65%	-2.45%	-2.39%	0.01%	4%	0.09	0.45
3	CHTR	211,073	equity	6.07%	-48.82%	-26.15%	-19.25%	0.02%	17%	0.28	0.61
4	ACN	210,358	equity	6.05%	-13.36%	8.01%	11.38%	0.08%	24%	0.20	1.22
5	AXP	131,981	equity	3.80%	-0.72%	8.16%	23.39%	0.08%	20%	0.30	0.66
6	LQD	104,803	fixed income	3.01%	-17.95%	-8.74%	-8.43%	0.01%	4%	0.09	0.45
7	FLT	101,632	equity	2.92%	-15.21%	-15.55%	-2.59%	0.05%	8%	0.25	0.34
8	V	98,086	equity	2.82%	-8.00%	-5.25%	0.60%	0.07%	17%	0.16	1.09
9	TIP	96,213	fixed_income	2.77%	-7.69%	-1.42%	-1.05%	0.01%	5%	0.04	1.11
10	CNC	85,275	equity	2.45%	46.25%	28.75%	25.74%	0.09%	14%	0.23	0.59
11	MUB	79,532	fixed_income	2.29%	-8.21%	-4.60%	-2.89%	0.01%	3%	0.05	0.58
12	NVO	78,793	equity	2.27%	10.53%	33.72%	28.61%	0.10%	24%	0.21	1.19
13	SHY	76,745	fixed_income	2.21%	-2.00%	-2.32%	-2.11%	0.00%	0%	0.02	0.27
14	COF	74,091	equity	2.13%	-30.57%	-9.05%	23.60%	0.06%	22%	0.59	0.38
15	GPN	68,835	equity	1.98%	-19.03%	-27.23%	-12.03%	0.05%	10%	0.29	0.34
16	VCSH	67,046	fixed_income	1.93%	-6.37%	-3.57%	-2.59%	0.01%	2%	0.04	0.62
17	SHV	62,909	fixed_income	1.81%	-0.01%	-0.03%	-0.03%	0.00%	1%	0.01	1.06
18	BIL	62,474	fixed_income	1.80%	0.39%	0.23%	0.16%	0.00%	1%	0.01	1.06
19	K	59,089	equity	1.70%	17.64%	16.55%	8.60%	0.03%	5%	0.12	0.40
20	VCIT	58,766	fixed_income	1.69%	-14.43%	-7.60%	-6.77%	0.01%	4%	0.08	0.48
21	GE	56,641	equity	1.63%	-28.86%	-20.64%	23.66%	-0.03%	1%	0.49	0.02
22	TJX	56,294	equity	1.62%	-1.33%	1.56%	9.79%	0.08%	16%	0.20	0.80
23	ETN	55,224	equity	1.59%	-5.98%	6.45%	21.61%	0.08%	23%	0.28	0.83
24	CCI	50,969	equity	1.47%	-5.07%	6.50%	6.25%	0.07%	18%	0.13	1.44
25	HDG	48,828	alternatives	1.40%	-3.45%	-5.92%	-4.83%	0.00%	1%	0.05	0.18
26	SBAC	47,631	equity	1.37%	-5.44%	15.42%	1.94%	0.09%	22%	0.19	1.16
27	TLT	46,140	fixed_income	1.33%	-26.10%	-12.68%	-17.39%	0.00%	5%	0.16	0.30
28	PFIX	44,329	alternatives	1.28%	56.66%	NULL	NULL	0.09%	32%	0.13	2.49
29	IGSB	41,363	fixed_income	1.19%	-6.41%	-3.63%	-2.55%	0.01%	3%	0.04	0.64
30	PFG	41,024	equity	1.18%	23.13%	24.26%	45.42%	0.06%	12%	0.37	0.34
31	VMBS	39,371	fixed_income	1.13%	-10.84%	-7.07%	-5.66%	0.00%	1%	0.05	0.31
32	WTMF	38,533	alternatives	1.11%	-3.27%	-0.21%	-1.34%	0.00%	1%	0.05	0.22
33	MARB	35,373	alternatives	1.02%	1.71%	1.88%	1.26%	0.00%	1%	0.01	0.38
34	LBAY	34,837	alternatives	1.00%	4.18%	13.24%	10.31%	0.04%	11%	0.08	1.34
35	GIGB	32,794	fixed income	0.94%	-15.88%	-7.67%	-7.51%	0.00%	4%	0.08	0.46
36	IAU	30,984	commodities	0.89%	-4.57%	-0.89%	-6.54%	0.07%	9%	0.14	0.65
37	FLSP	29,583	alternatives	0.85%	0.09%	-0.26%	2.09%	0.00%	0%	0.06	-0.01
38	KMLM	27,727	alternatives	0.80%	37.58%	23.80%	NULL	0.11%	24%	0.10	2.26
39	MSVX	27,281	alternatives	0.78%	-3.87%	-1.50%	-3.81%	0.00%	2%	0.05	0.44
40	FTLS	27,087	alternatives	0.78%	0.74%	5.08%	8.29%	0.03%	7%	0.07	0.99
41	BNDX	23,965	fixed_income	0.69%	-12.13%	-7.64%	-6.20%	0.00%	2%	0.05	0.40
42	UNG	23,372	commodities	0.67%	54.09%	104.31%	48.96%	0.06%	7%	0.53	0.13
43	RINF	23,298	alternatives	0.67%	1.31%	7.36%	6.88%	0.01%	3%	0.07	0.44
44	EIX	23,218	equity	0.67%	22.16%	15.36%	21.08%	0.03%	4%	0.17	0.25
45	RLY	22,135	alternatives	0.64%	12.51%	12.91%	21.59%	0.03%	9%	0.18	0.49
46	VTEB	19,106	fixed_income	0.55%	-8.91%	-5.04%	-3.11%	0.01%	3%	0.05	0.57
47	GM	18,704	equity	0.54%	-18.57%	-19.33%	14.48%	0.05%	15%	0.53	0.28
48	KRBN	13,966	commodities	0.40%	-2.94%	21.90%	32.25%	0.15%	70%	0.33	2.14
49	IAUM	13,661	commodities	0.39%	-4.43%	NULL	NULL	-0.01%	-3%	0.03	-1.07
50	UPAR	12,909	alternatives	0.37%	NULL	NULL	NULL	-0.17%	NULL	NULL	NULL
51	ROST	12,156	equity	0.35%	-16.54%	-15.86%	0.81%	0.07%	11%	0.27	0.40
52	BTAL	11,484	alternatives	0.33%	11.34%	9.17%	-8.30%	0.00%	1%	0.17	0.06
53	SCHP	11,407	fixed_income	0.33%	-7.57%	-1.32%	-0.82%	0.01%	5%	0.04	1.14
54	BAR	10,965	commodities	0.32%	-4.55%	-0.85%	-6.44%	0.02%	10%	0.14	0.70
55	SLV	10,513	commodities	0.30%	-21.24%	-19.77%	-17.15%	0.02%	10%	0.27	0.36
56	EOPS	10,040	alternatives	0.29%	-31.02%	NULL	NULL	-0.10%	-32%	0.04	-7.67
57	MJ	8,494	commodities	0.24%	-32.14%	-36.43%	-37.93%	-0.04%	-7%	0.37	-0.19
58	GOVT	8,300	fixed_income	0.24%	-11.72%	-6.32%	-7.15%	0.00%	2%	0.07	0.34
59	ARB	7,641	alternatives	0.22%	4.66%	4.77%	4.67%	0.02%	4%	0.02	2.09
60	SGOL	6,662	commodities	0.19%	-4.42%	-0.76%	-6.43%	0.03%	9%	0.14	0.67
61	KO	6,232	equity	0.18%	14.54%	16.86%	13.49%	0.05%	11%	0.12	0.99
62	VGSH	6,131	fixed_income	0.18%	-4.18%	-2.72%	-2.06%	0.00%	1%	0.03	0.55
63	SVIX	5,633	alternatives	0.16%	NULL	NULL	NULL	0.00%	NULL	NULL	NULL
64	TOKE	5,277	commodities	0.15%	-47.81%	-49.09%	-17.59%	-0.11%	0%	0.49	0.01
65	AAAU	4,090	commodities	0.12%	-4.48%	-0.81%	-6.42%	0.04%	13%	0.14	0.92
66	UVIX	2,422	alternatives	0.07%	NULL	NULL	NULL	-0.06%	NULL	NULL	NULL
67	CNBS	2,195	commodities	0.06%	-62.32%	-61.91%	-21.34%	-0.11%	25%	0.95	0.27
			Portfolio Performance		-4.69%	3.61%	8.06%				

For the 12M period ended 09 September 2022, PFIX, an alternative security reported highest returns of ~57% (1.28% of total portfolio) and CNBS, a commodities security was the

worst performing with -62% returns for the same period (0.06% of total portfolio, negligible impact)

For the 18M period ended 09 September 2022, UNG, a commodities security outperformed all securities in the portfolio with returns of 104% and CNBS was again the worst-performing security with -62% returns.

Lastly, for the 24M period ended 09 September 2022, PANW, equity security was the best-performing asset, and MJ, a commodities security was the worst-performing asset with -38% returns.

The 'NULL' results appearing in the returns table are due to the securities being recently introduced into the market and not present during the time period selected to calculate returns (12M, 18M, and 24M periods)

The results from the table above also indicate that PFIX, an **alternative** security, was the best performing in the portfolio as it reported a Risk-adjusted return of 2.49 which means that for every unit of risk considered, Paul can expect 2.49 units of returns. The main reason behind this is that PFIX is an interest-rate hedge ETF and since interest rates have been increasing over the last year, so have the returns.

On the other hand, EOPS, another alternative security reported a Risk-adjusted return of negative 7.67. The EOPS fund was closed on 19 October, 2022 by Elmes Advisors due to the inability to attract sufficient investment assets.

In terms of **Equity**, the best-performing security was CCI (1.47% of total portfolio), with Risk-adjusted returns of 1.44 as compared to the worst-performing security GE which reported a Risk-adjusted return of 0.02. PANW, equity security with the highest share of the portfolio (9.88%) reported Risk-adjusted returns of 1.08.

Similarly, for the **Fixed Income** class, SCHP was the best-performing asset with Risk-adjusted returns of 1.14 closely followed by TIP (2.77% of the total portfolio) which reported risk-adjusted returns of 1.11. SHY (2.21% of the total portfolio), reported risk-adjusted returns of 0.27 making it the worst-performing security in this asset class.

The **commodities** class had KRBN (0.40% of the total portfolio) as its best-performing security with risk-adjusted returns of 2.14 as compared to 0.45 of GLD (7.75% of the total portfolio). IAUM was the worst-performing commodities security with risk-adjusted returns of -1.07

On average, the equities in the portfolio reported the highest average returns of 16% with an average sigma of 0.27 (average risk-adjusted return of 0.6). The alternative class had a similar average risk-adjusted return of 0.6 but the average return was only 5% with an average sigma of 0.08. The Commodities class had the highest average sigma of 3.61 with an average return of 12% resulting in an average risk-adjusted return of 0.03

Recommendation

Based on this analysis, the following recommendations would help Paul maximize returns and minimize risk: in the equity class, replace GE (reducing sigma by 0.49), which is the worst-performing security with risk-adjusted returns of 0.02, with COST, which reported risk-adjusted returns of 2.49 and would add a sigma of 0.12 to the portfolio. The net result of this switch would lead to a reduction in sigma of 0.37. Additionally, Paul could also consider including MSFT (sigma of 0.17) which reported risk-adjusted returns of 2.09 in his portfolio. In terms of rebalancing, Paul could also consider interchanging weights for GLD and KRBN from the commodities class for a better overall risk-adjusted return, however, KRBN has a higher sigma of 0.33 vs sigma of 0.09 of GLD. Some of the better-performing fixed-income securities such as SCHP make up only 0.33% of the total portfolio, whereas SHY accounts for 2.21% of the total portfolio. Excluding SHY from the current portfolio and re-investing that share in SCHP would help deal with over-diversification and better risk-adjusted return of the portfolio.

The table below highlights the stocks that could be considered in blue and some of the highest-performing tickers in grey that are already part of the portfolio:

Sr. No	ticker	Risk Adjusted Returns	Asset Class
1	**LBAY**	6.17	alternatives
2	**COST**	2.49	equity
3	**PFIX**	2.49	alternatives
4	**KMLM**	2.26	alternatives
5	**KRBN**	2.14	commodities
6	**ARB**	2.09	alternatives
7	**MSFT**	2.09	equity
8	**TMO**	2.08	equity
9	**STE**	1.99	equity
10	**LLY**	1.89	equity

Appendix:

A. Screenshot of mySQL

```
1  USE invest;
2
3  -- STEP 1: Identify your client (customer# 148, Paul Bistre) in your database - learn about your client and what they have.
4  SELECT p.date, p.ticker, a.account_id,
5         p.value AS Price, p.price_type,
6         SUM(p.value*quantity) AS Market_Value,
7         s.sec_type, s.major_asset_class, s.minor_asset_class
8  FROM pricing_daily_new p
9  INNER JOIN security_masterlist s
10 ON p.ticker = s.ticker
11 INNER JOIN holdings_current h
12 ON s.ticker = h.ticker
13 INNER JOIN account_dim a
14 ON h.account_id = a.account_id
15 INNER JOIN customer_details c
16 ON a.client_id = c.customer_id
17 WHERE p.price_type = 'Adjusted' AND
18       c.customer_id = '148' AND
19       p.date = '2022-09-09'
20 GROUP BY ticker;

22 SELECT s.major_asset_class AS Asset_Class, COUNT(DISTINCT s.ticker) AS assets, SUM(p.value*quantity) AS Market_Value
23 FROM pricing_daily_new p
24 INNER JOIN security_masterlist s
25 ON p.ticker = s.ticker
26 INNER JOIN holdings_current h
27 ON s.ticker = h.ticker
28 INNER JOIN account_dim a
29 ON h.account_id = a.account_id
30 INNER JOIN customer_details c
31 ON a.client_id = c.customer_id
32 WHERE p.price_type = 'Adjusted' AND
33       c.customer_id = '148' AND
34       p.date = '2022-09-09'
35 GROUP BY s.major_asset_class;
```

```sql
-- STEP 2: use the above data to create a VIEW in the invest schema with data for your client
CREATE VIEW Suraj_Udasi_4 AS
SELECT z.ticker, z.date, z.Price, z.price_type
FROM
(
SELECT p.date, p.ticker, a.account_id, p.value AS Price, p.price_type
FROM pricing_daily_new p
INNER JOIN security_masterlist s
ON p.ticker = s.ticker
INNER JOIN holdings_current h
ON s.ticker = h.ticker
INNER JOIN account_dim a
ON h.account_id = a.account_id
INNER JOIN customer_details c
ON a.client_id = c.customer_id
WHERE p.price_type = 'Adjusted' AND
     c.customer_id = '148' AND
     p.date > '2016-09-01') z;

SELECT *
FROM Suraj_Udasi_4;
```

```sql
-- Q1: Calculating Returns, individual tickers
CREATE VIEW returns_SU1 AS
SELECT z.ticker, z.date, (z.p1-z.p0_daily)/z.p0_daily AS returns_daily,
                         (z.p1-z.p0_monthly)/z.p0_monthly AS returns_monthly,
                         (z.p1-z.p0_12M)/z.p0_12M AS returns_12M,
                         (POWER(1 + ((z.p1-z.p0_18M)/z.p0_18M), 12/18) - 1) AS 18M_ret,
                         (POWER(1 + ((z.p1-z.p0_24M)/z.p0_24M), 12/24) - 1) AS 24M_ret
FROM
(
SELECT date, ticker, Price AS p1, LAG(Price, 1) OVER(
                                                     PARTITION BY ticker
                                                     ORDER BY date
                                                     ) AS p0_daily
                                  ,LAG(Price, 21) OVER(
                                                     PARTITION BY ticker
                                                     ORDER BY date
                                                     ) AS p0_monthly
                                  ,LAG(Price, 250) OVER(
                                                     PARTITION BY ticker
                                                     ORDER BY date
                                                     ) AS p0_12M
                                  ,LAG(Price, 375) OVER(
                                                     PARTITION BY ticker
                                                     ORDER BY date
                                                     ) AS p0_18M
                                  ,LAG(Price, 500) OVER(
                                                     PARTITION BY ticker
                                                     ORDER BY date
                                                     ) AS p0_24M
FROM Suraj_Udasi_4
WHERE date > '2017-08-01'
) z;
```

```sql
SELECT *
FROM returns_SU1
WHERE date = '2022-09-09'
GROUP BY ticker;

-- Q1: Calculating reutnrs for the portfolio

CREATE VIEW portfolio_SU3 AS
SELECT a.account_id, p.ticker, AVG(p.value) AS value, SUM(h.quantity) AS quantity
FROM pricing_daily_new p
INNER JOIN security_masterlist s
ON p.ticker = s.ticker
INNER JOIN holdings_current h
ON s.ticker = h.ticker
INNER JOIN account_dim a
ON h.account_id = a.account_id
INNER JOIN customer_details c
ON a.client_id = c.customer_id
WHERE p.price_type = 'Adjusted' AND
     c.customer_id = '148' AND
     p.date = '2022-09-09'
GROUP BY p.ticker;

-- CREATE VIEW mktvalue_SU AS
SELECT ticker, (value)*(quantity) AS mktvalue
FROM portfolio_SU3
GROUP BY ticker;
```

```
120     -- CREATE VIEW total_mktvalue_SU AS
121     SELECT sum(mktvalue) AS total
122     FROM mktvalue;
123
124     -- CREATE VIEW portfolio_weights_SU AS
125     SELECT m.ticker, m.mktvalue/t.total AS weights
126     FROM mktvalue m, total_mktvalue_1 t
127     GROUP BY ticker;
128
129     -- CALCULATING PORTFOLIO RETURNS
130     CREATE VIEW SU_calc_pret AS
131     SELECT *
132     FROM returns_SU1
133     WHERE date = '2022-09-09'
134     GROUP BY ticker;
135
136     -- CREATE VIEW porfolio_returns_SU2 AS
137     SELECT p.ticker, SUM(p.returns_12M*w.weights) AS 12M_pret,
138                      SUM(p.18M_ret*w.weights) AS 18M_pret,
139                      SUM(p.24M_ret*w.weights) AS 24M_pret
140     FROM SU_calc_pret p
141     INNER JOIN portfolio_weights_SU w
142     ON p.ticker = w.ticker;
144 -- Q2: What is the most recent 12months sigma (risk) for each of the securities? What is the average daily return for each of the securities?
145
146 SELECT *
147 FROM returns_SU1;
148
149 SELECT r.ticker, AVG(r.returns_daily) AS Avg_daily_return, AVG(r.returns_12M) AS Avg_return, STD(r.returns_12M) AS Sigma,
150                                         AVG(r.returns_12M)/STD(r.returns_12M) AS Risk_adj_returns,
151                                         s.major_asset_class
152 FROM returns_SU1 r
153 LEFT JOIN security_masterlist s
154 ON r.ticker = s.ticker
155 GROUP BY ticker
156 ORDER BY Risk_adj_returns DESC;
```

```sql
-- Q3 - Suggest adding a new investment to your portfolio - what would it be and how much risk (sigma) would it add to your client?

CREATE VIEW new_sec_SU_12M AS
SELECT ticker, date, (p1-p0)/p0 as ret
FROM
(
SELECT ticker, date, value as p1, LAG(value, 250) OVER(PARTITION BY ticker
                                                       ORDER BY date
                                                       ) as p0
FROM pricing_daily_new p
WHERE p.price_type = 'Adjusted' AND
date > '2017-08-01') n;

SELECT c.ticker, AVG(c.ret) AS Avg_return, STD(c.ret) AS Sigma,
                                           AVG(c.ret)/STD(c.ret) AS Risk_adj_returns,
                                           s.major_asset_class
FROM new_sec_SU_12M c
LEFT JOIN security_masterlist s
ON c.ticker = s.ticker
GROUP BY ticker
ORDER BY Risk_adj_returns DESC
LIMIT 10;
```

B. Code for analysis:

```
USE invest;

-- STEP 1: Identify your client (customer# 148, Paul Bistre) in your database - learn about your client and what they have.
SELECT p.date, p.ticker, a.account_id,
       p.value AS Price, p.price_type,
       SUM(p.value*quantity) AS Market_Value,
       s.sec_type, s.major_asset_class, s.minor_asset_class
FROM pricing_daily_new p
INNER JOIN security_masterlist s
ON p.ticker = s.ticker
INNER JOIN holdings_current h
ON s.ticker = h.ticker
INNER JOIN account_dim a
ON h.account_id = a.account_id
INNER JOIN customer_details c
ON a.client_id = c.customer_id
WHERE p.price_type = 'Adjusted' AND
                c.customer_id = '148' AND
    p.date = '2022-09-09'
GROUP BY ticker;

SELECT s.major_asset_class AS Asset_Class, COUNT(DISTINCT s.ticker) AS assets, SUM(p.value*quantity) AS Market_Value
FROM pricing_daily_new p
INNER JOIN security_masterlist s
ON p.ticker = s.ticker
INNER JOIN holdings_current h
ON s.ticker = h.ticker
INNER JOIN account_dim a
ON h.account_id = a.account_id
INNER JOIN customer_details c
ON a.client_id = c.customer_id
WHERE p.price_type = 'Adjusted' AND
                c.customer_id = '148' AND
    p.date = '2022-09-09'
GROUP BY s.major_asset_class;

-- STEP 2: use the above data to create a VIEW in the invest schema with data for your client
CREATE VIEW Suraj_Udasi_4 AS
SELECT z.ticker, z.date, z.Price, z.price_type
FROM
(
SELECT p.date, p.ticker, a.account_id, p.value AS Price, p.price_type
FROM pricing_daily_new p
INNER JOIN security_masterlist s
ON p.ticker = s.ticker
INNER JOIN holdings_current h
ON s.ticker = h.ticker
INNER JOIN account_dim a
ON h.account_id = a.account_id
INNER JOIN customer_details c
ON a.client_id = c.customer_id
WHERE p.price_type = 'Adjusted' AND
                c.customer_id = '148' AND
    p.date > '2016-09-01') z;

SELECT *
FROM Suraj_Udasi_4;
```

```
-- Q1: Calculating Returns, individual tickers
CREATE VIEW returns_SU1 AS
SELECT z.ticker, z.date, (z.p1-z.p0_daily)/z.p0_daily AS returns_daily,
                                                    (z.p1-z.p0_monthly)/z.p0_monthly AS returns_monthly,
                                                    (z.p1-z.p0_12M)/z.p0_12M AS returns_12M,
                                                    (POWER(1 + ((z.p1-z.p0_18M)/z.p0_18M), 12/18) - 1) AS 18M_ret,
                                                (POWER(1 + ((z.p1-z.p0_24M)/z.p0_24M), 12/24) - 1) AS 24M_ret
FROM
(
SELECT date, ticker, Price AS p1, LAG(Price, 1) OVER(

        PARTITION BY ticker
                                ORDER BY date
                                ) AS p0_daily
                                                                        ,LAG(Price, 21) OVER(

        PARTITION BY ticker
                                ORDER BY date
                                ) AS p0_monthly
                        ,LAG(Price, 250) OVER(

        PARTITION BY ticker
                                ORDER BY date
                                ) AS p0_12M
                                                                        ,LAG(Price, 375) OVER(

        PARTITION BY ticker
                                ORDER BY date
                                ) AS p0_18M
                                                                        ,LAG(Price, 500) OVER(

        PARTITION BY ticker
                                ORDER BY date
                                ) AS p0_24M
FROM Suraj_Udasi_4
WHERE date > '2017-08-01'
) z;

SELECT *
FROM returns_SU1
WHERE date = '2022-09-09'
GROUP BY ticker;

-- Q1: Calculating reutnrs for the portfolio

CREATE VIEW portfolio_SU3 AS
SELECT a.account_id, p.ticker, AVG(p.value) AS value, SUM(h.quantity) AS quantity
FROM pricing_daily_new p
INNER JOIN security_masterlist s
ON p.ticker = s.ticker
INNER JOIN holdings_current h
ON s.ticker = h.ticker
INNER JOIN account_dim a
ON h.account_id = a.account_id
INNER JOIN customer_details c
ON a.client_id = c.customer_id
WHERE p.price_type = 'Adjusted' AND
            c.customer_id = '148' AND
    p.date = '2022-09-09'
```

```
GROUP BY p.ticker;

-- CREATE VIEW mktvalue_SU AS
SELECT ticker, (value)*(quantity) AS mktvalue
FROM portfolio_SU3
GROUP BY ticker;

-- CREATE VIEW total_mktvalue_SU AS
SELECT sum(mktvalue) AS total
FROM mktvalue;

-- CREATE VIEW portfolio_weights_SU AS
SELECT m.ticker, m.mktvalue/t.total AS weights
FROM mktvalue m, total_mktvalue_1 t
GROUP BY ticker;

-- CALCULATING PORTFOLIO RETURNS
CREATE VIEW SU_calc_pret AS
SELECT *
FROM returns_SU1
WHERE date = '2022-09-09'
GROUP BY ticker;

-- CREATE VIEW porfolio_returns_SU2 AS
SELECT p.ticker, SUM(p.returns_12M*w.weights) AS 12M_pret, SUM(p.18M_ret*w.weights) AS 18M_pret, SUM(p.24M_ret*w.weights)
AS 24M_pret
FROM SU_calc_pret p
INNER JOIN portfolio_weights_SU w
ON p.ticker = w.ticker;

-- Q2: What is the most recent 12months sigma (risk) for each of the securities? What is the average daily return for each of the
securities?

SELECT *
FROM returns_SU1;

SELECT r.ticker, AVG(r.returns_12M) AS Avg_return, STD(r.returns_12M) AS Sigma,

        AVG(r.returns_12M)/STD(r.returns_12M) AS Risk_adj_returns,
                s.major_asset_class
FROM returns_SU1 r
LEFT JOIN security_masterlist s
ON r.ticker = s.ticker
GROUP BY ticker
ORDER BY Risk_adj_returns DESC;

-- Q3 - Suggest adding a new investment to your portfolio - what would it be and how much risk (sigma) would it add to your
client?

CREATE VIEW new_sec_SU_12M AS
SELECT ticker, date, (p1-p0)/p0 as ret
FROM
(
SELECT ticker, date, value as p1, LAG(value, 250) OVER(PARTITION BY ticker
                        ORDER BY date
                        ) as p0
FROM pricing_daily_new p
WHERE p.price_type = 'Adjusted' AND
date > '2017-08-01') n;
```

```
SELECT c.ticker, AVG(c.ret) AS Avg_return, STD(c.ret) AS Sigma,

        AVG(c.ret)/STD(c.ret) AS Risk_adj_returns,
                s.major_asset_class
FROM new_sec_SU_12M c
LEFT JOIN security_masterlist s
ON c.ticker = s.ticker
GROUP BY ticker
ORDER BY Risk_adj_returns DESC
LIMIT 10;
```

C. References:

S&P 500 returns:
https://ycharts.com/indicators/sp_500_12_month_total_return#:~:text=Basic%20Info,month%20and%2023.29%25%20last%20year

Closure of EOPS ETF:
https://www.prnewswire.com/news-releases/emles-advisors-announces-closure-of-six-funds-301625936.html