A1: Individual Final Assessment

SQL and Data Management

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Data Extraction & Visualization DAT – 6081

Hult International Business School

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Step 1: Who is Paul Bistre?

Located in the Boston Campus, Paul Bistre currently has over $3,476,363 assets invested over three accounts in our bank *(Figure 2)*. While the vast majority of his assets are allocated in equity securities, we can see that the portfolio includes other asset classes such as alternatives, commodities, and fixed income *(Figure 1)*.

While we might assume that each account has a different purpose whereas, one might have a more aggressive strategy than the other, we noticed that the diversity of his portfolio varies between accounts. In terms of amount of securities composition, Account 2802 is most differentiated, containing 39 distinct securities, followed by Account 2801 with 26 distinct, and lastly Account #28 with just 12 distinct securities (*Figure 3)*.

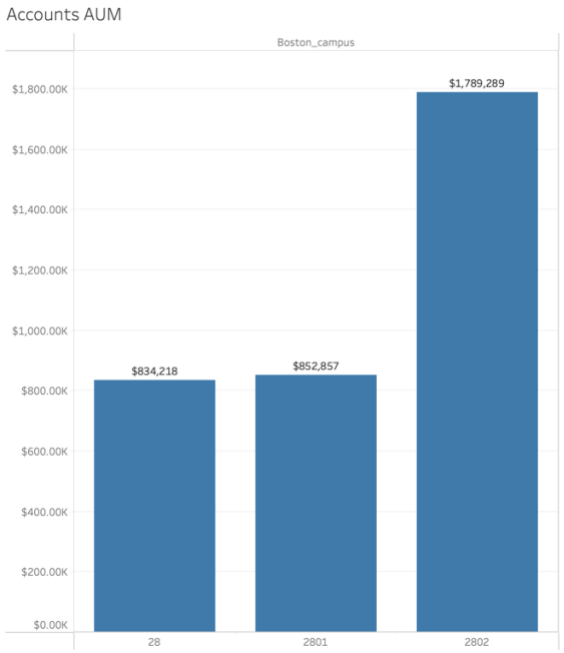

Figure 2 (AUM by Account)

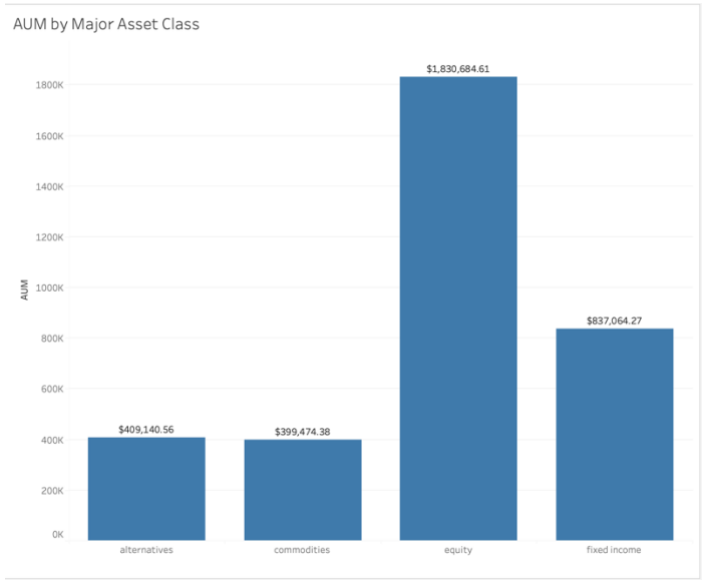

Figure 1 (AUM by asset class)

```sql
SELECT cd.full_name, ad.account_id,
 hc.ticker,
 sm.major_asset_class,
 sm.minor_asset_class,
 FORMAT((hc.quantity*hc.value),'NO') AS tot_invested
FROM customer_details cd
LEFT JOIN account_dim ad
    ON cd.customer_id = ad.client_id
INNER JOIN holdings_current hc
    USING(account_id)
LEFT JOIN security_masterlist sm
    USING(ticker)
WHERE ad.client_id = 148;
```

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Result Grid | Filter Rows: Search | Export:

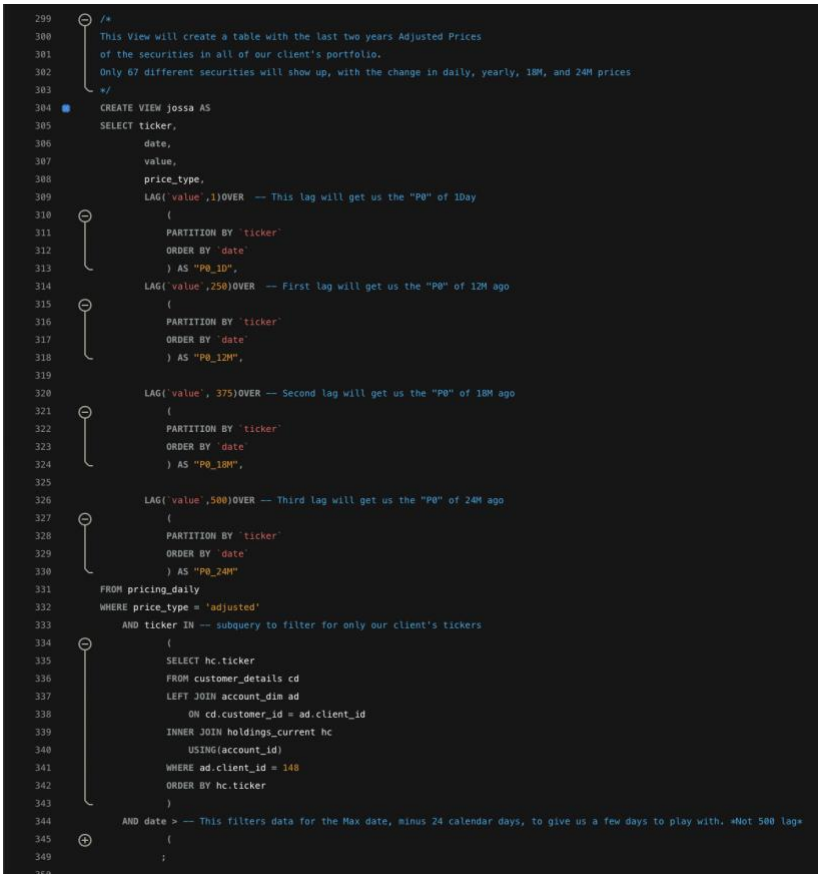
full_name	account_id	ticker	major_asset_class	minor_asset_class	tot_invest...
Paul Bistre	28	PFG	equity	large_cap	41,024
Paul Bistre	28	ETN	equity	large_cap	55,224
Paul Bistre	28	WTMF	alternatives		32,480
Paul Bistre	28	K	equity	large_cap	59,089
Paul Bistre	28	SHY	fixed_income		39,809
Paul Bistre	28	GPN	equity	large_cap	68,835
Paul Bistre	28	LBAY	alternatives		27,390

Code 1 (securities, with their investments, asset

Figure 3 (Account Composition. Asset classes in each account)

Step 2: View jossa

The view created to analyze the client #148, filters for the securities within our client's portfolio, as well for the adjusted price type. It only includes the last two years of data. This was not only done to find relevant information, but also to improve the performance of our queries. The decision to include previous prices that could help us in future calculations was done to avoid making future calculations more demanding.



```
/*
This View will create a table with the last two years Adjusted Prices
of the securities in all of our client's portfolio.
Only 67 different securities will show up, with the change in daily, yearly, 18M, and 24M prices
*/
CREATE VIEW jossa AS
SELECT ticker,
        date,
        value,
        price_type,
        LAG(`value`,1)OVER  -- This lag will get us the "P0" of 1Day
            (
            PARTITION BY `ticker`
            ORDER BY `date`
            ) AS "P0_1D",
        LAG(`value`,250)OVER  -- First lag will get us the "P0" of 12M ago
            (
            PARTITION BY `ticker`
            ORDER BY `date`
            ) AS "P0_12M",

        LAG(`value`, 375)OVER -- Second lag will get us the "P0" of 18M ago
            (
            PARTITION BY `ticker`
            ORDER BY `date`
            ) AS "P0_18M",

        LAG(`value`,500)OVER -- Third lag will get us the "P0" of 24M ago
            (
            PARTITION BY `ticker`
            ORDER BY `date`
            ) AS "P0_24M"
FROM pricing_daily
WHERE price_type = 'adjusted'
    AND ticker IN -- subquery to filter for only our client's tickers
            (
            SELECT hc.ticker
            FROM customer_details cd
            LEFT JOIN account_dim ad
                ON cd.customer_id = ad.client_id
            INNER JOIN holdings_current hc
                USING(account_id)
            WHERE ad.client_id = 148
            ORDER BY hc.ticker
            )
    AND date > -- This filters data for the Max date, minus 24 calendar days, to give us a few days to play with. *Not 500 lag*
            (
            ;
```

Code 2 (View)

Columns included in this view:

- Ticker (only those that client #148 has)
- Date (24 months from max date)
- Value at the latest date
- Price Type (Adjusted)
- The value 1 day before: P0 1d
- The value 12 Months before: P0 12M
- The value 18 Months before: P0 18M
- The value 24 Months before: P0 24M

Step 3:

Question 1:

Most recent Returns (12M/18M/24M)

Returns for each ticker 12M, 18M, & 24M.

Highest 12 month return 163.47% ticker SVIX, which is a short futures ETF. This security is extremely volatile but generated the highest returns for our client in the past year. Over the same time period the worst performing security was UVIX, creating a -95% return. UVIX is another very volatile instrument, it is a levered Futures ETF. UVIX was also the worst performing security over the 18-month period with a negative return of 95.62%.

Looking at the 18 month returns, PFIX, which is an interest rate hedge, provided the highest return rate at 93.55%, as well over the 24-month time period. This security has been our client's most profitable security.

From these two examples we can already tell that the client is not hesitant to invest in highly risky securities. Therefore, the spread of his returns is extremely big. Seeing the continuous negative performance of UVIX we could advise the client to sell this risky security and add more stable fixed income securities to his portfolio instead.

Also looking at his best performing security, which is an interest rate hedge, we could advise the client to sell this security now and realize the profits, based on the most recent changes in interest developments.

```
351     -- calculating returns for each ticker, showing the price used to calculat the return
352     SELECT
353         `date`,
354         ticker,
355         `value`,
356         P0_1D,
357         FORMAT(((`value`- P0_1D)/P0_1D)*100,2) AS "DailyReturn",
358         P0_12M,
359         ROUND(((`value`- P0_12M)/P0_12M)*100,2) AS "12MReturn",
360         P0_18M,
361         FORMAT(((`value`- P0_18M)/P0_18M)*100,2) AS "18MReturn",
362         P0_24M,
363         FORMAT(((`value`- P0_24M)/P0_24M)*100,2) AS "24MReturn"
364     FROM jossa
365     ORDER BY `date` DESC
366     ;
367
```

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Result Grid | Filter Rows: Search | Export: | Fetch rows:

date	ticker	value	P0_1D	DailyReturn	P0_12M	12MReturn	P0_18M	18MReturn	P0_24M	24MReturn
2023-10-06	WTMF	34.779999	34.669998	0.32	32.896954	5.72	34.020168	2.23	33.934502	2.49
2023-10-06	VTEB	47.52	47.709999	-0.40	47.362827	0.33	49.216122	-3.45	52.116688	-8.82
2023-10-06	VCSH	74.769997	74.809998	-0.05	72.064857	3.75	74.486496	0.38	78.219498	-4.41
2023-10-06	VGSH	57.459999	57.509998	-0.09	56.021629	2.57	57.064678	0.69	59.002445	-2.61
2023-10-06	VMBS	43.040001	43.25	-0.49	43.376148	-0.77	46.825764	-8.08	50.455872	-14.70
2023-10-06	UPAR	11.53	11.5	0.26	11.921452	-3.28	16.817438	-31.44	NULL	NULL

Code 3

Portfolio Returns:

From our analysis, we can observe that each account has had a different behavior in terms of returns. Focusing on the table in (Code 4) we find it hard to differentiate between each account, but if we look at the numbers provided by the calculated RoR, we can see the story for each account.

We can see that the account 2802 is the only account that has continuously been generating positive returns. This is also the customers largest account considering sum of assets, as well as the most diversified account. We see a general positive trends between the three accounts between September and November of 2022, where the three accounts begin to gain positive momentum.

RoR % *(Code 5)*	**12M**	**18M**	**24M**
Account 28	15.85	-6.49	-11.48
Account 2801	4.49	-8.81	-7.81
Account 2802	14.86	-1.55	2.61

Figure 4 (AUM Change over time, by account)

```sql
WITH AUM_calc AS
(

SELECT
    y.date,
    hc.account_id,
    SUM(hc.quantity*y.value) AS AUM_today,
    SUM(hc.quantity*y.P0_12M) AS AUM_12M,
    SUM(hc.quantity*y.P0_18M) AS AUM_18M,
    SUM(hc.quantity*y.P0_24M) AS AUM_24M
FROM holdings_current hc
LEFT JOIN
    (SELECT *
    FROM jossa
    ORDER BY `date` DESC
    LIMIT 67
    ) y
    USING(ticker)
WHERE hc.account_id IN('28','2801','2802')
GROUP BY hc.account_id)

SELECT
    `date`,
    account_id,
    ROUND((((AUM_today-AUM_12M)/AUM_12M)*100),2) AS "12 Month ror",
    ROUND((((AUM_today-AUM_18M)/AUM_18M)*100),2) AS "18 Month ror",
    ROUND((((AUM_today-AUM_24M)/AUM_24M)*100),2) AS "24 Month ror"
FROM AUM_calc
;
```

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Result Grid Filter Rows: Search Export:

date	account_id	12 Month ror	18 Month ror	24 Month ror
2023-10-06	28	15.84	-6.49	-11.48
2023-10-06	2801	4.49	-8.81	-7.81
2023-10-06	2802	14.86	-1.55	2.61

Code 4 (CTE of Return in %)

```sql
SELECT
    y.date,
    hc.account_id,
    FORMAT(SUM(hc.quantity*y.value),"NO") AS AUM_today,
    FORMAT(SUM(hc.quantity*y.P0_12M),"NO") AS AUM_12M,
    FORMAT(SUM(hc.quantity*y.P0_18M),"NO") AS AUM_18M,
    FORMAT(SUM(hc.quantity*y.P0_24M),"NO") AS AUM_24M
FROM holdings_current hc
LEFT JOIN
    (SELECT *
    FROM jossa
    ORDER BY `date` DESC
    LIMIT 67
    ) y
    USING(ticker)
WHERE hc.account_id IN('28','2801','2802')
GROUP BY hc.account_id;
```

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Result Grid Filter Rows: Search Export:

date	account_id	AUM_today	AUM_12M	AUM_18M	AUM_24M
2023-10-06	28	858,645	741,203	918,198	969,959
2023-10-06	2801	810,817	775,954	889,145	879,552
2023-10-06	2802	1,587,915	1,382,467	1,612,895	1,547,545

Code 4 Absolute AUM (today/12M/18M/24M)

Question 2: Daily Returns, and 12M Sigma

From looking at the number results for this calculation, we can see that the top securities, in terms of risk adj. returns, has very low volatility, as well as average return (*Code7)*. We can also identify some volatility in stocks like SVIX and GE further down the list, with higher returns than the leaders in the list, possibly more attractive to riskier investors.

The highest 12 months sigma is seen in the ticker UVIX, the same ticker we already identified to create the highest negative return.

```
-- Daily for every ticker
SELECT
    y.ticker,
    ROUND(AVG(y.DailyReturn),5)  AS "Average Daily Return",
    ROUND(STD(y.DailyReturn),5) AS "12M Sigma", -- Standard Deviation of Daily Returns | Filter for the last twelve months
    ROUND(AVG(y.DailyReturn)/STD(y.DailyReturn),5) AS Sharpe_ratio
FROM
    (
    SELECT
        `date`,
        ticker,
        `value`,
        ((`value`- P0_1D)/P0_1D)*100 AS "DailyReturn"
    FROM jossa
    WHERE date > -- This filters data for the Max date, minus 12M
            (
            SELECT DATE_SUB(MAX(`date`), INTERVAL 12 MONTH) AS ResultDate
            FROM pricing_daily
            )
    ORDER BY `date` DESC
    ) y
GROUP BY ticker
ORDER BY Sharpe_ratio DESC
;
```

Code 5 (Code for creation of mū, Sigma, Risk Adj. Return)

ticker	Average Daily Return	12M Sigma	Sharpe_ratio
BIL	0.01763	0.01844	0.95608
SHV	0.01762	0.02079	0.84768
GE	0.32065	1.59964	0.20045
NVO	0.24852	1.8821	0.13204
SVIX	0.4243	3.25693	0.13028
TJX	0.13593	1.17328	0.11586
ETN	0.17683	1.67729	0.10543
PFIX	0.22322	2.52952	0.08824
EOPS	0.04637	0.53197	0.08717
V	0.10497	1.23779	0.0848
FTLS	0.05209	0.63436	0.08211
FLT	0.151	1.89636	0.07963
ROST	0.11353	1.58921	0.07144
PANW	0.1697	2.56154	0.06625
CHTR	0.14003	2.2608	0.06194
VCSH	0.01364	0.22187	0.06148
IGSB	0.01337	0.22501	0.05942
VGSH	0.00976	0.17076	0.05717
SHY	0.00936	0.17306	0.0541
RINF	0.05298	0.97964	0.05408
KRBN	0.08373	1.5601	0.05367
HDG	0.02396	0.45135	0.05307
WTMF	0.02341	0.4719	0.0496
ACN	0.07974	1.7169	0.04644
MARB	0.01194	0.26668	0.04477

Code 6 (Outcome, ordered by mū/std ratio Descending)

Question 3: Portfolio Rebalancing

For new investment recommendation, we'll focus on the client's account that had the poorest performance over the last 24 months *(Code 4, Figure 4)*. Account 28 has had a negative return of over 11% over this period. We can also see that this account is the one with the lowest diversification out of the three, containing only 12 distinct securities, out of which 50% are the equity securities. We understand that the volatile nature of equity securities is what makes them attractive, but we highly recommend including securities with higher risk adjusted returns.

iShares Short Treasury Bond ETF, with Ticker SHV, qualified as fixed income, has a higher adjusted return than any other security in account #28 (*Code 8)*. For this reason, and the need for diversification explained before, we highly recommend to Mr. Paul Bistre to decrease the overall volatility of his account 28 by adding this stable ETF. Adding this security will decrease the overall account risk, increase the expected risk adjusted return for this account in the future.

Figure 5 (Distinct securities by asset class in each account)

```
572  SELECT CASE
573          WHEN sm.`major_asset_class` = 'equty' THEN 'equity'
574          WHEN sm.`major_asset_class` IN ('fixed income corporate','fixed_income') THEN 'fixed income'
575          ELSE sm.`major_asset_class` END AS `major_asset_class_new`,
576          shp.*, hc.account_id
577    FROM holdings_current hc
578    LEFT JOIN security_masterlist sm
579        USING(ticker)
580    LEFT JOIN shp
581        USING(ticker)
582    WHERE hc.account_id IN('28','2801','2802')
583    ORDER BY hc.account_id ASC, shp.Sharpe_ratio DESC;
584
```

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Result Grid Filter Rows: Search Export:

major_asset_class_n...	ticker	Average Daily Return	12M Sigma	Sharpe_ratio	account_id
equity	ETN	0.17683	1.67729	0.10543	28
equity	V	0.10497	1.23779	0.0848	28
equity	CHTR	0.14003	2.2608	0.06194	28
fixed income	SHY	0.00936	0.17306	0.0541	28
alternatives	WTMF	0.02341	0.4719	0.0496	28
commodities	IAUM	0.02934	0.87006	0.03373	28
commodities	GLD	0.02818	0.87406	0.03224	28
equity	GPN	0.03388	2.22979	0.0152	28
alternatives	LBAY	-0.00131	0.7224	-0.00181	28
equity	PFG	-0.0156	1.80065	-0.00867	28
alternatives	KMLM	-0.04351	0.93596	-0.04648	28
equity	K	-0.08329	1.19938	-0.06944	28
fixed income	SHV	0.01762	0.02079	0.84768	2801

Code 7 (Best Risk Adj. return outside of account #28)

Question 4: Risk Adj. Returns

Looking further at the entire portfolio, and the composition of securities, we evaluate which securities were providing the highest risk adjusted returns. The top two securities are fixed income securities, followed by two securities in equity, GE being Large Cap, and NVO being Small Cap, and lastly in our top 5 we've got SVIX categorized as alternatives.

major_asset_class_n...	ticker	Average Daily Return	12M Sigma	Sharpe_ratio
fixed income	BIL	0.01763	0.01844	0.95608
fixed income	SHV	0.01762	0.02079	0.84768
equity	GE	0.32065	1.59964	0.20045
equity	NVO	0.24852	1.8821	0.13204
alternatives	SVIX	0.4243	3.25693	0.13028

Code 8 (Risk Adjusted returns, and Asset Classes)

The high risk adjusted return of BIL can be explained when looking at the full name of the ticker. BIL is an index fund for treasury bills with short remaining maturities. Treasury bills are one of the lowest risk securities overall. Therefore, the risk adjusted return will be very high, due to the risk being close to zero. GE as a large-cap multinational company can also be expected to generate very steady returns at a low volatility.

From the other side, the lowest risk adjusted return is for the ticker UVIX. As indicated before in this report UVIX has shown to be continuously the worst performing security in our client's portfolio. Therefore, it would be a strong recommendation to our client to close this position.

The second lowest risk adjusted return is determined for the ticker UNG which is categorized as a commodity, oil. Considering the low risk adjusted returns, we could talk to our client about potentially closing this position as well. This could not only improve his portfolio return, but also set his portfolio up with higher ESG rated securities if that is in our client's interest.

Code 9

```
570  SELECT CASE
571          WHEN sm.`major_asset_class` = 'equty' THEN 'equity'
572          WHEN sm.`major_asset_class` IN ('fixed income corporate','fixed_income') THEN 'fixed income'
573          ELSE sm.`major_asset_class` END AS `major_asset_class_new`,
574          sm.minor_asset_class,
575          shp.*, hc.account_id
576    FROM holdings_current hc
577    LEFT JOIN security_masterlist sm
578        USING(ticker)
579    LEFT JOIN shp
580        USING(ticker)
581    WHERE hc.account_id IN('28','2801','2802')
582    ORDER BY shp.Sharpe_ratio ASC;
583
```

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Result Grid Filter Rows: Search Export:

major_asset_class_n...	minor_asset_class	ticker	Average Daily Return	12M Sigma	Sharpe_ratio	account_id
alternatives		UVIX	-0.93195	6.55168	-0.14225	2802
commodities	oil	UNG	-0.3569	4.2336	-0.0843	2801
equity	large_cap	CCI	-0.1275	1.77022	-0.07202	2801
equity	large_cap	K	-0.08329	1.19938	-0.06944	28
commodities	cannabis	TOKE	-0.08784	1.45206	-0.06049	2802
commodities	cannabis	CNBS	-0.16258	2.76658	-0.05876	2801
equity	large_cap	SBAC	-0.10862	1.94459	-0.05586	2802
commodities	cannabis	MJ	-0.15574	3.14577	-0.04951	2801
commodities	cannabis	MJ	-0.15574	3.14577	-0.04951	2802

Conclusion

The overall portfolio analysis leads to a high-risk, high-reward preference for investments, but highlights the benefits of diversification as it can be seen with lower-risk securities such as BIL. While Mr. Bistre's approach showcases his desire for significant gains, the substantial volatility and underperformance in segments of his portfolio demand a more balanced and diversified investment strategy. Investing in stable, fixed-income securities and rebalancing the asset allocation, especially in less diversified accounts, could potentially improve the overall performance and align with Mr. Bistre's investment goals, including potential interest in higher ESG-rated securities.