

A1: Part 1 Extracting using SQL

Presented to

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Data Extraction & Visualization

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By

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Step 1: Client Profile & Assets

The genesis of this profile research started off with the customer's account in the Table "*invest.account_dim"* which gave us the information on the different account under the client's ownership, comprising of a "*main account"* (160) and a "*sub account"* (16001), both under the "*client_id*" 128 of Mrs. Bojana Popovic. Followed by the joining of the *"invest.customer_details"* Table, it was imperative we retrieved the full name of the client. Also, the combination of the Table *"invest.holdings_current", "invest.security_masterlist"* and *"invest.pricing_daily_new"* was next to include the price of each investment and their details down to the major and minor asset classes. Also, the market adjusted values were derived by multiplying each holding's quantity by its price (value field in *"invest.holdings_current"*). With these configurations the client full asset allocation could be determined, the analysis was focused on the major asset classes after that we proceeded to get even more specific into the minor asset classes.

Based in Dubai, client Bojana Popovic's current portfolio is made of 4 major asset classes: 75.01% in equity, 8.92% in commodities, 8.37% in fixed income and 7.7% in alternative investments. Her current investment profile does point towards a more aggressive style; mainly in large cap equity investment (61.73%) such as Rockwell Automation Inc. (20.56%) as the largest investment under management and followed by smaller equity investments (13.28%). Most notably, the commodities invested are specific to the region's speciality such as oil (1.89% of the portfolio), precious metals (6.85%).

Step 2: Portfolio View

```sql
CREATE VIEW invest.Alexandre_LyV3 AS
SELECT
        sm.security_name,
        pdn.ticker,
        pdn.price_type,
        pdn.date,
        pdn.value AS price,
        hc.quantity,
        pdn.value * hc.quantity AS position_value,
        sm.major_asset_class,
        sm.minor_asset_class,
        sm.sec_type
FROM invest.customer_details AS cd
    JOIN invest.account_dim AS ad ON ad.client_id = cd.customer_id
    JOIN invest.holdings_current AS hc ON hc.account_id = ad.account_id
    JOIN invest.security_masterlist AS sm ON sm.ticker = hc.ticker
    JOIN invest.pricing_daily_new as pdn ON pdn.ticker = hc.ticker
    WHERE ad.client_id = '128' AND
    pdn.price_type = "Adjusted" AND
    pdn.date > '2019-08-01'
```

For this view, the required components of the assets owned by Mrs. Bojana Popovic were the security_name, the ticker, date of every transaction of each asset, the price purchased and its quantity combined to have the position's value, the major and minor asset classes and finally the sec_type. It imperative to filter to only have the assets of client_id 128 and the adjusted price, limiting to only take in values starting at 1st of August 2019. Also, this was based off the foundation built with the links of the table mentioned in step 1. With all of this information, we can assess the assets under management and answer the following questions pertaining the annual returns, sigma risk, possible recommendation of an investment aiding the current portfolio and the Sharpe Ratio.

Step 3: Further Questions

3.1 Annual Returns

```sql
SELECT z12.* , ln(z12.p1/z12.p0) AS cont_ror
FROM (
SELECT ticker, price_type, date, price  AS p1, LAG(price, 250) OVER (
                                                                    PARTITION BY ticker
                                                                    ORDER BY date
                                                                        ) AS p0
FROM invest.Alexandre_LyV3
WHERE price_type = "Adjusted" AND
        date > '2021-09-08'
ORDER BY date DESC
) z12;
```

For the 12 months assessment, the view in Step 2 was utilized to aggregate all the asset under management and then they were grouped by to show the return of each security in descendent order to show the real return at the end of 12 months (2022-09-09). The United States Natural Gas Fund (ticker: UNG) has highest return of 43.24% and the highest decrease was given to the ticker DIS (Walt Disney Inc. with a loss of 47.38%. We can see a great continuous return amongst the commodities ticker (DBC : 26.34%, DJP: 22.08%, LBAY: 19.63%). On the other side of the coin, technology companies under this portfolio are the ones who had the biggest decrease such as Google (GOOG) at 25.18%, Rockwell Automation Inc. (ROK) at 19.49% and Otis Worldwide Corp. (OTIS) at 18.98%. Some growing securities had low to moderate continuous returns inside the range of 0% to 15%, which is typical of stable equities. Other diminishing assets had low to moderate continuous decreases inside the range of 0% to 13% characterize by a normal market pullback.

ticker	price_type	date	p1	p0	cont_ror
UNG	Adjusted	2022-09-09	27.889999	18.1	0.43235622751247155
DBC	Adjusted	2022-09-09	25.389999	19.51	0.2634282016959814
DJP	Adjusted	2022-09-09	35.23	28.25	0.22080453476069617
LBAY	Adjusted	2022-09-09	27.583	22.66675	0.19630054795207125
BCI	Adjusted	2022-09-09	27.42	22.629499	0.19201835348765484
BIDU	Adjusted	2022-09-09	138.429993	118.919998	0.15191375082070083
RINF	Adjusted	2022-09-09	33.330002	29.174799	0.13315266363691416
RLY	Adjusted	2022-09-09	28.709999	25.518585	0.11783844907100299
DBA	Adjusted	2022-09-09	20.67	18.540001	0.10875275961853678
CDNS	Adjusted	2022-09-09	174.679993	164.630005	0.05925512651301734
FLSP	Adjusted	2022-09-09	21.375	20.50695	0.04145816174400044
MARB	Adjusted	2022-09-09	20.190001	19.690001	0.025076538415980367
ARB	Adjusted	2022-09-09	26.999001	26.344	0.024559320245748965
TSCO	Adjusted	2022-09-09	200.919998	198.819214	0.010510869476063832
BIL	Adjusted	2022-09-09	91.470001	91.118599	0.0038491169093302557
SGOL	Adjusted	2022-09-09	16.450001	17.209999	-0.045165014116041284
IAUM	Adjusted	2022-09-09	17.139999	17.934999	-0.04533920040076969
GLDM	Adjusted	2022-09-09	34.07	35.68	-0.046173076038933406
MSVX	Adjusted	2022-09-09	24.25	26.20672	-0.07759924904561269
BNDX	Adjusted	2022-09-09	48.709999	55.432087	-0.12927428652560974
GIGB	Adjusted	2022-09-09	45.294998	53.847878	-0.17296639010297252
OTIS	Adjusted	2022-09-09	73.400002	88.745087	-0.18984410620832373
ROK	Adjusted	2022-09-09	255.380005	310.343414	-0.19492681985741792
GOO…	Adjusted	2022-09-09	110.650002	142.332504	-0.25179381327357747
DIS	Adjusted	2022-09-09	115.18	184.979996	-0.47375156742362795

```sql
SELECT z24.* , ln(z24.p1/z24.p0) AS cont_ror
FROM (
SELECT ticker, price_type, date, price  AS p1, LAG(price, 500) OVER (
                                                                    PARTITION BY ticker
                                                                    ORDER BY date
                                                                        ) AS p0

FROM invest.Alexandre_LyV3
WHERE price_type = "Adjusted" AND
        date > '2020-09-08'
ORDER BY date DESC
) z24;
```

For the 24 months assessment, the view in Step 2 was utilized to aggregate all the asset under management and then they were grouped by to show the return of each security in descendent order to show the real return at the end of 24 months (2022-09-09). The highest return was awarded to the ticker UNG of a return of 79.70%, this return was very

beneficial considering its substantial volume. Most of the ticker owned did have positive return, in exception of SGOL (-13.30%), BIDU (-16.49%), BNDX (-12.81%), DIS (-13.05%), GIGB (-15.62%) and GLDM (-13.26%) who are mostly fixed income securities and commodities, which does affect as much since the portfolio is mostly comprised of equities with positive returns. The year 2021 represents a recovery period following the COVID-19 market decline, during which most assets rebounded and entered a growth period, as reflected in the table below where three quarter of the securities show positive continuous returns. While combining both year 2022 and 2021, we can see that some fixed income and commodities did not perform so well, but the equities did, while having mostly positive continuous returns.

ticker	price_type	date	p1	p0	cont_ror
UNG	Adjusted	2022-09-09	27.889999	12.57	0.7969551431820956
DBC	Adjusted	2022-09-09	25.389999	12.98	0.6709456450550574
DJP	Adjusted	2022-09-09	35.23	19.82	0.5752064634513042
CDNS	Adjusted	2022-09-09	174.679993	105.230003	0.5068072292823819
BCI	Adjusted	2022-09-09	27.42	16.681566	0.496968396718392
RLY	Adjusted	2022-09-09	28.709999	19.418369	0.3910259855475848
TSCO	Adjusted	2022-09-09	200.919998	137.0103	0.38285070344381766
GOO…	Adjusted	2022-09-09	110.650002	76.755997	0.36574056434946717
DBA	Adjusted	2022-09-09	20.67	14.75	0.33744029090784816
RINF	Adjusted	2022-09-09	33.330002	24.831228	0.2943558977256351
OTIS	Adjusted	2022-09-09	73.400002	58.792538	0.22190902077884012
ROK	Adjusted	2022-09-09	255.380005	217.317551	0.1613929990516399
ARB	Adjusted	2022-09-09	26.999001	25.798	0.04550289577686797
ARB	Adjusted	2022-09-09	26.999001	25.798	0.04550289577686797
MARB	Adjusted	2022-09-09	20.190001	19.382999	0.04079114020167886
MSVX	Adjusted	2022-09-09	24.25	23.505405	0.031186222679323864
FLSP	Adjusted	2022-09-09	21.375	20.763342	0.029032986822494226
BIL	Adjusted	2022-09-09	91.470001	91.175392	0.003226024491133492
BNDX	Adjusted	2022-09-09	48.709999	55.367294	-0.12810473112194465
DIS	Adjusted	2022-09-09	115.18	131.240005	-0.1305316241125146
GLDM	Adjusted	2022-09-09	34.07	38.900002	-0.13257707036540584
SGOL	Adjusted	2022-09-09	16.450001	18.790001	-0.13299932864351768
GIGB	Adjusted	2022-09-09	45.294998	52.952564	-0.1561998869493961
BIDU	Adjusted	2022-09-09	138.429993	163.259995	-0.16497925926464538
BIDU	Adjusted	2022-09-09	138.429993	163.259995	-0.16497925926464538

```sql
SELECT z36.* , ln(z36.p1/z36.p0) AS cont_ror
FROM (
SELECT ticker, price_type, date, price  AS p1, LAG(price, 750) OVER (
                                                                    PARTITION BY ticker
                                                                    ORDER BY date
                                                                        ) AS p0
FROM invest.Alexandre_LyV3
WHERE price_type = "Adjusted" AND
        date > '2019-09-08'
ORDER BY date DESC
) z36;
```

For the 36 months assessment, the view in Step 2 was utilized to aggregate all the asset under management and then they were grouped by to show the return of each security in descendent order to show the real return at the end of 36 months. Twenty-one assets were in the portfolio three years ago, six of them were fixed-income securities (RINF, RLY, ARB, BIL, GIGB, BNDX) as well as equities (CDNS, TSCO, GOOGL, ROK, BIDU, DIS) and eight were commodities related investments (BDC, DJP, BCI, GLDM, SGOL, DBA, UNG). The top 3 tickers (CDNS, TSCO, GOOGL) were equities showing very impressive growth continuous rate of return (CDNS: 94.65%, TSCO: 80.53%, GOOGL: 58.52%). The years 2020, 2021 and 2022 combined show us that only 4 securities (GIGB: -5.73%, BNDX: -10.34%, DIS: 16.61% and BIDU:-65.61%) have declining continuous rate of return.

ticker	price_type	date	p1	p0	cont_ror
CDNS	Adjusted	2022-09-09	174.679993	67.790001	0.94654098234977
TSCO	Adjusted	2022-09-09	200.919998	89.804291	0.8052740507967313
GOO…	Adjusted	2022-09-09	110.650002	61.6325	0.5851827557605734
DBC	Adjusted	2022-09-09	25.389999	15.137509	0.5171796529020087
ROK	Adjusted	2022-09-09	255.380005	154.939087	0.4997205989923955
DJP	Adjusted	2022-09-09	35.23	22.290001	0.4577598000922024
BCI	Adjusted	2022-09-09	27.42	18.285025	0.4051902552928506
RLY	Adjusted	2022-09-09	28.709999	20.944674	0.31536106959791765
DBA	Adjusted	2022-09-09	20.67	15.220938	0.30601139372419883
RINF	Adjusted	2022-09-09	33.330002	24.579735	0.3045356293687392
UNG	Adjusted	2022-09-09	27.889999	22.76	0.2032635565261215
GLDM	Adjusted	2022-09-09	34.07	29.780001	0.13458017083742935
SGOL	Adjusted	2022-09-09	16.450001	14.379	0.13455672915604883
ARB	Adjusted	2022-09-09	26.999001	25.174999	0.0699484664371333
ARB	Adjusted	2022-09-09	26.999001	25.174999	0.0699484664371333
BIL	Adjusted	2022-09-09	91.470001	90.412415	0.011629468561352238
GIGB	Adjusted	2022-09-09	45.294998	47.966656	-0.057309495882271175
BNDX	Adjusted	2022-09-09	48.709999	54.014874	-0.10337512579207661
DIS	Adjusted	2022-09-09	115.18	135.985275	-0.1660504857368596
BIDU	Adjusted	2022-09-09	138.429993	266.779999	-0.6560596128319222
BIDU	Adjusted	2022-09-09	138.429993	266.779999	-0.6560596128319222
IAUM	Adjusted	2022-09-09	17.139999	NULL	NULL
LBAY	Adjusted	2022-09-09	27.583	NULL	NULL
MARB	Adjusted	2022-09-09	20.190001	NULL	NULL
MSVX	Adjusted	2022-09-09	24.25	NULL	NULL
OTIS	Adjusted	2022-09-09	73.400002	NULL	NULL
FLSP	Adjusted	2022-09-09	21.375	NULL	NULL
CEG	Adjusted	2022-09-09	87.510002	NULL	NULL

3.2 Sigma

```sql
SELECT ticker, STD(y.cont_ror) as Risk
FROM (
SELECT z.* , ln(z.p1/z.p0) AS cont_ror
FROM (
SELECT ticker, price_type, date, price  AS p1, LAG(price, 250) OVER (
                                                                    PARTITION BY ticker
                                                                    ORDER BY date
                                                                        ) AS p0
FROM invest.Alexandre_LyV3
WHERE price_type = "Adjusted" AND
        date > '2021-08-01'
        ) AS z
) AS y
GROUP BY ticker;
```

Looking at the average and standard deviation of daily returns helps highlight how different the risk profiles are across the securities in the portfolio. This information can later be used to identify which ones deliver the strongest risk-adjusted performance. According to the data, we can decipher that UGN has the highest risk at 6.72 from the standard deviation, followed by the DBC at 6.17 from the standard deviation. Considering their volume traded and their relative positive continuous rate of return, this indeed does benefit the portfolio. Overall, this portfolio does represent a very aggressive strategy, and its exposure to risk is clearly substantial, taking into consideration that all assets are concentrated in volatile sectors such as commodities, technology, and emerging-market equities, while only a limited portion is allocated to defensive fixed-income holdings.

ticker	Risk
UNG	6.721342649591862
GOOGL	6.398108229108565
DBC	6.166774258844366
DBA	6.0614957067669035
SGOL	5.973603222406649
DIS	5.806113529196894
GLDM	5.649426750300674
BNDX	5.640648197784661
BIDU	5.619606014405778
CEG	5.521903469366112
BIL	5.3101124522717855
OTIS	5.153176231025631
BCI	4.760358162470156
CDNS	4.634578588417497
DJP	4.551138224036854
TSCO	4.486577043872008
IAUM	4.299040953510786
ROK	4.2583972815571745
RLY	4.119271148493489
GIGB	3.6665338447147935
CTA	3.579240851385349
RINF	3.297714169507154
MARB	3.019883570015238
MSVX	2.830218750762026
LBAY	2.631918922703019
ARB	2.571244661637062
FLSP	2.149463256154323

```sql
SELECT ticker, AVG(y.cont_ror) as Average_Daily_Returns
FROM (
SELECT z.* , ln(z.p1/z.p0) AS cont_ror
FROM (
SELECT ticker, price_type, date, price  AS p1, LAG(price, 1) OVER (
                                                                    PARTITION BY ticker
                                                                    ORDER BY date
                                                                        ) AS p0
FROM invest.Alexandre_LyV3
WHERE date > '2019-09-08'
        ) AS z
) AS y
GROUP BY ticker;
```

For the daily returns, the average are calculated on continuous rate of return basis. They are lower since the prices of the securities have not significantly change in one day. The highest performers are the defensive securities (SGOL: 0.2589%, BNDX: 0.2364%, RLY: 0.1958%).

ticker	Average_Daily_Returns
SGOL	0.0025896047885571693
BNDX	0.002364373775687304
RLY	0.00195843293100763
GIGB	0.001489188211716288
RINF	0.000755152831055994
CDNS	0.00020662686593733752
CTA	0.0001663697514314746
OTIS	0.00016112102039934114
TSCO	0.0001472203726749159
GOOGL	0.0001303727095791941
DIS	0.000123312354544262
ROK	0.00011204925832000784
DBC	0.00011015944922876167
DJP	0.00010124656144931828
DBA	0.00007287379282040827
BCI	0.00004607765690276648
BIDU	0.000030327997321988198
GLDM	0.00002674448239601258
ARB	0.000010204778427511737
BIL	0.000002701859871817186
MSVX	-0.000030066266560197654
IAUM	-0.00001812439917057338
MARB	-0.0013799752511097587
LBAY	-0.0019048563467929352
UNG	-0.002480569242305527
FLSP	-0.0062479390875489005
CEG	-0.007520872407061226

3.3 Addition of Investment for Diversification

Considering the previous information retrieved from the past queries and since we cannot add another ticker that is not in the investment portfolio, the basis of the choice of investment were the yearly sigma risk, the yearly continuous return and the daily average return. The strategy is to diminish the risk of the portfolio while still having continuous stable return: AltShares Merger Arbitrage ETF (ARB) will be the selected investment to increase in this portfolio for its low risk (2.57 from the standard deviation), positive and constant growth throughout the last 3 years (2022 : 2.46%, 2021: 4.55% and 2020: 7.7%) and finally a good daily average continuous return of 0.001%.

3.4 Sharpe Ratio

```
29 •  SELECT ticker, AVG(y.cont_ror) as e_ror, STD(y.cont_ror) as std_ror, AVG(y.cont_ror)/STD(y.cont_ror) as sharpe
30    FROM (
31    SELECT z.* , ln(z.p1/z.p0) AS cont_ror
32    FROM (
33    SELECT ticker, price_type, date, price  AS p1, LAG(price, 250) OVER (
34                                                                  PARTITION BY ticker
35                                                                  ORDER BY date
36                                                                      ) AS p0
37    FROM invest.Alexandre_LyV3
38    WHERE date > '2019-09-08'
39           ) z
40    ) y
41    GROUP BY ticker
```

Based off the table below, we can determine that Simplify Managed Futures Strategy ETF (CTA) has the best risk-adjusted return according to the high Sharpe ratio (0.069227), highest expected return of 0.2585 and a moderate volatility compared to the rest of the securities (3.73). This is not the lowest, but given the extremely strong return, the volatility is justified. The ratio return/volatility is the strongest among all securities.

ticker	e_ror	std_ror	sharpe
CTA	0.25851814429375664	3.734343507120064	0.06922719985476819
MARB	0.06277811013836454	2.5731037003895088	0.024397815808535575
CEG	0.13531754178856326	5.57186268891983	0.024285871591497553
LBAY	0.050276482546798174	2.3031302678481036	0.021829630415900563
FLSP	0.0299148626588262	1.7471222019836263	0.017122364208331752
RINF	0.03392070584072826	2.7947194314516612	0.012137427986146298
CDNS	0.04725249744211788	4.7255712064611615	0.009999319738852028
RLY	0.03094615515754311	3.438285038082851	0.009000462385980174
BCI	0.038629012567340866	4.485266771371359	0.008612422523873679
TSCO	0.032358366864080945	4.63099843487071	0.006987341351797355
OTIS	0.031710679458708715	5.5093807953939535	0.00575576106215 4211
DBC	0.035574534431394175	6.231634493034589	0.005708700417387705
IAUM	0.022373253634661295	4.328030832742118	0.005169384068478605
DBA	0.02623318228073386	5.6466616155805385	0.004645786141735501
ROK	0.018483912805594676	4.226303347013383	0.0043735414351307195
ARB	0.00857386140211177	2.0344838259504177	0.0042142686477767664
GOOGL	0.02728306421621986	6.615135869887594	0.0041243392052480185
DJP	0.017540612093910606	4.676917068878441	0.00375046464061356
UNG	0.025037007842392007	6.724160098970764	0.0037234401730298337
GLDM	0.01960735421646199	5.457375171609631	0.0035928177191231806
BIL	0.011592952028418334	5.1589564134422625	0.0022471506055394353
SGOL	0.010123826710688455	5.631031145386634	0.0017978637392163349
BIDU	0.004830472730274872	5.906219421991772	0.0008178620510251679
GIGB	0.00018547232163454…	3.505457921337385	0.00005290958436716362
DIS	-0.006020541766270578	5.652827198228214	-0.0010650496742864559
BNDX	-0.00622299408048195	5.4344964393528565	-0.0011450912057682733
MSVX	-0.010596122762339573	2.6835491290904976	-0.0039485480804038