

Getting to know each other by... sharing code

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SimCorp Italiana

Asset and Liability Management



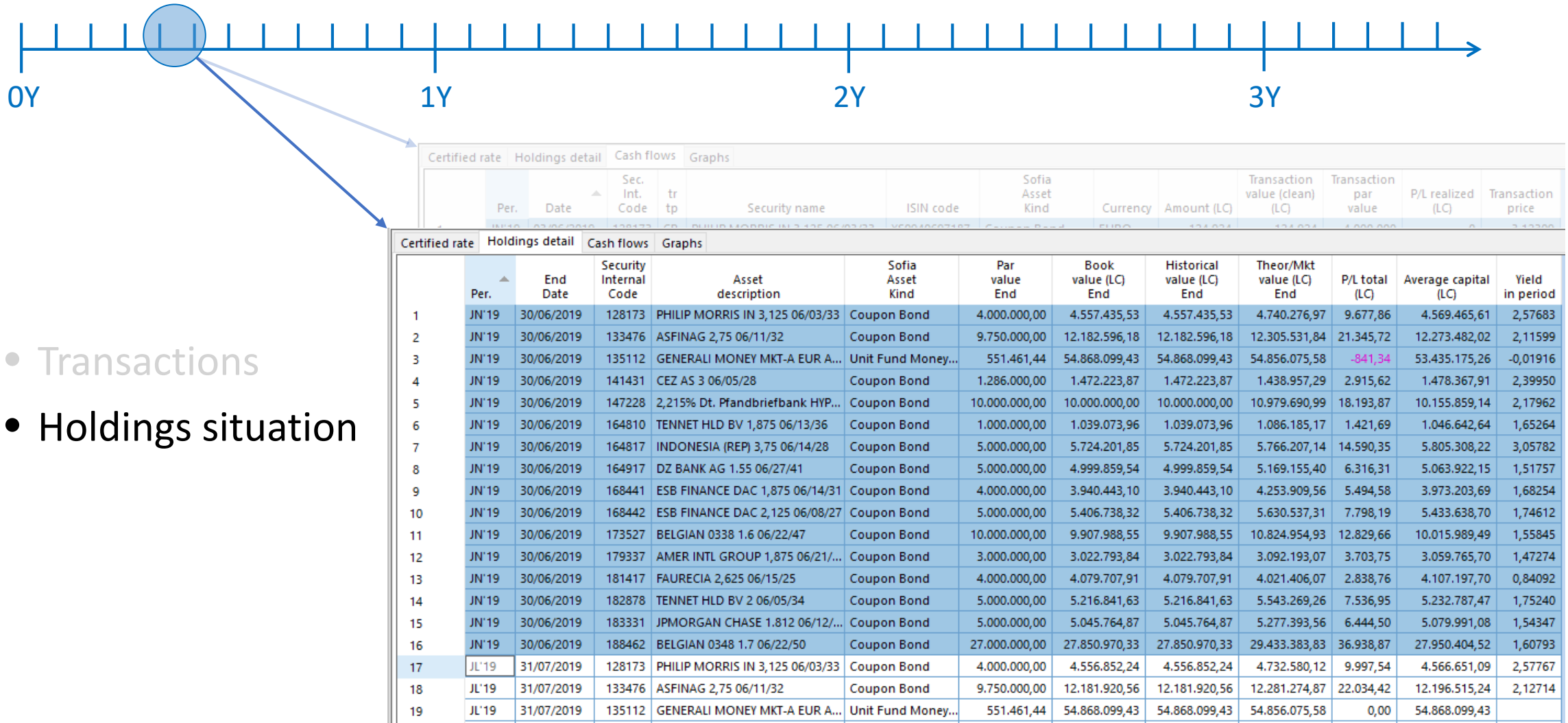
Asset and Liability Management



- Transactions

Certified rate	Holdings detail		Cash flows		Graphs								
	Per.	Date	Sec. Int. Code	tr tp	Security name	ISIN code	Sofia Asset Kind	Currency	Amount (LC)	Transaction value (clean) (LC)	Transaction par value	P/L realized (LC)	Transaction price
1	JN'19	03/06/2019	128173	CP	PHILIP MORRIS IN 3,125 06/03/33	XS0940697187	Coupon Bond	EURO	124.924	124.924	4.000.000	0	3,12309
2	JN'19	03/06/2019	135112	SC	GENERALI MONEY MKT-A EUR AC...	LU1079698293	Unit Fund Money...	EURO	656.285	656.285	6.598	-191	99,47300
3	JN'19	04/06/2019	135112	AC	GENERALI MONEY MKT-A EUR AC...	LU1079698293	Unit Fund Money...	EURO	-8.750.000	8.750.000	87.963	0	99,47400
4	JN'19	05/06/2019	141431	CP	CEZ AS 3 06/05/28	XS0940293763	Coupon Bond	EURO	38.556	38.556	1.286.000	0	2,99817
5	JN'19	05/06/2019	182878	CP	TENNET HLD BV 2 06/05/34	XS1828037827	Coupon Bond	EURO	99.939	99.939	5.000.000	0	1,99878
6	JN'19	08/06/2019	168442	CP	ESB FINANCE DAC 2,125 06/08/27	XS1239586594	Coupon Bond	EURO	106.185	106.185	5.000.000	0	2,12370
7	JN'19	11/06/2019	133476	CP	ASFINAG 2,75 06/11/32	XS0790003023	Coupon Bond	EURO	268.125	268.125	9.750.000	0	2,75000
8	JN'19	12/06/2019	183331	CP	JPMORGAN CHASE 1.812 06/12/29	XS1835955474	Coupon Bond	EURO	90.545	90.545	5.000.000	0	1,81089
9	JN'19	13/06/2019	164810	CP	TENNET HLD BV 1,875 06/13/36	XS1432384409	Coupon Bond	EURO	18.739	18.739	1.000.000	0	1,87386
10	JN'19	14/06/2019	164817	CP	INDONESIA (REP) 3,75 06/14/28	XS1432493440	Coupon Bond	EURO	187.500	187.500	5.000.000	0	3,75000
11	JN'19	14/06/2019	168441	CP	ESB FINANCE DAC 1,875 06/14/31	XS1428782160	Coupon Bond	EURO	74.954	74.954	4.000.000	0	1,87386
12	JN'19	15/06/2019	181417	CP	FAURECIA 2,625 06/15/25	XS1785467751	Coupon Bond	EURO	51.992	51.992	4.000.000	0	1,29980
13	JN'19	17/06/2019	135112	AC	GENERALI MONEY MKT-A EUR AC...	LU1079698293	Unit Fund Money...	EURO	-3.500.000	3.500.000	35.186	0	99,47100
14	JN'19	18/06/2019	135112	SC	GENERALI MONEY MKT-A EUR AC...	LU1079698293	Unit Fund Money...	EURO	1.323.179	1.323.179	13.302	-330	99,47100
15	JN'19	20/06/2019	135112	SC	GENERALI MONEY MKT-A EUR AC...	LU1079698293	Unit Fund Money...	EURO	1.285.048	1.285.048	12.919	-320	99,47100
16	JN'19	21/06/2019	179337	CP	AMER INTL GROUP 1,875 06/21/27	XS1627602201	Coupon Bond	EURO	56.136	56.136	3.000.000	0	1,87121
17	JN'19	22/06/2019	173527	CP	BELGIAN 0338 1.6 06/22/47	BE0000338476	Coupon Bond	EURO	160.000	160.000	10.000.000	0	1,60000
18	JN'19	22/06/2019	188462	CP	BELGIAN 0348 1.7 06/22/50	BE0000348574	Coupon Bond	EURO	172.282	172.282	27.000.000	0	0,63808
19	JN'19	23/06/2019	147228	CP	2,215% Dt. Pfandbriefbank HYPN...	13100086	Coupon Bond	EURO	221.500	221.500	10.000.000	0	2,21500
20	JN'19	27/06/2019	164917	CP	DZ BANK AG 1.55 06/27/41	XS1438039452	Coupon Bond	EURO	77.481	77.481	5.000.000	0	1,54963
21	JL'19	01/07/2019	178405	RE	NORDEA KREDIT 2 10/01/50	DK0002038744	Coupon Bond	DKK	31.585	31.585	235.872	408	100,00000
22	JL'19	01/07/2019	178405	RE	NORDEA KREDIT 2 10/01/50	DK0002038744	Coupon Bond	DKK	-152	-152	-1.135	-2	100,00000
23	JL'19	01/07/2019	178405	CP	NORDEA KREDIT 2 10/01/50	DK0002038744	Coupon Bond	DKK	27.496	27.496	41.067.964	0	0,50000

Asset and Liability Management



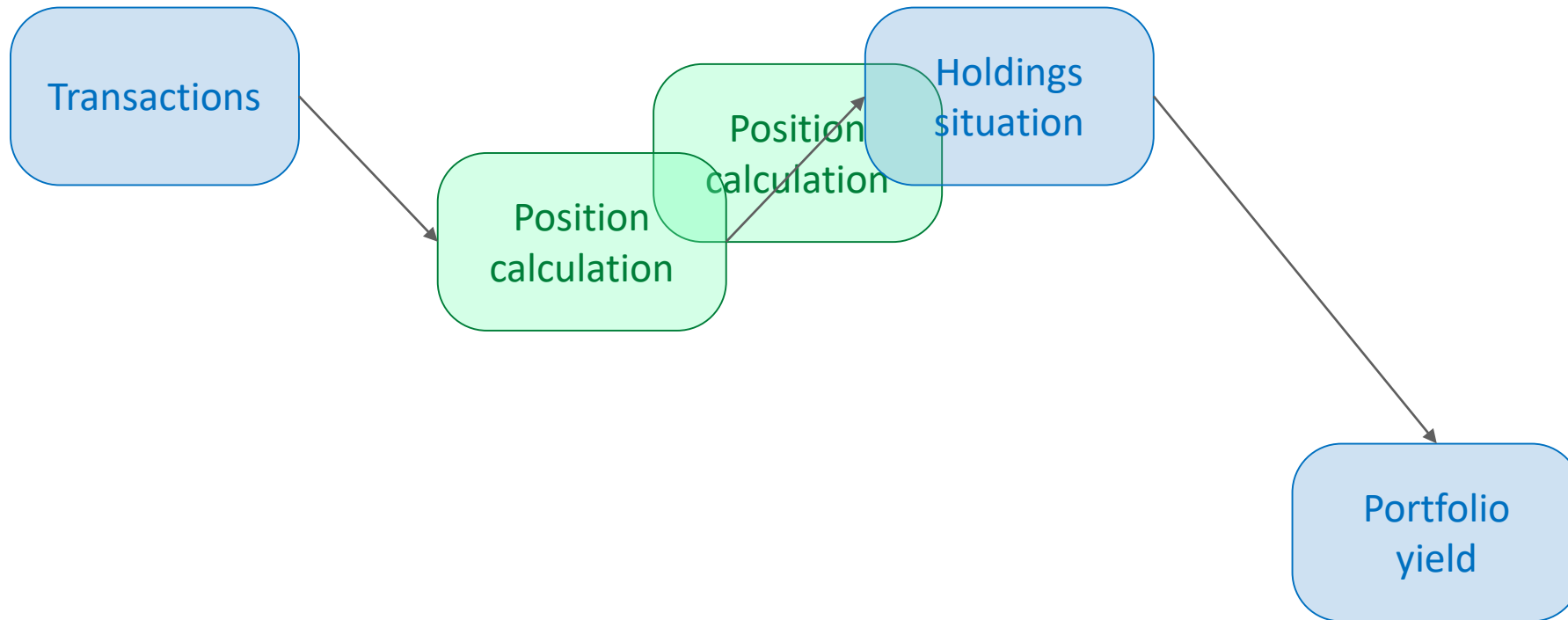
- Transactions
- Holdings situation

A horizontal timeline with an arrow pointing to the right. Major tick marks are labeled 0Y, 1Y, 2Y, and 3Y. There are 10 minor tick marks between each major tick mark. A blue circle is drawn around the 5th minor tick mark after 0Y. A line points from the text 'The first event occurs' to this circle.

- | Certified rate | | | | | | | | | | | | | | | Holdings detail | | Cash flows | | Graphs | | | | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|---------------|------------------------------|------------------------|---|---------------------------------------|-----------------------|---------------------------------|---------------------|---------------|--------------------------------|----------------------------|-------------------|-------------------|-----------|--|
| | | | | | | | | | | | | | | | Per. | Date | Sec. Int. Code | tr tp | Security name | | ISIN code | Sofia Asset Kind | Currency | Amount (LC) | Transaction value (clean) (LC) | Transaction par value | P/L realized (LC) | Transaction price | | |
| 1 | | | | | | | | | | | | | | | JN'19 | 03/06/2019 | 128173 | CP | PHILIP MORRIS IN 3,125 06/03/33 | | XS0940697187 | Coupon Bond | EURO | 124.924 | 124.924 | 4.000.000 | 0 | 3,12309 | | |
| 2 | | | | | | | | | | | | | | | JN'19 | 03/06/2019 | 131431 | SC | GENERALI MONEY MKT-A EUR AC... | | LU1079698293 | Unit Fund Money... | EURO | 656.285 | 656.285 | 6.598 | -191 | 99,47300 | | |
| 3 | | | | | | | | | | | | | | | JN'19 | 04/06/2019 | 128173 | AC | GENERALI MONEY MKT-A EUR AC... | | LU1079698293 | Par value | EURO | 4.000.000 | 4.000.000 | 87.963 | 0 | 99,47400 | | |
| 4 | | | | | | | | | | | | | | | Per JN'19 | 04/06/2019 | 131431 | CP | CEZ description 28 | | CZ0402937363 | End Bond | EURO | 3.556 | 3.556 | 1.100 | 0 | in period | | |
| 5 | | | | | | | | | | | | | | | JN'19 | 19/30/06/2019 | 128173 | CP | PHILIP MORRIS IN 3,125 06/03/33 | | Coupon Bond | EURO | 4.557.435,53 | 4.557.435,53 | 4.740.276,97 | 9.677,860 | 4.569.465,61 | 2,57683 | | |
| 6 | | | | | | | | | | | | | | | JN'19 | 19/30/06/2019 | 131431 | AC | ASFINAG 2,750 06/18/32 C 2,125 06/03/33 | | Coupon Bond | EURO | 9.750.000,00 | 12.182.596,18 | 12.305.631,84 | 23.345,780 | 12.273.482,02 | 2,11599 | | |
| 7 | | | | | | | | | | | | | | | JN'19 | 19/30/06/2019 | 131431 | SC | GENERALI MONEY MKT-A EUR AC... | | Unit Fund Money | EURO | 54.868.099,43 | 54.868.099,43 | 54.856.075,58 | 9.750,000 | 53.435.175,26 | -0,01906 | | |
| 8 | | | | | | | | | | | | | | | JN'19 | 19/30/06/2019 | 141431 | CP | CEZ 2,500 06/03/33 | | Coupon Bond | EURO | 1.477.992,87 | 1.477.992,87 | 1.478.492,99 | 9.945,630 | 1.478.367,91 | 2,39950 | | |
| Certified rate | | | | | | | | | | | | | | | Holdings detail | | Cash flows | | Graphs | | | | | | | | | | | |
| | | | | | | | | | | | | | | | Per. | Total income | Average capital total assets | Monthly certified rate | Total income (annual) | Average capital total assets (annual) | Annual certified rate | Coupon (incl. simulated assets) | Estimated dividends | Redemptions | Purchases | Sales (incl. simul.assets) | | | | |
| 1 | | | | | | | | | | | | | | | JN'19 | 3.228.601 | 2.484.739.324 | 1,58090 | 122.925.429 | 2.328.457.224 | 5,27927 | 1.748.859 | 0 | 0 | -12.250.000 | 3.264.512 | 3,92215 | 1,51757 | | |
| 2 | | | | | | | | | | | | | | | JL'19 | 3.337.517 | 2.480.773.619 | 1,58405 | 118.695.960 | 2.344.673.346 | 5,06237 | 3.925.999 | 0 | 139.384 | 0 | -242.068 | 3,20269 | 99,68254 | | |
| 3 | | | | | | | | | | | | | | | AU'19 | 3.326.048 | 2.484.047.337 | 1,57652 | 118.093.094 | 2.354.008.010 | 5,01668 | 1.312.766 | 0 | 0 | 0 | -169.779.584 | 3,63870 | 99,74602 | | |
| 4 | | | | | | | | | | | | | | | SE'19 | 3.225.270 | 2.487.379.981 | 1,57760 | 116.009.521 | 2.369.146.150 | 4,89668 | 1.912.825 | 0 | 0 | 0 | 0 | 5,98949 | 99,55845 | | |
| 5 | | | | | | | | | | | | | | | OC'19 | 3.333.614 | 2.490.476.883 | 1,57603 | 115.328.373 | 2.372.728.662 | 4,86058 | 2.081.002 | 0 | 139.885 | 0 | 0 | 9,76570 | 1,47274 | | |
| 6 | | | | | | | | | | | | | | | NO'19 | 3.211.967 | 2.493.261.105 | 1,56738 | 114.726.592 | 2.380.417.875 | 4,81960 | 2.772.325 | 0 | 0 | 0 | 0 | 7,19770 | 0,84092 | | |
| 7 | | | | | | | | | | | | | | | DE'19 | 3.333.694 | 2.496.289.238 | 1,57240 | 61.944.844 | 1.606.213.199 | 3,85658 | 2.944.692 | 0 | 0 | 0 | 0 | 2,78747 | 0,85240 | | |
| 8 | | | | | | | | | | | | | | | JA'20 | 3.335.619 | 2.499.089.288 | 1,57154 | 58.229.298 | 2.468.319.252 | 2,35907 | 5.410.832 | 0 | 140.584 | -12.800.513 | -72.163.315 | 9,99108 | 1,54347 | | |
| 9 | | | | | | | | | | | | | | | FE'20 | 3.113.160 | 2.502.696.894 | 1,56563 | 59.307.093 | 2.463.662.167 | 2,40727 | 4.264.163 | 0 | 0 | 0 | 0 | 0,40452 | 1,60793 | | |
| 10 | | | | | | | | | | | | | | | MR'20 | 10.046.787 | 2.504.837.397 | 4,72257 | 46.452.288 | 2.517.072.153 | 1,84549 | 6.618.821 | 6.713.223 | 0 | -17.450.251 | -9.412.203 | 6,65109 | 102,57767 | | |
| 11 | | | | | | | | | | | | | | | AP'20 | 3.137.286 | 2.514.975.125 | 1,51772 | 46.210.118 | 2.509.877.621 | 1,84113 | 2.509.737 | 0 | 3.141.287 | 0 | 0 | 0 | 6,51524 | 102,12704 | |
| 12 | | | | | | | | | | | | | | | MA'20 | 3.305.176 | 2.518.598.489 | 1,54514 | 45.934.740 | 2.472.687.220 | 1,85769 | 6.218.049 | 0 | 0 | -11.847.789 | 0 | 8,09943 | 0,50000 | | |

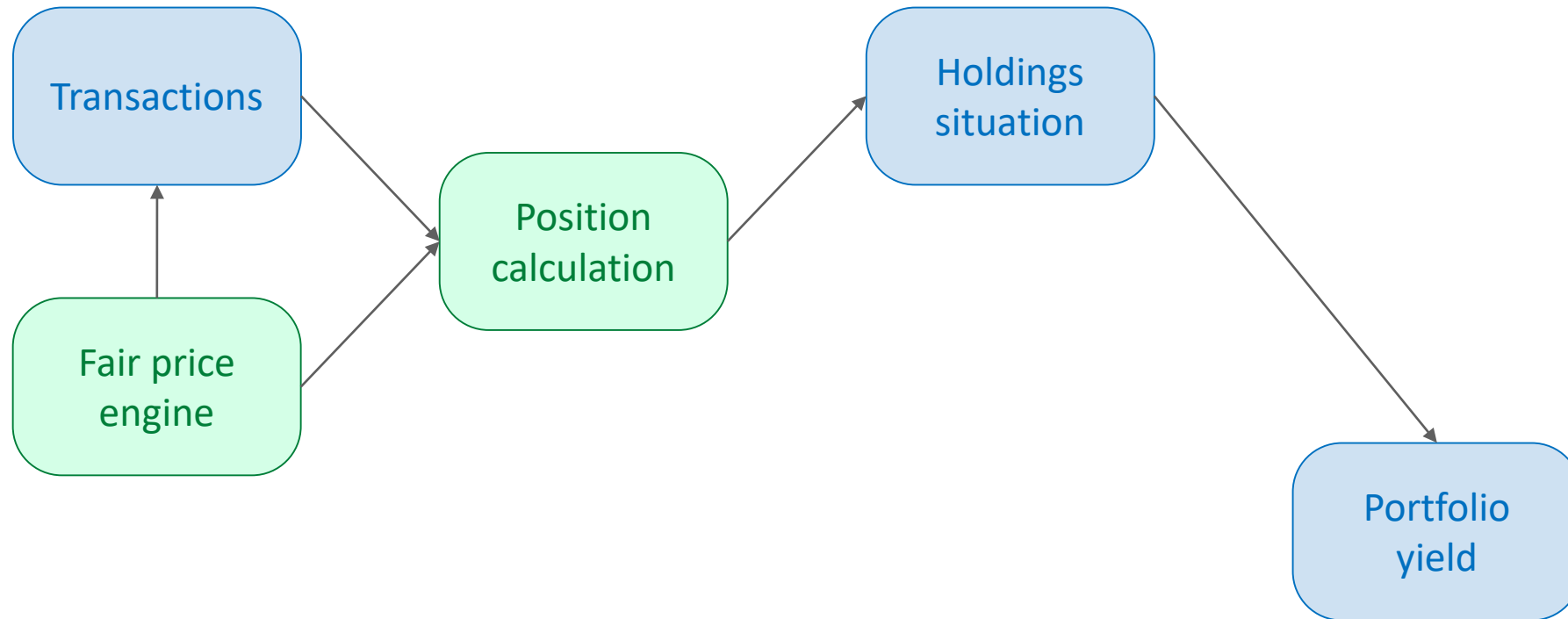
Asset and Liability Management

A **quite** simple scheme



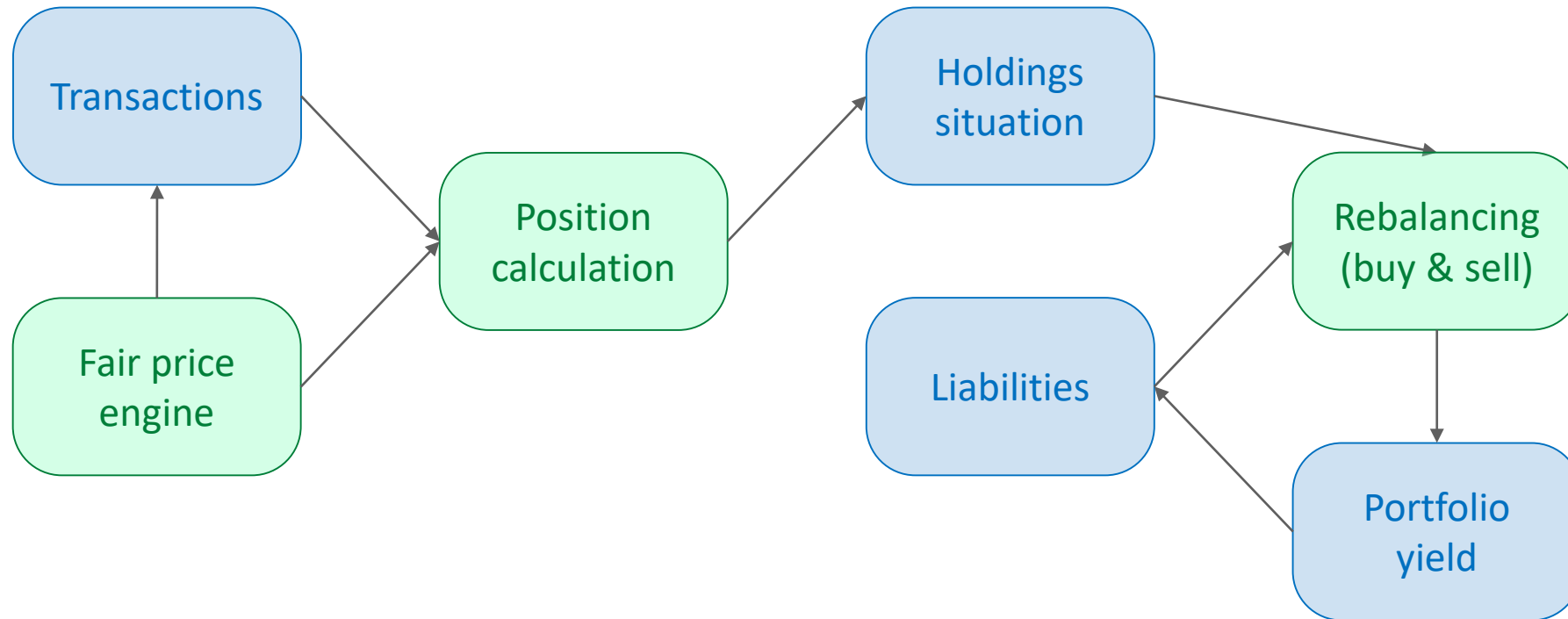
Asset and Liability Management

A **quite** simple scheme



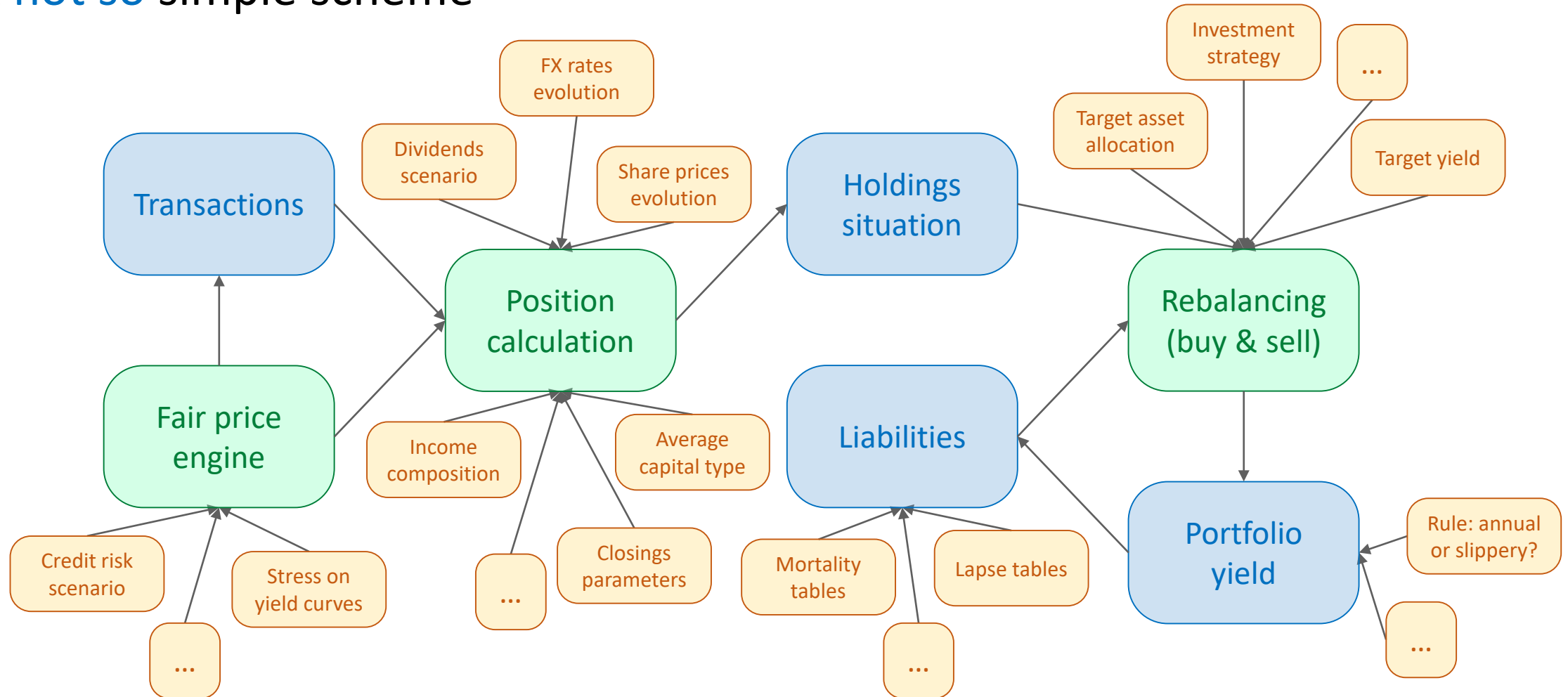
Asset and Liability Management

A **quite** simple scheme



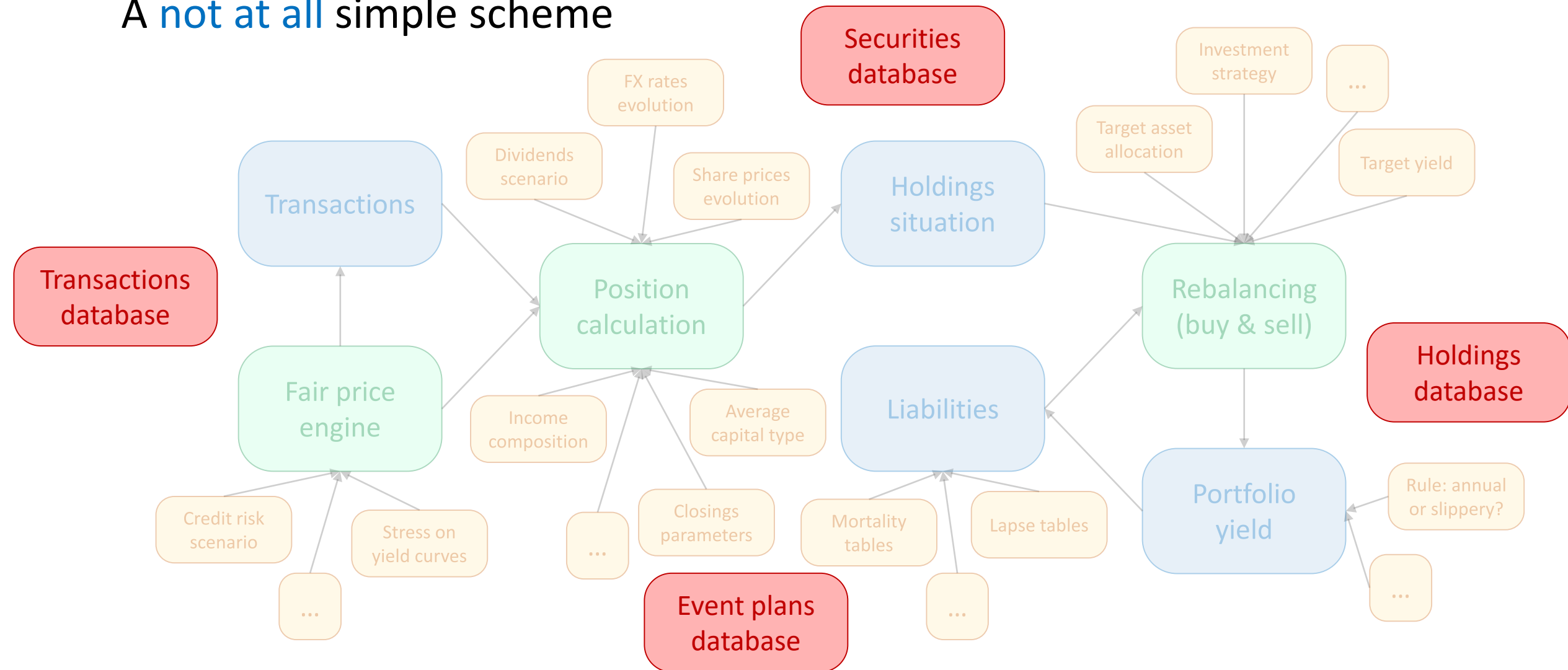
Asset and Liability Management

A **not so** simple scheme



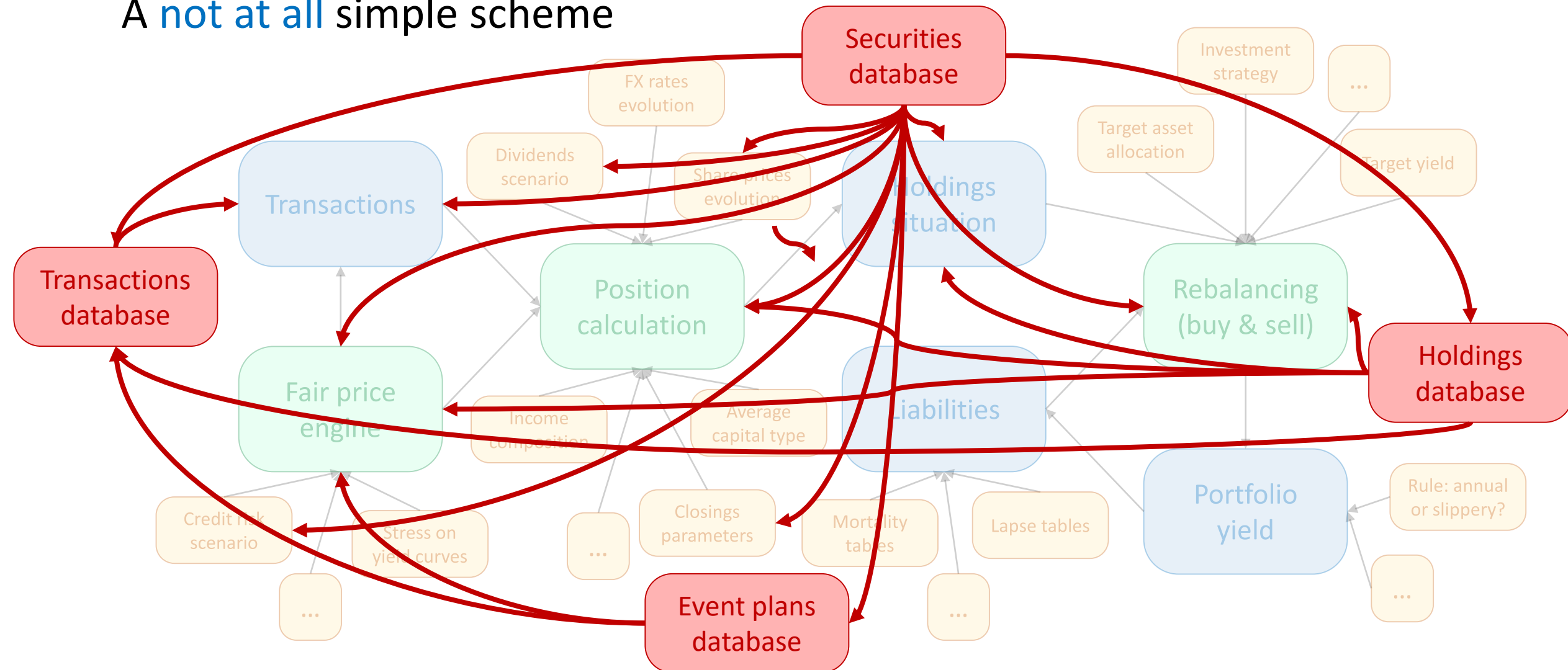
Asset and Liability Management

A **not at all** simple scheme



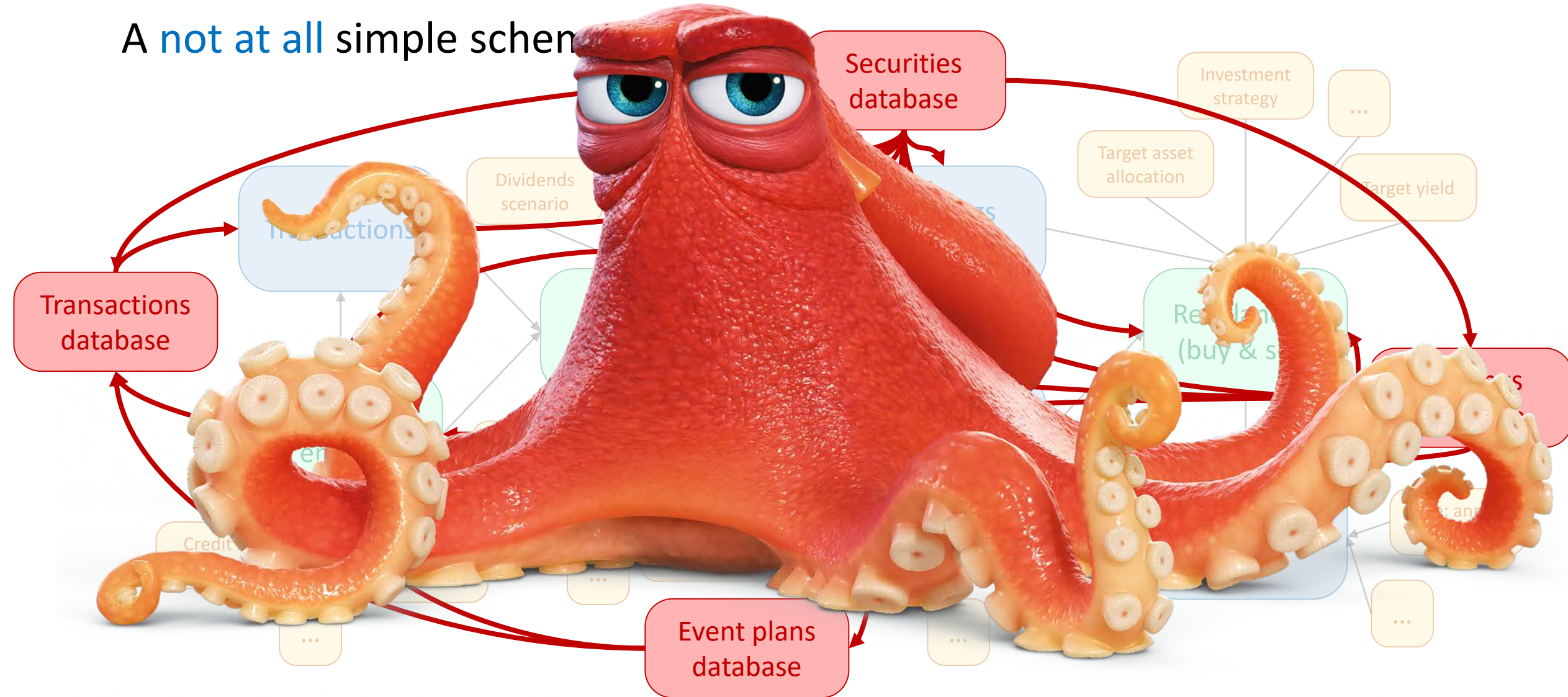
Asset and Liability Management

A **not at all** simple scheme



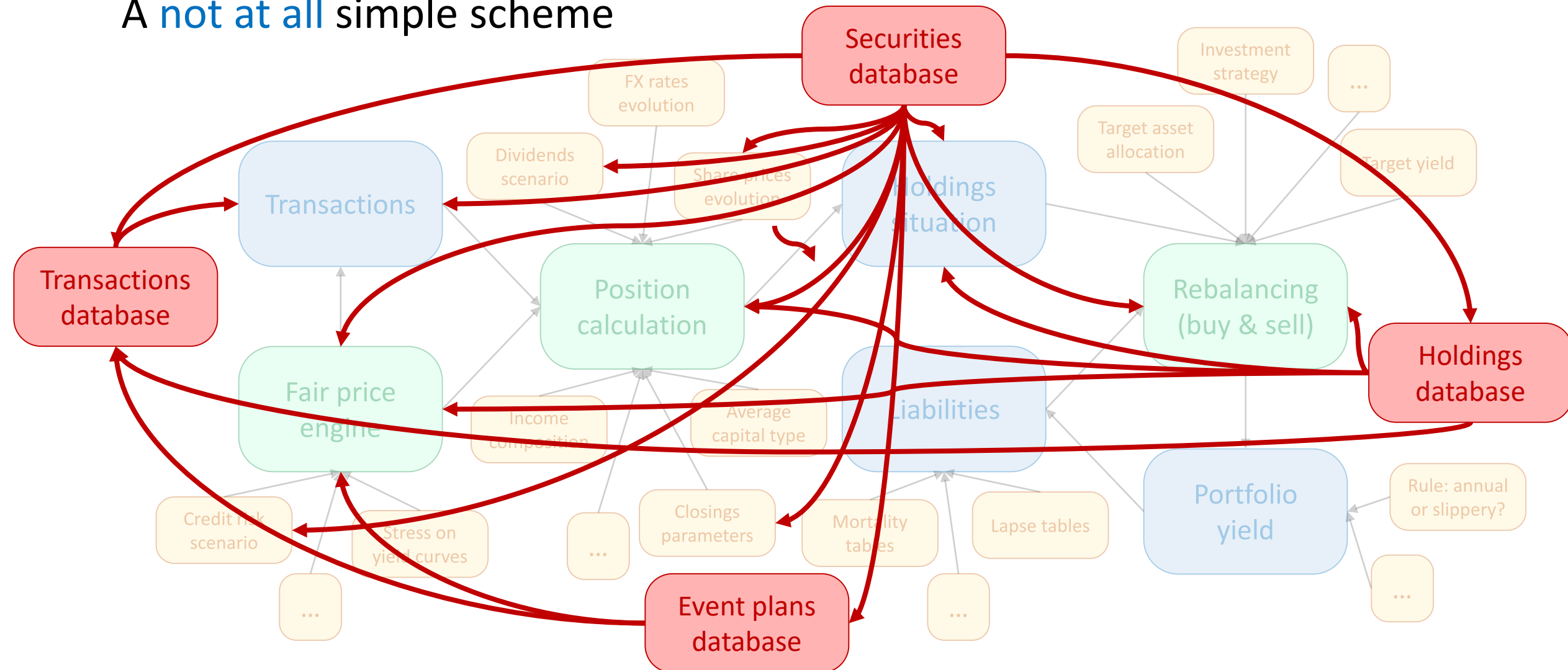
Asset and Liability Management

A **not at all** simple scheme



Asset and Liability Management

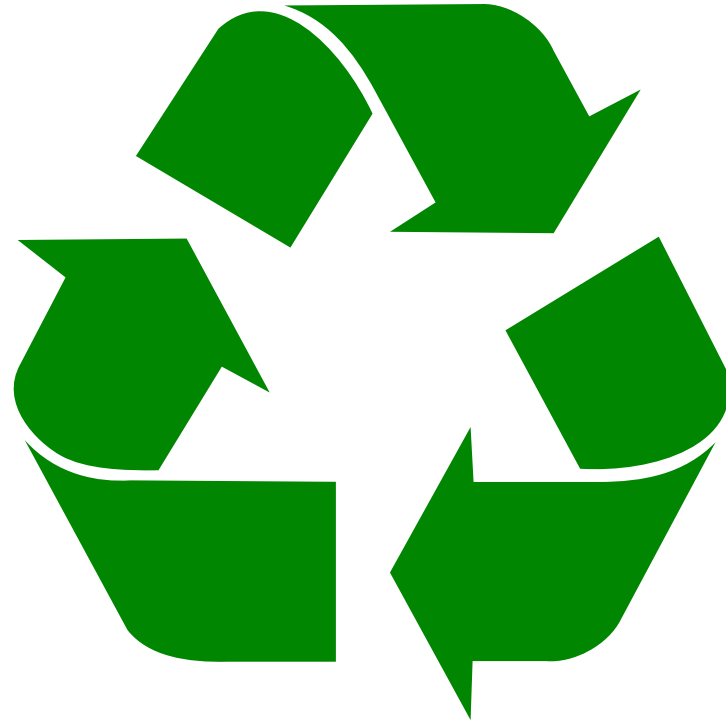
A **not at all** simple scheme



The new adventure

The game

- SimCorp was aiming to build Dimension's own ALM module
- Sofia had already learnt the ropes of ALM over the years
- So... We decided to go **green** and **reuse** some Sofia code!



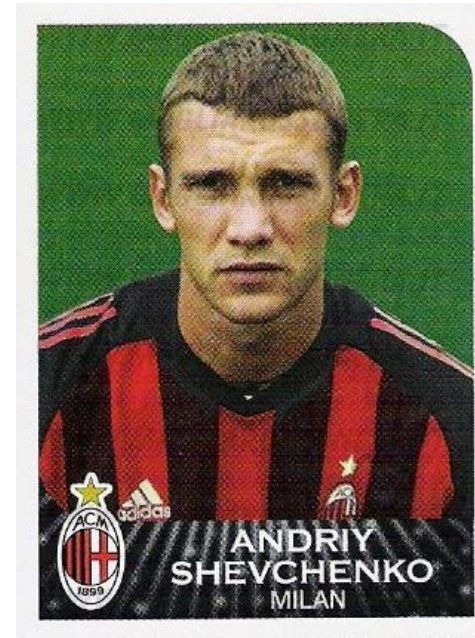
The new adventure

The players

- 2 scrums in Copenhagen
- 2 scrums in Kiev
- 3 programmers in Milan



Denmark



Ukraine



Italy

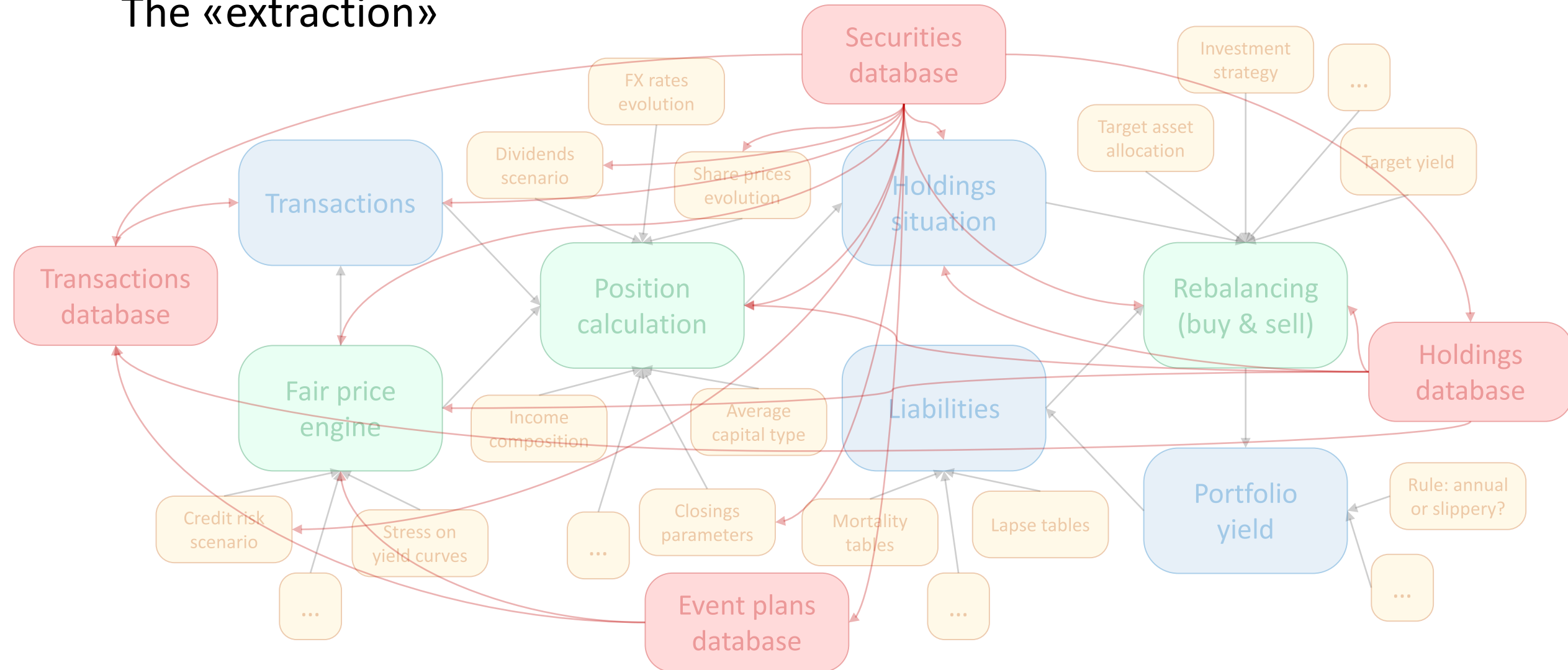
The new adventure

The players



The Rebalancing Component

The «extraction»



The Rebalancing Component

The «extraction»

**Rebalancing
(buy & sell)**

The Rebalancing Component

What it does

Rebalancing
(buy & sell)

- Reads transactions and holdings situation
- Sums all cash flows to get the total liquidity
- Buys and sells to achieve the target asset allocation
- Computes fair prices and cash flows of all new assets bought
- Iterates for each period

The Rebalancing Component

What it does, **what it needs to do it**

Rebalancing
(buy & sell)

- Reads transactions and holdings situation
 - Sums all cash flows to get the total liquidity
 - Buys and sells to achieve the target asset allocation
 - Computes fair prices and cash flows of all new assets bought
 - Iterates for each period
- Transactions and holdings situation stored in a «comfortable» data structure
 - Asset allocation classes
 - Asset allocation target weights
 - Fictitious assets information
 - Yield curves

The Rebalancing Component

The «extraction»: a few bumps along the way

Rebalancing
(buy & sell)

- Remove dependency on system-specific databases or tables
- Avoid reading and writing files for intermediate results
- Translate, map, adapt

The Rebalancing Component

Rebalancing
(buy & sell)

The «extraction»: a few bumps along the way

- Remove dependency on system-specific databases or tables
- Avoid reading and writing files for intermediate results
- Translate, map, adapt
- Refactor, refactor, refactor

«No guts, no glory...»



The Rebalancing Component

The architecture

Dimension

Position results



Asset allocation
classes and weights,
investment strategy,
yield curves



Rebalancing results



Rebalancing



Collect data



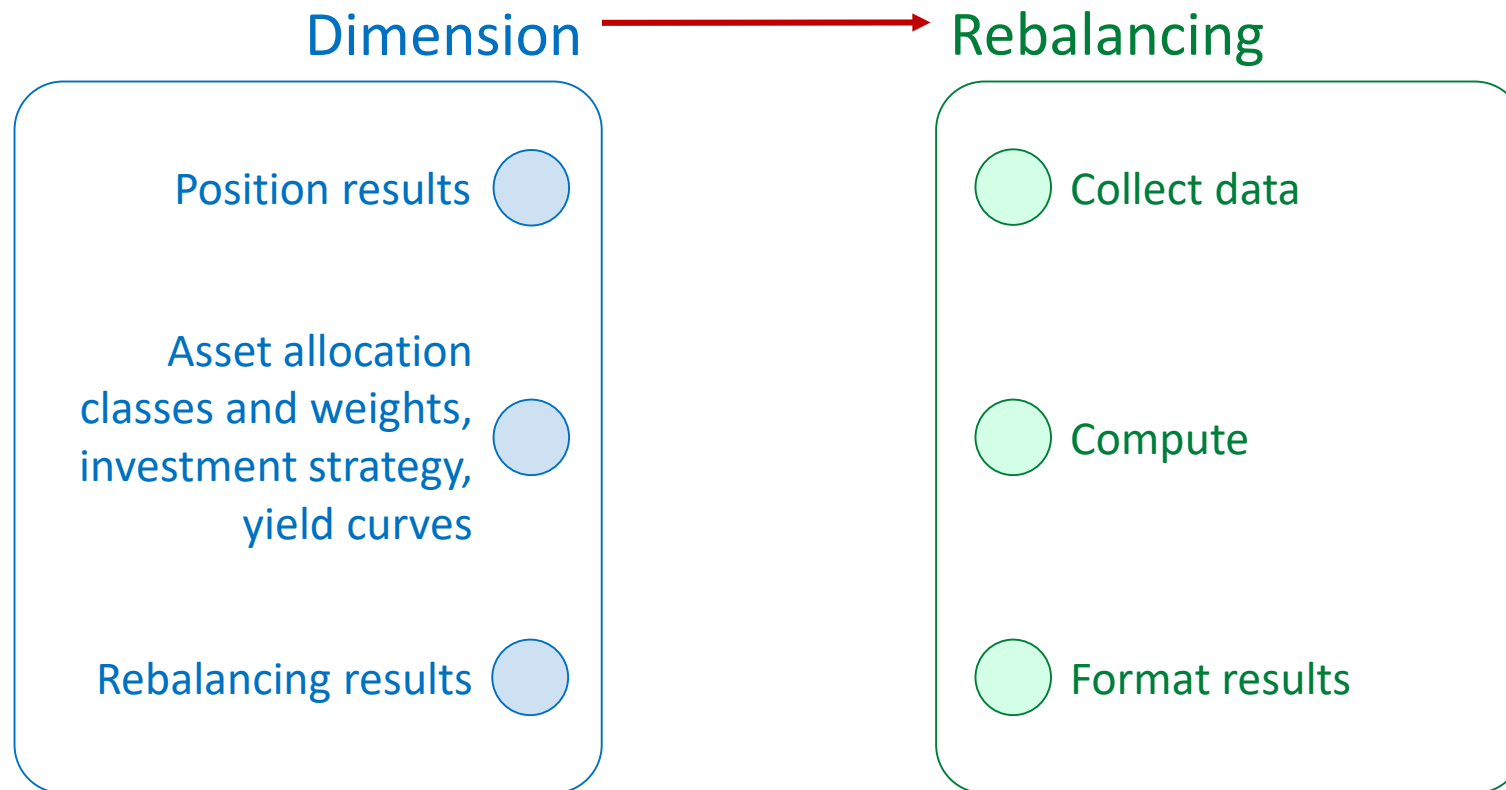
Compute



Format results

The Rebalancing Component

The architecture



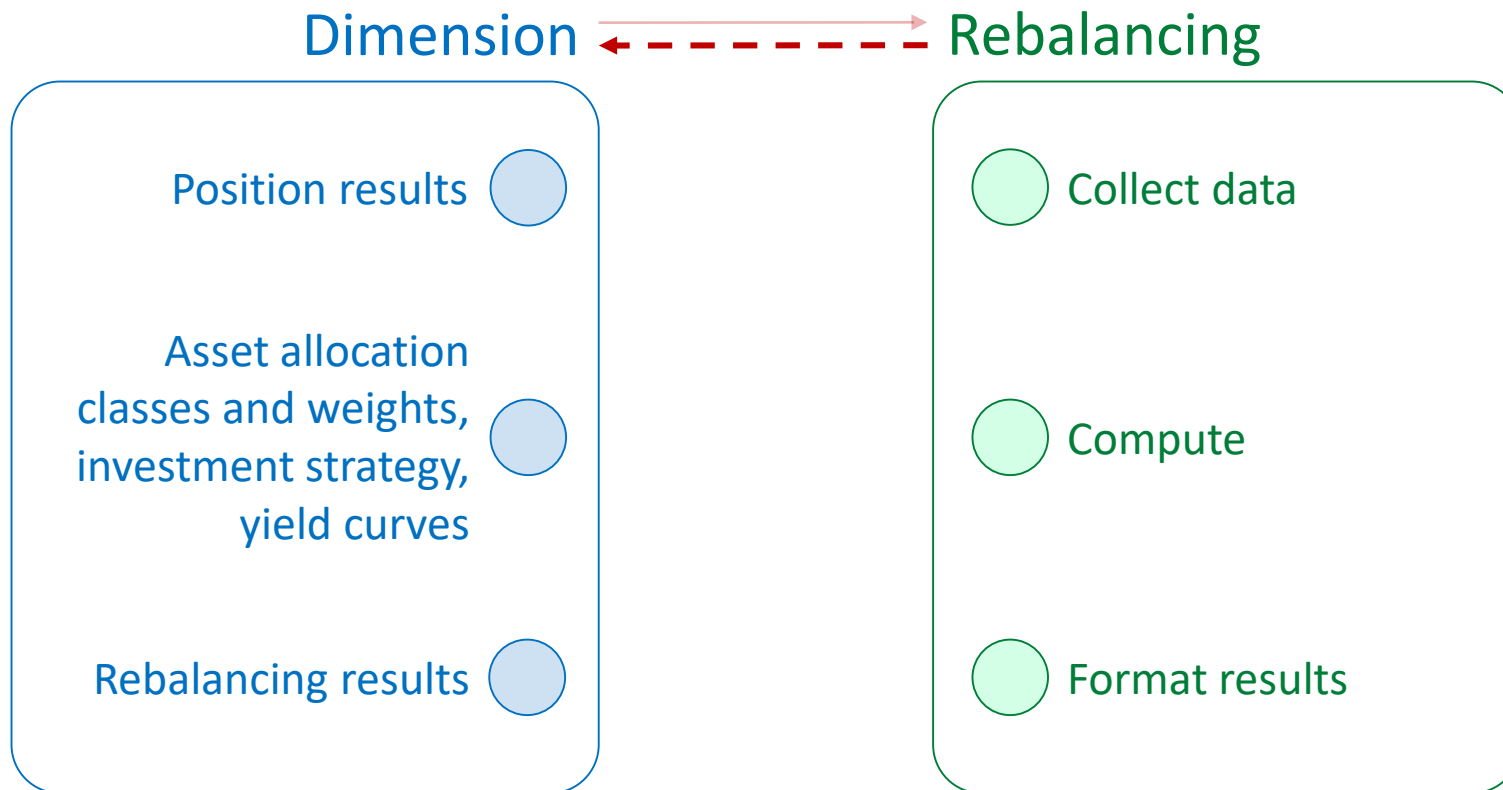
D: «Compute this!»

JSON:

```
{
  "positionService": "https://dk01sv8700.scdom...",
  "resultService": "https://dk01sv8700.scdom.n...",
  "targetAllocationDefinition": "NTTB D_GI SMA...",
  "dates": {
    "start": "2019-06-30",
    "end": "2021-12-31"
  },
  "forecast": "NTTB D_FRST SMALL",
  "accounting": "MAIN",
  "pricingProfile": "KYS PRICE",
  "portfolio": "",
  "portfolioGroup": "",
  "label": "NTTB 20_8",
  "instrumentTypes": [
    "Equity",
    "Fund certificate",
    "Bond",
    "Index bond",
    "ABS",
    "SSD"
  ],
  "logaat": 1
}
```


The Rebalancing Component

The architecture

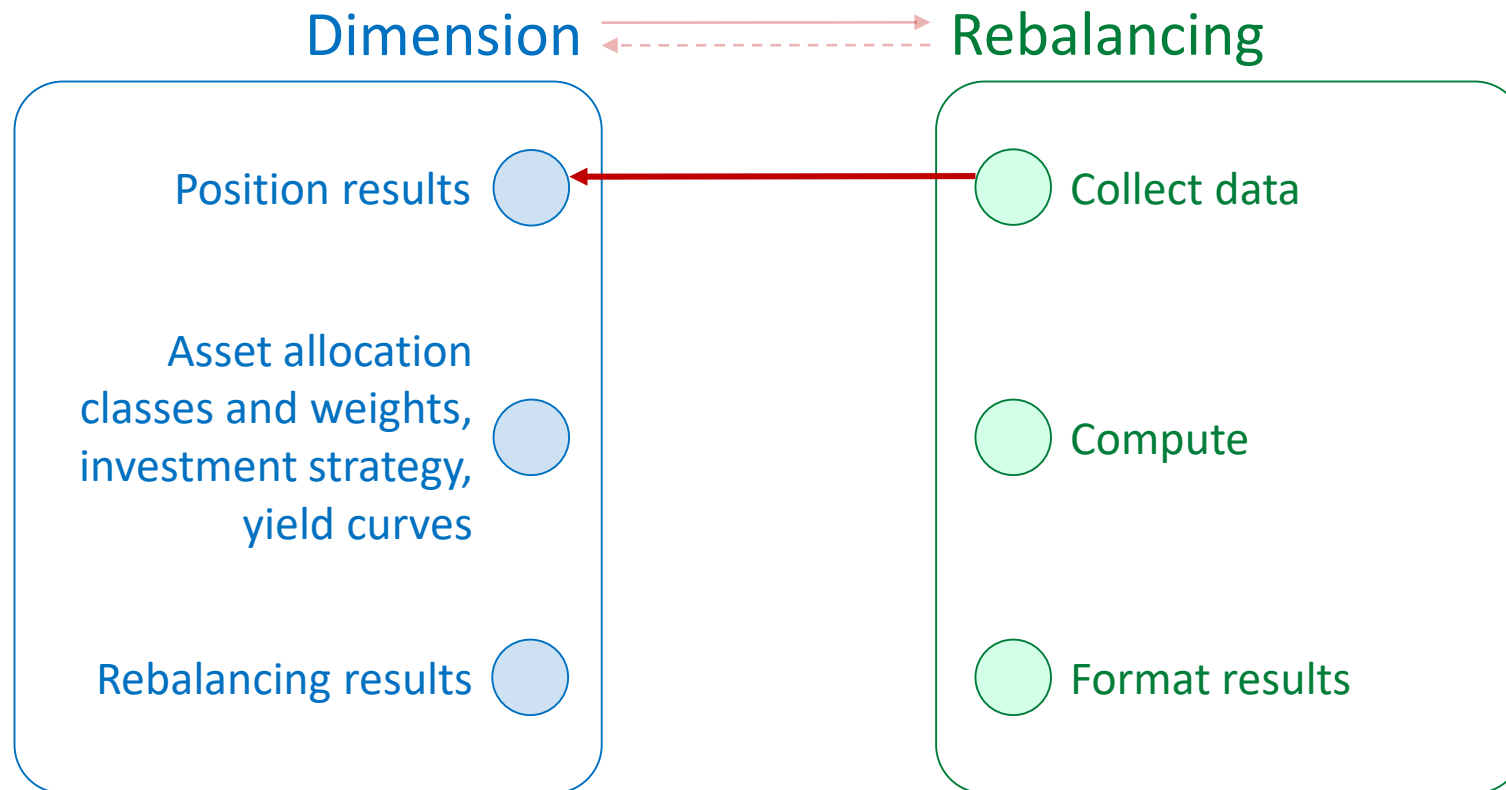


R: «Ok, work in progress»

```
JSON:
{
  "done": false,
  "reqid": "3ZCKKYMYPYWEXEXQPG44LTMW2M",
  "status": "inprogress",
  "log": [
    "2019-08-23 10:01:26Z [2] Checking argumen...",
    "2019-08-23 10:01:26Z [2] Starting",
    "2019-08-23 10:01:26Z [2] Defining paramet...",
    "2019-08-23 10:01:28Z [2] Querying: Positi...",
    "2019-08-23 10:01:28Z [2] ... batch receiv...",
    "2019-08-23 10:01:28Z [2] ... done",
    "2019-08-23 10:01:28Z [2] Converting the p...",
    "2019-08-23 10:01:28Z [2] Defining paramet..."
  ]
}
```

The Rebalancing Component

The architecture



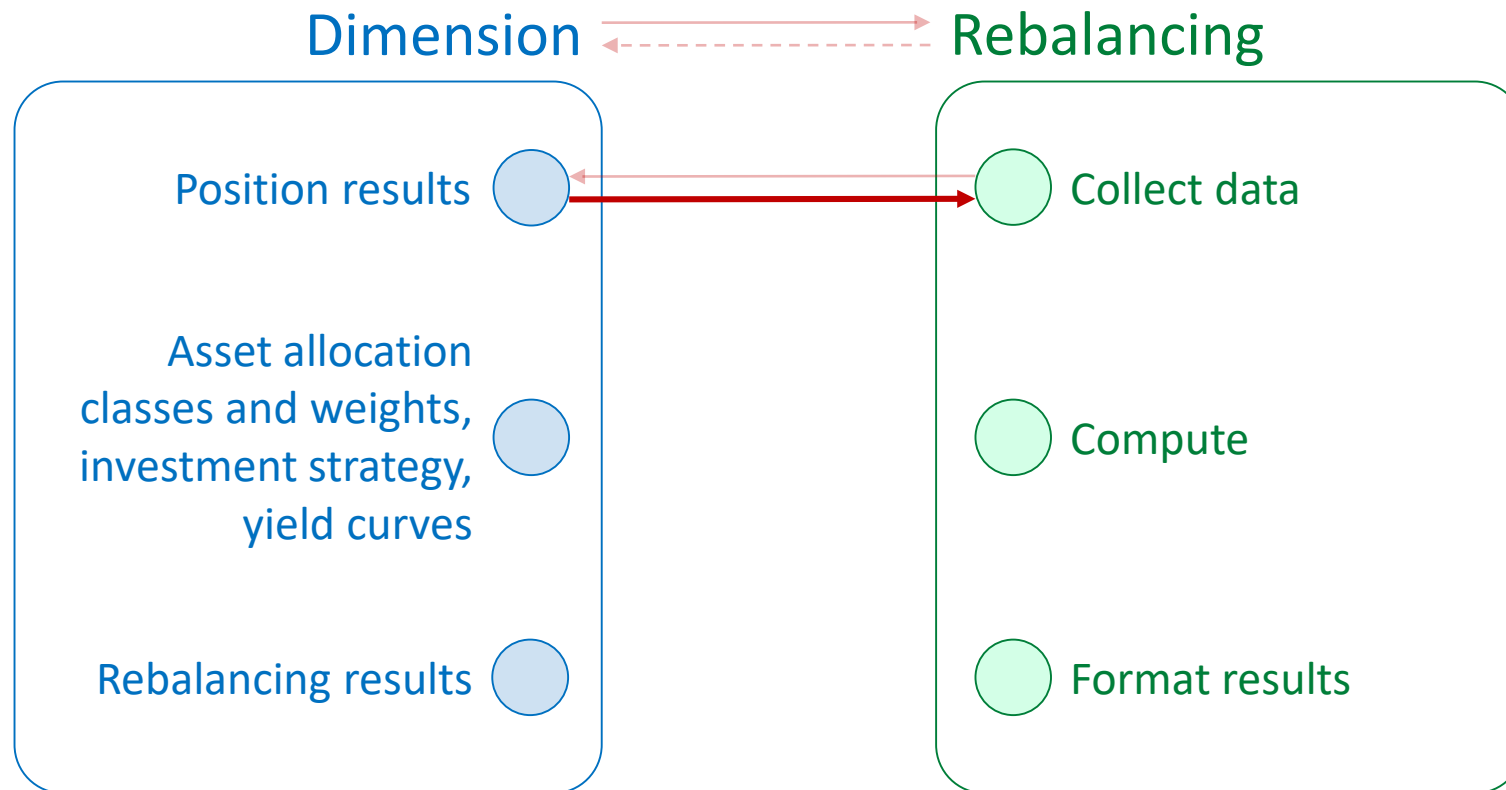
R: «Fetch me some data»

URL:

```
https://dk01sv8700.scdom.net:44300/odata/
PositionResult?$filter=(PositionCalculationId
eq 'NTTB D_FRST SMALL' and date(AnalysisDate)
ge 2019-06-30 and date(AnalysisDate) le
2021-12-31 and AccountingFramework eq 'MAIN'
and PricingProfile eq 'KYS PRICE' and
PositionType eq 'Original')&$select=
AnalysisDate,AccountingFramework,ExternalId,
InstrumentType,Portfolio,SecurityId,
Transactions,Nominal,AccruedInterestQC,
AccruedInterestPC,AccountingAnalytics,
CleanValueQC,CleanValuePC
```

The Rebalancing Component

The architecture



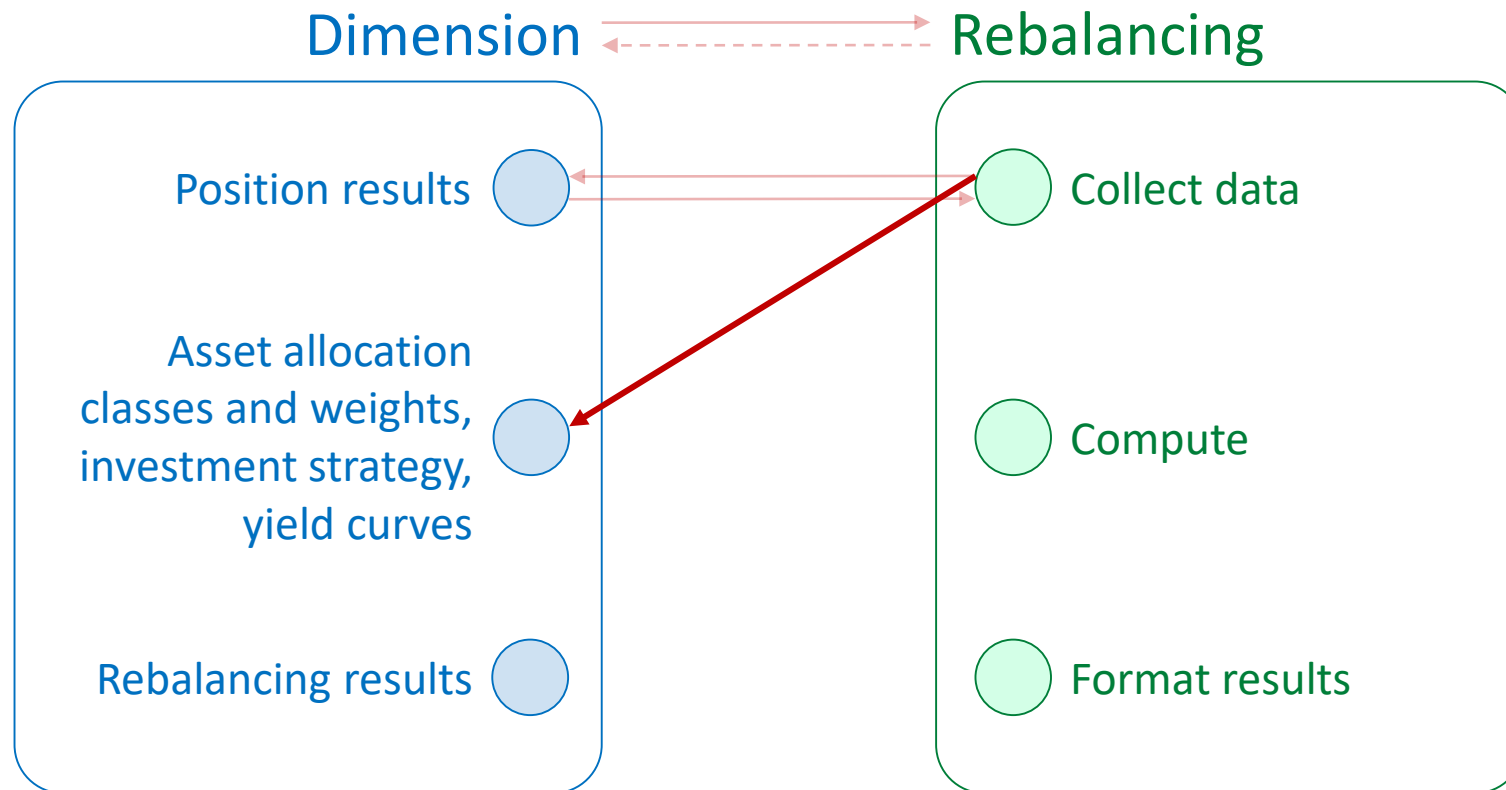
D: «Help yourself!»

JSON:

```
[
  {
    "AccruedInterestPC": 0,
    "AccruedInterestQC": 0,
    "AnalysisDate": "2020-08-31T02:00:00+02:00...",
    "CleanValuePC": 21000,
    "CleanValueQC": 21000,
    "ExternalId": "05f9a0a9-df36-47f4-afb7-94d...",
    "InstrumentType": "Equity",
    "Nominal": 1000,
    "Portfolio": "D_GI SMAL1",
    "SecurityId": "KYS EUR 01",
    "Transactions": [
      {
        "BankAccount": "D_GI BA1",
        "BusinessTransactionCode": "DividendPm...",
        "ElementaryTransactionCode": "Dividend...",
        "Nominal": 0,
        "NominalBasis": 1000,
        "PaymentAmountPC": 12000,
        "PaymentAmountQC": 12000,
        "PaymentDate": "2020-08-20T02:00:00+02:00...",
        "TradeDate": "2020-08-20T02:00:00+02:00..."
      }
    ]
  },
  "AccountingAnalytics": {
    ...
  }
]
```

The Rebalancing Component

The architecture



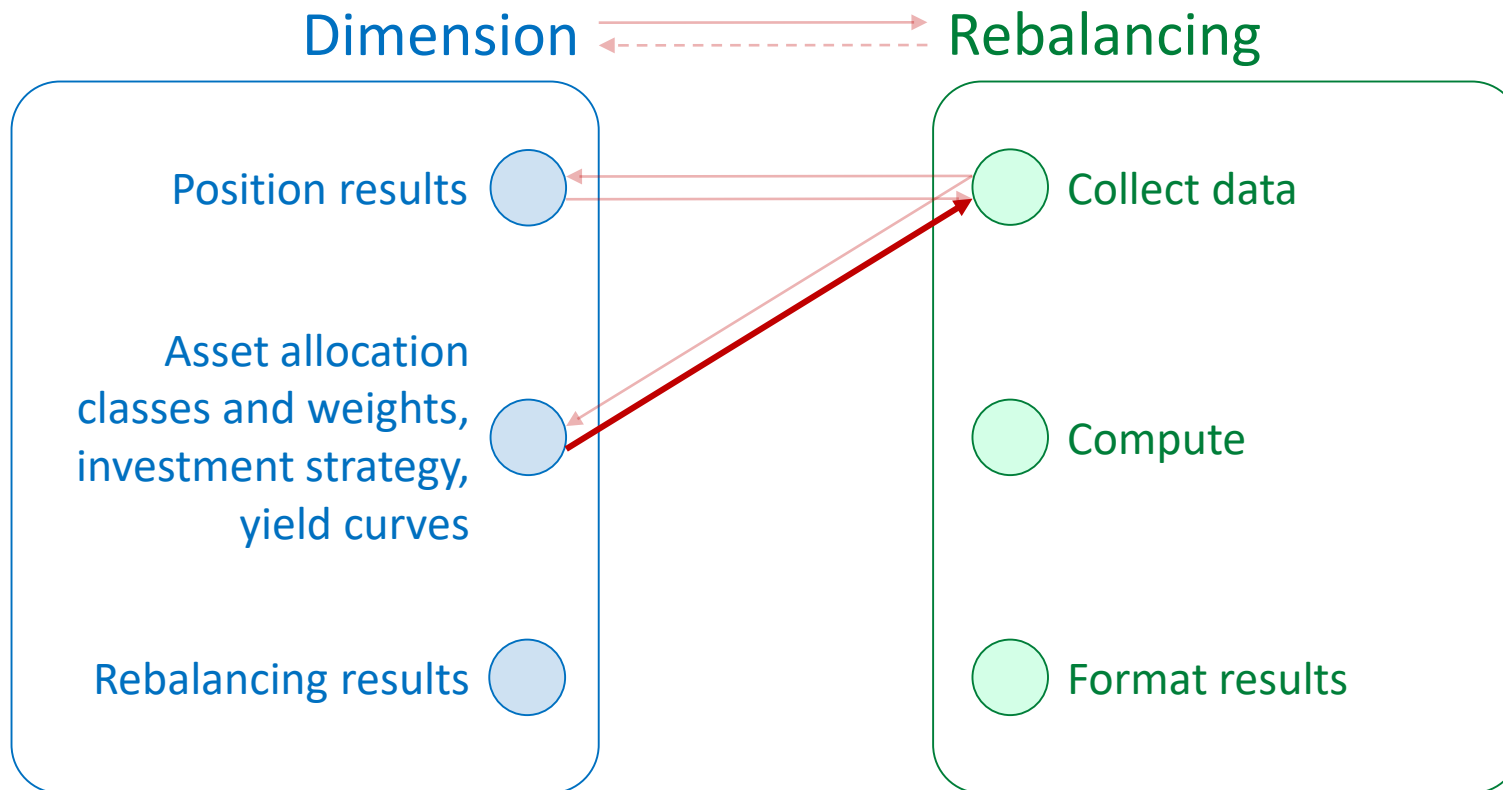
R: «Fetch me more data»

```
URL:
https://dk01sv8700.scdom.net:44300/odata/
  GetTargetAllocation

JSON BODY:
{
  "argument": {
    "FromDate": "2019-07-31",
    "TargetAllocationId": "NTTB D_GI SMALL2"
  }
}
```

The Rebalancing Component

The architecture

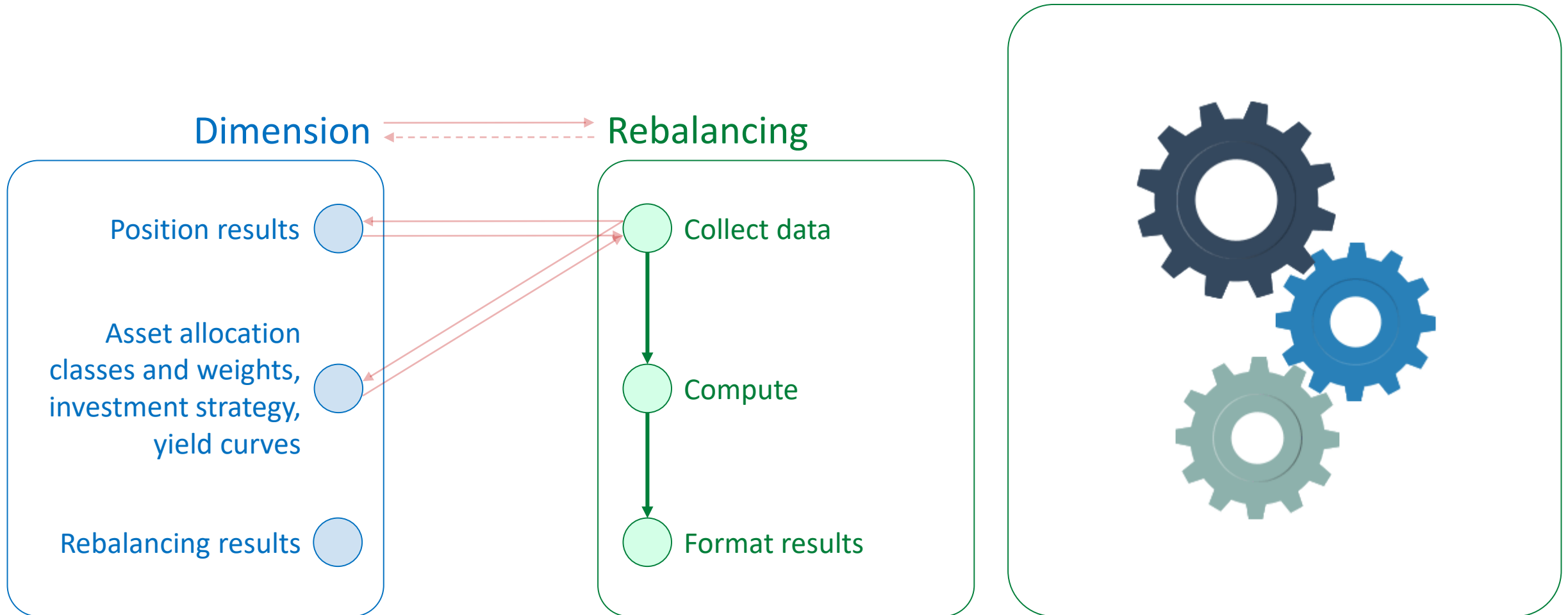


D: «There you go!»

```
{
  "TargetClasses": [
    {
      "Date": null,
      "TargetClassId": "LIQUIDITY",
      "TargetWeight": 0,
      "Tolerance": 0
    },
    {
      "Date": null,
      "TargetClassId": "NTTB ASSETS",
      "TargetWeight": 100,
      "Tolerance": 0
    }
  ],
  "RepresentativeSecurities": [
    {
      "AnnualCouponRate": 0,
      "CouponFrequency": "Quarterly",
      "Date": "2021-07-31T00:00:00+02:00",
      "PriceTypeCode": 5,
      "RepresentativeSecurityKey": 4257,
      "RepresentativeSecurityType": "FloatingR...",
      "TargetClassId": "NTTB ASSETS",
      "TargetWeight": 25,
      "TermToMaturity": 20,
      "YieldCurveId": "OAK ZC EUR"
    },
    ...
  ]
}
```

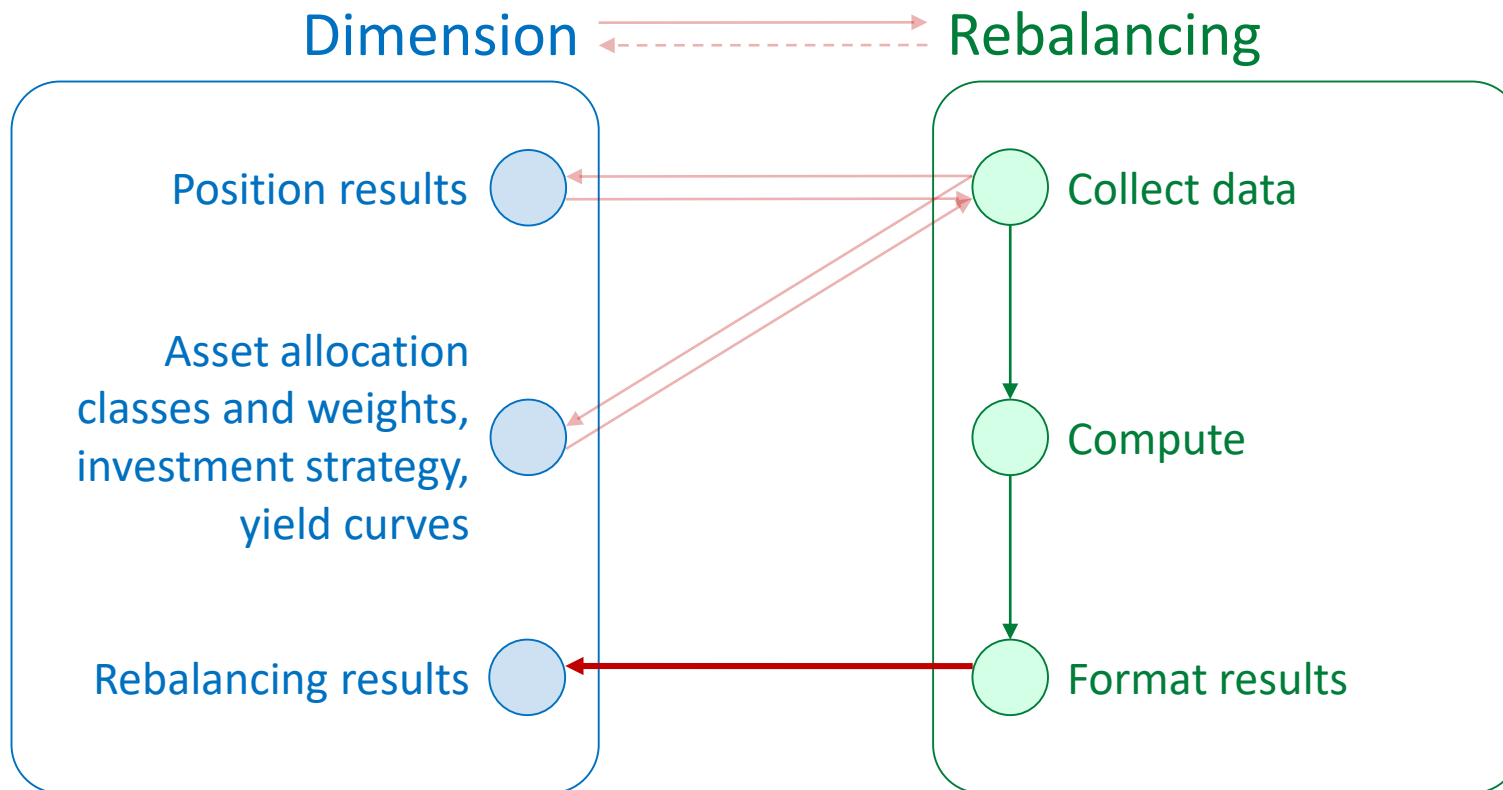
The Rebalancing Component

The architecture



The Rebalancing Component

The architecture



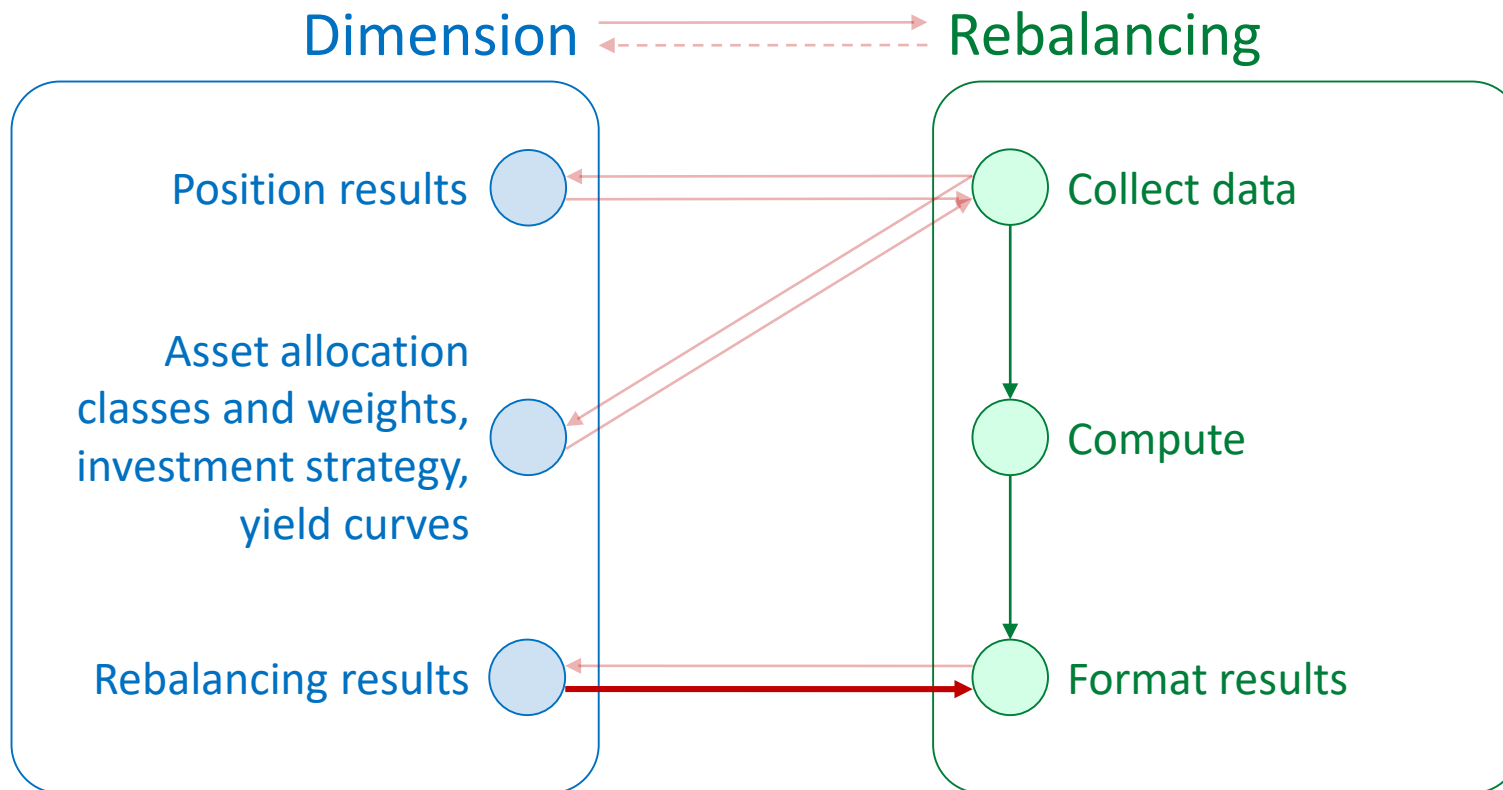
R: «Here's the result!»

JSON:

```
{
  "Portfolio": "",
  "PortfolioGroup": "",
  "PositionCalculationId": "NTTB D_FRST SMALL",
  "WhatIfLabel": "NTTB 20_8",
  "Simulations": [
    {
      "TradeDate": "2019-07-31",
      "Transactions": [
        {
          "BusinessTransactionCode": "Buy",
          "FictitiousSecurityCode": 1000001,
          "Nominal": 9142,
          "RepresentativeSecurityKey": 3968,
          "ExternalId": ""
        }
      ]
    },
    {
      "TradeDate": "2019-08-31",
      "Transactions": [
        {
          "BusinessTransactionCode": "Buy",
          "FictitiousSecurityCode": 1000002,
          "Nominal": 11000,
          "RepresentativeSecurityKey": 3968
        }
      ]
    }
  ]
}
```

The Rebalancing Component

The architecture

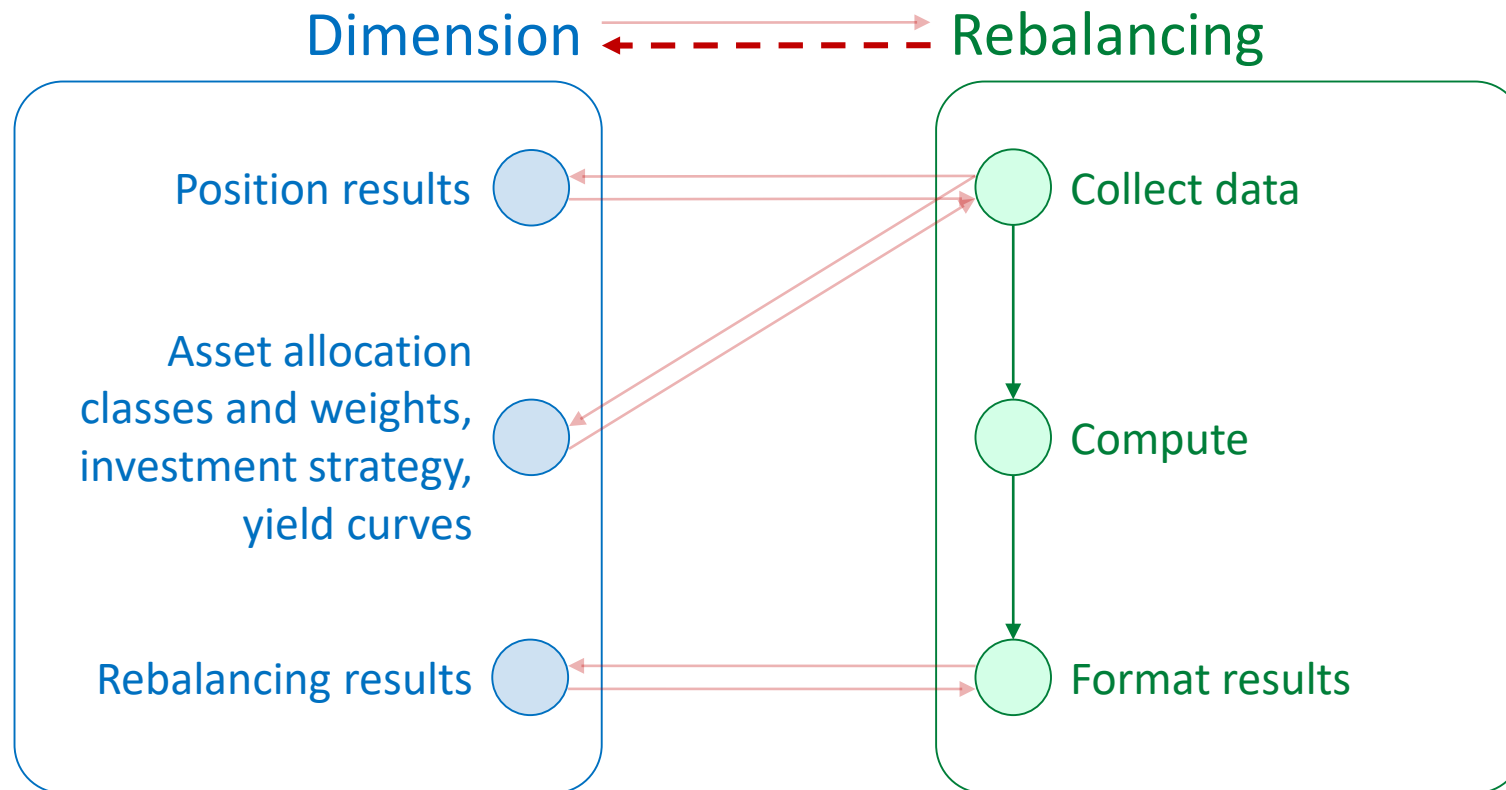


D: «Roger that!»

```
JSON:
{
  "response":{
    "IsOk":true,
    "Message":null
  }
  "statusCode":"OK"
}
```


The Rebalancing Component

The architecture



D: «I'm done!»

JSON:

```
{
  "done": true,
  "elapsed": 3719,
  "reqid": "3ZCKKYMYPYWEXEXQPG44LTMW2M",
  "status": "ok",
  "output": "https://dk01sv8700.scdom.net:4430...",
  "result": {
    "response": {
      "isOk": true,
      "Message": null
    },
    "statusCode": "OK"
  },
  "log": [
    "2019-08-23 10:01:26Z [2] Checking argumen...",
    "2019-08-23 10:01:26Z [2] Starting",
    "2019-08-23 10:01:26Z [2] Defining paramet...",
    "2019-08-23 10:01:28Z [2] Querying: Positi...",
    "2019-08-23 10:01:28Z [2] ... batch receiv...",
    "2019-08-23 10:01:28Z [2] ... done",
    "2019-08-23 10:01:28Z [2] Converting the p...",
    "2019-08-23 10:01:28Z [2] Defining paramet...",
    "2019-08-23 10:01:28Z [2] Start the comput...",
    "2019-08-23 10:01:29Z [2] Formatting the r...",
    "2019-08-23 10:01:31Z [2] Result sent to: ..."
  ]
}
```

The Rebalancing Component

Demo time...