APPENDIX B

MJ HUDSON Allenbridge

Strategic Asset Allocation Review

London Borough of Bromley Pension Fund

DECEMBER 2019

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Background and Requirements

The London Borough of Bromley Pension Fund ("the Fund") requirement was for MJ Hudson Allenbridge to undertake an overall strategic asset allocation ("SAA") exercise for the Fund. We will consider the funding position and associated impact on cashflow contributions to meet the Fund's immediate and long-term liabilities when undertaking an asset liability model ("ALM") review, which will follow later. In this report, we undertook an asset only SAA modelling exercise, which will generate a portfolio that maximises the expected returns, for a given level of risk, within the given portfolio constraints. The portfolio should be expected to exceed the actuarial return on investment assumptions which we have taken as the future service required return target of CPI+2.25%. This is because the Fund's membership is relatively mature (the average age is 52 years), as such the post retirement return assumption will drive the majority of the liabilities. This amounts to a target return greater than 3.75% at the current time (CPI was 1.5% in October 2019). If we assume the Bank of England's inflation target of 2% for CPI and add 2.25%, we get an investment return target of 4.25%. We added a margin for prudence (a conservative 0.25% outperformance of the target) and hence the portfolio is targeting an investment return of above 4.50% which is what we have used in our modelling.

This document:

- Sets out 4 potential long-term SAA portfolios for the Fund resulting from the SAA analysis;
- Details the modelling, key constraints and determination of assumptions;
- Provides key considerations for the SAA going forward and details any recommended changes.

Recommendation

Based on our Long-Term Capital Market Assumptions ("LTCMA") we believe the Fund can retain a targeted investment return over and above the level assumed by the actuary. This can be achieved by the existing SAA but can also be achieved at a lower risk exposure than the current portfolio and we have made recommendations to effect this. In addition, our recommended changes add to the yield of the Fund thereby aiding the cash flow generated to cover the forecast cash outflows predicted by the actuary.

A. STRATEGIC ASSET ALLOCATION

We recommend 4 potential long-term asset allocations for consideration:

1) Rebalance to the current SAA, move all existing assets to distribution units to aid cash generation.

At present Baillie Gifford Global Alpha Growth Fund, Baillie Gifford Fixed Interest, Fidelity Institutional UK Aggregate Bond Fund and MFS Global Equity Fund are held as accumulation units. If all four portfolios were moved from accumulation to distribution units, this would meet the Fund's cash outflow forecast with an estimated annual income distribution of £23.1 million by 2025/2026[1]. Any further increases in distributions required by the Fund will require changes to the strategic asset allocation or monthly divestments from the Fund assets.

Using the current SAA and our LTCMA this suggests a return of 4.56% per annum for this portfolio which is above our long-term return requirement of a 4.5% return.

2) Multi-Asset Credit ("MAC") Portfolio

The Fund should decrease the existing allocation within the current SAA to investment grade credit by 5% (from 15% to 10%). And add a 5% allocation into a new multi-asset credit portfolio, as this asset class is forecasted to add to the Fund's return and boost cash flow, however this does increase risk.

3) 55% Equity Portfolio

[1] Figures came from the Fund's actuary (Mercer) – see table 6

The Fund should decrease the existing allocation within the current SAA as follows:

- Investment grade credit by 5% (from 15% to 10%);
- Global equities by 5% (from 60% to 55%).

And add/increase allocations into:

- 5% new allocation into multi-asset credit, as this asset class is forecasted to add to the Fund's return and boost cash flow, however this does increase risk;
- 5% allocation to global property as this adds diversification and reduces risk with no loss of return or cash flow.

As an alternative to investing in global property this could be achieved by increasing the weighting in multi-asset income ("MAI") and UK commercial property by 2.5% each. The advantage is that these are existing portfolios, however, the near term (2-3 years) outlook for the UK property market is uncertain and return forecasts are below those for international property. Increasing the multi-asset income weighting does increase the Fund's exposure to equities and higher yielding credit so it's not so diversifying.

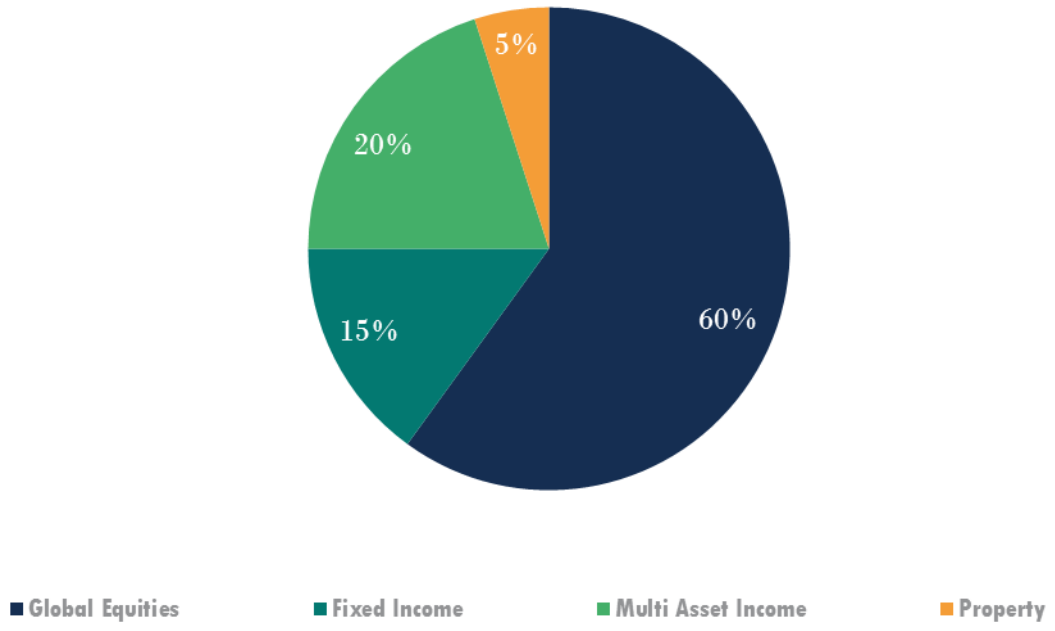
4) 50% Equity Portfolio

The Fund can further improve returns and diversify the 55% equity portfolio further by:

- Reducing the equities allocation by an additional 5% (from 55% to 50%);
- Investing 2.5% into a global infrastructure fund and 2.5% into a private equity fund. This will decrease risk further and aid cash flow as well as very marginally increase return. Our recommendation for these styles of assets would be to target equity like returns but with acceptable levels of leverage limits at both at the Fund and underlying asset level.

Our understanding is that the Fund has a long-term investment horizon and is thereby prepared to accept short term volatility or illiquidity in order to achieve higher investment returns. The Fund believes that, over the longer-term, equities are expected to outperform other liquid assets e.g. government bonds. As such the portfolio should still incorporate a significant allocation to equities.

CHART 1: CURRENT STRATEGIC ASSET ALLOCATION



Source: London Borough of Bromley Pension Fund, MJ Hudson Allenbridge

B. CURRENT PORTFOLIO

As of 30th September 2019, the Fund had a value of £1,117,687,367, which was invested across four managers: Baillie Gifford, Fidelity, MFS and Schroders.

TABLE 1: FUND ALLOCATION AS OF SEPTEMBER 2019

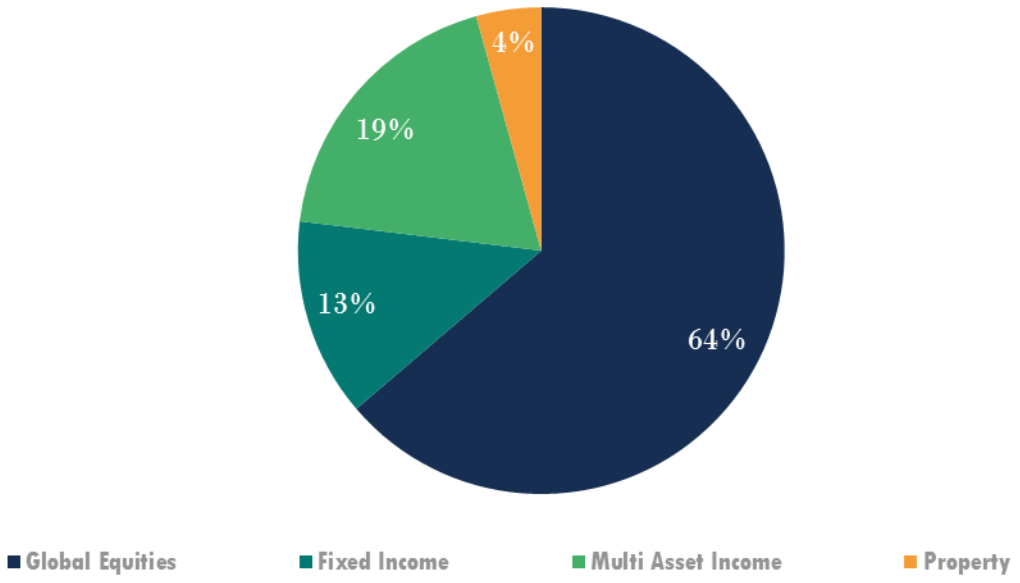
Fund	Asset Class	Valuation as of 30/09/19	% of total portfolio
Baillie Gifford Global Alpha Growth Fund	Global Equities	£451,324,481	40.4%
Baillie Gifford Fixed Interest	Fixed Income	£63,045,534	5.6%
Fidelity Institutional UK Aggregate Bond Fund	Fixed Income	£84,415,277	7.6%
Fidelity Institutional Diversified Income Fund	Multi Asset Income Fund	£93,406,798	8.4%
Fidelity UK Pooled Property Fund	Property Fund	£48,197,824	4.3%
MFS Global Equity Fund	Global Equities	£261,044,066	23.4%
Schroder Multi Asset Income Fund	Multi Asset Income Fund	£116,253,387	10.4%

Note: Figures may not add to 100% due to rounding

Source: London Borough of Bromley Pension Fund, MJ Hudson Allenbridge

Chart 2 shows the Fund's current tactical asset allocation as of 30th September 2019. As can be seen below, the Fund is currently overweight equities by 4% by market value compared to the SAA and underweight the other three asset classes.

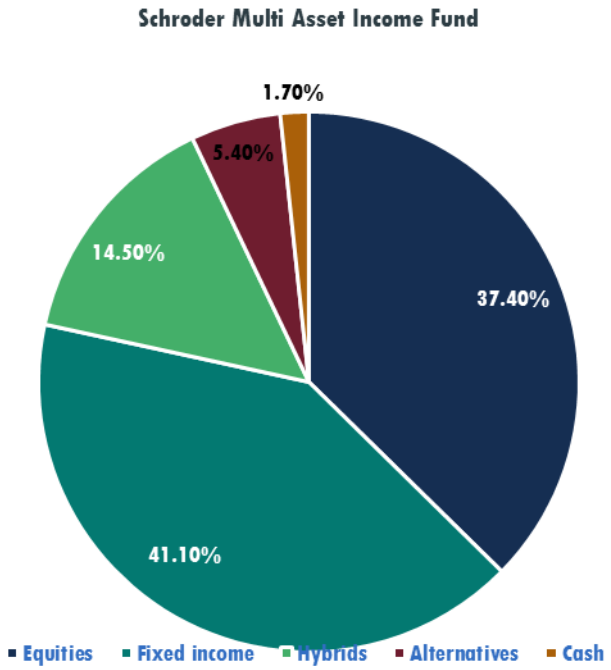
CHART 2: CURRENT TACTICAL ASSET ALLOCATION

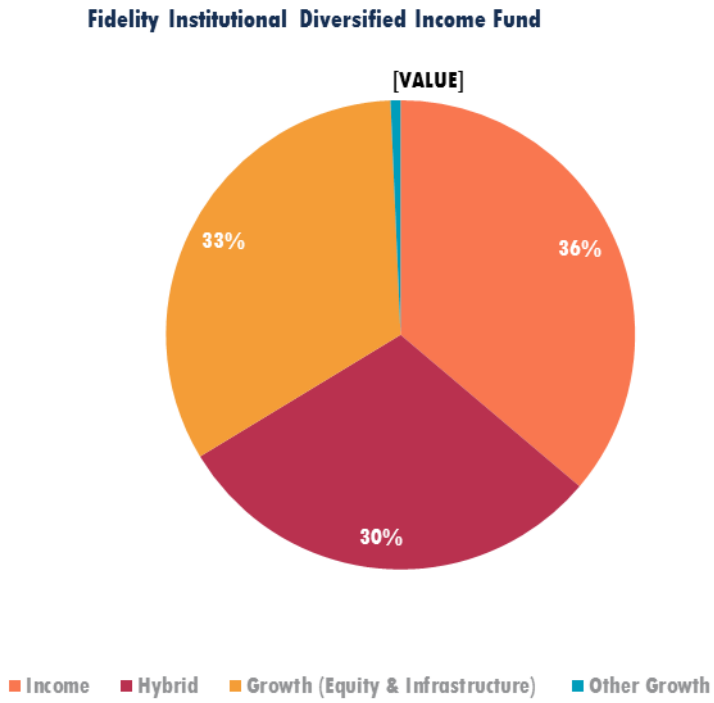


Source: London Borough of Bromley Pension Fund, MJ Hudson Allenbridge

It is important to note that multi-asset income funds can invest across a wide range of asset classes. Schroders and Fidelity as of September 2019 had an allocation of 37.4% and 22.8% of their MAI portfolios invested in equities, meaning the Fund's allocation to equities is substantially higher than the 64% quoted above – it increases the equities' asset allocation to 70%. Multi-asset income funds also have exposure to infrastructure, property and credit, as shown by the chart below.

CHART 3: MULTI-ASSET INCOME FUND BREAKDOWN AS OF 30TH SEPTEMBER 2019





Source: MJ Hudson Allenbridge, Schroders, Fidelity

The Recommended Strategic Asset Allocation

C. EFFICIENT FRONTIER

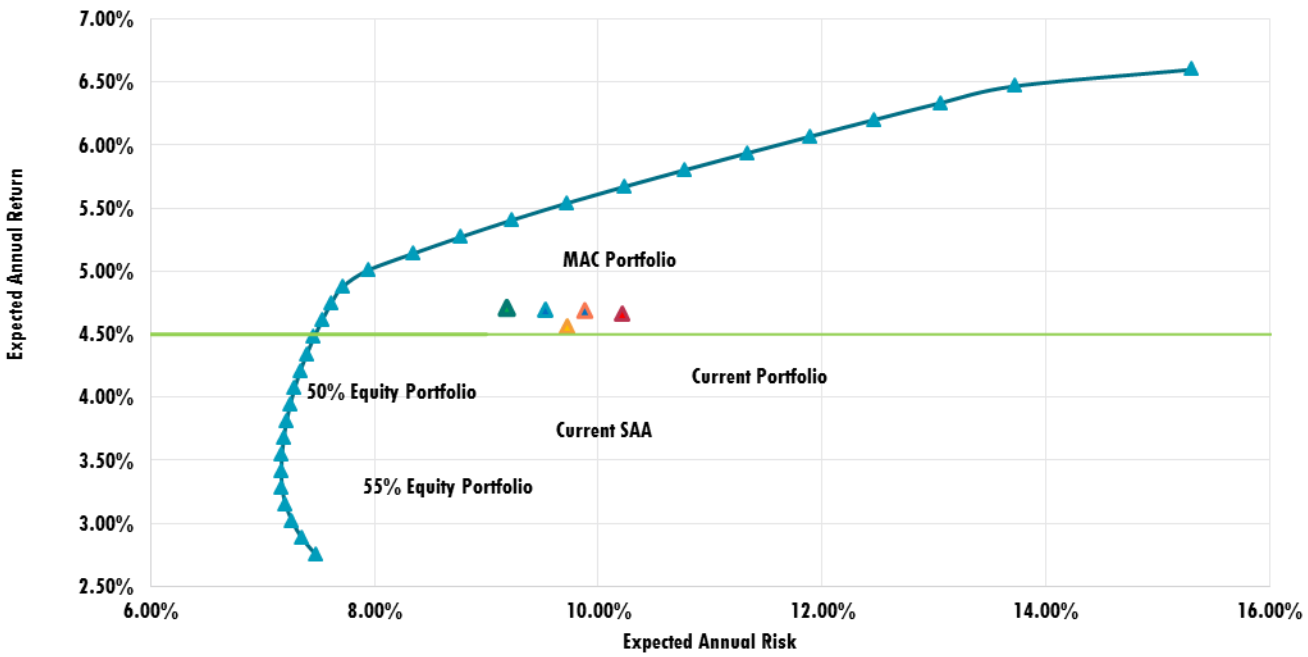
Chart 4 shows thirty modelled portfolios plotted by risk (i.e. expected volatility) and return, used to form an efficient frontier. The points on the efficient frontier represent the most efficient portfolios from a risk-return perspective, i.e. the lowest possible risk for a given level of return, based on the modelling assumptions and constraints. At the lowest risk level, the efficient portfolio would contain only cash; at the highest risk level the portfolio would contain only the asset classes with the highest assumed return; in this case, emerging market equities and private equity (see appendix).

To make these modelled portfolios more relevant we added in constraints which we believe reflect the requirements of the Fund and the investment beliefs of the Pensions Investment Sub Committee ("PISC"). We have constrained equities to a minimum of 50% and cash to a maximum of 1% (table 3 in the appendix shows the constraints that we have used and explains why). If we left the SAA model totally unconstrained it produces results which, whilst academically interesting, are not fit for purpose as the model does not require any diversification of asset classes. However, what is noticeable from these unconstrained models is that they skew away from equities as an asset class. This is because equities have traditionally been more volatile than other asset classes yet positively correlated particularly to those with a higher return assumption i.e. a more attractive risk/return payoff can be found outside equities. In addition, the model does not reflect the Fund's specific requirements of sufficient yield and liquidity. These Fund specific constraints are the reason why the current and recommended portfolios are not closer to the efficient frontier line.

The point highlighted in red represents the current position of the Fund at the time of the review. Note the current Fund's risk and return were calculated based on forward looking assumptions (table 2 in the appendix). As can be observed, the proposed portfolios (Option 3 - 55% equity and Option 4 – 50% equity mentioned below) have a materially lower risk for very similar returns. Moreover, the proposed target portfolios are more diversified, as are their sources of risk and return generation, providing for a more efficient and resilient investment portfolio.

The mean variance optimisation ("MVO") modelling yielded the following results:

CHART 4: EFFICIENT FRONTIER



Note: The green line represents the target return for the Fund

Source: MJ Hudson Allenbridge

D. RECOMMENDED ASSET ALLOCATIONS

We recognise and support the view of the PISC that equities provide an attractive long-term return for a pension fund and as such, we therefore introduced three levels of minimum equity weightings into the model and ran different scenarios:

A) Minimum 60% exposure to global equities
B) Minimum 55% exposure to global equities
C) Minimum 50% exposure to global equities

Further to this we have recognised the Fund's cash flow requirements by requiring each of the above portfolios to hold a minimum of 5% in UK commercial property and 20% in multi asset income. To set the constraint for MAI we have split out the underlying exposure of the MAI funds managed by Fidelity and Schroders into the relevant asset classes (see table 1 in appendix)

As a final constraint we have recognised the Fund's requirement for an element of liquidity by limiting the exposure to alternatives (illiquid asset classes) to 15%. Perhaps more controversially we have also required the models to hold a minimum of 10% in a combination of UK Gilts and UK investment grade credit. The rationale for this is that the model did not allocate to these asset classes at all due to the low returns and the more favourable profile of other asset classes. However, we were not comfortable with removing this allocation completely at the current time and have detailed our rationale below in the section on UK gilts. We have considered multiple scenarios and our approach has resulted in several proposals, summarised in table 2 below.

TABLE 2: RECOMMENDED ASSET ALLOCATIONS

	Current Portfolio	Option 1) Current SAA	Option 2) MAC Portfolio	Option 3) 55% Equity Portfolio	Option 4) 50% Equity Portfolio
Equities	64%	60%	60%	55%	50%
Multi Asset Income	19%	20%	20%	20%	20%
UK Gilts UK Investment Grade Corporate Bonds	13%	15%	10%	10%	10%
UK Real Estate	4%	5%	5%	5%	5%
Multi Asset Credit	0%	0%	5%	5%	5%
Global Real Estate	0%	0%	0%	5%	5%
Infrastructure	0%	0%	0%	0%	2.5%
Private Equity	0%	0%	0%	0%	2.5%

TABLE 3: EXPECTED STATISTICS OF THE RECOMMENDED ASSET ALLOCATIONS

Portfolio Characteristics	Current Portfolio	Option 1) Current SAA	Option 2) MAC Portfolio	Option 3) 55% Equity Portfolio	Option 4) 50% Equity Portfolio
Expected annual return	4.67%	4.56%	4.69%	4.69%	4.71%
Expected annual volatility	10.21%	9.72%	9.88%	9.52%	9.18%
Expected Sharpe ratio (Rf=1.8%)	0.28	0.28	0.29	0.30	0.32
Expected normal annual VaR (95%)	-12.13%	-11.43%	-11.56%	-10.97%	-10.40%
£ Annual VaR at 95%	£135,576,616	£127,783,986	£129,209,598	£122,626,785	£116,185,534

Source: MJ Hudson Allenbridge

Risk Considerations

A. THE MODEL

The portfolio optimisation was performed using MVO. This allowed us to consider the level of uncertainty (or expected volatility) directly in the model and to determine a portfolio with the highest expected returns for that level of volatility. However, the model did not consider the exposures of risk or liquidity risk explicitly. Also, an important consideration in the portfolio construction within each asset class is the choice of strategy and manager, which can be selected to increase diversification of the sources of risk within each asset class and make the portfolio more efficient and resilient.

B. CASHFLOW ASPECTS

TABLE 4: CURRENT YIELDS AS OF SEPTEMBER 2019

Fund	Income Producing	Valuation as of 30/09/19	Target Distribution Yield	Estimated Income Amount	Source
Baillie Gifford Global Alpha Growth Fund	No	£451,324,481	N/A	N/A	N/A
Baillie Gifford Fixed Interest	No	£63,045,534	N/A	N/A	N/A
Fidelity Institutional UK Aggregate Bond Fund	No	£84,415,277	N/A	N/A	N/A
Fidelity Institutional Diversified Income Fund	Yes	£93,406,798	4.5%	£4,203,300	Fidelity Quarterly Report
Fidelity UK Pooled Property Fund	Yes	£48,197,824	4.6%*	£2,217,100	Fidelity Factsheet
MFS Global Equity Fund	No	£261,044,066	N/A	N/A	N/A
Schroder Multi Asset Income Fund	Yes	£116,253,387	4.2%	£4,882,650	Schroders Quarterly Report

*Based upon the last 4 distributions paid as of 30th September 2019

Source: London Borough of Bromley Pension Fund, MJ Hudson Allenbridge, Baillie Gifford, Fidelity, MFS and Schroders

Table 4 shows the Fund is currently meeting its £10 million cash outflow requirement as the total estimated income for the portfolio is £11.3 million, however, the cash outflow for 2018/19 is calculated after receiving a deficit reduction payment. Going forward, in the absence of these payments the cash outflow is increased.

TABLE 5: ACCUMULATION FUNDS' YIELDS

Fund	Target Distribution Yield
Baillie Gifford Global Alpha Growth Fund	0.6%*
Baillie Gifford Fixed Interest	2.3%*
Fidelity Institutional UK Aggregate Bond Fund	1.9%**
MFS Global Equity Fund	2.3%**

*Based on September 2019 yields
**Based on October 2019 yields

Source: MJ Hudson Allenbridge, Baillie Gifford, Fidelity and MFS

From table 5, if Bromley currently were to switch accumulation funds into distribution funds this would enable the Fund to produce an estimated annual income of £23.1m, which would meet liabilities till 2025/2026 as per the actuary's cashflow projections in table 6. The timing of these switches can be done to fit the cash outflow requirements.

TABLE 6: ACTUARY'S CASHFLOW PROJECTIONS

Year	Total Liabilities	Total Expected Contributions	Cashflow Requirement
2019/2020	£38,561,464	£29,991,732	-£8,569,732
2020/2021	£36,815,253	£23,847,903	-£12,967,350
2021/2022	£37,400,869	£23,201,352	-£14,199,517
2022/2023	£38,923,085	£22,500,751	-£16,422,334
2023/2024	£39,631,760	£21,771,800	-£17,859,960
2024/2025	£41,306,377	£21,094,637	-£20,211,740
2025/2026	£42,112,541	£20,423,944	-£21,688,597
2026/2027	£43,836,662	£19,686,983	-£24,149,679
2027/2028	£44,001,093	£18,889,095	-£25,111,998
2028/2029	£44,810,421	£18,253,425	-£26,556,996
2029/2030	£45,843,761	£17,526,052	-£28,317,709
2030/2031	£46,567,530	£16,651,011	-£29,916,519
2031/2032	£47,363,374	£15,830,293	-£31,533,081
2032/2033	£47,528,565	£15,011,696	-£32,516,869
2033/2034	£48,601,969	£14,221,505	-£34,380,464
2034/2035	£49,470,990	£13,219,904	-£36,251,086
2035/2036	£49,378,817	£12,169,436	-£37,209,381
2036/2037	£49,603,677	£11,299,455	-£38,304,222
2037/2038	£49,318,393	£10,467,225	-£38,851,168
2038/2039	£49,078,451	£9,693,722	-£39,384,729
2039/2040	£48,624,935	£8,961,168	-£39,663,767
2040/2041	£48,423,455	£8,312,016	-£40,111,439

Source: London Borough of Bromley Pension Fund's Actuary (Mercer); MJ Hudson Allenbridge

TABLE 7: ESTIMATED CASHFLOWS FOR RECOMMENDED PORTFOLIOS

	Yields	Option 1) Current SAA	Option 2) MAC Portfolio	Option 3) 55% Equity Portfolio	Option 4) 50% Equity Portfolio
Equities	1.45%	£9,723,900	£9,723,900	£8,913,600	£8,103,200
Multi Asset Income	4.35%	£9,723,900	£9,723,900	£9,723,900	£9,723,900
UK Gilts UK Investment Grade Corporate Bonds	1.9%	£3,185,400	£2,123,600	£2,123,600	£2,123,600
UK Real Estate	4.60%	£2,570,700	£2,570,700	£2,570,700	£2,570,700
Global Real Estate	4.60%	£0	£0	£2,570,700	£2,570,700
Multi Asset Credit	4.35%	£0	£2,431,000	£2,431,000	£2,431,000
Infrastructure	4.00%*	£0	£0	£0	£1,117,700
Private Equity	0.00%	£0	£0	£0	£0
Estimated Total Income		£25,203,900	£26,573,100	£28,333,500	£28,640,800

*Based on MJ Hudson Allenbridge research on core infrastructure.
Note: Equity, MAI and bond yields were an average of the Fund's current managers' yields. MAC yields were the same as MAI and likewise with UK real estate and global real estate.

Source: MJ Hudson Allenbridge

Cashflows from the 55% equity portfolio (£28.6m) and 50% equity portfolio (£28.3m) show that the Fund can meet the cash requirement till 2029/2030. While the MAC portfolio will meet the cash requirement till 2028/2029 and the current SAA till 2027/2028.

C. STRESS TESTING

We have stressed the portfolios, by increasing the correlation coefficients by 20% (all negative correlations decreased in magnitude and positive correlations increased in magnitude) for all assets to simulate change in regime for the portfolios to see how the value at risk ("VaR") would change. In table 8, the more diversified portfolios (option 3 – 55% equity and option 4 – 50% equity portfolio) returned a lower VaR.

TABLE 8: STRESS TESTED PORTFOLIOS

Portfolio Characteristics under a 20% Increase in Correlations	Current Portfolio	Option 1) Current SAA	Option 2) MAC Portfolio	Option 3) 55% Equity Portfolio	Option 4) 50% Equity Portfolio
Expected annual return	4.67%	4.56%	4.69%	4.69%	4.71%
Expected annual volatility	10.37%	9.88%	10.07%	9.76%	9.47%
Expected Sharpe ratio (Rf=1.8%)	0.28	0.28	0.29	0.30	0.32
Expected normal annual VaR (95%)	-12.39%	-11.70%	-11.87%	-11.36%	-10.87%
£ Annual VaR at 95%	£138,504,804	£130,754,982	£132,704,489	£127,011,303	£121,543,163

Source: MJ Hudson Allenbridge

D. UK GILTS

The SAA review explicitly looks at long term returns. We monitor the LTCMA of the major asset managers, this enables us to see change in expectations at an early stage. We then challenge these assumptions amongst our senior advisers and research team to develop our own set of assumptions. Using these return expectations and the assumed volatility and correlations between asset class returns, we model the best asset class structure for the Fund on a 10-year view.

However, this tells us nothing about the journey path to achieve those long-term return assumptions, although history tells us it will not be a straight line of constant annual returns.

Looking at the LTCMA for government bonds we can see that from today's yield levels most forecasters expect a very low level of future return. They are predicting 0-1% per annum over the next 10 years for 10-year UK gilts as an example. This means we expect a very limited change in yields over that period given the at the current yield on the 10-year gilt around to 0.8%.

Given the Fund's negative cash flow trajectory predicted by the actuary, why would the Fund retain any exposure to such a low yielding and potentially low return asset class? The answer is because it adds diversification. Specifically, government bonds are almost the only asset class which would rise in value (yields fall) if we entered a global recession (gold is a second possibility).

The response to a global recession from governments and central banks around the world would be to cut interest rates yet further and increase, once again, quantitative easing. This would force interest rates and bond yields down further. German government bunds currently yield -0.3% at the 10 year and were below 0% out to 30 years as recently as September this year. If UK 10 Year gilts fell to a 0% yield the return from current levels would be around 8%. Remember bond and gilt prices can be heavily influenced by the government, but the price is set by the market, this means that price anomalies can exist for a prolonged period, particularly if the market believes central banks have lost the ability to control the economy. In such a scenario it is possible to see gilt yields move to negative yields. A 0% yield should not be a floor.

More importantly, in a recessionary environment, we would expect all risk assets to decline in value, possibly substantially against a rise in government bond prices in many developed countries.

In addition to this, government bonds in the major developed economies are the most liquid of all assets because there should in theory be no chance of default. The government can always print more money to meet its liabilities. In the event of a market crisis, a holding in gilts will always be tradable with a reasonably transparent price.

If central bank action is to cut interest rates and renew quantitative easing and it does not boost the economy out of a recessionary environment, there is a strong argument that further, more inflationary, action could be taken which would undermine the attraction of government bonds. There are obvious signs of more inflationary measures being put forward by governments in many parts of the developed world with higher spending commitments and it appears austerity has now become a dirty word, this should all be inflationary in the medium term. The difficulty is in assessing when and how big this inflationary impact might be. In this environment, which may come towards the end of a recession, as governments use all available levers to boost the economy, gilt yields may rise, and prices fall.

We believe the Fund should retain some exposure to investment grade credit and UK government gilts but do not feel at 15% weighting in the SAA is appropriate at the present time and that exposure to a diversified set of assets will mitigate much of the risk against holding a higher level of UK government gilts and investment grade credit. If we do enter a global recession and gilt yields decline further, we would recommend revisiting this allocation with a view to reducing the weighting to UK gilts further.

E. PASSIVE VS ACTIVE

There has been much debate that because the average asset manager underperforms their benchmark, one should not pay for active fund management but select the required index and invest into that, passively, at a lower fee.

Whilst we have much sympathy for this view, we believe it is possible to select active managers who are more likely to outperform. These active managers should have a number of attributes as follows:

1) Stable ownership with the key intellectual thinkers holding part of the equity in the business, preferably a majority. There should be a high level of equity ownership by staff across all levels;
2) This should lead to stable personnel with a limited need to recruit at senior levels;
3) A well-articulated investment philosophy backed by academic research;
4) A thought through investment process which is designed to enact the investment philosophy;
5) Enough resources to implement the investment philosophy and process;
6) A culture which is collegiate, encourages intellectual curiosity and challenge, but is not confrontational.

Within equities, our preference is for asset managers that conduct primary research into the companies they wish to invest in and hold them over the long term (otherwise what is the point of spending money on the research effort).

Investing for the long term then makes ESG (environmental, social and governance) part of the research process because you are investing over a time scale where these issues are gaining more importance. ESG considerations are much harder to enact with passive management because the passive manager is merely replicating an index with no consideration of the ESG issues which may be involved in. Even if you are passively matching a low carbon or ESG style index you have delegated the ESG issue to an index provider who will be far less thorough when charging 5bp than an active manager charging 35bp and conducting primary research as described above.

The Fund has two managers who they have invested with over the long term, both have many of the attributes described above and both have outperformed their respective benchmarks; hit their performance target over the long term and achieved this through a variety of market conditions. Whilst it is unlikely that either manager can show statistically that they have added value (using a T-Square test with 95% probability), we have some confidence that this is the case, but we continually challenge this assumption at every meeting we have with them.

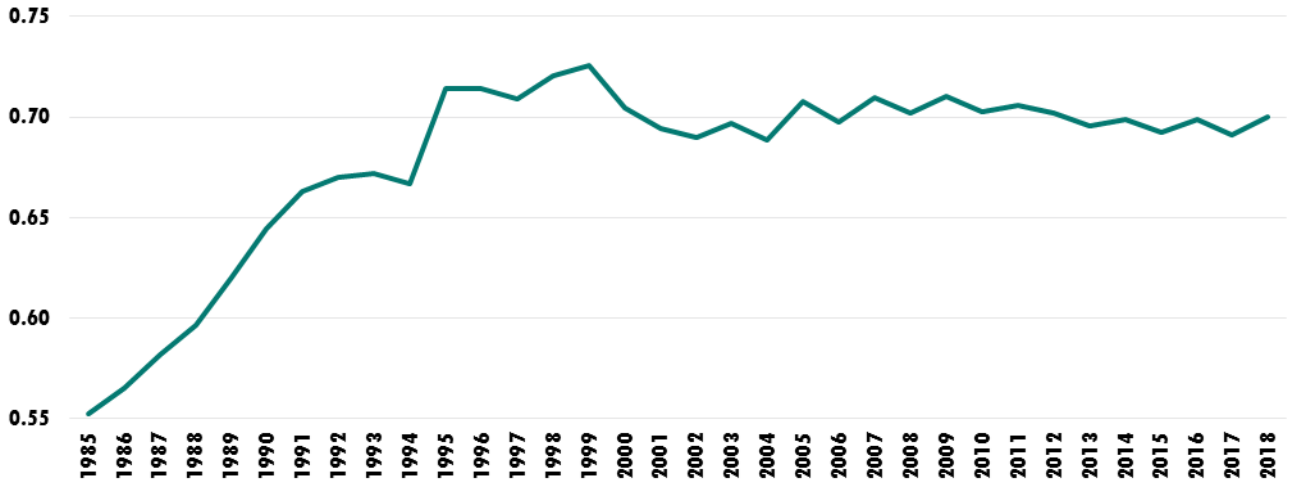
Whilst, we cannot guarantee selecting asset managers who will hit their performance target over the long run, we do believe we can bias the outcome through the high level of scrutiny and due diligence on the manager's approach.

F. STERLING AND HEDGING

The modelling has been conducted on hedged proxies for the MAI and unhedged proxies for equities. The unhedged equities pose a currency risk should sterling rally over the long term. Over the years, sterling has depreciated against the US dollar and JP Morgan's LTCMA suggests that it will likely strengthen over the long term from current levels. The Fund could consider implementing a hedging programme into the base currency of sterling and this should be discussed with the Fund's investment adviser.

For reference, below is a chart of the long-run historic PPP relative to USD:

TABLE 9: GBP HISTORIC PPP RELATIVE TO USD



Source: OECD

G. IMPLEMENTATION CONSIDERATIONS

Multi-Asset Credit

The modelling suggests an allocation to MAI and multi-asset credit. MAC strategies, for instance, comprise of high yield, loans, structured credit and emerging market debt. When considering MAC managers, the Fund should be wary as the global economy is at the latter end of the business cycle. We would recommend appointing managers that can tactically allocate the portfolio to a more defensive position if required, with some tactical flexibility to allocate to investment grade credit.

Infrastructure

The modelling suggests an allocation to infrastructure. The strategic assumptions are based on core infrastructure, which is the most conservative in terms of returns. The stable income stream and store of real value can provide good portfolio diversification properties with an often inflation linked income stream.

However, this is an illiquid investment, with an extended commitment period, and investment period. As such the distributions would not be expected to start before the first 2-3 years. Should an investment into infrastructure be considered, the Fund should consider starting now, before the income is required.

Furthermore, there are potentially higher returns in non-core infrastructure, the so called Core-Plus, Value-Added and Opportunistic sub-strategies. These typically involve risk in the form of potentially higher leverage and some degree of construction risk. The allocation could target greenfield infrastructure if required and returns in this area do not seem to be below more traditional infrastructure funds at the current time.

Conclusions

In this report, we have conducted a SAA modelling exercise considering the Fund's beliefs, potential investment universe, liquidity requirements, and reasonable constraints. We have combined these with the long-term capital market assumptions.

As described above, we have compared three potential strategic asset allocations to the current SAA, recommending for consideration a de-risking of the equity exposure either from 60% to 55% or to 50%. These represent a conservative reduction of exposure, whilst maintaining the required return and income profile of the Fund.

There is some further flexibility around the implementation. On the one hand, the Fund may consider an appropriate tactical asset allocation positioning around the suggested SAA. On the other hand, although this report does not discuss manager implementation, it is of course an important dimension to consider in choosing the appropriate managers to implement the strategy.

Appendix 1 – Methodological Approach

A. OPTIMISATION AND MODELLING

The portfolio optimisation methodology used was a Mean Variance Optimisation ("MVO"), using long-term forward-looking assumptions across asset classes (discussed later). The modelling was carried out using internal models built in Microsoft Excel.

Appendix 2 - Key Assumptions and Constraints

B. MULTI-ASSET INCOME FUNDS

TABLE 1: MAPPING SCHRODERS AND FIDELITY MULTI ASSET INCOME FUNDS TO ASSET CLASSES FOUND IN THE INVESTMENT UNIVERSE.

Asset Class	Schroder Multi Asset Income Fund	Fidelity Institutional Diversified Income Fund
UK Investment Grade Corporate Bonds	8.20%	29.43%
US High Yield Bonds Hedged	25.00%	9.45%
Emerging Markets Local Currency Debt	2.50%	5.20%
Emerging Markets Corporate Bonds Hedged	5.60%	3.18%
Global Credit Sensitive Convertible Hedged	14.50%	6.05%
Diversified Hedge Funds Hedged	9.30%	19.39%
AC World Equity	34.90%	27.30%

Source: MJ Hudson Allenbridge

C. RISK AND RETURN ASSUMPTIONS

Below is the summary of the forward-looking expected return and expected risk assumptions in the investment universe:

TABLE 2: FORWARD-LOOKING ANNUAL RISK/RETURN ASSUMPTIONS

Asset Class	Sub-Asset Class	Expected Annual Return	Expected Annual Volatility
Cash	UK Cash	1.80%	0.68%
Bonds	UK Gilts	0.00%	6.64%
Multi Asset Income	UK Investment Grade Corporate Bonds[1]	2.00%	7.38%
	US High Yield Bonds Hedged	5.20%	8.27%
	European High Yield Bonds Hedged	4.80%	8.54%
	US Leveraged Loans Hedged	4.90%	7.55%
	Emerging Markets Sovereign Debt Hedged	5.00%	8.44%
	Emerging Markets Local Currency Debt	4.40%	11.16%
	Emerging Markets Corporate Bonds Hedged	4.80%	8.16%
	Global Credit Sensitive Convertible Hedged	4.30%	7.11%
	Diversified Hedge Funds Hedged	4.40%	7.28%
Multi Asset Credit Multi Asset Credit	US High Yield Bonds	3.70%	9.38%
	US Leveraged Loans	3.50%	10.54%
	AC World Equity	5.50%*	13.39%

Asset Class	Sub-Asset Class	Expected Annual Return	Expected Annual Volatility
Equity	Emerging Markets Equity	7.70%	18.46%
Alternatives	UK Core Real Estate	4.30%	10.43%
	US Core Real Estate	5.50%	16.19%
	Global Infrastructure Equity	4.50%	9.48%
	Private Equity	7.30%	16.22%
Commodities	Commodities	1.00%	13.94%
	Gold	1.50%	18.31%

**AC World Equity is an average of JPM, Baillie Gifford and MFS Long Term Capital Assumptions. Baillie Gifford and MFS have been running the equities mandate for the Fund since 1999 and 2013 respectively.*
[1]Used to model both Bonds and Multi Asset Income

Source: MJ Hudson Allenbridge, JP Morgan Asset Management LTCMA 2020, Baillie Gifford and MFS

We did not model UK equities as a separate asset class as the Fund's equities managers (Baillie Gifford and MFS) have a global mandate and can tactically shift into UK equities if they deem them to be attractively undervalued.

Below is the summary of the constraints used in the modelling:

TABLE 3: MODELLING CONSTRAINTS FOR EFFICIENT FRONTIER

Sub-Asset Class	Group	Min %	Max %	Group Min %	Group Max %	Constraint Details
UK Cash	N/A	0%	1%	N/A	N/A	Min: N/A. Max: Low allocation to cash due to low interest environment and to provide a buffer against adverse market conditions.
AC World Equity	N/A	50%	100%	N/A	N/A	Min: To reflect the minimum equity exposure the Fund should ideally retain. Max: N/A

Source: MJ Hudson Allenbridge

D. CORRELATION ASSUMPTIONS

TABLE 4: EXPECTED CORRELATION COEFFICIENT MATRIX

Sub-Asset Class		Expected Correlation Coefficients																			
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
UK Cash	A	1.00	-0.15	-0.09	-0.06	-0.15	-0.20	-0.17	0.12	0.00	0.24	-0.07	-0.26	-0.16	-0.11	-0.03	-0.36	-0.42	-0.11	-0.16	-0.02	0.17
UK Investment Grade Corporate Bonds	B	-0.15	1.00	0.41	0.33	0.47	0.32	0.18	0.54	0.55	0.32	0.55	0.36	0.30	0.37	0.34	-0.03	0.25	0.17	0.20	0.10	0.14
US High Yield Bonds Hedged	C	-0.09	0.41	1.00	0.57	0.88	0.78	0.20	-0.18	0.69	0.28	0.71	0.24	0.59	0.61	0.64	0.45	0.39	-0.05	0.44	0.30	-0.07
US High Yield Bonds	D	-0.06	0.33	0.57	1.00	0.47	0.44	0.83	0.15	0.38	0.48	0.36	-0.01	0.19	0.62	0.50	0.10	0.23	0.29	0.43	0.31	0.19
European High Yield Bonds Hedged	E	-0.15	0.47	0.88	0.47	1.00	0.85	0.19	-0.23	0.56	0.20	0.64	0.36	0.64	0.53	0.56	0.40	0.36	-0.06	0.41	0.16	-0.17
US Leveraged Loans Hedged	F	-0.20	0.32	0.78	0.44	0.85	1.00	0.34	-0.35	0.36	0.01	0.50	0.32	0.64	0.40	0.41	0.59	0.51	-0.04	0.39	0.21	-0.27
US Leveraged Loans	G	-0.17	0.18	0.20	0.83	0.19	0.34	1.00	0.11	0.05	0.21	0.10	-0.06	0.05	0.35	0.23	0.17	0.32	0.33	0.33	0.21	0.12
UK Gilts	H	0.12	0.54	-0.18	0.15	-0.23	-0.35	0.11	1.00	0.18	0.34	0.05	-0.18	-0.31	0.00	-0.01	-0.44	-0.22	0.28	-0.25	-0.08	0.39
Emerging Markets Sovereign Debt Hedged	I	0.00	0.55	0.69	0.38	0.56	0.36	0.05	0.18	1.00	0.56	0.90	0.17	0.37	0.54	0.65	0.14	0.19	0.07	0.27	0.30	0.21
Emerging Markets Local Currency Debt	J	0.24	0.32	0.28	0.48	0.20	0.01	0.21	0.34	0.56	1.00	0.42	0.01	0.05	0.57	0.63	-0.40	-0.11	0.21	0.15	0.34	0.42
Emerging Markets Corporate Bonds Hedged	K	-0.07	0.55	0.71	0.36	0.64	0.50	0.10	0.05	0.90	0.42	1.00	0.25	0.44	0.51	0.62	0.26	0.28	0.01	0.33	0.32	0.14
Global Credit Sensitive Convertible Hedged	L	-0.26	0.36	0.24	-0.01	0.36	0.32	-0.06	-0.18	0.17	0.01	0.25	1.00	0.43	0.28	0.21	0.00	0.30	0.02	0.32	0.16	-0.14
Diversified Hedge Funds Hedged	M	-0.16	0.30	0.59	0.19	0.64	0.64	0.05	-0.31	0.37	0.05	0.44	0.43	1.00	0.56	0.58	0.47	0.35	-0.12	0.61	0.36	-0.11
AC World Equity	N	-0.11	0.37	0.61	0.62	0.53	0.40	0.35	0.00	0.54	0.57	0.51	0.28	0.56	1.00	0.84	0.10	0.29	0.15	0.67	0.41	0.03
Emerging Markets Equity	O	-0.03	0.34	0.64	0.50	0.56	0.41	0.23	-0.01	0.65	0.63	0.62	0.21	0.58	0.84	1.00	0.15	0.19	0.06	0.63	0.48	0.15
UK Core Real Estate	P	-0.36	-0.03	0.45	0.10	0.40	0.59	0.17	-0.44	0.14	-0.40	0.26	0.00	0.47	0.10	0.15	1.00	0.64	-0.20	0.30	0.08	-0.40
US Core Real Estate	Q	-0.42	0.25	0.39	0.23	0.36	0.51	0.32	-0.22	0.19	-0.11	0.28	0.30	0.35	0.29	0.19	0.64	1.00	0.06	0.26	0.18	-0.25
Global Infrastructure Equity	R	-0.11	0.17	-0.05	0.29	-0.06	-0.04	0.33	0.28	0.07	0.21	0.01	0.02	-0.12	0.15	0.06	-0.20	0.06	1.00	0.19	0.08	0.19
Private Equity	S	-0.16	0.20	0.44	0.43	0.41	0.39	0.33	-0.25	0.27	0.15	0.33	0.32	0.61	0.67	0.63	0.30	0.26	0.19	1.00	0.37	-0.11
Commodities	T	-0.02	0.10	0.30	0.31	0.16	0.21	0.21	-0.08	0.30	0.34	0.32	0.16	0.36	0.41	0.48	0.08	0.18	0.08	0.37	1.00	0.42
Gold	U	0.17	0.14	-0.07	0.19	-0.17	-0.27	0.12	0.39	0.21	0.42	0.14	-0.14	-0.11	0.03	0.15	-0.40	-0.25	0.19	-0.11	0.42	1.00

Source: MJHA, JPM LTCMA 2020

Appendix 2 – Defined Terms and Methodologies

Portfolio optimisations have been conducted using both long-term market assumptions for each asset class. Constraints on asset class weights, sub-asset class weights and minimum required return were used for the mean variance optimisation.

MEAN VARIANCE OPTIMISATION: Mean variance optimisation seeks to obtain the optimal asset allocation that provides the minimum expected risk (volatility) for each given expected level of return based on the assumptions and constraints.

The technique of mean-variance portfolio optimisation is the most widely used approach to optimise portfolio allocations (following the work of Markowitz on Modern Portfolio Theory). The inputs required, referred to as long-term capital market assumptions, are expected returns for the assets under consideration and the covariance matrix of those assets. The covariance matrix itself can also be estimated separately as correlations and variance of the assets, which help in formulating forward-looking views.

Key benefits

- This optimisation considers both risk and returns and from a pragmatic perspective, gives a good general framework for a strategic asset allocation;
- The technique is comparatively fast to run, computationally, which is important when exploring different asset allocation scenarios;
- The output provides a range of optimised portfolios by expected returns and volatility, and the results are often intuitive.

Key considerations

- The model is very sensitive to the initial inputs/assumptions made for each asset. Differences in expected returns or volatilities can make a meaningful difference in the optimal portfolio generated. As such, it is important to choose assumptions on a reasonable basis and refine them when appropriate.
- The MVO technique only takes mean and variance into account and does not (by default) take into account other properties of the distribution of returns (such as skewness or kurtosis). These factors can be important for those strategies which exhibit elements of tail risk.
- MVO identifies whether a portfolio allocation is diversified across asset classes, but not necessarily diversified across the sources of risk / risk factors.

There are several ways to refine the approach. For instance, a stressed correlation matrix can be used, consisting of estimates of correlations during stressed environments, calculating Modified VaR to address the skew and kurtosis of the likely return distributions and other techniques and risk measure or scenario analysis can supplement the approach, such as expected shortfall (an average of losses in the extreme part of the distribution).

VALUE AT RISK (VAR) 95%: The maximum expected loss of the portfolio with 95% level of confidence. The calculation method we used is the variance-covariance method, which is a parametric calculation that assumes normal return distribution.

$$VaR_p = \mu + z_p\sigma$$

where: μ is the Expected Asset Return. z_p is the distance between μ and the VaR_p in number of standard deviations. In other terms, number of standard deviations at $(1-z_c)$ or -1.96 with p = 95% probability. σ is the standard deviation.

SHARPE RATIO: Risk-adjusted returns, where the portfolio returns over the risk-free rate are risk-adjusted.

$$Sharpe\ Ratio = \frac{Portfolio\ Return - Risk\ Free\ Rate}{Volatility\ of\ Portfolio}$$

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