**Portfolio Management: Assignment 9**

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Part A

A.1.1

Hedge funds differ from more traditional money managers because:

1. Generally offer higher risk adjusted return (debatable) and lower volatility than portfolios of common stock.

2. Are not subject to normal regulation; use significant leverage, sell securities short, and avoid several SEC and RIA filings and regulations.

3. Generally not available to the public (retail investors); only accredited investors and high net-worth individuals may invest.

4. Offer investments that may be uncorrelated to traditional portfolios; some would argue that some hedge funds simply charge a liquidity premium

5. Charge non-standard fees; management fees and incentive/performance fees

A.1.2

Paulson Credit; because John Paulson shorted mortgage backed securities during the Financial Crisis; he took a big, and well paid, bet.

A.2.1

Hedge Fund replication is the act of act of providing “hedge fund beta”, or the systematic aprt of hedge fund performance. In short, these strategies attempt to give investors a top-down approach to ‘tracking’ a hedge fund by mimicking its return structure. For example, one approach is to construct a portfolio that has high return correlations to the historical hedge fund’s, and matches the hedge funds moments—its return distribution, skew, kurtosis, and volatility.

A.2.2

Instead of offering a “top-down approach”, AQR attempted to, essentially, construct their own hedge fund portfolio. Specifically, AQR aimed to capture classical, liquid hedge fund strategies that were uncorrelated with traditional markets and implement them at low cost. Finally, AQR would bundle these strategies together into a portfolio and manage its construction, risk-management, and trading.

A.2.3

AQR believed their approach superior to traditional replication strategies because they felt that traditional replication strategies simply offered investors a liquidity premium, not true alpha. Secondly, most replication strategies are based upon past data and assumptions, and AQR felt that these backward looking approaches were not appropriate to take advantage of current market opportunities. And finally, AQR offered competitive fees much lower than traditional replication strategies.

Part B

1. *Would you participate in the FLOP plan if Ford offered no discount on its stock? Compare the 20-year Sharpe ratios of Ford and the market portfolio.*

Mkt Sharpe ratio = (20\*Em-20\*Ef)/(sqrt(20)\*Sm) = 0.4334

Ford Sharpe ratio = (20\*Eg-20\*Ef)/(sqrt(20)\*Sg) = 0.1532

If Ford offered no discount it is better to invest in the market as it has a higher Sharpe ratio.

1. *What is the minimum discount on the Ford stock that you would require in order to participate in the FLOP plan? Explain how you computed the discount.*

Ford Sharpe ratio is comprised of Eg = 0.7% and Sg = 9.53%. As the standard deviation is not likely under anyone’s control, the other component we would like to change in order to achieve a similar Sharpe ratio to the market’s is be the expected return. To achive a 0.4334 Sharpe ratio, it will require an expected return of:

Rf\*20\*12 + (20\*12\*FordSD/20\*12\*MarketSD)\*(20\*12\*Emkt-20\*Rf) = 3.1038 over 20 years.

To achieve that we will need to decrease Ford’s price by 1 - exp(20\*12\*Eford-20\*12\*Eminford) = 76.13%

1. *How would your answer change if you had T years until retirement instead of 20? Plot the minimum required discount against T for T = 1, . . . , 40. Explain.*

The more years until retirement the more volatile the portfolio will be. To offset that, we will require a greater return which is achieved by having a bigger discount.



1. *The implicit assumption so far has been that your labor income is irrelevant for your decision. From now on, we relax this assumption. Your retirement portfolio grows not only through its own log returns (rR) but also through your monthly contributions that are based on your labor income (rL). Assume, for simplicity, that both sources of income are equally important, so that the log growth rate of your overall portfolio can be approximated by rP = 1 2rR + 1 2rL. Your monthly contributions are such that E(rL) = 1% per month and σ(rL) = 5% per month.3 The correlation between rL and market returns rM is ρL,M = 0.02 and the correlation between rL and Ford returns rF is ρL,F = 0.3. The correlation ρL,F reflects the fact that your labor income from Ford tends to be higher when Ford is doing well (e.g., your bonus is higher or your options are worth more).*
   1. *What is the minimum discount on the Ford stock that you would require in order to participate in the FLOP plan? Explain the difference between this discount and the discount computed in part 2.*

The principle is the same as in Q2 but the total return of either the Ford portfolio or the market will be comprised of: 0.5\*Elabor + (1-0.5)\*(Eford or Emkt )

The standard deviations will also need to be recalculated by taking the sqrt of the portfolio variance.

We need to come up with the minimum return required by both labor and portfolio return.

The minimum return required from labor over 20 years is: 3.1530

From this, the minimum return required from Ford over 20 years is: 3.9060

And the discount rate we will require will be:

1 - exp(20\*12\*Eford-20\*12\*Eminford) = 89.3%

The reason why this is a higher discount is that now there’s another element of our performance which is more correlated with Ford’s performance and that decides the overall performance and volatility of our portfolio. This creates a lower Sharpe ratio that the one in question 2 and thus require a bigger discount to increase the return in order to match the market’s portfolio return.

* 1. *How does your answer depend on ρL,F? Plot the minimum required discount against ρL,F for ρL,F between 0 and 1. Plot three lines, one for T = 20, one for T = 10, and one for T = 5 years.*



1. *Give an example of one profession in which the correlation between labor income and own-company stock return is high and one in which it is low.*

High correlation: hedge funds/banking - Most compensation is bonus based on fund’s performance.

Low correlation – Consulting – now stock element in compensation. At least in not very senior levels.

1. *What if anything have you learnt from this exercise?*

Don’t tie all of your retirement fate to the company you work in.

C.

1.

a) Assuming normal distribution of returns:

The **probability of being underfunded at year end is 21.69%**

Pr (z< 4.0-4.64.6 - 0.12.32) =0.2169

b) Pr( V0 (1 + r) < 4.0 ) = 1/6 V0 = 4.0 / (1 + r), where r = 0.12 + 0.32\*norminv(1/6)

V0 = 4.9357, so we must **add $335.7 million to the fund.**

c) Let S = initial value of the stock portfolio, 4.6 – S = amount held in t-bills

then V1 = S(1 + r) + 1.04(4.6 - S) .12 + .32\*norminv(1/6) = -0.1896

S(1 + -0.1896) + 1.04(4.6 – S) = 4.0 gives S = $3.4146 billion

We must put 4.6 – 3.4146 = **$1.1854 billion into t-bills.**

d) As discussed in class, I would recommend that Quantie shift some or perhaps all assets away from stocks and into bonds in order to better match pension assets to obligations, since the fund is defined-benefit. This shift should increase shareholder value for several reasons:

- Pension funding requirements will be more predictable, and therefore cash flows to equity-holders more stable. This will decrease the risk of financial distress and allow the firm to more efficiently invest its cash holdings in the future.

- It costs money to insure against pension shortfalls caused by poor stock returns.

- Shareholders do not risk excess returns from the stock fund being distributed to the pensioners as excess benefits.

2. The crisis in Europe will be larger for two reasons:  Europe’s contributor-to-pensioner ratio is decreasing more rapidly (due to a shrinking population, higher unemployment in several countries, and slightly lower average retirement age), and the US now has a larger proportion of DC pensions.

3. Three differences between the US and UK pension systems:

-In the UK, public pension liabilities are discounted using a rate mandated by Eurostat. This rate is typically in line with a government bond rate, and much lower than the expected return rate used by public funds in the US.

-The UK is phasing in a mandatory employer contribution-matching scheme, where by 2019 employers must match at least 3% of employee contributions.

-UK law mandates that defined pension benefits be pegged to inflation, so long as the inflation rate is between 0-5%.

4. True. Lower interest rates lead to lower discount rates. Higher liabilities are calculated from these lower discount rates, leading to a larger gap between pension assets and liabilities.

5. It seems reasonable that pension funds should incorporate assets that are correlated with inflation, since the funds’ obligation increase with wage growth. However, the fund could probably do this more efficiently using TIPS than equities, since these bonds would provide more consistent cash flows while still offering inflation protection.

The article’s conclusion that equities are suitable pension investments because of their longer time horizons seems suspect to me. I don’t believe that most companies plan projects on more than a 30-year time horizon, so to say that equity investments have a longer time horizon than long term bonds does not make sense to me.