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1.   PRINCIPLES OF BOND PORTFOLIO MANAGEMENT[1]

1. The article discusses the difference between bonds and equities. It describes a framework for selecting and managing bond portfolios. Internationally, half of the total investment of $27,000billion is held in bonds and loans.

2. The central idea is that the risk of investing in bonds in many markets can be expressed in terms of exposure of a portfolio to a relatively small number of factors. The level of exposure for each factor needs to be decided by the portfolio manager, and choose the bond that will give the desired level of exposures in a cost effective way.

3. On basis of country / type the variety in bonds is 1,800 or more which is bewildering, but broadly can be grouped as government bonds and non-government bonds. Under non-government bonds the most important are corporate bonds

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[1] Business Standard 'Mastering Investment - Part One Article by Stephen M. Schaefer, Professor of Finance, London Business School.   Further reading: 'Journal of Fixed Income' June 1991 issue "Common factors affecting bond returns" by Litterman R. and Scheinkman. And September 1996 issue 'Does duration extension enhance long term expected returns?' by Limanen A.

though there are other issues as well, such as mortgage-backed bonds.

4. DIFFERENCE BETWEEN BOND AND EQUITY PORTFOLIO: Bond portfolios differ from equity portfolios essentially in their rate of return. Compared to returns on equities the return on bonds with low level of default, tends to be more highly correlated with one another. This means diversification is less important in the management of a bond portfolio that an equities portfolio. In equity market it is difficult to create a portfolio with best value assets without significantly changing the risk level, because as the portfolio becomes more concentrated, the potentially diversifiable risk gets eliminated. In the case of bonds however, it is easier to concentrate on best value assets without taking on diversifiable risk. Therefore, diversification is less important in bonds portfolio, but the decision on what to hold and what not to hold becomes more important for bonds. In sum, asset specific risk is typical of equities, which the government bond market has a high correlation that enables one to be substituted for the other. The corporate bond market lies between these two rates of returns.

5. In bond markets, the rate of return over short periods of a week or a month is the difference between the value that actually occurs and the value expected. This involves (a) asset exposure to a small number of factors and (b) the 'unexpected' portion of the change in each factor. In equation form: Bond return = mean return + (exposure to factor 1 x unexpected change in factor 1) + (exposure to factor 2 x unexpected change in factor 2). Here, the mean return is the average return the portfolio will earn, and factors 1 and 2 are the risks of higher gains to which the portfolio is exposed.

6. The average return comes from two sources :(1) the exposure to factors driving the returns may generate a risk premium. The risk premium is the average rate of return greater than the

short term risk-less interest rate on cash. (2) asset selection based on 'good value' which means that they have a high expected rate of return relative to the risks they attract. As the bonds are highly correlated they can be substituted for one another with out increasing the exposure risk of the portfolio. So the real task in a bond portfolio is to have an eye for selecting 'good value' bonds.

7. GOVERNMENT BONDS: In Government bonds prices are well explained by the yield curve. Changes in the curve can be modeled on one or two factors such as a 10 year rate and the spread between the long rate and the short rate. The third factor can be the fluctuation is the yield spread or the difference in yield between government bonds and corporate bonds. In the mortgage backed bonds other additional factors are involved to capture the fluctuation in the rate of pre-payment.

8. For selecting government bonds an intermediate term yield rate such as for 10 year bond, and the spread between short term and long term rate provide the three factors needed for adopting the equation in paragraph 5. These three factors can explain the variability in the yield curve of government bonds. The first factor produces the parallel shift in the whole curve. The second factor changes the shape by flattening or making the curve steeper. The actual shift over a week is the combination of the level and the slope factors.

9. The sensitivity of the price of a bond to the shift in a factor is called bond exposure. It is a generalization of a risk measure called "duration".

10. CHOOSING EXPOSURES: Changes in factors 1, 2, and 3 are beyond the control of an investor. However, the extent of 'bond exposure' can be chosen by the portfolio manager. The overall risk of factors is the 'factor exposure' part of the 'bond exposure'. In government bonds the default risk is not significant. As such, volatility of the portfolio = portfolio exposure to intermediate return of factor1 and the yield spread

of factor 2. This means that the volatility of the two factors themselves is the bond exposure and includes the correlation between the two factors.

11. Another method uses the 'volatility of the tracking error' in place of 'volatility of portfolio exposure' to calculate the risk. The 'tracking error' is the difference between the rates of return on the portfolio held and the rates of return of a benchmark portfolio selected. The benchmark portfolio is a personal choice of a leading portfolio.

12. PORTFOLIO RISK PREMIA: Risk premium is the difference between the risk less interest rate and expected rate of return. It equals the sum of the asset's exposure to each underlying factor into the risk premium on that factor. In the Capital Asset Pricing Model the only factor that has a non-zero risk premium is the return on the market portfolio. The exposure of an individual asset is called 'beta'. The risk premium predicted by CAPM is beta times the risk premium on market portfolio.

13. In arbitrage pricing theory which is an extended form of CAPM, there may be more than one factor but the form of relation is the same.

14. CAPM and similar methods are widely used in corporate finance. First the required rate of return (with discount rate) is specified for real investment opportunities; the cost of capital of regulated utilities; and the expected return on risk portfolios. In government bonds the risk premium on a bond or a portfolio = exposure to intermediate rate (factor1) x risk premium per unit exposure to intermediate rate + exposure to spread (factor 2) x risk premium per unit exposure to spread. In theory choosing the exposure to intermediate rate or the level of rate and the spread fixes the risk premium of the portfolio. However, the question is what are the risk premiums associated with the level and the spread? For this long term bonds are not necessarily risky for everyone as pension funds and life insurance funds have a natural demand

for long term bonds. This tends to push up their prices and reduce expected returns.

15. In sum, a portfolio's exposure to underlying risk factors largely determines its risk. Also that the risk premium associated with in the intermediate rate and the spread is difficult to distinguish from zero. Therefore the exposure has little effect on its long term expected return.

16. In contrast, the risk premium associated with exposure to equity market is strongly positive. This means that holders of equities can be expected to outperform an investment in short term or long term risk-less bonds. But outside the long run the risk premium may vary predictably. The spread between the five year and three month rates has a correlation of just over 0.2 with excess return on bonds over the following months. Excess return here means the difference between actual rate of return earned and the risk less rate of return.

17. Other effects include the level of real yields and the ratio of a weighted average of past tock market wealth to the current stock market level. Thus, even though long run risk premia on bonds may be close to zero, the risk premium over the next month may be predictably positive or negative depending on the slope of the term structure and recent performance of the market.

2   CORPORATE BONDS AND OTHER DEBT INSTRUMENTS

By Stephen M. Schaefer on page 11 of Mastering Investment Part Two

1. The underlying yield curve based on the relation between yield of government bonds and maturity, determines the price of all types of debt. The yield curve itself depends upon factors such as intermediate rate and spread (difference between short term and long term rates) in

corporate bonds factors additional to those effecting government bond become important.

2. The Difference: Risk of default is the most important difference between government bonds and corporate bonds. Default is linked to (a) the value of the assets of a company. Only when the assets are worth less than the debt of the company that default occurs for the equity holders. (b) The likelihood of default also goes up with a fall in the value of company's assets. This establishes a positive relation between the value of corporate debt and the value of corporate assets. However, the sensitivity the low grade bond is over four times higher than that of high grade bonds. This means that both the high grade and the low grade bonds have a statistically significant relation with the return on the Standard & Poor 500 index. This is an index of the value of corporate assets. A corporation depends on these assets for repayment of its debts.

3. Limited liability bonds: The nature of limited liability means that the holders of corporate debt have sold an option to default to its shareholders. From this the following implications accrue:

   a) The variables important in pricing of options particularly volatility, -are likely to be important in pricing corporate debt. Analysts have shown that the Credit Spread which is the difference between yield between corporate and otherwise similar government bonds – increased with increase in implied volatility of the options on Standard and Poor index. Compared to the yield of 10-year government bonds, the corporate bonds have been known to have a correlation of 0.5 to 0.6. One result of this correlation is that any rise in interest rate volatility increases the volatility of the present value of a company's debt. This increases the chance of debt value increasing the asset value and thereby increasing the risk of default by the company.

Therefore, credit spread is significant in determining the price of limited liability bonds.

b) Secondly, the conventional method of pricing options based on Black-Scholes model, can also be used to price corporate debt. The method gives the 'fair value' or the 'intrinsic value' of the debt relative to the price of default free government bonds. It also gives the value of the company's assets that collateralize the debt.

c) Yet in this method corporate prices have been found to be too low and even lower than the cost of the mimic portfolio. This indicates that there is a wide gap between theory and practice. One research, instead of using data on individual bonds, used data on credit and default rates for credit- rating categories of AAA, AA etc. Then the theoretical credit spread was calculated using an option pricing based model. This gave the default rate equal to that estimated by the rating agencies.

d) For example this method produced a credit spread of 10 basis points while the average in the market was 90 basis points. The reason for this small spread is as follows: Assuming zero returns and ignoring the effect of risk premium on pricing, then the yield spread on the bond will be near or equal to the probability of default per year. In this model the probability of default on a 10 year AA bond is 0.1 per cent. Therefore the yield curve given earlier was also 10 basis points or 0.1 % per annum. This is different from 90 basis points average spread actually observed. This also implies that the market either thinks that the default is much more likely than what the rating agencies say, or that some special features of the corporate bonds overcome the default risk and make them attractive.

e) What are these special features that overcome the default risk, are best known to the individual investor because it is not connected to the individual

issuing company, but is systematic across corporate issues. A price discount is one such feature of a reward for the low levels of liquidity in the corporate bonds market. For institutional buyers liquidity is less important and there they regard corporate bonds as good value.

4. **Risk Management: Factor Risk Exposure (FRE)** of a portfolio provides a means of calculating its risk. FRE is a useful framework for managing risks also. For a government bond exposure the intermediate rate and the spread may be changed in several ways. One way is by buying and selling the bonds themselves.

5. Another way is to separate the determination of factors of exposure from the choice of assets. For example the exposure to a long term bond may be made larger, while that to shifts in level of rates could be moderated. This is achieved by combining long position in 'good value' in long term bonds with short position is another 'fair value' or expensive bond.

6. A more practical method is to use derivatives by selling bond futures contracts, for instance. Thus derivatives can be used to separate the decision to hold a particular bond for a longer or shorter period from the risk exposure of a portfolio that continues on the earlier basis.

7. This separation of risk factors from particular choice of assets through use of derivatives has important consequences in the management of a bonds portfolio. The range of assets in a bond portfolio can include government bonds, corporate bonds, mortgage backed securities. But through the use of derivatives for equity risk factors, equities too can be added to bond portfolios. Further, derivatives can eliminate exposure to the bond related risk factors. In sum, by blending bonds and equities the range of assets in a portfolio can be balanced and managed more efficiently.

8. Enhanced Equity Index Funds for competing in equity market: Institutional portfolios based on mutual funds run by fixed income managers compete in the equity market. A common product is a portfolio designed to produce a return equal to that on the Standard & Poor 500 plus a premium. This becomes a part of the 'enhanced' index fund.

9. For these a three part strategy is used:

   a) A portfolio of bond assets is selected on basis of 'good value'. Yield curve factor, credit spread factor, mortgage factors are then used as exposure for this bond portfolio.

   b) Derivatives are used to eliminate or hedge as much of the risk in (a) as is possible. The returns at this stage on such an enhanced index portfolio would ideally be equal to cash plus premium from manager's expertise in selecting the 'good value' bonds.

   c) Exposure to equity market is added typically through a swap in which the manager will pay the short term interest rate to receive the return on Standard & Poor 500 index.

The net result would be a portfolio that would behave like Standard and Poor 500 equity index but where the out performance comes from the investment in bonds and not from the investment in equities.

Further reading:

a) Collin- Dufresne P., Goldstein R. s. and Martin J. S. (1999) 'The determinant of credit spreads' working paper GSIA Carnegie Mellon University at http://www.andrew.cmu.edu/user/dufresne/pub/spreadn1.pdf

b) Huang, J. and Ming H. (2000) 'How much of the corporate treasury yield spread is due to credit risk?' working paper, Smeal College of Business, Penn State University

c) Kao,D., "Estimating and pricing credit risk: an overview" Financial Analysts Journal, July/August 2000, 50-66.

3 STOCKS AND BONDS IN THE PORTFOLIO LIFE CYCLE [2]
Steven Davis and Rajnish Mehra

1. Equities are said to be the preferred investment for the young and bonds are for the aged as older investors have lower tolerance for risk. Another reason is the lower risk from longer term stock ownership. In contrast to this conventional wisdom, the standard portfolio theory does not recommend a shift from equity to bonds due to age of investor. The standard theory holds that the optimal portfolio is a combination of a broadly diversified equity fund and safe, risk free securities. This depends on the investor's risk aversion and not on age.

2. In reality, labour income accounts for two thirds of a nation's income and human capital is the largest component of wealth for many households. Human capital is the skill and energy that a worker brings to the employment market. The value of human capital derives from the current and future income a worker expects to earn. As future labour earnings are uncertain, human capital is a risky asset. Portfolio allocation and asset pricing researches give risky labour income a major role in standard theory. This recognizes two facts: (a) dividends and wages affect consumption and portfolio decisions (b) the share of wealth in the form of human capital declines with age. This is also the basis for the life cycle of portfolio allocation and asset pricing.

3. Portfolio allocation: Young and middle age human capital have large illiquid claims on income streams that flow from human capital and small business ownership. The value of this illiquid income fluctuates with news about wages, employment and profits and decreases with age. Towards retirement this value nears zero.

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[2] Mastering Investment Part Four 20th September 2002 pages 5 and 6

4. How these factors matter for portfolio? (1) Essentially, the choice of asset allocation depends on investor's future consumption and liquidity needs or future returns from a security. If the security is likely to pay off when the consumption is low, it is preferred because the marginal utility of consumption varies inversely with consumption. For this reason investments that pay off when consumption is high are less valuable than those that pay off when consumption is low.

5. Risky human capital: A worker- investor should curtail or eliminate exposure to risky financial assets that are expected to do well in times of good news about their own employment income, and raise exposure to financial assets that do well in times of bad news for their own employment sector. This is based on covariance to two closely related variables. In other words, they should load up on risky securities having a negative covariance with their own employment sector and avoid securities with a positive covariance. For this reliable information on covariance is needed.

6. Researches offer two messages (a) Correlation between equity return and value of human capital rises with the education level of the worker. This is also supported by the view that capitalists are more closely aligned with highly educated professional human capital. The less educated worker should hold a larger fraction of financial wealth in own industry equity (b) A worker- investor holding stock in own industry or company is less risky. Economic theory suggests that portfolio strategy reduces risk for some workers. In the case of steel worker, the ups and downs in steel stocks will reflect the rise and fall of demand for steel, and therefore capital and labour will rise and fall together. In such a case he is well advised to minimize his exposure to steel securities. If however, the ups and downs in steel stocks are due to developments that shift he relative demand for capital and labour such as labour saving technological innovations and war bargaining conflicts that alter the division of a fixed pie then equity returns co-vary with the value of human capital. In this case the steel worker is well advised to load up with steel stocks.

7. In sum, by applying the risky human capital aspect in to financial theory yields a clear principle for portfolio choice. But

this principle requires a strong empirical foundation and knowledge of covariance for its application. Currently the knowledge on covariance between asset returns and human capital is sketchy. Better knowledge of this could improve pension fund management, mutual fund design, and creation of new securities and institutions.

8. Ageing advice: Does this life cycle support the conventional wisdom that worker investor should shift to bonds with age. Yes, it does but only under certain conditions. The life cycle of the labour path of a high education based secure job is similar to the returns generated by the high income bonds. The life cycle of the labour path of a blue collar worker is similar to returns from a broad based equity fund. In other words, by virtue of his job a factory worker implicitly holds an 'asset' in the form of human capital that is similar to an equity, while a secure government job is more like a bond.

9. The total portfolio in these cases is the sum of financial holdings plus the holdings implicit in the human capital. For the secure job bond similar portfolio it is logical to off set the reduction of return from bond towards retirement with increase in the holdings of bonds in the portfolio. For the insecure job worker ageing involves a reduction in human capital that progressively lowers his implicit position in equity. Therefore, he should offset this decline in his human capital with an increase in the share of equity in his financial portfolio. This gives the clear general principle that investors should re-balance their financial portfolios as they age to as to maintain the balanced total portfolio inclusive of the human capital. For some it will mean increase in bond holdings while for others increase in equity holdings will be more logical. In addition after retirement the return on human capital is zero.

10.The premium puzzle: The life cycle perspective also helps in understanding the premium puzzle. Average stock returns have greatly exceeded the average bond returns over recorded financial history. Adjusted for inflation the average annual return in the past 110 years has been 7.9 % while that on government securities was 1%. The difference of 6.9% is the 'equity premium'. This is a puzzle because it defies easy explanation in theories of asset pricing. If the cost of funding of

equity is 12.9 per cent a return of 7.9% is in fact a loss. As a result what looks like a high demand for equities by averaging the human capital of a young worker becomes a zero or a near zero demand because human capital is risky and highly illiquid. Deeper reasons are adverse selection and problems of enforcement, moral hazard and problems in lending markets with out secure collateral. The result is that most young human capital has little or no participation in the equity markets.

11. Who then holds equities and how are they priced? The life cycle perspective helps to show that equities are held by the middle aged and older persons who have accumulated financial wealth over their life cycle and their wage uncertainty has largely been resolved. After retirement the future 'wages' are zero or a fixed amount of pension. Therefore, at this stage of life cycle equity income is highly correlated with consumption, and it no longer helps to diversify the effects of risky human capital. For the middle aged and older persons to hold equity it must command a higher return over bonds and other safe securities. In the circumstances there is something of a 'free lunch' for young people with substantial financial asset holdings, as for them alone equities will be a desirable asset. As equities are priced for older investors, the young investors can reap high equity returns with less impact on consumption risk.

My conclusion form this article is that there is scope for designing new institutions / securities for participation of the young in the equity markets.