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Asset Allocation for Government Pension Funds in Pakistan: A Case for International Diversification

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Abstract

Reforms have begun in Pakistan to sustain the funded pension scheme for government-operated pension schemes such as the Employees Old Age Benefit Institution (EOBI). Presently, the EOBI operates its own fund and invests most of its assets in government-backed securities which are basically interest-bearing debt instruments. Although the returns on the EOBI's fund have been high for a short period due to higher interest rates and minimum pension distributions, this trend is not likely to continue. Funded pension schemes depend heavily on portfolio performance because risk is transferred to contributors. Therefore, asset allocation becomes considerably important. The purpose of this study is to determine optimal asset allocation and the role of international diversification specifically for the EOBI's funds and generally for newly created funded pension schemes in Pakistan. The article analyzes the potential benefits accrued through international investments based on historical returns over almost five decades with varying degrees of risk aversion coefficients. Varying degrees of risk may allow policymakers to incorporate their strategies for future asset behavior and take timely action to counter the potential threat of aging, demographic shifts, and liabilities and to ensure decent benefits for pensioners.

Keywords: Asset allocation, international diversification, pension fund, Pakistan.

JEL Classification: G11, G23.

1. Introduction

Pension reforms have become an important part of public policy across the globe and Pakistan is no exception. The existing pay-as-you-go (PAYG) or defined benefit (DB) schemes in which the government guarantees an agreed level of retirement benefits to government servants are

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losing favor due to demographic trends, unfunded future liabilities, higher fiscal deficits, and lower benefits for pensioners. These factors have prompted governments to gradually replace PAYG schemes with either fully or partially funded pension schemes where risks are borne by contributors to the fund rather than by the government. Keeping in view the above factors, the federal and provincial governments of Pakistan are implementing reforms by introducing funded pension schemes such as the Punjab Pension Fund, which became operational in 2009. Other provinces will follow suit. Also, the federal government is considering a funded pension scheme for federal government servants in order to provide resources for the economic development of Pakistan under the newly approved National Finance Commission Formula 2009.

Currently, there exists a government-operated pension scheme known as the Employees Old Age Benefit Institution (EOBI) for private workers of small and medium firms/establishments. The federal government intends to carry out meaningful reforms to the EOBI to make it economically viable and sustainable through actuarial valuations, converting it into a state pension scheme for employees based on defined contributions and benefits. Since retirement benefits in fully funded pension schemes depend on portfolio performance, asset allocation becomes important. Therefore, attention should be paid to reforming the EOBI's existing investment strategies. The EOBI invests in domestic assets as international investments are prohibited, but funded pension schemes invest more in foreign securities than defined benefit schemes (Jorge, 2004). The purpose of this study is to determine optimal asset allocation and the role of international diversification specifically for the EOBI's fund and generally for newly created funded pension schemes in Pakistan. The paper will analyze the potential benefits accrued through international investments based on historical returns over almost five decades with varying degrees of risk aversion coefficients. The varying degrees of risk may allow policymakers to incorporate their strategies for future assets and make timely decisions.

Asset allocation is a portfolio choice among broad investment classes. According to Swensen (2005):

> Construction of a financial asset portfolio involves full measures of science and art. The science encompasses the application of basic investment principles to the problem of combining core asset classes in an efficient, cost effective manner. The art concerns the use of common-sense judgment in the challenge of combining incorporating individual characteristics into the asset allocation process. (p. 81)

There are two types of asset classes: One is risk-free (less) assets and the other is risky assets. Usually, treasury bills or short-term instruments such as money market funds of up to one year's maturity are considered risk-free assets because they are not sensitive to interest rate fluctuations and there is widespread consensus that they will not default. On the other hand, risky assets contain various potential asset classes including domestic equities, foreign equities, domestic long-term government bonds, domestic real estate investment, domestic inflation-protected bonds, domestic corporate bonds, foreign government bonds, call options, and hedge funds, etc. In order to achieve higher-than-expected returns on a portfolio with a low level of risk or minimum risk with a given level of return, financial analysts use mean-variance analysis. Additionally, variance (square of standard deviation) measures volatility. Being volatile, risky assets have a high standard deviation while risk-free assets have a low standard deviation.

Efficient frontiers are used to construct efficient portfolios of risky assets and helps in calculating the optimal risky portfolio. The efficient frontier of risky assets gives the highest expected return for each unit of risk (Markowitz, 1952). It is constructed with the help of expected returns, standard deviations, and correlation coefficients between each pair of assets. The correlation coefficient among risky assets is a useful statistical tool used to calculate the benefits of diversification: the lower the correlation coefficient among assets, the greater the benefits of diversification. Markowitz (1952) further states that portfolios with low correlations among constituent assets will have superior risk-return profiles than highly correlated portfolios. A complete portfolio is the final step in optimal asset allocation, which is a combination of risk-free assets and risky assets. The asset allocation decision for a complete portfolio depends on the intersection of the capital allocation line (CAL) with the efficient frontier of risky assets.

After describing asset allocation theory, it is useful to discuss the theoretical and practical aspects of international diversification of funded Pakistani pension schemes. First, the international investment of pension funds is carried out to achieve the benefits of diversification. Modern portfolio theory (Solnik 1988, 1998) suggests that diversified domestic portfolios can eliminate unsystematic risk resulting from the different performance of industries and firms, but the systematic risk of the whole economy remains as such. Systematic risk can be minimized through international investments which play an important role in spreading risk. The expansion of investment opportunities helps investors reduce the total risk of their portfolios and offers additional profit potential (Solnik and McLeavey, 2005). The authors maintain that a reduction in the total risk of a portfolio is not the sole motive of international investment. In fact, risk reduction can easily be achieved

through investment in risk-free bills—such investments also lower the expected return. The authors believe that international diversification lowers risk without compromising the expected return.

Second, currency risk does not pose a problem from the perspective of pension fund investments. Although currency fluctuations affect not only the total return but also the volatility of any foreign currency investment, the contribution of currency risk is insignificant from the point of view of pension fund investment due to their long duration regardless of whether it is a developed or developing economy. Pfau (2009) states that the Pakistani pension system and population are young while pension liabilities are of long duration, hence currency risk becomes negligible (p. 4). He further proves that hedged international assets do not provide protection from high inflation to Pakistani investors (p. 13). Empirical studies indicate that currency risk is smaller than the risk of the corresponding stock market. (Solnik, 2005). In addition, Jorion, et al's (1999) study stresses that the contribution of country risk to the total risk of a portfolio, including a small proportion of foreign assets, is negligible. Solnik goes on to say that holding some foreign assets provides diversification from domestic fiscal and monetary risks, as bad domestic monetary policy can affect domestic asset prices, leading to home currency depreciation. The author further states that the contribution of currency risk decreases with long-term investment. In addition, currency risk is considered negligible as some authors argue that exchange rate risk does not add greatly to the long-run risks of international investment (Dimson, Marsh, and Staunton, 2002).

Third, pension fund managers usually adopt long-term management strategies so that international diversification is beneficial. Ilikiw (2004) mentions that asset allocation is primarily responsible for any pension fund's long-term investment performance. The author further states that asset allocation focuses on finding mathematically optimized portfolios of domestic and foreign asset classes. The author maintains that these portfolios are based on assumptions in order to achieve specific risk-return objectives with high confidence. The author goes on to say that these policy portfolios are "no-brainers" because they do not incur additional costs, or the risks and uncertainty of active management (Ilikiw, 2004: p. 220). Hence, active management policy involving real estate, private equity, and hedge funds which are return-enhancing investments are outside the scope of this paper. Additionally, the selection of international assets along with associated risk is not a problem in today's world due to the emergence of index funds with a low cost. This study uses the Vanguard Total Stock Market Index (VGTMX) and Vanguard International Stock Index (VGTSX) as proxies for US stocks and world stocks (non-US), respectively, providing a solution to the problem of

selecting appropriate asset classes. Fourth, financial theory arguments for international investments also apply to Pakistan. Kotlikoff (1999) argues that developing countries should invest all their assets in the world financial market. However, this investment strategy is difficult to implement in developing countries for economic and political reasons.

From the practical standpoint, Pakistan's domestic financial and capital markets are too small to absorb the growing size of pension funds. The asset allocation appropriate for a pension fund is about 15.4% of assets invested in domestic stocks. As the pension fund grows bigger, it will have a greater impact on the Pakistani stock market since it does not have the capacity to absorb ever-increasing pension fund assets, which would chase a few securities, resulting in a price bubble. Roldos (2004) (as cited by Pfau, 2009) says that the lack of supply and diversity of local security markets will distort prices and increase the volatility of pension funds. Although the capital markets in Pakistan have developed robustly in the last decade, external macroeconomic shocks such as oil shocks can lead to high inflation, which could damage domestic financial assets. Additionally, the Karachi Stock Exchange is poorly diversified and dominated by a few fund managers with a small number of actively traded companies and initial public offerings (IPOs). Indeed, small markets in developing countries are volatile and illiquid due to their inherent characteristics and the entry and exit of foreign institutional investors (Davis and Steil, 2001). As domestic and foreign markets do not move in tandem, international investments avert the risk of disasters such as war, earthquakes, and so on.

Another problem is the consistent and dependent supply of long-term government bonds in Pakistan. The Securities and Exchange Commission of Pakistan (2007) reports that the bonds market is both illiquid and insufficient as government instruments are held to maturity and are not available for trading (p. 6). The report further mentions that the National Savings Scheme (NSS) accounts for 41% of government debt as of 30 June 2006 while Pakistan investment bonds (PIBs) constitute 13% of government debt (p. 20). The NSS is under the control of Central Directorate of Savings while PIBs are controlled by the State Bank of Pakistan. The report goes on to say that the highly subsidized nature of the NSS, along with the inbuilt option that allows investors to redeem the investment at any point without penalty, makes it a costly source of funding for the government. In addition, the higher interest rate instruments of the NSS makes PIBs noncompetitive and unattractive (p. 22). Keeping in view the returns of the NSS, the EOBI started to liquidate its portfolio of PIBs around three years ago and is investing primarily in the NSS (p. 27). Taking the emerging issues into account, the State Bank of Pakistan started

electronic bond trading in January 2010 to develop the secondary debt market. Although a welcome step, it will take time to yield benefits. Under the circumstances, if Pakistan's pension funds continue to invest in government bonds, it will prove an expensive source of funding for the government and further worsen the economic situation.

On the other hand, a fund manager of the Voluntary Pension Scheme (VPS) has already calculated various individual investment options with reference to domestic asset classes.[1] Pension fund investments across various asset classes have been extensively studied both theoretically and empirically. However, analysts have rarely studied the allocation of pension funds across domestic and foreign holdings (Burtless, 2006). Burtless goes on to say that most academic analysts and financial planners believe in obtaining higher risk-adjusted expected returns by including foreign investments. In contrast, national provident funds in Asia follow conservative investment strategies (Chan-Lau, 2004). Additionally, the overall investment portfolios in most Asian countries are concentrated in government securities (Asher, 2000) although financial planners recognize that large unfunded debt may require governments to pay higher interest on debt issuance. Moreover, it is also perceived that international investment will worsen the domestic economy[2] as large capital outflows are likely to deplete a country's reserves. However, hardly any substantive academic research has been undertaken on optimal asset allocation with historical returns and the role of international diversification for government pension funds in Pakistan. This paper aims to guide policymakers in determining asset allocation for government pension funds in Pakistan.

Presently, government servants' pensions are financed by the annual budget while the EOBI operates its own fund. However, the EOBI is restricted to domestic investments and a large chunk of its funds are invested in interest-bearing debt instruments, financing government debt. Although the returns on domestic investments have historically been high over short periods, this trend is not likely to be continued in the future due to lack of sustainability and the benefits of international diversification. Reisen's (1997) study says that obtaining benefits for domestic financial markets does not mean prohibiting all foreign investment but striking a balance between foreign and domestic.

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[1] Mr. Nasim Beg of Arif Habib Investments discusses various individual investment options at the World Bank conference held in Karachi in May 2007.

[2] Mr. Muhammad Iqbal Hussain (Ministry of Finance) gave this opinion at the World Bank conference held in Karachi in May 2007.

The present study is divided into the following sections: The demography of Pakistan, the pension system in Pakistan, methodology, results, and conclusions.

2. Demography of Pakistan

The demographic pattern in Pakistan makes pension reforms an important issue of public policy. The website of the finance division of the Government of Pakistan reports that the population of Pakistan has increased from 32.4 million in 1947 to 163.76 million during 2008/09. The population of Pakistan has been increasing at an annual rate of 2.6% since inception. However, the population growth rate decreased to 1.87% by 2005 (Ministry of Finance [MOF], 2009).

Although the fertility rate has declined from 6.3% in 1974 to 3.0% in 2008, it is still greater than the replacement rate and the population will tend to increase due to the reduced infant mortality rate of 70.2 per thousand births in 2008 and increased life expectancy at birth. This trend will keep on increasing in the future as forecasted by Table 1.

The forecast of demographic variables in Table 1 shows that Pakistan's 60+ population takes on a U-shaped pattern. The number of people aged 60+ will touch 19.2 million in 2025, more than double the size it was 2005. Similarly, the old age dependency ratio has been increasing since 1990 and will become 16 in 2050. This aging of population calls for pension reforms at the earliest.

Another interesting feature reinforces this need. A significant proportion of Pakistan's population is settled in rural areas where the extended family system ensures that family members take care of one another. Specifically, elderly family members are given financial and moral support. The fast pace of urbanization has brought about to some extent a change the family structure to a nuclear one. This requires astute policymaking for social security and occupational and government pension schemes so that the elderly can enjoy a decent standard of living.

Table-1: Forecast of Some Demographic Variables for Pakistan

Year	Total Population ('000)	Population Growth Rate (%)	Total Fertility Rate (%)	Life Expecta-ncy at Birth Male	Life Expecta-ncy at Birth Female	Depen-dency Ratio Old	Depen-dency Ratio Child	Population 60+ ('000)	Popula-tion 60+ (%)
1950	36944					9	67	3040	8.2
1955	41127	2.15	6.6	44.8	42.1	9	70	3043	7.4
1960	46259	2.35	6.6	46.7	44.5	8	75	3081	6.7
1965	52327	2.47	6.6	48.6	46.8	7	79	3113	5.9
1970	59565	2.59	6.6	50.5	49.1	7	79	3367	5.7
1975	68294	2.74	6.6	52.4	51.5	6	79	3782	5.5
1980	79222	2.97	6.6	54.4	53.7	6	79	4312	5.4
1985	95005	3.63	6.6	56.4	56	6	80	5072	5.3
1990	112991	3.47	6.66	58.5	58.1	6	84	6079	5.4
1995	127766	2.46	5.8	60.5	61.4	7	85	7027	5.5
2000	144360	2.44	4.96	61.4	62.2	7	77	8167	5.7
2005	158081	1.82	3.99	63.3	63.9	7	63	9323	5.9
2010	173351	1.84	3.52	65.2	65.8	7	55	10765	6.2
2015	190659	1.9	3.16	66.9	67.5	7	50	13005	6.8
2020	208315	1.77	2.88	68.4	69.1	8	49	15893	7.6
2025	224956	1.54	2.67	69.7	70.5	9	47	19246	8.6
2030	240276	1.32	2.5	70.8	72	10	42	22725	9.5
2035	254730	1.17	2.37	71.9	73.5	11	38	26597	10.4
2040	268506	1.05	2.25	72.8	74.8	12	35	31706	11.8
2045	281201	0.92	2.15	73.6	76	13	34	38717	13.8
2050	292205	0.77	2.06	74.4	77	16	32	48112	16.5

Source: http://esa.un.org/unpp/

Notes:
1. All forecasts are using medium variant.
2. Years for pop. growth rate, total fertility rate, and life expectancy at birth are given in 6-year periods.
For example, Year 1955 represents 1950-1955,
Year 1960 represents 1955-1960,
Year 1965 represents 1960-1965.
3. The total dependency ratio is the ratio of the sum of the population aged 0-14 and that aged 65+ to the population aged 15-64.
All ratios are presented as number of dependants per 100 persons of working age (15-64).
- The child dependency ratio is the ratio of the population aged 0-14 to the population aged 15-64.
- The old-age dependency ratio is the ratio of the population aged 65 years or over to the population aged 15-64.

3. Pension System in Pakistan

Pakistan is gradually moving toward a multi-pillar model of pensions (Table-2). Pillar 1 takes the form of the EOBI fund for private workers of large and medium enterprises. The government servants' (central and provincial) pension scheme covers pillars 1 and 2. The newly introduced VPS for registered taxpayers is represented by pillar 3.

Table-2: Pension System

	Private Workers	Government Servants	Registered Taxpayers
Pillar 1	EOBI	Pension-cum-gratuity	×
Pillar 2	×	General Provident Fund	×
Pillar 3	×	VPS	VPS

3.1. EOBI

The EOBI was conceived by the Federal Ministry of Labour, Manpower, and Overseas Pakistanis in 1976. It is a corporate body that provides national pensions to employees (laborers) of private sector industries/commercial establishments employing 10 or more persons (excluding managerial and professional staff). Establishments formed after 2008 and employing five or more workers also register with the institution. The EOBI provides registered employees with an age, invalid, and survivor's pension. It manages its administrative affairs but takes policy guidance from the federal ministry.

The EOBI is engaged in identifying and registering establishments and employees, and collecting and managing pension funds. The minimum amount required for a pension is Rs. 2,000 per month while the maximum amount, introduced in 1983, is calculated according to the formula below:

$$\text{Pension} = \frac{(\text{Average salary of final 12 months' wages} \times \text{no. of years of insurable employment})}{50}$$

The pension calculation is based on average final 12 months of wages. The possible retirement age is 60 years for men and 55 years for women, while the contribution of employees should not span less than 15 years. Until 2001, only employers contributed to the fund. The mandatory

contribution on the part of employers is 5% of the minimum wage (Rs. 6,000) of employees, while employees have had to contribute 1% of their wages to the pension fund since 2002. In 2005, contributions were linked to the minimum wage and benefits were also enhanced. The federal government started contributing a matching grant in 1986 under Section 9-A of the EOBI Act but stopped this in July 1995. Since then, the EOBI has had to generate an income from its own resources.

Table-3: EOBI Fund (Rs Billion)

Year	Fund at Beginning of Year	Govt. Contribu-tion	Contributions from Employers and Employees	Income from Assets	Pension Pay-ments	Fund at Year's End
FY1994	11.6	0.7	0.8	2	0.4	14.5
FY1995	14.5	0.6	1	2.5	0.5	18
FY1996	18		1.2	3	0.5	21.4
FY1997	21.4		1.3	3.6	0.6	25.5
FY1998	25.5		1.3	4.3	0.6	30.3
FY1999	30.3		1.4	5	0.7	35.9
FY2000	35.9		1.5	5.4	0.9	41.5
FY2001	41.5		1.7	6.3	1.3	47.9
FY2002	47.9		1.9	8.4	1.4	58.9*
FY2003	58.9		2.3	10.3	1.6	69.3
FY2004	69.3		2.7	12	1.7	81.6
FY2005	81.6		2.7	14.18	1.9	96.001
FY2006	96.001		3.37	17.45	2.89	109.95
FY2007	109.95		4.85	26.02	3.45	131.95
FY2008	131.95		5.84	27.32	4.23	154.37

Source: FY1994 to 2005, State Bank of Pakistan.
Source: FY2005 to 2008, EOBI.

In the fiscal year (FY) 1994, the EOBI had an accumulated fund of Rs14.5 billion, which increased to Rs. 154.37 billion by the end of FY2008. However, the distribution of the fund in terms of pensions remained as low as 16.3% of its income during this period (State Bank of Pakistan [SBP], 2004). During FY1999 to 2008, pension payments increased by more than three times due to enhanced pension benefits committed by the government and the increasing number of pensioners.

The EOBI Act says that money not required immediately for expenses may be invested. EOB investment (rules) 1979 allow investment in diversified assets such as government guaranteed securities, interest-bearing deposits in guaranteed banks, securities and preference securities in Pakistan along with real estate either freehold or leasehold. However, investment was restricted to fixed income securities of government schemes such as federal investment bonds (FIBs), PIBs, and NSSs. The government banned institutional investors from investing in NSSs in 2000 (SBP, 2004), however the restriction was removed in November 2006. Therefore, the EOBI has started to increase its domestic equity investment; the predominance of government securities in its portfolio is shown in Table-4.

Table-4: Portfolio Position of EOBI's Fund

	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004
Government Securities	90.39%	91.10%	93.09%	96.14%	93.85%	91.73%
Other	9.51%	8.82%	6.82%	3.63%	4.33%	3.70%
Equity	0.10%	0.08%	0.08%	0.23%	1.82%	4.57%
Total	**100**	**100**	**100**	**100**	**100**	**100**

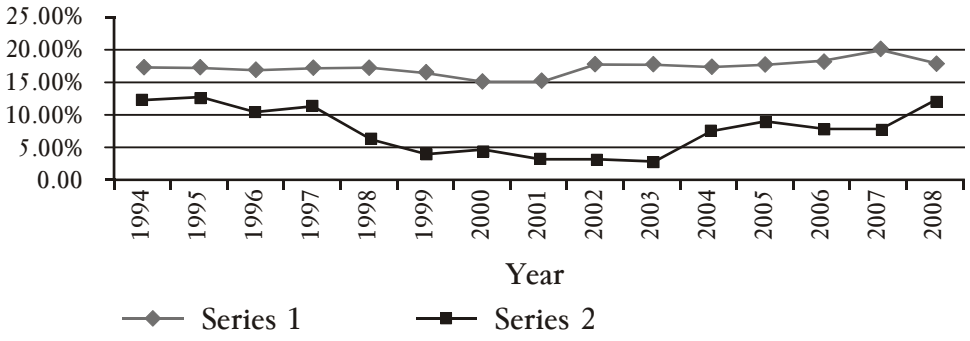
Source: State Bank of Pakistan.

The approximate return calculated as income from fund assets divided by the value of the fund at the beginning of the year from FY1994 to FY2008 is shown in Figure-1. The fund has yielded a high nominal return on its investments of between 15 and 18% during this period. There are a number of factors behind this high return. First, the fund invested in government-backed securities such as FIBs, PIBs, and NSSs, which yielded a high average return of around 17% during that period. Furthermore, this huge investment in interest-bearing debt instruments implies converting explicit debt to implicit debt.[3] An increasing budget deficit pushes governments to issue bonds, i.e., investing fund money in bonds mean financing the deficit. Additionally, the volume of assets could grow rapidly because the pensions distributed from the fund remained very low (between 2.5 and 3.5%) during the period due to nominal pensions committed by the government. The income from assets includes office premises and their rents, which is the lowest investment priority of the fund. Pfau (2009) states that the EOBI ignores capital gains/losses resulting from changing bond

[3] Mr. Muhammad Iqbal Hussain (Ministry of Finance) mentioned this point at the World Bank conference in Karachi in May 2007.

prices since government securities are held to maturity. But yields have fallen in recent years and it is doubtful whether such high returns can be maintained in the future.

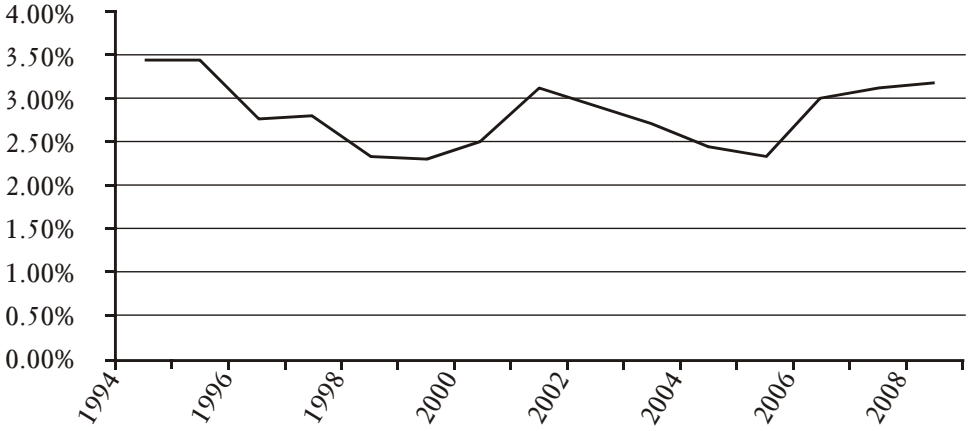
Figure-1: E.O.B.I's Fund Returns and Inflation



Source: Author's calculation.
Series 1= return, Series 2= inflation.

Note: Inflation calculation from International Financial Statistics.

Figure-2: Percentage of Pension Distributed



Source: Author's calculation from information in Table-3.

Note: Percentage of pension distributed = pension amount distributed/Fund at the beginning of the year.

The last actuarial valuation of the fund was carried out on 30 June 2002 and indicated that the existing scheme is not financially viable. The fund will start depleting in 2024 and will become negative in 2035 keeping in view simultaneous government reforms such as enhancing pension benefits and minimum wages (EOBI, 2009). Moreover, the fund does not

invest in US or world stocks and is hence devoid of the advantages of international diversification.

3.2. Government Servants' Pensions

The present pension system for government servants in Pakistan was introduced in 1954 comprising a pension-cum-gratuity-cum-General Provident Fund (GPF). This matches pillars 1 and 2 of the World Bank's pensions model. Pillar 1 includes DB pensions and gratuities, which are usually financed through taxes. No contributions are made by employees, and thus it is maintained on an unfunded basis. Pillar 2 is the mandatory contribution of government servants in the form of either a GPF or contributory provident fund (CPF). The pension system has been amended many times since then. The salient features of this system are as follows:

The retirement age for civil servants is 60 years. There are no pension benefits for up to 10 years of service, although pension benefits start after 10 years in case of invalid government servants. A civil servant is eligible for a pension provided s/he completes 25 years of service. A pension is calculated according to the following formula:

Full (gross) Pension =

$$\frac{\text{Last Pay / Pensionable Emoluments X (10-30 years) Service x 7}}{300}$$

The full (gross) pension is calculated at 70% of the last current basic pay/pensionable emoluments on completion of 30 years' qualifying service; where the period of qualifying service is less than 30 years but not less than 10 years, there is a proportionate reduction in percentage. The minimum replacement rate is 70/300 for up to 10 years of service while the maximum replacement rate is 210/300 after completing 30 years of service. There is no benefit toward a pension after 30 years of service.

3.2.1. GPF

All government servants in permanent pensionable or nonpensionable service or those temporary or officiating posts who have completed two years of continuous service are bound to join the GPF as compulsory subscribers. From time to time, the government fixes the amount of subscription toward the GPF in the form of interest. According to a government provision, the

interest is credited to the subscriber's account note.[4] The interest rate is determined each year according to the method of calculation prescribed from time to time by the government. If a subscriber is not interested in the interest rate, it is not transferred to his or her account, and s/he is allowed the facility of interest-free house building/conveyance.

Although the GPF is considered the savings of salaried employees, it is very small. The government does not utilize the contribution of employees to the fullest extent. Instead, it uses contributions to meet annual government expenditures and payments to retiring employees in that year. Since the government does not invest the GPF properly, it places an additional burden on the government exchequer. The outstanding amount of the GPF stood at Rs. 21.5 billion in April 2005 (SBP, 2004).

3.3. VPS

The Securities and Exchange Commission of Pakistan (SECP) introduced the third pillar in the form of a VPS through pension system rules in 2005. This is a voluntary self-contributory pension scheme for salaried and self-employed individuals with a valid national tax number (NTN). Employers can also contribute to the pension accounts of their employees. Pension account holders have individual pension accounts and have the option of holding more than one account. They can also move their pension account from one fund manager to the other. Finally, account holders have the option of withdrawing 25% of the balance amount at retirement age (SECP, 2005).

The SECP has already given licenses to four asset management companies under VPSs. These asset management companies offer three types of accounts, i.e., equity fund, debt fund, and money market fund to account holders. However, the coverage of the VPS scheme remains limited because there were 1.8 million taxpayers (around 1% of the total population) on 30 June 2009 (MOF, 2009). The VPS covers contractual government servants who are not covered under the government pension system and private employees not covered by any other scheme. Despite its limited coverage, it is a step in the right direction.

[4] Finance Division Notification SRO 423 (1) / 90 dated 24 April 1990.

4. Analyses

4.1. Methodology

This section describes how pension funds in Pakistan can benefit from international diversification through optimal asset allocation. Asset allocation is a portfolio choice among broad investment classes and an application of mean-variance analysis. Mean variance analysis requires not only the inputs of expected return and standard deviation of each asset class, but also the correlations of returns for each pair of assets. In this case, the inclusion of international assets will expand the set of available asset classes which increases return per unit of risk as the total standard deviation of a portfolio will be less than the standard deviation of the individual asset. As correlation across asset classes in usually low and even negative, mean variance analysis is a powerful tool in asset allocation for risk reduction through diversification.

Mean variance analysis is based on the premise that investors prefer higher returns and avoid risk or volatility of returns. Investors try to maximize expected portfolio returns r_p for a given level of portfolio risk (variance) σ_P or minimize risk for a given level of return. We assume that investors choose the portfolio weights that maximize utility U with the common utility function:

$$U_p = r_p - 0.005A\sigma_P^2$$

U_p is the utility of the portfolio. Here A is the investor's risk aversion coefficient; r_p is the expected return of the portfolio and σ_P is the expected standard deviation. The above equation shows that utility increases with portfolio return r_p and decreases with portfolio variance σ_P^2. Thus, of all feasible portfolios, the investor should consider those that maximize expected return for a given level of variance. A=0 implies that the investor is risk-neutral, A=2 implies an aggressive investor. By increasing the values of A, risk can be minimized. A=5 to 8 indicates a conservative investor, typically a pension fund manager.

We use a standard finance statistical package to calculate the optimal portfolio. The package includes a set of portfolio construction and optimization functions designed to build an optimal portfolio that optimize risk-adjusted returns. Since the efficient frontier is a line on the risk return plane, we need inputs in the form of compatible matrices of expected returns on each asset class, the variance-covariance matrix, and number of

portfolios to be analyzed along the efficient frontier. We call the function used to compute the efficient frontier, ***frontcon***.

In the next step, we define the ***portalloc*** function which comprises input arguments of portfolio risk, portfolio expected returns, and portfolio weights, all of which are outputs of the ***frontcon*** function. Other input arguments are the risk-free rate r_f, the borrowing rate (which is not specified and taken as default), and the degrees of risk aversion of investors which are 2, 5, and 8 for portfolio allocation of international assets and 3 for the calculation of a portfolio without international assets. We use varying degrees of risk aversion coefficients to determine optimal asset allocation. However, the final decision with regard to the suitability of risk-averse coefficients for Pakistani funded pension schemes lies with fund managers/policymakers. ***Portalloc*** is an inbuilt function which returns the optimal capital allocation of individual classes along the efficient frontier. The difference between ***portalloc*** and ***frontcon*** is that ***portalloc*** divides the whole portfolio into risk-free investments and risky investments depending on the investor's propensity for risk. It then calculates the weights of different asset classes in the portfolio along the efficient frontier. This is called a capital allocation decision between a risky portfolio and nonrisky assets. The point at which the capital allocation line (CAL) intersects, the efficient frontier becomes our desired complete portfolio with weights assigned to different asset classes. A complete portfolio would be based on the separation property (Tobin, 1958) principle in which portfolio choice is based on the technical requirements of a portfolio and personal preferences of investors, i.e., to achieve the best mix of risky and risk-free assets.

There are certain limitations to the mean-variance model since it depends on input data. Small changes in input data can affect optimal asset allocation a great deal. To minimize this effect, we use historical time series data of long duration with boom and bust cycles. Pfau (2009) states that the mean-variance approach is static, focusing only on a given point without considering the future. The author also says that the limitation becomes less important for a long lived pension fund (p. 11).

Keeping in view the above methodology, our calculations are based on historical time series data of assets such as US large stocks, world stocks, Pakistani stocks, and Pakistani treasury bonds. We do not include US bonds and world bonds for two reasons. First, the historical returns on these assets are quite low over a long period of time. Second, long-term bonds are illiquid compared to stocks and hence it is better to invest in foreign stocks. We have selected US large capital stocks and ignored emerging markets for various reasons. First, the US stock market is more transparent than stock

markets in emerging markets. Second, the US stock market accounts for around 46% of the total market capitalization of the world as reported by the World Bank in 2008. Pension fund investment is done primarily following a passive investment strategy where stable and large security markets are important. On the contrary, emerging markets are riskier and more volatile, and an active investment strategy has to be followed. Practically, this is difficult for Pakistani fund managers to adopt given their lack of expertise. Third, larger security markets are better regulated and entail lower trading costs (Bodie, Kane, and Marcus, 2007). Similarly, we select world stocks (non-US) which represent the world stock markets of developed countries keeping in view the aforementioned factors. Emerging markets' stocks have been excluded to avoid potential losses associated with their riskier nature; pension fund investment should not be done in riskier assets. Moreover, emerging markets would be highly correlated with Pakistani markets and devoid of the benefits of diversification. Finally, although real estate investments in Pakistan may yield better returns, we exclude them from the data due to valuation problems, nontransparency, and nonregulation of real estate assets.

4.2. Data Sources

The historical data to be used for this study consist of five asset classes. The dataset includes US large capital stocks, world stocks (excluding US stocks), Pakistani stocks, Pakistani treasury bond returns, and 1-year treasury bills. We use annual data for the returns at the year's end for the period 1962 to 2009. The annual returns on US large capital stocks are obtained from the website (www.mhhe.com/bkm) for the period 1962 to 2003 while the Vanguard Total Stock Market Index (VTSMX) has been used as a proxy from the site www.yahoofinance.com for the period 2004 to 2009 by taking the adjusted returns in December every year. Similarly, the annual returns of world stocks are obtained from the website (www.mhhe.com/bkm) for the period 1962 to 2003 while Vanguard Total International Stock Index (VGTSX) has been used as a proxy from the site www.yahoofinance.com for the U.S. stocks for the period 2004 to 2009 by taking the adjusted close returns for December every year. All non-Pakistani assets are quoted in terms of $US and are converted to Pakistani rupees by taking the annual percentage changes at the year's end from the International Financial Statistics (IFS) database for the period 1962 to 2009. Exchange rate data is used to convert the returns on non-Pakistani assets into Pakistani rupees so that the results are from the point of view of Pakistani investors. Similarly, data on Pakistani stocks is obtained from two sources. Annual stock returns are calculated using the State Bank's General Index of Share Prices from 1962 to 1991. Annual returns on the KSE 100 Index are calculated for the period 1992 to 2009.

The annual yield of Pakistani long-term treasury bonds is obtained from the IFS database for the period 1962 to 2009. In order to be consistent with the other data, we calculate the total return *(RET)* on these bonds which consists of the yield and capital gains/losses from the interest rate movements using the following formula.

RET_t = $yield_{t-1}$/ $yield_t$ + (1-$yield_{t-1}$/ $yield_t$)/ (1+$yield_t$ /100)^{10} - 1 + $yield_{t-1}$/100

The data is presented in Table-5.

Table-5: Asset Returns

Year	Pakistani Stocks	Pakistani Treasury Bonds	US Stocks	World Stocks
1962	13.742	2.78	-8.790	-7.200
1963	13.649	3.22	22.630	14.350
1964	-6.565	3.62	16.670	11.050
1965	-4.594	1.49	12.500	10.490
1966	-1.065	1.98	-10.250	-6.470
1967	-3.653	4.55	24.110	23.750
1968	14.793	2.2	11.000	19.920
1969	4.393	1.32	-8.330	-6.210
1970	10.950	3.02	4.100	-2.940
1971	-37.689	3.56	14.170	19.220
1972	-15.412	5.76	101.450	107.540
1973	15.222	5.76	0.370	0.760
1974	-18.924	5.68	-27.341	-24.951
1975	29.263	5.78	37.260	31.840
1976	1.354	-15.17	23.980	16.760
1977	17.537	7.58	-7.260	6.430
1978	31.205	7.95	6.500	21.140
1979	23.394	7.80	18.770	18.020
1980	-0.930	1.28	32.480	30.430
1981	14.228	22.53	-4.980	-4.180
1982	-48.149	9.67	41.762	30.932
1983	31.272	9.68	33.085	34.575
1984	38.522	9.67	13.545	10.435
1985	-3.307	9.60	45.399	53.769
1986	-3.006	11.91	22.915	43.095
1987	30.207	12.15	9.853	20.703

1988	17.024	7.90	20.334	25.324
1989	4.866	9.20	45.439	33.049
1990	3.740	9.04	2.476	-11.984
1991	36.749	9.23	40.304	28.574
1992	-25.650	-20.6	13.096	-0.874
1993	74.020	12.30	21.928	32.568
1994	-5.320	14.91	10.040	15.420
1995	-26.900	13.06	41.231	24.081
1996	-10.540	13.0	37.089	26.219
1997	30.890	12.73	47.120	29.920
1998	-46.110	77.45	38.152	30.122
1999	46.000	9.9	30.928	36.988
2000	9.990	3.8	-0.721	-4.721
2001	-16.130	5.8	3.542	-0.388
2002	112.210	8.9	-25.658	-20.578
2003	65.520	6.2	25.388	34.458
2004	39.07	-6.2	11.85	13.34
2005	53.68	-8.5	3.88	12.70
2006	5.06	-4.0	14.22	26.22
2007	40.18	12.0	-1.2	9.90
2008	-58.33	-12.0	-54.4	-63.3
2009	60.05	26	18.01	24.74

Sources: Pakistani Stocks: State Bank of Pakistan, Karachi Stock Exchange. Pakistani Treasury Bonds: International Financial Statistics. U.S. Stocks: S&P 500, Center for Research in Security Prices (CRSP), University of Chicago and Vanguard Total Stock Market Index (VTSMX) World Stocks: Datastream and Vanguard Total International Stock Index (VGTSX).

5. Results

The objective is to consider the role of international assets for funded Pakistani pension schemes. Table-6 presents the means, standard deviations, and correlation coefficients. The historical data is used to determine optimal asset allocations for varying degrees of risk aversion. Finally, we check optimal asset allocation by prohibiting foreign assets.

Table-6: Historical Mean Returns, Standard Deviations, and Correlation Coefficients

	Pakistani Stocks	Pakistani Treasury Bonds	US Stocks	World Stocks
Means	11.6	6.95	16.10	16.15
Standard Deviations	32.40	13.41	24.40	24.33
Correlation Coefficients				
Pakistani Stocks	1	-0.059	-0.074	0.072
Pakistani Treasury Bonds	-0.059	1	0.23	0.23
US Stocks	-0.074	0.23	1	0.93
World Stocks	0.072	0.23	0.93	1

Pakistani stock returns show a high volatility with a mean return of 11.6% and standard deviation of 32.4%, while the total returns on Pakistani bonds are 6.95% with a 13.41% standard deviation. The risk-free rate is assumed to be 5%. In Pakistani rupees, the mean returns on US stocks are 16.10% with a 24.4% standard deviation; the mean returns on world stocks are 16.15% with a standard deviation of 24.33%.

The correlation of 1 between asset classes will not show any benefits of diversification. Similarly, the correlation between US stocks and world stocks (non-US) is 0.93 which is quite high from the perspective of diversification. However, decreasing correlations imply greater benefits of diversification. Negative correlations are attractive for optimal portfolios as they reduce portfolio variance with the same returns. The correlations among Pakistani stocks, Pakistani bonds, and US stocks is -0.059 and -0.074. Being negative, they provide the benefits of diversification. Moreover, the correlation between Pakistani stocks and world stocks (non-US) are 0.072 so there are fewer benefits of diversification. However, the correlation among Pakistani bonds, US stocks, and world stocks is 0.23. The results help in calculating optimal asset allocation (Table-7).

Table-7: Results of Portfolio
Asset Allocation for Varying Degrees of Risk Aversion Based on Annual Data, 1962-2009.

		Risk Aversion Coefficient		
		2	5	8
Return (%)		15.03	10.3	8.30
Risk (%)		19.63	10.3	6.4
Portfolio Weights (%)	Pakistani Stocks	23.6	15.4	9.60
	Pakistani Bonds	0	7.8	4.9
	Pakistani Bills	0	39.8	62.4
	US Stocks	66.0	37.0	23.1
	World Stocks (Non-US)	10.4	0	0
Percentage Stocks		100	52.4	32.7
Percentage International		76.4	37.0	23.1

Reward to Variability Ratio = 0.51

Optimal Asset Allocation with International Assets

Table-7 presents the optimal asset allocation of historical data with risk aversion coefficients of 2, 5, and 8. In this section, we vary the risk aversion coefficients to observe the corresponding changes in optimal asset allocation decision. Risk aversion coefficient A = 2 implies an aggressive investor while A = 5 and 8 indicates a risk-averse investor. The calculation using an A = 2 portfolio shows that Pakistani assets constitute 23.6 of the complete portfolio while the remaining 76.4 goes to US stocks and world stocks with an overall return of 15.03% and a risk of 19.63%. The biggest allocation is for US stocks at 66.0, followed by Pakistani stocks at 23.6, and world stocks at 10.4. Pakistani bonds play no role. Additionally, the reward to variability ratio is 0.51 for all portfolios as all exist on the same CAL.

Although we have started our analysis from the point of view of an aggressive investor, pension fund investments are more suited to conservative investors. For risk aversion coefficients of 5 and 8, asset allocations change in favor of Pakistani bonds and bills. With a risk aversion coefficient of 5, the percentage allocated to US stocks and Pakistani stocks decreases to 37.0 and 15.4%, respectively. Interestingly, world stocks lose their position while the major portion of the portfolio is dominated by

Pakistani bills and bonds. The portfolio seems good from the perspective of Pakistani pension funds as it gives an overall return of 10.3% with a 10.3% standard deviation. The average inflation rate of five decades becomes 7.3% (IFS database) and the real returns on the fund are 3.0%, which is a plausible investment for a pension fund such as the EOBI along with newly created funded pension schemes. Additionally, the portfolio is balanced with stocks' share of 51% and aggregate bonds and bills' share of 47%. The portfolio with its international components also fulfills the requirements of the EOBI's long-term commitments.

With a risk aversion coefficient of A = 8, the portfolio favors Pakistani bills and bonds with an overall return of 8.3% and standard deviation of 6.4%. Although the portfolio favors bonds and bills, US and Pakistani stocks hold an adequate share of 23.1 and 9.6%, respectively. However, the ultimate decision to select a portfolio depends on policymakers' insights and priorities.

Optimal Asset Allocation with Pakistani Assets

Table-8: Asset Allocation of Pakistani Assets Based on Annual Data 1962-2009
Risk Aversion=3

Return (%)	7.2
Risk (%)	8.6
Pakistani Stocks	21.9
Pakistani Bonds	39.1
Pakistani Bills	39.0

Reward to Variability Ratio - 0.26

Table-8 presents the results of the portfolio after removing international assets. We start calculating the optimal asset allocation with Pakistani assets for the historical period with a risk aversion coefficient of 3. The portfolio gives an overall return of 7.2% with a standard deviation of 8.6% and heavily tilts toward Pakistani bills and bonds. Almost 82% of the total assets go toward bonds and bills. Moreover, the reward to variability ratio decreases to 0.26, showing an increase in portfolio variance by compromising returns in comparison with optimal asset allocation with international assets. If the risk aversion coefficient A increases further, the

percentage allocated to Pakistani bills will increase. Thus, we stop calculations at A = 3 as the overall return will further decrease.

Moreover, if we allocate about 82% of the assets to Pakistani treasury bonds and bills, the pension fund will generate almost the same payment stream as a PAYG system, which is already in practice in Pakistan. As Funke and Stadtmann (2004) explain, the only difference between a pure PAYG system and pension fund is that the government undertakes its financing through the medium of a pension fund rather than income tax. Such an approach makes the pension fund irrelevant. In addition, the ever-increasing budget deficit prompts the government to issue bonds: if we allocate most of our assets toward treasury bonds, it will simply help in financing the budget deficit.

6. Conclusion

We have found that a risk-aversion coefficient of 5 may be suitable to sustain the defined benefit pension fund of the EOBI as it gives an overall return of 10.3% with a 10.3% standard deviation. With an average inflation rate over five decades of 7.3%, the real returns on the fund become 3.0%, which is a plausible investment for a pension fund such as the EOBI and newly created funded pension schemes alike. Additionally, the portfolio is balanced with stocks' share of 51% and aggregate bonds and bills' share of 47%. The portfolio with its international components also fulfills the requirements of the EOBI's long-term commitments. Another reason to include US and world stocks in the asset allocation is that pensioners' consumption of goods and services and prices of goods and services are highly correlated with stock prices in Pakistan.

The removal of international assets from the optimal portfolio enhances the portfolio's variance and compromises returns. The portfolio gives an overall return of 7.2% with a standard deviation of 8.6% and heavily tilts toward Pakistani bills and bonds even with a risk-averse coefficient of A = 3. Almost 82% of the total assets go toward bonds and bills. Moreover, the reward to variability ratio decreases from 0.51 to 0.26, showing an increase of portfolio variance by compromising returns in comparison with optimal asset allocation with international assets. In short, the present study presents a strong case for international diversification. However, pension fund assets should neither be invested to retire the government debts of provincial governments nor to bolster the stock exchanges in times of economic crises. It is important to note that the EOBI's sustainability depends on allowing for international investments. The findings are highly relevant to the newly created Punjab Pension Fund.

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