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### **The practical implementation of the first lesson of portfolio theory**

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#### **ABSTRACT**

In a pension deal the strategic asset allocation (SAA) is a crucial building block. Therefore, obtaining the optimal SAA is of high importance. For a liability organization, such as a pension fund, this is done by first considering the objectives and constraints. Second, the risk and return profile of a liability organization determines the optimal SAA. In this paper we will describe our methodology to honor the first lesson of portfolio theory.

Keywords: Strategic asset allocation, Risk-return profile, Pension funds, Pension deal

JEL Classification: G11, G22, G23, G32, G38

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# 1 Introduction

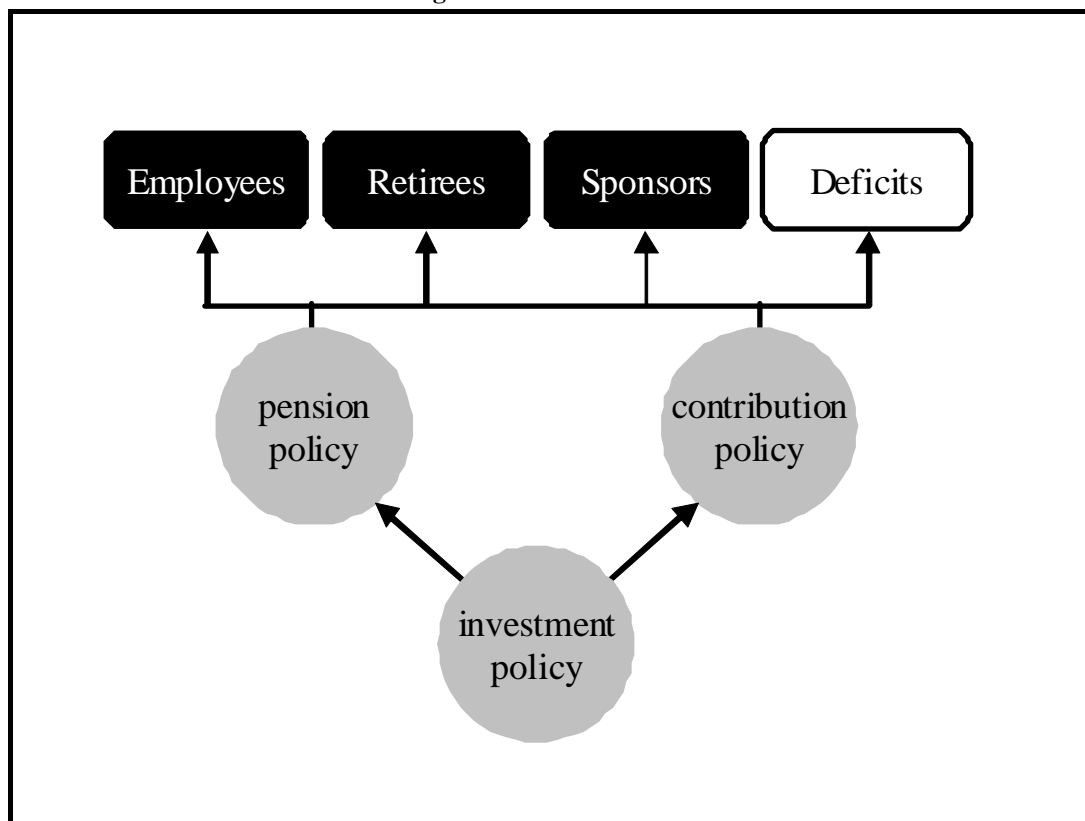
In the editor's corner of the Financial Analysts Journal August 2007, Mr. Richard Ennis wrote, "In short, institutional investors have generally failed to integrate portfolio investment policy in the larger context of the circumstances of the bearer of investment risk. Why? Why have ostensibly sophisticated and well advised institutions not heeded the first lesson of portfolio theory and integrated their risk decisions?" Indeed, with respect to the main decision of strategic asset allocation, i.e. the decision regarding the appropriate amount of investment risk, a rather important explanatory factor still seems to be herding. Otherwise it cannot be explained that for instance pension funds in the US and the UK have much more risky strategic asset allocations than for instance Dutch and Swiss funds, whereas there is neither a logical reason for the small differences in risk exposures of pension funds within specific countries either. Note that all funds have the objective to secure an income for people once they have retired and are no longer willing or able to generate (sufficient) income themselves. Hence, if the risk exposures of the strategic asset allocations of pension funds would not satisfy "the first lesson of portfolio theory", in other words be fundamentally wrong, we are facing an immense financial and social problem indeed ("pension tsunami").

In this paper we will describe our methodology to honor the first lesson of portfolio theory. It implies that characteristics, preferences, and constraints of scheme members come first, whereas the investment policy comes second. Rather than being the main objective itself, the investment policy is used to serve optimally the requirements and needs of the clients. The methodology is based on three main principles. The first principle is to make explicit and transparent the maximum amount of risk that the "bearer of investment risk" is able and willing to take. Second, the amount of risk in the strategic asset allocation (SAA), together with the unavoidable risk factors in pension schemes, for instance longevity, should equal the accumulation of risk that all stakeholders are prepared to take. Third, in return each bearer of investment risk should get a fair part of the profits. Our methodology pertains to any liability organization: pension funds, insurance companies, and (ultra net worth) individuals. In the remainder we will especially concentrate on pension funds.

## 2 The relevance of return and risk

Before we turn to the methodology we first elaborate on the relevance of risk and return for the important example of determining a pension deal, cf. Figure 1. The SAA is a crucial building block of the pension deal. Investment returns are used to reduce the expected contributions to the fund, possibly for cost of living allowance (COLA), and to create buffers if these are considered to be insufficient. On the other hand, of course these stakeholders are also the ones that have to absorb the accompanying risk.

Figuur 2.1: Pension deal

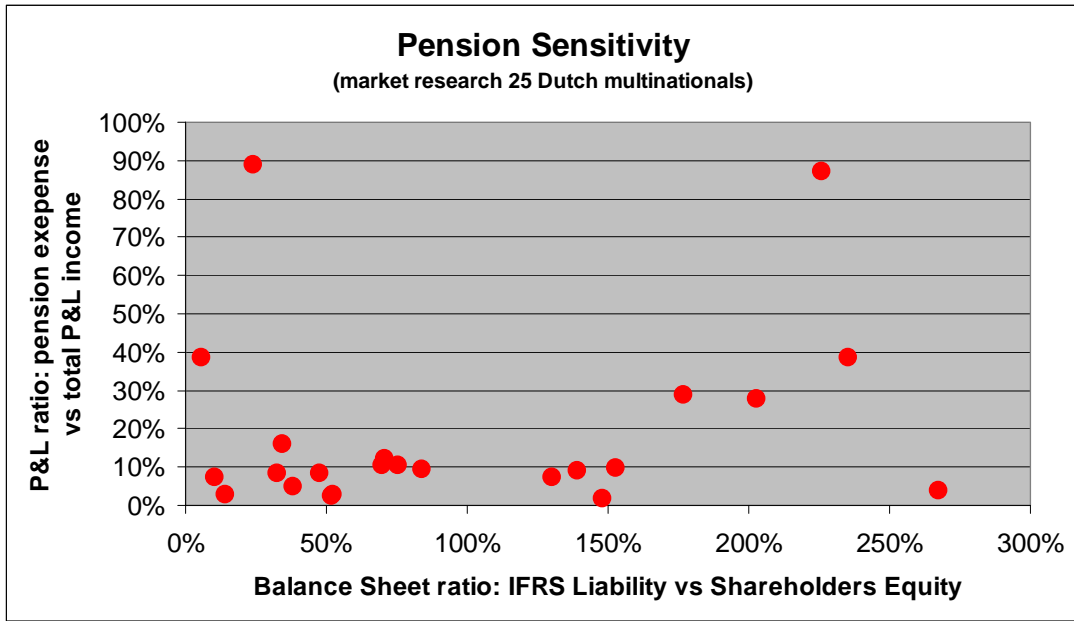


First, let us focus on the return side of the SAA. For a median pension scheme an additional return of 100 basis points on the investment portfolio is equivalent to either 30 percent less contribution or 30 percent higher pensions. This figure refers to the cash that is needed by the plan. With respect to the cost that companies reporting under the International Financial Reporting Standards (IFRS) have to take into account in the P&L, the expected future returns on pension assets can be taken into account. This implies that one percent additional expected return on pension assets reduces pension cost accordingly. Therefore, both from the perspective of the pension fund as well as from the perspective of the sponsoring company, setting pension assets at risk, and applying these risk budgets to accomplish return on pension assets is of crucial importance to realize adequate pensions at affordable pension cost. Of course, this expectation-driven long term economic view explains why pension funds (especially in the US and in the UK) show relatively large equity exposures.

Although the long-term expectations driven approach is unquestionably valid, it is unilaterally based on expected developments only. It neglects the accompanying risk, thereby violating the first lesson of portfolio theory both from a short term and from a long term point of view. And, the consequences of this violation are inconceivably large. As an example we consider a typical Dutch defined benefit (DB) scheme. The standard deviation of nominal funded ratio growth is approximately ten percent. The nominal funded ratio is defined as pension assets over the present value of future pension payments without being corrected for future COLA. Let's assume that the funded ratio growth has a log-normal distribution. Then, there is a 2.5% chance that the funded ratio will drop in any year by 20% or more. On a Dutch national scale such a drop is equivalent to thirty percent of Gross Domestic Product. Thus, no matter whether such an event is absorbed by a deteriorated funding status, a higher contribution, and/or (temporary) lower pension accruals, the short term risk ought to be taken into account by all the stakeholders of the plan. Of special interest is the impact of pension risk on the P&L statements of companies that report under IFRS. Mr. Warren Buffett continuously warns about the fact that many companies use unrealistically high expected portfolio returns in determining their pension cost. Keeping in mind that one percent additional expected return results in 30 percent lower pension cost, and, in view of the increasingly short-term focus of shareholders and governing boards, it is understandable that portfolio returns "estimates" are unrealistically high.

In this paper we address the accompanying risk. For many companies shareholders equity approximates the value of their pension liabilities. We refer to Figure 2 that for 25 Dutch multinationals depicts the ratio of the IFRS pension liability versus shareholders equity (horizontal axis), and the ratio of the IFRS pension expense versus total P&L (vertical axis). The IFRS pension liability of these 25 Dutch multinationals is on average equal to their shareholders value, but, as can be verified from the figure, for some multinationals the pension liability is more than 250% of their shareholders equity. Thus, for this sample a drop of 20% of the pension assets is on average equal to a drop of 20% in shareholders equity, rising to 50% of shareholders equity for some individual companies. Clearly, in contrast to the long-only expectation paradigm, this risk should be taken into account and should be managed. In addition, long term risk should not be neglected either. Many adherers of the long-only paradigm emphasize that equity risk evaporates in the long term. However, if we assume that equity returns are independently and identically distributed with mean 8% and standard deviation 20%, there is a 2.5% chance that the 25-years cumulative return is still negative. Therefore, the long-term might turn out to be prohibitively long. Second, the worst possible outcome only worsens at growing investment horizons. Thus, also from a long-term perspective, risk should be taken into account and be managed.

**Figuur 2.2: Pension sensitivity**

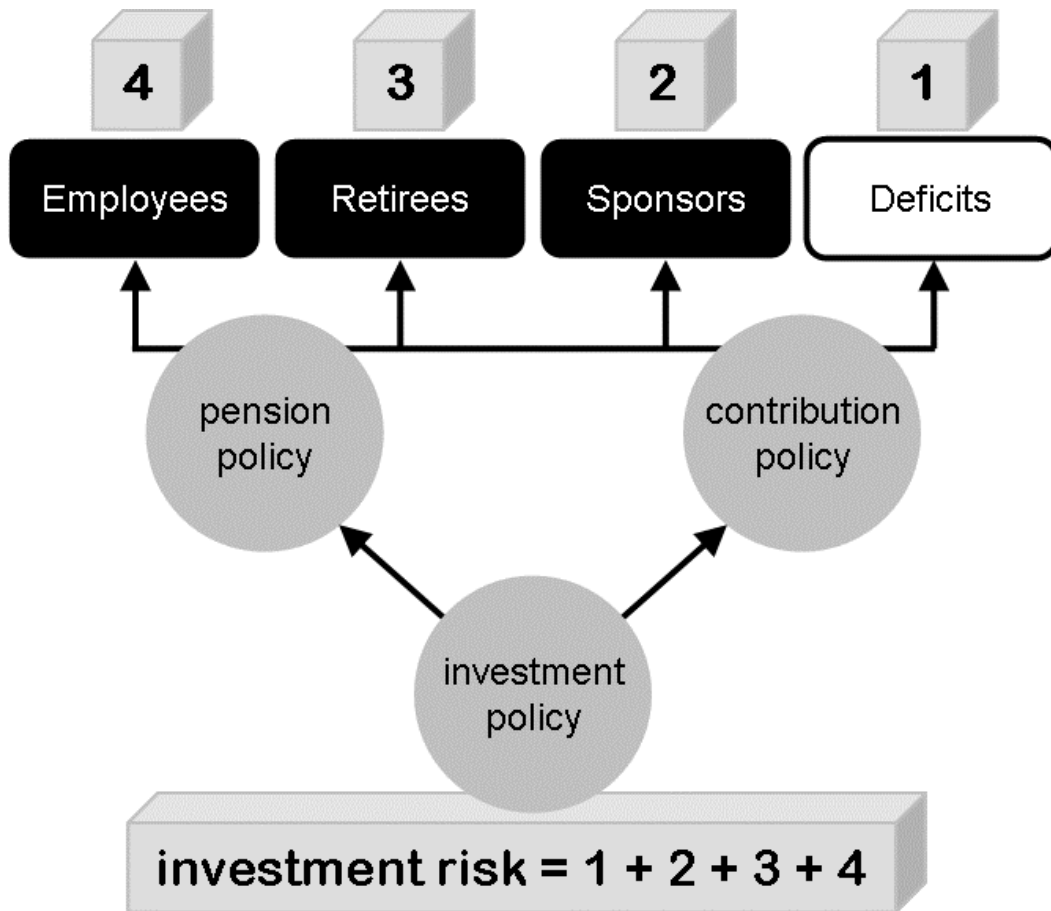


### 3 The methodology

In this section we explain the three principles of the methodology also for the case in figure 2.1 to create the pension deal of a pension fund. In any pension deal four different risk bearers can be distinguished. In arbitrary order:

- The sponsor can take up risk by being (partly) responsible for pension deficits. Of course, the more pension risk the sponsor is able and willing to bear, the higher the risk exposure of the SAA can be, with an according higher expected return. All extremes exist in practice. In full DB systems the sponsors bear all the risk. Thus, in DB sponsors have the ultimate responsibility of the SAA of the fund, and get an appropriate reward for this risk exposure in terms of a lower expected contribution. In full Defined Contribution systems the sponsor does not bear any risk, and gets logically no return either. Also hybrid systems exist, like conditional DB, where the sponsor bears a limited pension risk. From the point of view of setting a pension deal and choosing the optimal corresponding risk profile of the SAA, the most important principle is that the risk sharing agreement between the sponsor and the pension fund is explicitly defined and transparent to all stakeholders (including the regulators). We will refer to this pension risk exposure as the risk budget that is provided by the sponsor. In Figure 3.1 this risk budget is abstractly depicted as one of the boxes.
- Analogously, employees and pensioners can take up part of the risk. This is for instance the case with full DC, where each individual fully bears her own pension risk, and thus gets all portfolio return. In DB-systems participants can bear pension risk by temporary postponement of COLA, or even by cutting in accrued pension rights.
- In capital based systems risk can also be partly absorbed by allowing temporary deficits. Allowing a deficit is de facto nothing else than risk transfer to (not knowing) future stakeholders and to current stakeholders in the future. Just as the risk budgets provided by the participants and the sponsor, this defines a risk budget that contributes to the appropriate amount of risk in the SAA of the fund.

**Figuur 3.1: Main principle of ALM and pension investment**



Now we have established the building blocks for the methodology to implement and satisfy the first lesson of portfolio theory for the case of designing pension deals. The three principles of the methodology concern:

**I. Identification risk budgets:**

First of all, for each risk bearer an explicit and transparent risk budget should be identified. In practice these risk budgets have various components. First all these should distinguish in short term and long term risks. Secondly the risk budgets should be defined in terms of the goals and constraints of the stakeholders. For participants this means that the risk budget should be defined in maximum deviations from the pension level that is aspired. For the sponsor the risk budget should distinguish in cash consequences on the one hand and the consequences under IFRS for the P&L and BS on the other.

**II. Corresponding risk exposure SAA:**

Secondly, it is crucially important that the risk exposure of the SAA, with the addition of unavoidable risk, like for instance longevity risk, is equal to the combined risk budgets provided by all the stakeholders. Of course, if this principle is not satisfied, the fund carries more risk than can be accounted for. The question then is who will ultimately absorb the risk if it actually materializes? On the other

hand, if the SAA has a lower risk exposure than the risk budget allows for, the fund yields a too low expected return and endangers the pension deal from a return rather than a volatility perspective.

**III. Fair reward for risk:**

Third, in a fair pension deal each stakeholder should get a fair return for his or her risk budget. Sponsors that are able and willing to bear risk should be rewarded with a lower expected contribution. Analogously, as mentioned before, in DC schemes where individuals bear all the risk, they should benefit from the entire return as well. The possibility of temporary underfunding of capital based pension systems is an interesting risk budget. In such systems the future stakeholders that actually (without knowing) provide the risk budgets should be rewarded for their part in the form of compensation for a deteriorating funding status in bad financial periods. This can be done by creating buffers in healthy financial periods. The behavioral finance teaches us that indeed it is an efficient game to create buffers in good times in order to prevent suffering in bad times. Shiller (2003) states “*making generations depend on the success of their investments for their own retirement is not risk management*”. Risk budget management can accomplish this.

A summarizes report that contains the numerical results of three principles for a pension deal is contained in Figure 3.2.

**Figur 3.2: Risk-return profile of a Pension Deal**

<u>Risk-return profile of a Pension Deal</u>		
	short term	long term
<u>Solvency</u>		
Probability funded ratio < 100%	1.2%	1.0%
Probability funded ratio < 105%	4.0%	2.4%
Probability ever hitting 105%	5.0%	13%
2.5% Surplus at Risk	103%	105%
<u>Sponsor</u>		
Expected contribution rate (%salaries)	11%	7.2%
Average jump contribution rate	2.5%	10%
2.5% risk level IFRS liabilities (%salaries)	150%	250%
<u>Participants</u>		
Expected Purchasing Power in year 25		99.5%
2.5% Purchasing power at Risk in year 25		91%

## 4 Conclusion

Several concluding observations are of significant importance:

- **What if the first lesson of portfolio theory is not satisfied?**

This implies that the SAA either contains too little or too much risk exposure. The consequences of a too low exposure are obvious. The consequences of a too large exposure might turn out disastrous. This is due to the fact that people frequently react irrational to the materialization of risk that was not anticipated. And if the risk in the SAA is higher than the accumulated risk budget of all stakeholders, than by definition part of the risk IS unanticipated. Worldwide we have seen the irrational and frequently unnecessary dramatic consequences. Pension funds that became underfunded in the years 2000-2002 lost their belief in the long run and closed their funds at the worst possible moment. We also know that private investors that have been lured in products of which they do not know or understand the risk, voluntarily or involuntarily step out when the unknown risk has materialized. On the other hand, interesting research by Lerner et al (2007) on private equity investments shows that organizations that are most aware of the accompanying risk (in this case endowment funds) are capable of making the best performance. The consequences of satisfying the first lesson of portfolio theory are so easy to understand. If the end client is aware of the risk, and therefore cannot be forced to divest at markets lows, is neither willing to divest at market lows.

- **Regulators and risk management**

In many cases risk management and regulation focuses too much on detailed level, say on stock level and on the performance of individual asset managers, and too little on the strategic level. This is without any doubt of enormous practical importance, but the fact that the risk budgets of the end clients are violated is of larger importance.

- **Practice**

Last but not least, how do we accomplish that all the three principles are respected in practice? Over the last two decades we have been engaged in hundreds of ALM projects for well over hundred pension funds and insurance companies. About 30 of those are located outside our small country, especially in the US, Switzerland, the UK, and the Nordic countries. For the applied (scenario-) models we refer to Boender et al 2007. The most important result of those projects is not the strategic asset allocation, as is often assumed. The most important result is the risk budgets that the stakeholders are able and willing to provide. Asset allocation is nothing else than exploiting the long-term and short-term dynamics of the available asset classes to identify the SAA that optimally serves the wishes and constraints of the end clients. Our recent focus is on ALM for individuals, better known as wealth management. Also in this area the methodology and the first lesson of portfolio theory are still hugely violated, yet the lesson is very simple: preferences, characteristics, and constraints of the clients come first, whereas the SAA and its constituting asset classes humbly come second.

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