Reading 16: Linking Pension Liabilities to Assets

a. contrast the assumptions concerning pension liability risk in asset-only and liability-relative approaches to asset allocation;

- Under an asset-only approach, a pension fund focuses on selecting efficient portfolios. This approach ignores the fact that a future liability is subject to market-related risk. Market risk arises from interest rate risk, inflation risk, or from an exposure to economic growth. A failure to recognize the risk in the liabilities could lead to a portfolio that does not adequately satisfy them.
- In liability-relative approach, the portfolio is chosen for its ability to mimic the liability(i.e. the portfolio will have a high correlation with the liability).
- In the asset-only approach, the risk-free investment is the return on cash.
- In a liability-relative approach, the risk-free investment is a portfolio that mimics the liability in performance. The portfolio, which has a correlation of one with the liabilities, does not exist. The pension fund manager must construct this portfolio into its various exposures. This approach can also be applied to non-pension obligations, such as meeting insurance liabilities and retirement planning.

b. discuss the fundamental and economic exposures of pension liabilities and identify asset types that mimic these liability exposures;

- Many pension managers measure their pension liability through duration management. This approach focus on short-term changes in the liability relative to changes in interest rates. This approach is valid only when pension risk is short-term, as in the case of firms near bankruptcy.
- The future pension obligation, for most corporations, is largely unrelated to short-term changes in long-term interest rates. A better understanding of pension liabilities requires a decomposition of the **liabilities' risk exposures**.
- The pension obligation should first be separated into that due to inactive and that due to active participants.
  - ✓ Inactive participants consist of retirees and those no longer

employed by the firm who are owed a future benefits. The future benefits for this group are fixed unless the benefits are indexed to inflation. The relevant benchmark is a portfolio of bonds paying a nominal amount equal to the promised payments. If the future payments are indexed to inflation, the benchmark is a portfolio of inflation-indexed bonds.

- ✓ Active participants are those currently working for the firm. The obligations to these employees can be separated into that owed for past service and that owed for future service. The obligations for past service are similar to that for the retirees and are again fixed unless there is inflation indexing.

- In the case where a pension plan is frozen, the liability mimicking portfolio is one consisting of nominal and inflation-indexed bonds.
- Future benefits are those from wages to be earned in the future, by existing employees as well as new entrants into the plan. Most pension benefits are not inflation-indexed after retirement.
- First component: wages to be earned in the future
  - ✓ The growth in future wages can be decomposed into from inflation and from real growth. The liability-mimicking portfolio is a portfolio of inflation-indexed and nominal bonds. The closer the workforce is to retirement, the larger the proportion of nominal bonds in the portfolio.
  - ✓ The real growth of wage is due to increases in labor productivity. This productivity will be reflected in GDP. The liability-mimicking portfolio is a portfolio of nominal bonds and stocks.
- Second component: future service rendered
  - ✓ These benefits are those that have not been earned yet but will be credited to employees at some points in the future. This amount is uncertain and not usually funded, so it is not modeled in the investment benchmark.
- Third component: future benefits from new entrants
  - ✓ Uncertain and excluded from the benchmark portfolio.
- Pensions are also subject to non-market exposure referred to as liability noise. These exposures can be divided into two parts, that due to plan demographics and that due to model uncertainty.
  - ✓ Plan demographics: the number of participants and can be estimated using statistical models. It is more predictable when the number of participants is larger.

✓ Model uncertainty: the source of liability noise arising from retirees is the mortality assumption. If the mortality assumption is incorrect, **the pension plan will be responsible for the retirees' benefits for a** different period of time than that modeled. (No financial products could be applied to hedge the longevity risk.) The liability noise arising from active participants is even greater than that from retirees.

Market Related Exposure and Liability Mimicking Assets

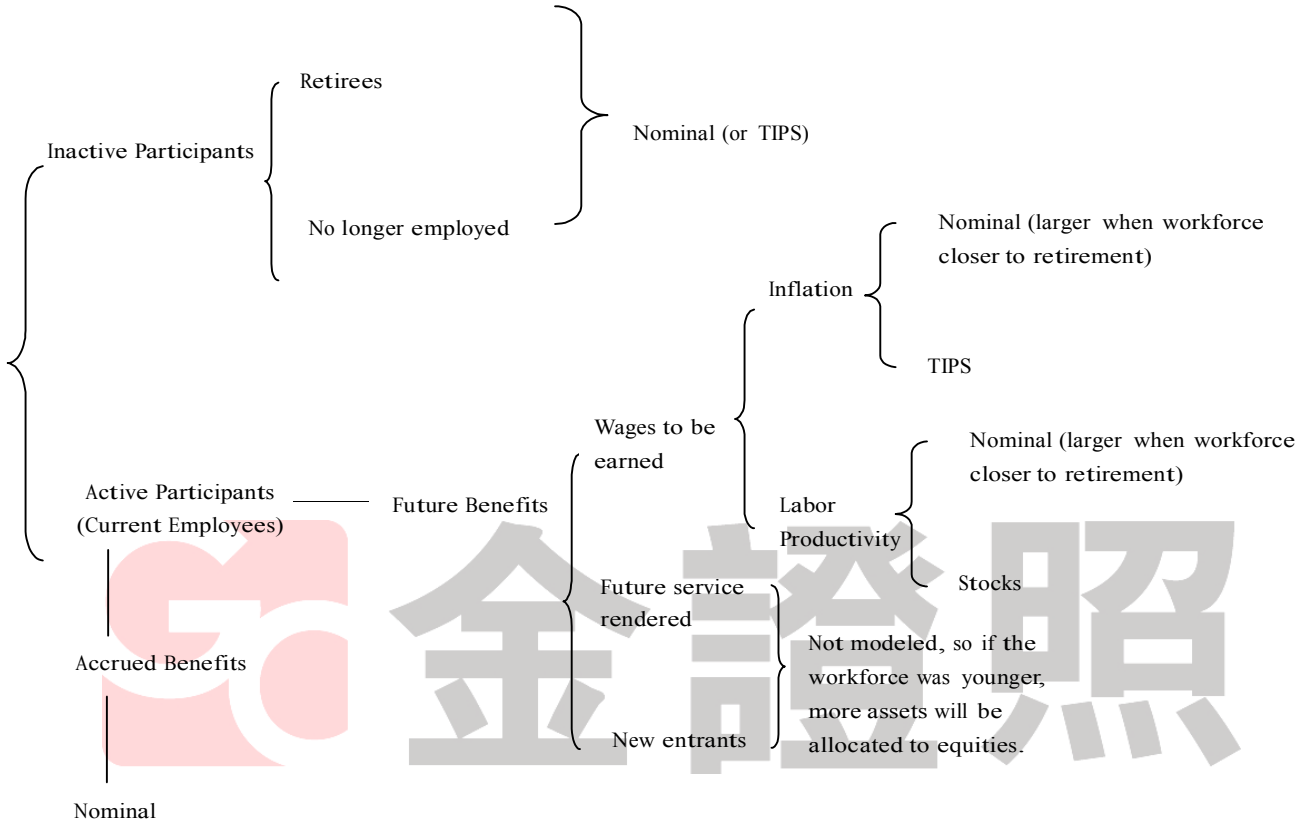
Portion of the Investment Benchmark	Market Related Exposures	Liability Mimicking Assets
Inactive	Term structure	Nominal bonds
Active- accrued	Term structure	Nominal bonds
Active- future wage	Inflation	Real rate bonds
	Growth	Equities
	Term structure	Nominal bonds

c. compare pension portfolios built from a traditional asset-only perspective to portfolios designed relative to liabilities and discuss why corporations may choose not to implement fully the liability mimicking portfolio.

- In order to satisfy the future liabilities over time, the best portfolio for a pension plan will be a liability-mimicking portfolio consisting of nominal bonds, real return bonds, and stocks.
- The weights in these assets will be determined by the proportion of future obligations relative to accrued, inflation indexing of the benefits, and the plan status. If the workforce is younger, more will be allocate to equities. If a significant amount of benefits that were indexed to inflation, inflation-indexed bonds are used more than nominal bonds. If plan was frozen, and without future obligations, nominal bonds will dominate the portfolio.
- The liability-mimicking, low-risk portfolio will be costly and will not provide a return in excess of the liabilities. An investment in the low-risk portfolio requires future cash payments by the sponsor to satisfy the obligations, which is not modeled or funded. For pension plans, the best use of the low-risk portfolio is as a benchmark.
- In the traditional asset-only approach, the portfolio is usually composed

of 60%~70% equities with the rest in short and medium duration nominal bonds. In a liability-relative approach, derivatives can be used to hedge the market-related exposure and can be hedged with bond futures contracts. (Derivatives are relative inexpensive and free up capital for use.)

- The liability-mimicking portfolio is typically composed of derivatives, long duration bonds, inflation-indexed bonds, equities, as well as other components dedicated to generating an efficient return.


Inactive Participants
Retirees
No longer employed
Nominal (or TIPS)
Active Participants
(Current Employees)
Future Benefits
Wages to be earned
Inflation
Nominal (larger when workforce closer to retirement)
TIPS
Labor Productivity
Nominal (larger when workforce closer to retirement)
Stocks
Future service rendered
New entrants
Not modeled, so if the workforce was younger, more assets will be allocated to equities.
Accrued Benefits
Nominal