

# **Risk-taking of Defined Benefit Pension Plan**

2017/04/16

## **Abstract**

Regarding the risk-taking decision problem of defined benefit pension plan from the viewpoint of equity holders, literature found that, maximizing the value of equity, the boundary solution such as 0% equity or 100% bond is the optimal. However, the pension plans in real economy have the middle range asset allocation such as 60/40 equity-bond weights, contradicting the theory in literature. Therefore, we theoretically examined the risk-taking decision of defined benefit plan in terms of the maximization of equity holders' value. We consider the equity holders' position represented by the two put options: pension liability guarantee option and default option. Former is the option that the company has to pay for deficit of pension benefit, and the latter is the option that the company can default the liability if it has not enough assets to repay it. We found that the optimal solution for risk-taking is in middle range, which is consistent with the behavior of pension investments in real economy. Regarding the default option, it has a time value for wide range of value of underlying assets which is sum of pension assets and business assets. The value of the default option has the diversification effect that the change of its value is relatively insensitive of fluctuation of the underlying assets. As the results, the change of value of the default option with respect to the risk-taking is slower than that of pension liability guarantee option. This mechanism causes the internal solution of pension risk-taking.

Keyword: Defined benefit plan, Risk-taking, Optimal portfolio selection, Put option

JEL code: G11, G28, G32