Capital Structure Choices, Pension Fund Allocation Decisions and the Rational Pricing of Liability Streams - Appendix

November 6, 2020

Effect of Surplus Sharing Rule

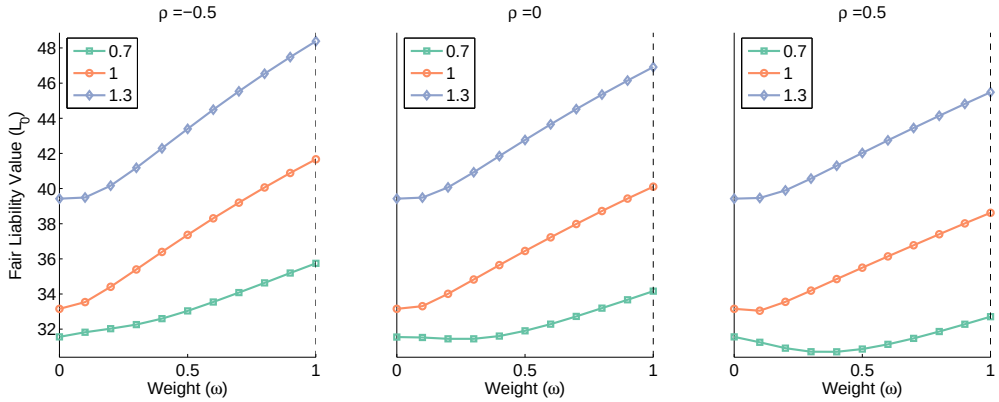
Figures 10 and 11 show the impact of allocation decisions on claim values when pensioners have access to surpluses. Unlike in the case where surpluses go to equity holders, pension claims tend to be more valuable when the pension fund takes a risky strategy than when it invests only in the risk-free asset. In contrast, equity value is maximal for a zero investment in the risky asset. Hence, a conflict of interest still exists between pensioners and equity holders, but the terms are reversed with respect to the case where equity holders are entitled to surpluses.

Figures 12 and 13 focus on the effect of funding decisions. Pensioners have obviously a preference for high funding levels, and equity holders have the exact opposite view because they have no claim on surpluses. From the bondholders' perspective, there is an optimal funding ratio because exceedingly large ratios compromise the firm's ability to redeem its debt. Very low funding ratios are suboptimal too, like they are in the case where surpluses go to equity holders, because they make it likely for the sponsor to be called to fund its pension plan later.

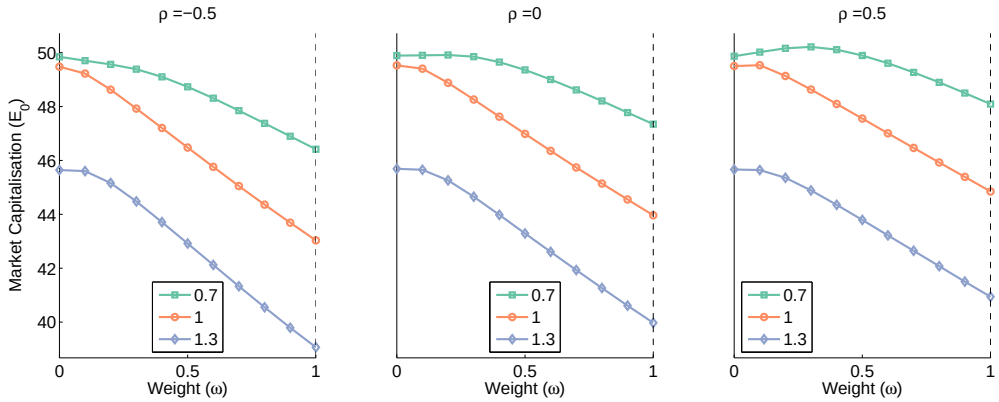
Figure 14 shows the impact of the initial funding ratio of the pension plan on the fair value of pension claims. Instead of being indifferent to the funding level as they are when they have

Figure 10: Impact of allocation decisions on pensioners and equity holders when pensioners have access to surpluses.

(a) Impact on pensioners.



(b) Impact on equity holders.

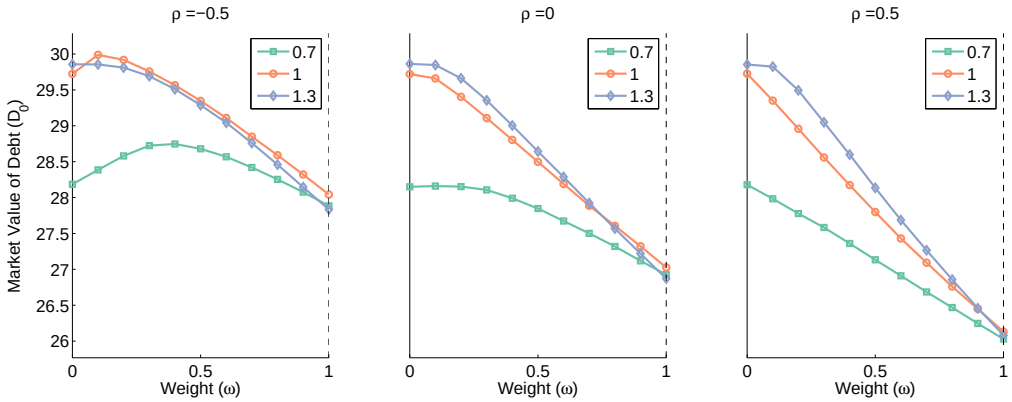


These figures perform comparative static analysis with respect to the allocation to the risky asset, ω, for various levels of the regulatory funding ratio (70%, 100%, and 130%) and the correlation ρ between the firm's unlevered value and the risky portfolio held by the pension fund. All other parameters are fixed at their base-case values (see Table 1 in the paper). The vertical dashed line identifies the base case value of ω.

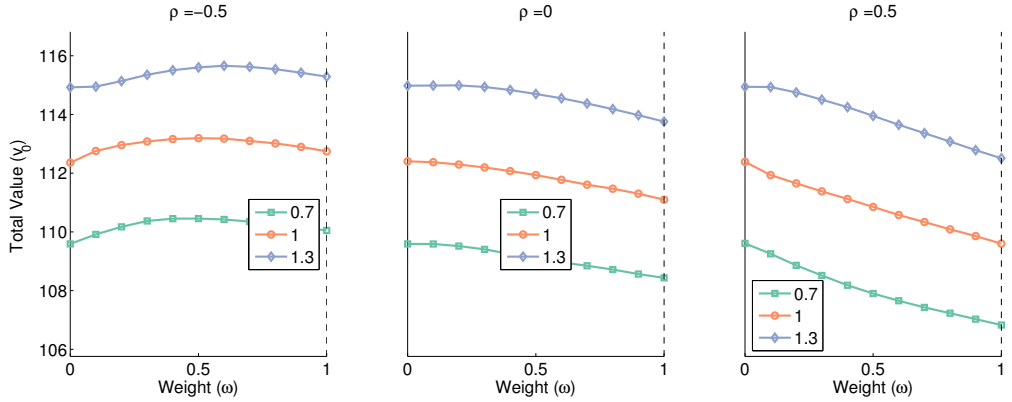
no rights on surpluses, pensioners now clearly prefer a large funding ratio.

Figure 11: Impact of allocation decisions on bondholders and total value when pensioners have access to surpluses.

(a) Impact on bondholders.



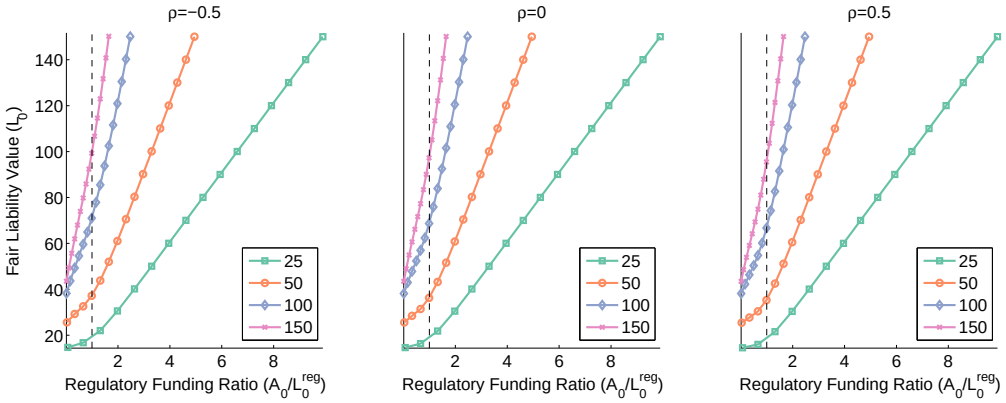
(b) Impact on total value.



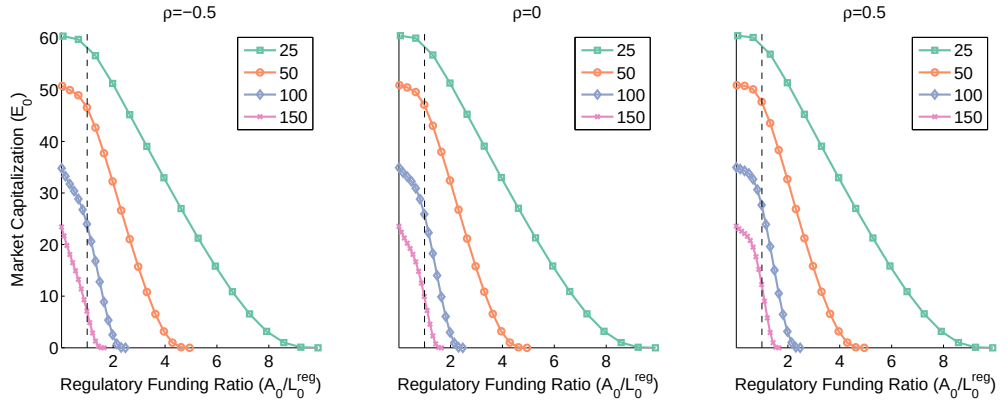
These figures perform comparative static analysis with respect to the allocation to the risky asset, ω, for various levels of the initial funding ratio (70%, 100% and 130%) and the correlation ρ between the firm's unlevered value and the risky portfolio held by the pension fund. Unless otherwise indicated, parameters are fixed at their base-case values (see Table 1 in the paper). The vertical dashed line identifies the base-case value of ω.

Figure 12: Impact of funding decisions on pensioners and equity holders when pensioners have access to surpluses.

(a) Impact on pensioners.



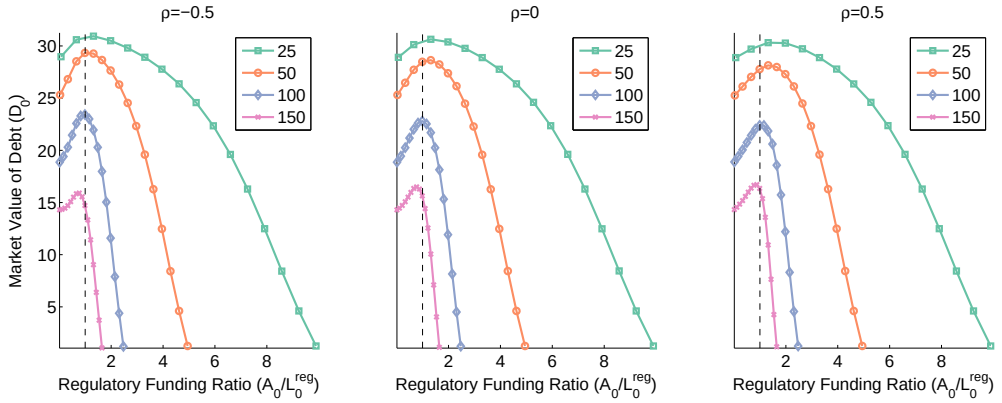
(b) Impact on equity holders.



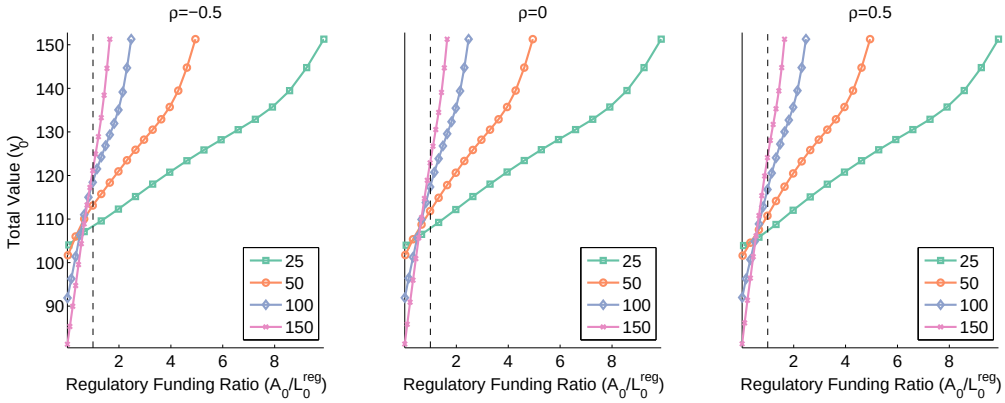
These figures plot the regulatory funding ratio of the pension fund against the fair liability value and equity value for different values of the promised payment to pensioners, L (25, 50, 100 and 150). The curves are parametrised by A_0, the initial capital made available to the pension fund. Unless otherwise indicated, other parameters are fixed at their base-case values (see Table 1). The vertical dashed line represents the regulatory funding ratio in the base case.

Figure 13: Impact of funding decisions on bondholders and total value when pensioners have access to surpluses.

(a) Impact on bondholders.

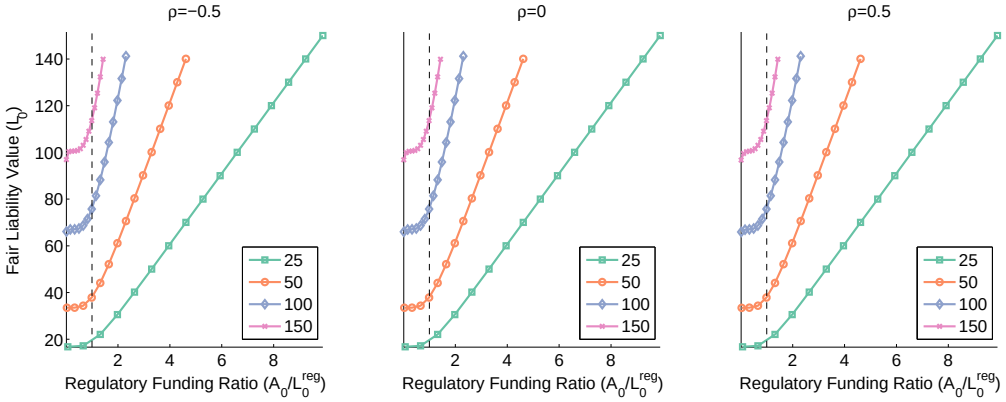


(b) Impact on total value.



These figures plot the regulatory funding ratio of the pension fund against the bond value and the total firm value for different values of the promised payment to pensioners, L (25, 50, 100 and 150). The curves are parametrised by A_0, the initial capital made available to the pension fund. Unless otherwise indicated, other parameters are fixed at their base-case values (see Table 1). The vertical dashed line represents the regulatory funding ratio in the base case.

Figure 14: Impact of funding decisions on pensioners in the presence of the PBGC, when pensioners have access to surpluses.



These figures plot the regulatory funding ratio of the pension fund against the fair liability value for different values of the promised payment to pensioners, L (25, 50, 100 and 150) and the correlation ρ between the firm's unlevered value and the risky portfolio held by the pension fund. The curves are parametrised by A_0, the initial capital made available to the pension fund. Unless otherwise indicated, other parameters are fixed at their base-case values (see table 1). The vertical dashed line identifies the base-case regulatory funding ratio.

Effect of Tax Reversion

In the US, any surplus returned to the sponsor plan is subject to a special tax regime known as "the reversion tax". A new legislation was passed in 1986 regarding the tax treatment of excess pension assets, which levied a 10% excise tax on reversions from defined-benefit plans. This rate was raised to 50% in 1990, unless the sponsor gives at least 25% of the reversion to participants (in the form of contribution to some other plan), in which case the reversion tax is 20% (Ippolito (2001, 2002)). The remaining amount after debt payment, if strictly positive, goes to equity holders. We denote with θ_{rev} the reversion tax rate, taken equal to 50% if γ is greater than 75%, and to 20% otherwise.

With a reversion tax, the payoff to pensioners is still given by Equation (2), but the payoffs to bondholders and equity holders are modified with respect to Equations (3) and (4): any occurrence of the surplus C_T in these equations must be replaced by the shrunk surplus, $(1 - \theta_{\text{rev}})C_T$. The total value of the firm and the pension fund is now given by the two equivalent formulas:

$$v_0 = L_0 + E_0 + D_0 = V_0 + (1-\theta)A_0 + TS_0 - RT_0 - BC_0,$$

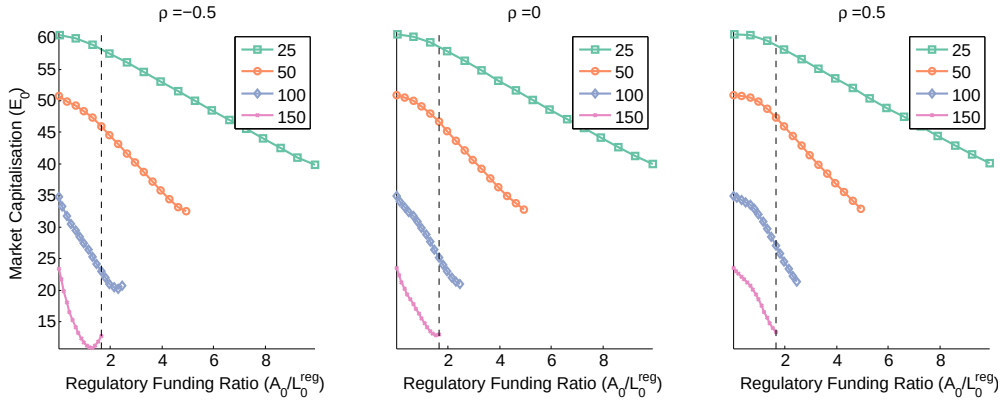
where RT_0 denotes the present value of the reversion tax, $\gamma\theta_{\text{rev}}C_T$.

Figure 15 shows that in general, equity value is decreasing in the funding level. This can be attributed to the fact that reverted surpluses are taxed at a higher rate than the initial contribution. Indeed, for large funding levels, the payoff to equity holders can be approximated as $E_T \approx [(1-\theta_{\text{rev}})(A_T - L) + V_T - D]^+$. (This approximation holds exactly if $\theta = 0$ and $A_T \geq L$.) By increasing the endowment to the pension plan, A_0, the initial owners of the firm increase A_T, but they decrease the amount available for the industrial projects, V_0. By Equation (1), the change in V_0 for a change ΔA_0 in A_0 is $-(1-\theta)\Delta A_0$, but the increase in A_T is proportional to $(1-\theta_{\text{rev}})\Delta A_0$. Because θ_{rev} is greater than θ, the net impact of an increase in A_0 on the payoff to equity holders tends to be negative. This happens because the sponsor does not fully recover the funds on which it gave up at date 0. For bondholders, the situation is less different than in the absence of the reversion tax, because corporate bonds are more senior than equities and, as such, are marginally less affected by the reversion tax rate. The negative effect of a greater

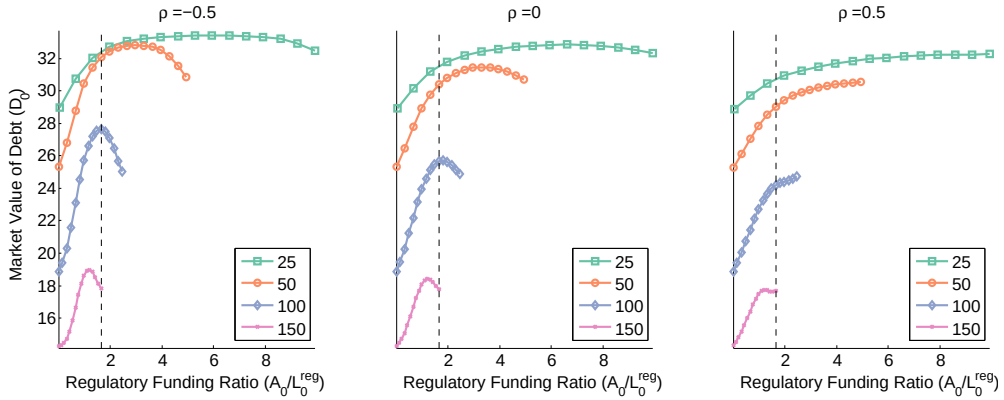
funding that negatively impacts equity holders materializes in bonds only for large funding levels. The bottom panel in Figure 15 considers the effect of funding on the total value of the firm and the pension fund. By construction, pensioners are not affected by the tax reversion, so the value of their claims is still increasing in the funding ratio. On the other hand, a greater funding is detrimental to equity holders. The competition between these two effects results in the existence of an optimal funding ratio, which maximizes the total value.

Figure 15: Funding decisions in the presence of a tax on reverted surpluses.

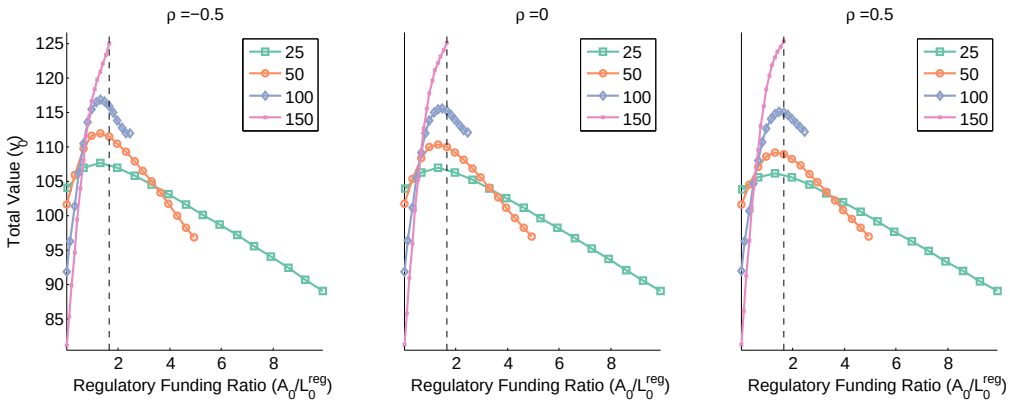
(a) Effect on equity holders.



(b) Effect on bondholders.



(c) Effect on aggregate firm and pension fund.



These figures plot the regulatory funding ratio of the pension fund against the total value of the firm, the market value of corporate bonds or the total value of the firm, for different values of the promised payment to pensioners, L (25, 50, 100 and 150). The curves are parametrised by A_0, the initial capital made available to the pension fund. A 50% tax is deducted from surpluses returned to the sponsor company. Other parameters are fixed at their base-case values (see Table 1). The vertical dashed line represents the regulatory funding ratio in the base case.

References

Ippolito, R. 2001. Reversion Taxes, Contingent Benefits, and the Decline in Pension Funding. *Journal of Law and Economics* 44(1): 199–232.

———. 2002. Stayers as "Workers" and "Savers": Toward Reconciling the Pension-Quit Literature. *Journal of Human Resources* 37(2): 275–308.