

Pricing Buy-ins and Buy-outs

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The phrase “pension de-risking” has recently become part of the pension plan lexicon. According to a survey by Prudential Financial Inc., around 40% of senior financial executives in mid-sized and large companies with at least \$250 million defined benefit (DB) plan assets indicated that they will give “serious consideration” to pension risk transfer in 2014 and 2015 (Walts, 2013).¹ Such a trend of pension de-risking is driven by pension deficits due to the latest market downturns, low interest rate environments, new pension accounting standards, and prolonged life expectancy of retirees.

The 2007-2009 credit crisis and the subsequent drop in discount rates were a nightmare for many pension firms whose funding deficits were posting double-digit rises. Despite corporate contributions and a rebound in equities afterwards, pension deficits persist as evident by the fact that the plans of FTSE 100 companies were only 91% funded in 2013 (Lane Clark & Peacock LLP, 2013). In reaction to this, more stringent accounting standards set out new approaches to reflect changing circumstances and promote transparency. For example, effective on January 1, 2013, the revised international pensions standard IAS19 requires pension assets be calculated using a discount rate based on corporate bonds, rather than an expected return based on the actual assets held. Using 2012 data to illustrate possible effects from this change, Lane Clark & Peacock LLP (2013) shows that total 2012 profits of FTSE 100 companies will be £2 billion lower when recalculated under the new version of IAS19. In addition to market and regulatory risks, longevity risk has recently emerged as another significant concern for DB plans. Unanticipated mortality improvements increase the value of pension liabilities through longer lifetime annuity payments (Lin and Cox, 2005; Cox and Lin, 2007; Cox et al., 2010, 2013; Lin et al., 2013, 2014).

As pension liabilities become increasingly visible on the balance sheet following more stringent accounting standards, fluctuations in financial markets and increases in life expectancy can have a major and immediate impact on a firm’s share price. Growing pension deficits make the firm

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¹The survey analyzes responses from 181 senior financial executives.

riskier and thus more difficult to access credit. As a result, the firm may have to forgo otherwise profitable projects. In response to those challenges, capital markets have developed a few solutions for DB plans to off-load risks such as pension buy-ins and pension buy-outs (Lin et al., 2014). Pension firms are clamoring to buy-ins and buy-outs. In fact, according to Prudential (2013)'s survey, 48% of CFOs have already implemented or are planning to implement buy-in or buy-out strategies. Indeed, 2013 had a strong start with buy-in and buy-out deals worth more than £5.5 billion, including the record buy-out of £1.5 billion by EMI with Pension Insurance Corporation (Hawthorne, 2013).

Both buy-ins and buy-outs involve pension firms buying bulk annuities from insurance companies. A market for buy-ins and buy-outs will develop if they are effective, economically affordable and transparently priced. While there exists a rich literature that explores pension buy-in and buy-out activities, little is known about whether and the extent to which pension buy-in prices should differ from those of pension buy-outs. Deciding what explains buy-in and buy-out price difference requires an in-depth evaluation of these two pension de-risking methods.

The key difference between pension buy-outs and pension buy-ins arises from credit risk. Pension buy-outs are the most direct way to take pension liabilities off balance sheets. Thus, pension firms with buy-outs are not subject to counter-party risk. However, a buy-in bulk annuity is written in the name of the pension trustee and the liabilities remain in the pension firm. As obligations of buy-in insurers are usually not fully collateralized, a significant credit risk arises (Roy, 2012). Jerry Gandhi, the Group Pensions Director at RSA Insurance Group, highlighted the impact of credit risk on pension firms with buy-ins, "Our largest concern was the risk of the counter-party defaulting and this of course was a concern for the trustees and the company. The trustees in their own right would be able to get rid of the risk but in event of default, it would come back to the scheme, which would then sit back with the company" (Deutsche Bank, 2011). Despite the fact that credit risk is an indispensable part in buy-ins, the lack of a promising model in which to quantify buy-in counter-party risk severely limits previous studies in this area. Indeed, much of the prior research ignores the cost of credit risk embedded in buy-in transactions and applies the same pricing model for buy-ins and buy-outs. As a result, their calculated buy-in prices are still in doubt.

To fill the gap, following Cummins (1988), Phillips et al. (1998) and Grosen and Jørgensen (2002), this paper brings a contingent claims framework to the pricing of pension buy-in bulk annuities, motivated by the importance of default risk component embedded in buy-in transactions. Specifically, an option pricing approach is adopted to model a buy-in insurer's default risk. The liabilities created by issuing buy-in bulk annuities are analogous to risky corporate debts. The buy-in insurer is assumed to issue a bulk annuity policy and receive a premium payment, similar to the proceeds of a bond issue. In return, it promises to make a survival payment to the pension firm at the end of each period contingent on no default. Using this bond analogy, the value of the buy-in policy equals a default risk-free loan in the amount of all promised payments less a put option owned by the buy-in insurer. This put option is known as the insolvency put (Phillips et al., 1998). With this setup, our model has important implications for pension plans as it describes how default risk affects buy-in risk premium, which in turn explains the price difference between buy-ins and buy-outs.

While our model implies that buy-ins demand for lower premiums than buy-outs because buy-ins impose credit risk on pension firms, the prices of both buy-ins and buy-outs should be determined by the magnitude of investment risk and longevity risk transferred to insurers. Nevertheless, we notice there are only a few preliminary papers on pricing these two risks for bulk annuities. Developing asset pricing theory in this area is important since it will help market participants better understand these pension risk management instruments. To extend the existing literature, as the second objective of this paper, we propose how to explicitly price investment risk premium and longevity risk premium.

Investment risk premium is a form of compensation for an insurer who bears the risk of uncertain pension asset returns. When pension assets fall below pension liabilities, capital infusion by the insurer is required to back its promises to pay the plan's retirees or the trustee. Thus, we can view such promises analogous to put options sold by the insurer to the pension firm. The price of bulk annuities should reflect the capital strain that investment risk places on the insurer. Accordingly, we propose a model to price investment risk assumed by the insurer as a series of one-year put options, where the strike prices are the values of the pension liabilities at various valuation dates.

In addition to investment risk, longevity risk is another major risk shifted to an insurer in a buy-in or buy-out deal. Longevity risk arises from unexpected gains in life expectancy and is significant to a DB pension scheme when measured from a financial perspective. According to International Monetary Fund (2012), each additional year of life expectancy increases the present value of liabilities of a typical DB plan by about 3-4 percent. To price longevity risk premium, we apply the Wang transform, a market-based equilibrium pricing method that unifies the finance and insurance pricing theories (Wang, 2002). It has been used to price longevity and mortality securities since its first application in this area by Lin and Cox (2005). The Wang transform is a technique that allows us to price new products using securities whose prices are known (Lin and Cox, 2008). In this paper, we derive the market price of risk λ for longevity risk based on an existing longevity-linked security and then use the same λ to price the longevity risk premium of a buy-in or buy-out.

We have obtained some preliminary results. Our models show that investment risk and longevity risk determine bulk annuity prices. Moreover, default risk plays an important role in explaining the price difference between buy-ins and buy-outs when a bulk annuity insurer has a low asset-liability ratio and there is a mismatch between assets and liabilities.

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