

# Defined Contribution Pension Plans Management And Market Opportunities

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## *Short Abstract*

DC plan members have been severely impacted by the financial earthquakes and now face a drop of the accumulated assets devoted to their retirement funding. But many financial analysts have argued that the financial crisis represents a great opportunity to carry out new investments, in particular for long horizon investors. In this context, the debate dealing with the pension solution panel offered to DC plan members is now in the limelight. Do the financial crisis and the sharp decline of the equity returns represent an opportunity for defined contribution pension plan participants to reinforce their current exposure towards risky assets? Kojien and al. (2009) develop a tractable continuous portfolio choice model where stock returns exhibit short run momentum and long run mean reversion. We extend this previous framework in three different ways. First we consider a DC plan pension investor during the accumulation phase whose aim is to maximize his terminal wealth. Second, we extend the asset investment field by introducing bond assets as a third investment class. Third, we introduce a mean reverting equity risk premium and study the optimal investment strategy for DC plan members.

**Keywords:** Defined contribution pension scheme, Market opportunities, Portfolio asset allocation

**JEL codes:** G23, G12

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The landscape of funded pension schemes has known significant changes over the past months. The proportion of defined benefit pension plans has significantly been reduced due to a series of well-known shocks (financial crises, accounting rules changes and population aging). All these shocks have involved huge financial imbalances between pension assets and pension scheme commitments, which led numerous DB plan to disclose significant financial deficits. For instance, British DB pension plans displayed a deficit of £200bn in December 2008<sup>3</sup>.

Meanwhile, the number of defined contribution pension plans has gained ground, sustained by recent pension reforms, which encourage employees to adopt this type of pension solution to organize their retirement. However, DC plan members have also been impacted by the financial earthquakes and face a drop of the accumulated assets devoted to their retirement funding. Beyond the financial troubles, the losses generated by the financial crisis raise the question of the nature of the pension investment solutions proposed to DC plan members. Widespread solutions such as lifecycle funds or constant mix funds do not provide any guarantee to the pensioners against unfavourable and unexpected changes. Moreover, they do not allow the investor to benefit from financial market opportunities due to their “static” nature while more and more financial analysts argue that the financial crisis represents a great opportunity to carry out new investments in particular for long horizon investors. Against this background, the debate dealing with the pension solution panel offered to DC plan members is now in the limelight. Do the financial crisis and the sharp decline of equity returns represent an opportunity for defined contribution pension plan participants to reinforce their current exposure towards risky assets?

Several authors like Fama and French (1986, 1987) or Summers and Poterba (1988) have provided evidence about the mean reverting nature of stock returns. Against this backdrop, the development of market timing strategies makes sense (Kojien and al., 2009). Nevertheless, Summers and Poterba (1988) observe positive autocorrelation in returns at shorter horizon, which attests the existence of returns momentum. In the same vein, Balvers and Wu (2005) point out that stock returns can be persistent in the short term, which enhances market opportunity perspectives. Balvers and Wu show that the combination of momentum and mean reverting properties in the building of financial strategies outperforms pure momentum or pure mean reverting strategies. Besides, Kojien and al. (2009) developed a tractable continuous portfolio choice model (Merton, 1973) assuming that stock performances have two key characteristics: equity performances “tend to continue” over a short period of time which corresponds to the so-called momentum properties and over a medium and long term horizon, stock performances are assumed to be mean reverting. In this context, Kojien and al. (2009) predict that under a complete information framework, the allocation to equities is not a linear function of the remaining time horizon, namely, of the remaining years of the investor before his retirement. As the momentum in the stock returns is less persistent than mean reverting, the investor will hedge “the performance variable by reducing the allocation to stock whereas the mean reverting variable will be hedged by increasing the allocation to this asset class”.

We extend the framework developed by Kojien and al. in three different ways. On the one hand, we consider a standard DC plan investor during the accumulation phase who pays constant contributions at each date  $t$  and whose aim is to maximize his terminal wealth at date  $T$ . In addition, whereas Kojien and al. consider two asset classes (equity and cash), we extend this framework assuming that the nominal interest rate dynamics is described by a Ornstein Ulhenbeck process and we assume that the term structure of interest rates has the same form as in Vasicek (1977), which allows us to introduce bonds as the third investment asset class. The investor can invest in three securities: cash, stocks and bonds. Furthermore, as in Blake and Cairns (2006), Kowernberg (2005), Munk and Sørensen (2007), we introduce a mean reverting equity risk premium. The equivalence between the equity risk premium level and the expected return on equities is explored to refine the market timing investment opportunities. The outline of this paper is as follow. In section 2, we focus on the theoretical and empirical evidences of stock return and risk premium properties. In section 3, we present the different blocks of the model focusing our attention on the financial one. In particular, we explain with great care the equity market modelling. In section 4, we derive the optimal portfolio for a DC plan member under a CARA framework. In section 5, we discuss the optimal investment strategy and finally conclude.

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<sup>3</sup> This amount has been calculated using a panel of 7800 DB plans (source; Pension Protection Funds)