國科會專題研究計畫研究成果報告

成長選擇權與公司最適負債決策

Growth Option and The Optimal Level of Debt

計畫篇號：NSC 88-2416-H-002-013

執行期限：民國 87 年 8 月 1 日～民國 88 年 7 月 31 日

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摘要

本計劃建構三個模型以探討和資產特性相關的成長選擇權價值及減資（或離開市場）的賣權價值如何影響公司最適負債決策。此三種模型如下：(1) 先發行公司債，而後再決定生產規模的兩期模型；(2) 公司債發行後或正發行時，決定是否執行一個離散投資計畫的連續時間模型；及 (3) 增加產能與否以及公司債融資數量同時決定的連續時間模型。上述模型皆假設股東會因對債務清償僅具有限責任，從而會依自身利益來宣告破產時機。因此，發行公司債導致下列代理人成本：股東和債權人間，對破產時機及（或）執行投資選擇權時機意見相左所產生的利益衝突。公司最適負債即在此種代理人成本與發行公司債的租稅扣抵利益間取得均衡。本計劃以分析解進行比較靜態分析，並輔以數值分析來印證理論意涵。

關鍵字：代理人成本；成長選擇權；有限責任。

Abstract

This project constructs three different models to investigate how asset characteristics related to both a firm's growth option value and its put option value to disinvest (or contract capacity) affect the firm's choice of debt levels. These models include: (1) a two-period model in which a firm issues bonds first, followed by purchasing and installing capital; (2) a continuous-time model in which a firm decides whether to undertake a discrete investment project when bonds either are issued or have been issued; and (3) a continuous-time model in which a firm decides whether to add capacity when bonds are issued. In all these models, the firm is assumed to maximize its claims to equityholders after bonds are issued since equity has limited liability. Consequently, debt financing yields an agency cost arising from the conflict of interest between equity and debt holders over the optimal timing of declaring bankruptcy and/or and agency cost arising from the conflict of interest between equity and debt holders over the optimal timing of exercising the investment option. Debt financing also yields a tax advantage since coupon payments are tax deductible. The firm's choice of debt levels involves a tradeoff between the benefit and the cost mentioned above. Comparative static results are then derived. There results are also demonstrated through numerical examples.

Keywords: Agency Cost; Growth Option; Limited Liability.

計劃緣由與目的

Myers(1977)認為一個未來能繼續成長，但在公司債發行後，即服膺股東權益的公司，會放棄一些對公司整體有利的投資契機，從而造成『投資不足』的問題。如此一來，會損害債權人權益。由於債權人會理性預期股東未來的行為，因此這些損失會轉嫁到股東身上。Myers 因而推斷：公司負債和成長選擇權價值佔公司總價值比重呈反比關係。

Myers 的模型並未考慮成長選擇權與資本結構為內生決定，且未考慮在序列投資決策的情況下，投資成本可能無法回收及延後投資成本可能增加的問題。本計劃不但考慮這些因素，而且也考慮發行公司債會產生租稅利益，從而可探討下列因素如何影響公司最適負債決策：(1) 公司稅稅率變動；(2) 資本報酬變異性變動；(3) 投資成本不可回收程度增加，導致延後減資（或退出市場）的賣權價值增加；(4) 延後投資成本下降，導致未來成長選擇權價值增加。

結果與討論

本計劃和過去應用『實質選擇權』法來探討公司最適負債決策的文獻不同處如下：首次，關照點不同。例如，Fries, Miller and Perraudin (1997) 探討完全競爭均衡下，產品需求價格彈性和公司債價值間的關係。 Mauer and Ott (1999) 衡量代理人成本，及其和公司債發行數量間的關係。Mello, Parsons and Perraudin (1997) 探討公司如何使用債券來規避匯率風險。本計劃則探討資產特性和公司最適負債決策間的關係。其次，過去文獻多因模型複雜，而只能以數值分析來說明其結果。本計劃則以分析解進行比較靜態分析。最後，本計劃模型設定上的特色如下：(1) 過去文獻多假設投資成本完全無法回收。本計劃則假設投資成本可部份回收，因而可探討資本不可逆轉程度變動對公司最適負債的影響。(2) 過去文獻多假設公司破產時，債權人可獲得公司完全以發行股票來融資的價值（如 Mauer and Triantis, 1994），導致隨後必須採數值分析。本計劃則假設公司破產時，債權人可獲得資本的再售出價值，因而可獲得公司價值的分析解。(3) 過去文獻多假設資本購買成本不隨時間變動。然而，由於土地及天然資源有限，或者由於管制造成供給短缺，會導致資本價格日趨上漲（Abel et al., 1996; Dixit and Pindyck, 1998）。因此，本計劃假設資本價格呈幾何遞增趨勢，從而可探討延後投資成本增加所導致的成長選擇權價值下降，如何影響公司最適負債決策。(4)，過去文獻多假設公司債發行後，公司才執行投資選擇權，因而產生下列兩種代理人成本：(a) 股東和債權人對公司破產時機歧異所產生的利益衝突，及 (b) 股東和債權人對何時執行投資選擇權時機歧異所產生的利益衝突。在某些情況下，本計劃假設公司融資和投資決策同時發生，因而可規避第二種代理人成本。如此一來，不但利於分析進行，同時在某些場合（如公司成長選擇權佔公司價值極大比率時）更合乎現實。

雖然本計劃儘可能以分析解進行比較靜態分析，然而，除了在第三種模型（見摘要）可獲得公司稅稅率增加，導致公司負債增加的結論外，其餘比較靜態結果皆不確定。本計劃因而亦進行數值分析，以歸納這些結果。最後，本計劃並說明所獲結論為何和過去文獻有所差異。

計劃結果自評

原計畫內容係僅建立兩期模型，但增

加 Myers (1977) 所未考慮若干公司債發行的利益或成本等因素。目前完成的計劃則遵循 Myers 所考慮的代理人成本問題，但除考慮兩期模型外，亦考慮離散投資計畫以及連續投資計畫（亦即產能擴充）的連續時間模型。以上修正，係基於連續時間模型理論意涵較多，從而學術貢獻也較大。本計劃的離散投資計劃模型(Jou, 1999)已投稿至 Quarterly Review of Economics and Finance （為 SSCI 期刊），並獲得小幅修改再審查的意見。至於其餘兩個模型也會分別撰寫文章，再陸續投稿至其他 SSCI 的期刊。

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