Dual Ownership, Capital Structure and Investment*

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Abstract

This paper provides a theoretical model for a better understanding of the impact of dual ownership (DO) on different types of corporate finance decisions, focusing on the dynamics of debt restructuring, default, capital structure, and irreversible investment decisions. The study links the literature on DO with that on dynamic capital structure and debt renegotiation. In our model bank debt and market debt coexist with different seniority. The main findings show that moderate levels of DO may lead to underinvestment and lower leverage, while the optimal bank (market) debt decreases (increases) as the weight of DO increases in the firm. Additionally, the bank (market) credit spreads decrease (increase) as DO increases.

Keywords: Dual Ownership; Dynamic Capital Structure; Debt Restructuring; Investment Decisions; Real Options.
JEL codes: G31; G32; D81.

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1 Introduction

Dual ownership occurs when a given investor (e.g., a bank or a fund) holds both equity and debt in the same firm. Such a position creates asymmetries among investors regarding agency incentives and conflicts. In fact, the typical separation between the residual claim and the fixed claim do not occur for the dual owner, while this separation remains for the other investors in the firm. For instance, and differently from a typical investor, dual owners have a monitoring incentive that may prevent actions of expropriation taken by large shareholders, along with an important informational edge (Jiang et al., 2010).

Dual ownership (DO) is a recent and increasingly important phenomenon, and the literature studying its effects in the context of corporate finance remain scarce. Jiang et al. (2010) studies the impact of DO on non-commercial banking institutions. They empirically show that syndicated loans with DO have lower yield spreads when compared to those without DO. Bodnaruk and Rossi (2016) reveal that the joint holding target's debt and equity has important implications for the behavior of target shareholders in the context of M&A events, namely, they show that dual owners are more prone to accept a lower equity premium, using their voting right to support the deal. More recently, Chava et al. (2019) study how DO affects firms investment policies and they show these firms are less likely to have capital expenditure restrictions, and Yang (2021) examines the role of dual owner in corporate innovation, showing that firms with DO generate fewer but more valuable patents. In the field of corporate taxation, Francis et al. (2022) reveal that firms with dual holders show a more aggressive tax behavior. All this literature offers empirical evidence of the impact of DO, however a theoretical construct becomes necessary for a better understanding of this phenomenon and its effects on different types of corporate finance decisions.

Our paper also relates to the literature that address the dynamic capital structure, which started with the classical contribution of Leland (1994) for the valuation of debt and the definition of an optimal capital structure. Two types of bonds where considered (protected and not protected), affecting the bankruptcy trigger, bonds value and optimal leverage. Moreover, our work relates to the literature that considers debt renegotiation. Fan and Sundaresan (2000) show how the bargaining powers of shareholders and debt holders affect the restructuring process, payout policies and yield spreads. Goldstein et al. (2001) study the optimal leverage ratios and tax benefits, considering the option to increase future leverage. The exercise of a growth option with ex post bargaining and restructuring is studied by Sundaresan and Wang (2007). Hackbarth et al. (2007) examine the optimal combination and priority structure of bank and market debt in which banks have the advantage of renegotiating outside formal bankruptcy procedures. The option to renegotiate debt in periods of financial distress, held by shareholders, tends to exacerbate underinvestment problem, leading to a wealth shift from shareholders and creditors (Pawlina, 2010). Finally, Luo et al. (2022) develop a debt renegotiation model with positive externalities and explores optimal downward debt restructuring policies in moments of financial distress.

Our paper links these two strands of literature, studying the effects of DO on the dynamics of debt restructuring, default and capital structure (the optimal level of debt, leverage ratio, and credit spreads). Both bank debt and market with asymetric seniority is considered. Furthermore, we study how DO impacts irreversible investment decisions. Our main results show that (i) moderate levels of DO may lead to underinvestment, and to an overal smaller leverage; (ii) however, the optimal bank (market) debt decreases (increases) as the weight of DO increases in the firm; furthermore (iii) the bank (market) credit spreads decreases (increases) as DO increases.

The remainder of this paper unfolds as follows: In Section 2, the model is presented. Section 3 conducts numerical comparative statics, namely in the effect of dual ownership on investment timing, leverage ratio, and credit spreads. Finally, Section 4 concludes the paper.

2 Model

Consider a firm that possesses a proprietary investment opportunity that yields a stream of cash flows (EBIT) that is subject to a shock modeled by a geometric Brownian motion process:

$$dX(t) = \alpha X(t)dt + \sigma X(t)dW \tag{1}$$

where $X(0) = X > 0$, α represents the risk-neutral drift, with the constraint that $\alpha < r$ where r is the risk-free interest rate, σ is the instantaneous volatility, and $dW(t)$ is the increment of a Wiener process.

Any generic time-homogeneous contingent claim $G(X)$ paying $vX + k$, must satisfy the following ordinary differential equation:

$$\frac{1}{2}\sigma^2 X^2 G''(X) + \alpha X G'(X) + vX + k = rG(X) \tag{2}$$

which has the general solution:

$$G(X) = K_1 X^{\beta_1} + K_2 X^{\beta_2} + \frac{vX}{r-\alpha} + \frac{k}{r} \tag{3}$$

where

$$\beta_1 = \frac{1}{2} - \frac{\alpha}{\sigma^2} + \sqrt{\left(-\frac{1}{2} + \frac{\alpha}{\sigma^2}\right)^2 + \frac{2r}{\sigma^2}} > 1 \tag{4}$$

$$\beta_2 = \frac{1}{2} - \frac{\alpha}{\sigma^2} - \sqrt{\left(-\frac{1}{2} + \frac{\alpha}{\sigma^2}\right)^2 + \frac{2r}{\sigma^2}} < 0 \tag{5}$$

Unlevered firm

The valuation of a contingent investment opportunity for an unlevered firm was first considered by McDonald and Siegel (1986). Adopting a similar approach, we assume that the instantaneous after-tax profit of the firm is given by:

$$\pi(t) = X(t)(1-\tau) \tag{6}$$

where τ is the corporate tax rate. The value of the unlevered firm is then calculated as the present value of its after-tax profits:

$$U(X) = \frac{X(1-\tau)}{r-\alpha} \tag{7}$$

The optimal investment of a sunk cost K by the unlevered firm occurs at the following threshold:

$$X_U = \frac{\beta_1}{\beta_1 - 1}\left(\frac{r-\alpha}{1-\tau}\right)K \tag{8}$$

The value of the idle firm (the investment opportunity) when the EBIT is below the investment threshold ($X < X_U$) is:

$$F_U(X) = (U(X_U) - K)\left(\frac{X}{X_U}\right)^{\beta_1} \tag{9}$$

Levered firm

For a levered firm, there are multiple models that determine the optimal capital structure in a dynamic framework incorporating real options. The seminal contribution of Leland (1994) extended the traditional static trade-off theory by incorporating the contingent claims approach, thereby laying the foundation for a proliferating body of literature that applies the contingent claims analysis to various capital structure issues.[1]

Our model setting is based on (Hackbarth et al., 2007) and incorporates modifications and extensions to account for the following elements: i) the firm possesses two distinct forms of debt - private bank debt and publicly traded market deb; ii) the private bank debt is susceptible to renegotiation as shareholders have the option to threaten to default

[1] Please refer to Strebulaev et al. (2012) for a review.

and refuse to honor debt payments; iii) the interplay between leverage and investment decisions (Childs et al., 2005) and its relationship with debt renegotiation (Pawlina, 2010) are also included. However, our main extension is to consider dual ownership by the bank, allowing it to be a (minority) shareholder.

Under this setting, the instantaneous profit of the levered firm is:

$$\pi(t) = (X(t) - b - c)(1 - \tau) \tag{10}$$

were b and c are the bank and market perpetual coupon promised payments, respectively.

Shareholders have "deep pockets", and that there are no emission costs, with all profits distributed as dividends and losses covered by new equity issues. Upon default, debtholders receive a fraction of the unlevered firm, bearing a proportional default cost ϕ. The firm also has the option to renegotiate bank debt, which, as in Hackbarth et al. (2007), is senior.

The majority shareholders have the option to renegotiate bank debt by offering a new debt service that is acceptable for the bank. The bank possesses an equity stake γ an he is a non-controlling shareholder.

As the bank seeks to avoid the default cost ϕ, it is willing to accept a lower debt service in the event of renegotiation. Shareholders benefit from a lower bank debt service in such cases, and since the bank is also a shareholder, it partially compensates for its loss in debt value. Assuming no bargaining power for the bank, majority shareholders make a take-it-or-leave-it offer to the bank, as shown in Mella-Barral and Perraudin (1997) and Hackbarth et al. (2007). The value of the new debt service is equal to the reservation value of the bank:

$$S(X) = R(X) = \left(1 - \frac{1-(1-\phi)(1-\tau)}{1-\gamma(1-\tau)}\right)\frac{X}{r-\alpha} - \left(1 - \frac{1}{1-\gamma(1-\tau)}\right)\frac{c}{r} \tag{11}$$

When the bank has no equity in the firm ($\gamma = 0$), the reservation value is simply the liquidation value $(1-\phi)U(X)$. As the bank also benefits from the debt tax-shield as a shareholder, it is willing to accept a lower debt service ($\partial S(X)/\partial\gamma < 0$).

Prior to renegotiation ($X \in [X_R, \infty)$), the value of bank debt is represented by the equation:

$$B(X) = B_1 X^{\beta_1} + B_2 X^{\beta_2} + \frac{b}{r}, \tag{12}$$

where the boundary condition $\lim_{X\to\infty} B(X) = \frac{b}{r}$ implies that $B_1 = 0$.

The bank accepts the new offer $S(X)$ at a low threshold X_R, which is found by satisfying the value-matching and smooth-pasting conditions:

$$B(X_R) = S(X_R) \tag{13}$$

$$B'(X_R) = S'(X_R) \tag{14}$$

This yields the following solution:

$$X_R = \frac{\beta_2}{\beta_2 - 1}\left(\frac{r-\alpha}{(1-\gamma-\phi)(1-\tau)}\right)\frac{b-\gamma(1-\tau)(b+c)}{r} \tag{15}$$

$$B(X) = \frac{b}{r} + \left(S(X_R) - \frac{b}{r}\right)\left(\frac{X}{X_R}\right)^{\beta_2}. \tag{16}$$

Equityholders have a lower strategic default threshold, denoted as X_D. Since bank debt holds a senior position, market debt holders receive no compensation in the event of default, while the bank bears the cost of default since renegotiation is no longer optimal for shareholders.

The value of market debt prior to default ($X \in [X_D, \infty)$), can be expressed as:

$$C_1 X^{\beta_1} + C_2 X^{\beta_2} + \frac{c}{r}, \tag{17}$$

where C_1 is set to zero due to the boundary condition:

$$\lim_{X\to\infty} C(X) = \frac{c}{r}. \tag{18}$$

By applying the value-matching condition, $C(X)$ can be written as:

$$C(X) = \frac{c}{r} - \frac{c}{r}\left(\frac{X}{X_D}\right)^{\beta_2}. \tag{19}$$

It is noteworthy that at X_D, no smooth-pasting condition is observed, as the timing of default is not optimized by debtholders, but rather by majority shareholders.

Prior to renegotiation ($X \in [X_R, \infty)$), the value of equity is:

$$E(X) = \left(\frac{X}{r-\alpha} - \frac{c}{r} - \frac{b}{r}\right)(1-\tau) + E_1 X^{\beta_1} + E_2 X^{\beta_2} \tag{20}$$

while in the region $[X_D, \infty)$ it is:

$$\left(\frac{X}{r-\alpha} - \frac{c}{r} - S(X)\right)(1-\tau) + E_3 X^{\beta_1} + E_4 X^{\beta_2} \tag{21}$$

The following boundary condition must apply:

$$\lim_{X\to\infty} E(X) = \left(\frac{X}{r-\alpha} - \frac{c}{r} - \frac{b}{r}\right)(1-\tau) \tag{22}$$

implying $E_1 = E_3 = 0$.

The constants E_2 and E_3 and the default threshold X_D are found using the following value-matching and smooth-pasting conditions:

$$E(X_R) = E_R(X_R) \tag{23}$$

$$E_R(X_D) = 0 \tag{24}$$

$$E_R'(X_D) = 0 \tag{25}$$

which yields the following solution:

$$X_D = \frac{\beta_2}{\beta_2 - 1}\left(\frac{r-\alpha}{\tau + \phi(1-\tau)}\right)\frac{c}{r} \tag{26}$$

$$\begin{aligned} E_R(X) = &\left(\frac{X}{r-\alpha} - \frac{c}{r} - S(X)\right)(1-\tau) \\ &- \left(\frac{X_D}{r-\alpha} - \frac{c}{r} - S(X_D)\right)(1-\tau)\left(\frac{X}{X_D}\right)^{\beta_2} \end{aligned} \tag{27}$$

$$\begin{aligned} E(X) = &\left(\frac{X}{r-\alpha} - \frac{c}{r} - \frac{b}{r}\right)(1-\tau) \\ &+ \left(E_R(X_R) - \left(\frac{X_R}{r-\alpha} - \frac{c}{r} - \frac{b}{r}\right)(1-\tau)\right)\left(\frac{X}{X_R}\right)^{\beta_2} \end{aligned} \tag{28}$$

2.1 Optimal leverage

When equityholders raise capital, they decide on optimal leverage. If the goal is to raise an amount K for investing, then they have to decide how to finance it:

$$K = B(X,b,c) + C(X,b,c) + E(X,b,c) = V(X,b,c) \tag{29}$$

Equityholders maximize the value of their stake by choosing the optimal levels of b and c, which is equivalent to maximize the total value of the firm. The optimal financing policy, b^* and c^* is the solution to:

$$\arg\max_{b,c} V(X,b,c) \tag{30}$$

The total value of the firm can be expressed as the sum of the value of the unlevered firm and the debt tax shields less the value of the bankruptcy costs:

$$
\begin{aligned}
V(X) &= U(X) + TS(X) - BC(X) \\
&= U(X) + \tau\left(B(X) + C(X) + \left(\frac{X_D}{r-\alpha} - S(X_D)\right)\left(\frac{X}{X_D}\right)^{\beta_2}\right) \\
&\quad - \left(\frac{X_D}{r-\alpha} - S(X_D)\right)\left(\frac{X}{X_D}\right)^{\beta_2}
\end{aligned} \tag{31}
$$

The solution to the optimization problem (30) is:

$$
b^* = \frac{\beta_2 - 1}{\beta_2}\left(\frac{r}{r-\alpha}\right)\frac{1-\tau}{1-\gamma(1-\tau)}(1-\gamma-\phi+\gamma(1-(1-\phi)(1-\tau)))hX \tag{32}
$$

$$
c^* = \frac{\beta_2 - 1}{\beta_2}\left(\frac{r}{r-\alpha}\right)(1-(1-\phi)(1-\tau))hX \tag{33}
$$

$$
\tag{34}
$$

where

$$
h = \left(\frac{\tau}{\tau - \beta_2(1-\gamma(1-\tau))}\right)^{-1/\beta_2} \tag{35}
$$

As in Hackbarth et al. (2007), it can be shown that $X_R(b^*) = X$: bank debt is issued up to firm's bank debt capacity. Additionally, $X_D = hX_R$. When the bank is a dual owner default is optimal before renegotiation if $h > 1$, which occurs for high uncertainty, high equity stakes or low tax shields. In fact, since $X_R = X$, when optimal leverage is chosen, h needs to be smaller than 1 so a money machine of raising capital and defaulting immediately is excluded.

Similarly to Hackbarth et al. (2007), it can be demonstrated that the optimal level of bank debt, b^*, corresponds to the firm's bank debt capacity, such that $X_R(b^*) = X$. Moreover, we have $X_D = hX_R$. When the bank is a joint owner of the firm, defaulting is the optimal choice before renegotiation if $h > 1$, which can happen under conditions of high uncertainty, high equity stakes, or low tax shields. However, it is worth noting that, since $X_R = X$, h must be less than 1 to preclude the possibility of a scenario where the firm raises capital and defaults immediately, effectively becoming a "money machine".

2.2 Investment timing

Let us consider that the firm raises capital to finance a sunk investment K in order to start receiving the X. Optimal investment timing occurs when a threshold X_I is reached from below:

$$
X_I = g\frac{\beta_1}{\beta_1 - 1}\left(\frac{r-\alpha}{1-\tau}\right)K = gX_U < X_U \tag{36}
$$

where

$$g = \frac{(1-\gamma(1-\tau))(1-\tau)}{1-\gamma(1-\tau)-\tau(1-h)(1-(1-\phi)(1-\tau))} < 1 \tag{37}$$

Additionally, $X_R = X_I$ and $X_D = hX_I$.

At the time of investment, majority shareholders of the firm determine the optimal level of leverage by issuing perpetual bank debt with coupon $b^*(X_I)$ and perpetual market debt with coupon $c^*(X_I)$. This decision is made jointly with the investment decision, and it is only made once.

3 Comparative statics

In this section, a numerical analysis is conducted to examine the impact of various model parameter values, including on the investment trigger, default policies, leverage ratios, and credit spreads. The base-case parameter values are outlined in Table 1.

Table 1: The base-case parameter values.

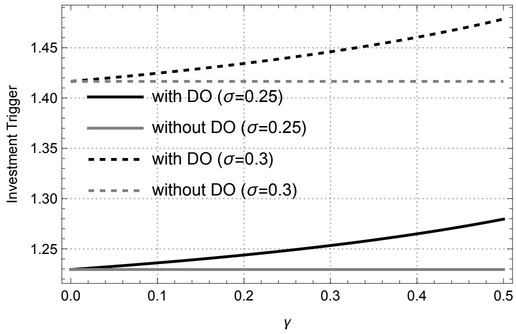
Parameter	Description	Value
γ	Bank equity stake	0.25
τ	Corporate tax rate	0.15
ϕ	Bankruptcy cost	0.4
σ	Volatility	0.25
r	Risk-free interest rate	0.06
α	Risk-neutral drift rate	0.01
K	Investment cost	10

Underinvestment

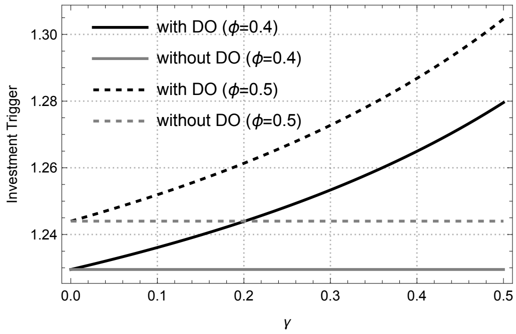
In the context of our dynamic investment model, underinvestment is expressed by larger investment triggers (Pawlina, 2010). Figure 1 depicts this underinvestment phenomenon, as the investment triggers are, in general, higher than those under separate ownership. Considering that the dual owner holds a minority stake in the firm ($\gamma < 0.5$), the effect remains for different levels of bankruptcy costs and risk neutral drifts (Figures 1(b) and 1(c)).

The impact of the bank equity stake

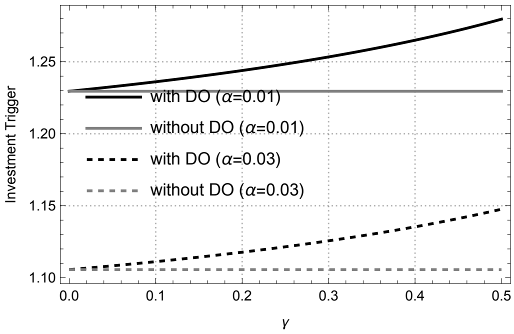
Figure 2 shows the effect of different levels of DO on the capital structure and cost of debt. DO increases the trigger of default (and so tends to accelerate default). A larger equity state for the dual owner reduces (increases) the bank (market) debt coupon. Moreover,



(a) σ



(b) ϕ



(c) α

Parameter values as in Table 1.

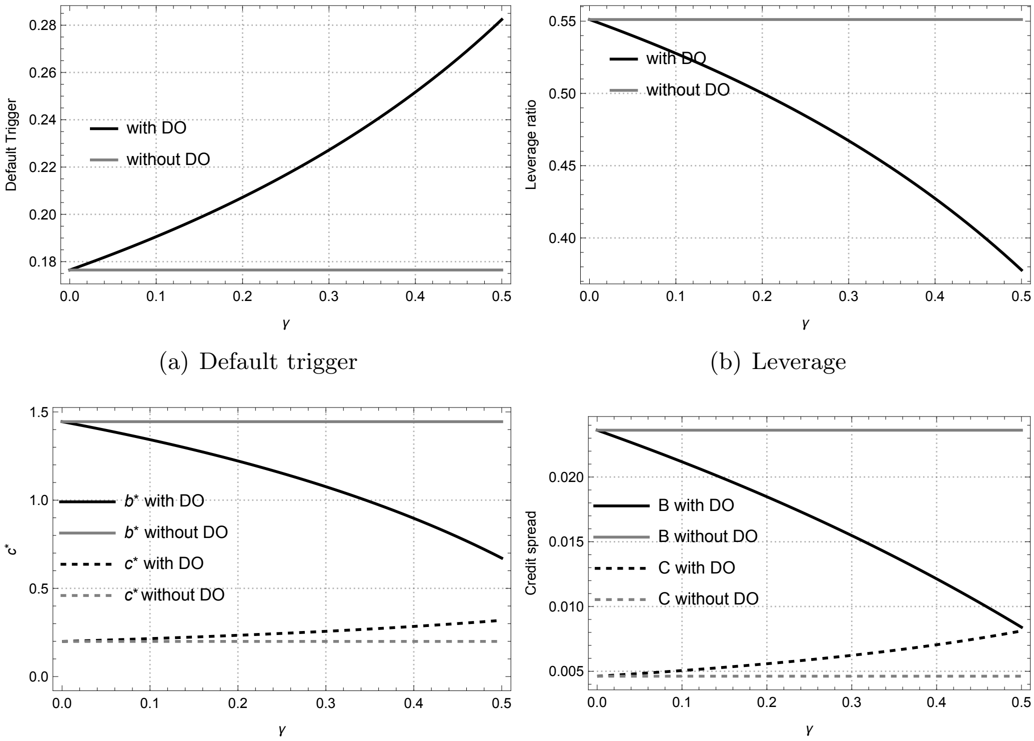
Figure 1: Underinvestment for different levels of volatility, default costs and growth rates

a higher level of dual ownership decreases the leverage ratio and reduces (increases) the bank (market) debt credit spread.

The impact of volatility and growth rates

The standard deterrence effect of volatility is confirmed in Figure 3(a) where a higher volatility is shown to increase the investment triggers. A higher volatility increases the optimal bank debt and has a non-monotonic on the optimal market debt (Figure 3(d)). The combined effect is a deterrence effect of default (Figure 3(b)) but an increase in credit spreads of both bank and market debt (Figure 3(e)) and leverage ratios (Figure 3(c)). The effects of DO shown in Figures 1 and 2 are magnified by volatility.

The growth rate has the opposite effect of volatility: a higher growth rate accelerates investment (Figure 4(a)) and default (Figure 4(b)), increases bank and market debt (Figure 4(d)) but reduces credit spreads (Figure 4(e)) and leverage ratios (Figure 4(c)). The effects of DO shown in Figures 1 and 2 are reduced by the growth rate.



(a) Default trigger (b) Leverage

(c) Optimal coupons (d) Credit spreads

Parameter values as in Table 1. For leverage ratios and credit spreads $X = 2$.

Figure 2: The effect of γ

4 Conclusion

In this paper, we study the impact of dual ownership (DO) on debt restructuring, default, capital structure, investment decisions, and credit spreads, where both bank debt and market is coexist.

The observed underinvestment phenomenon, represented by higher investment triggers under dual ownership, emphasizes the importance of considering ownership structure in investment decisions.

Furthermore, the analysis demonstrates that dual ownership not only influences the default triggers but also has significant implications for the capital structure and cost of debt. The effects of dual ownership are magnified by volatility but mitigated by the growth rates.

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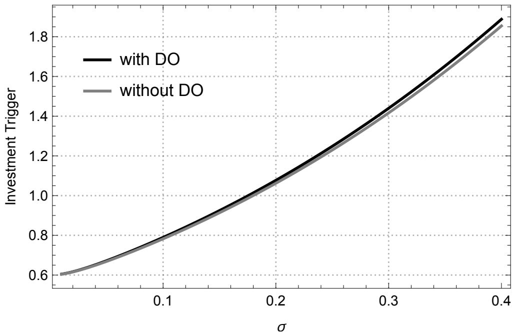
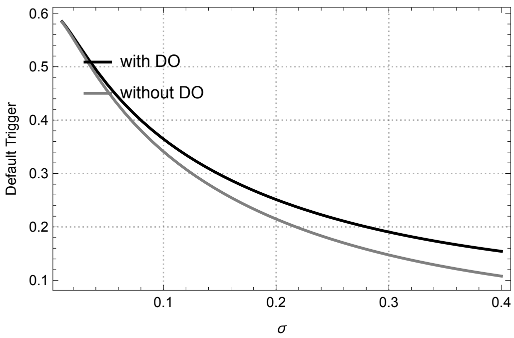
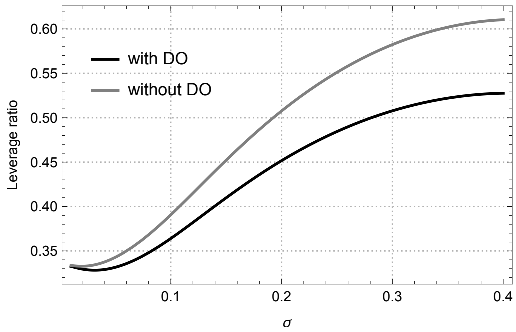


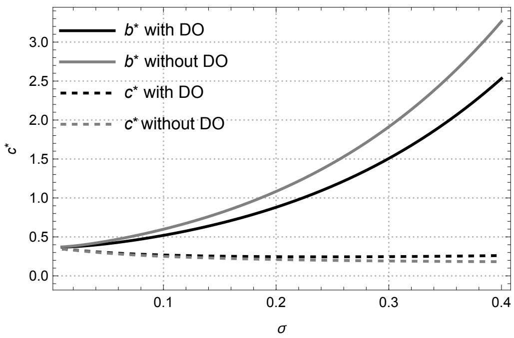
(a) Investment trigger



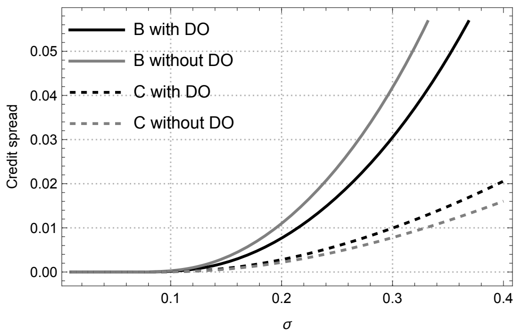
(b) Default trigger



(c) Leverage



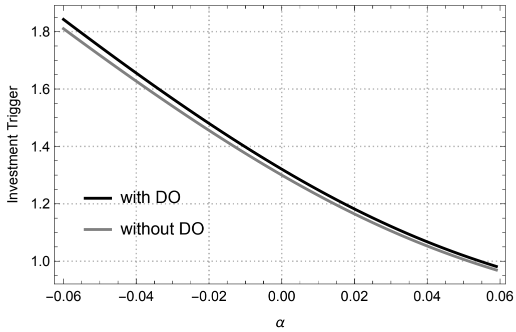
(d) Optimal coupons



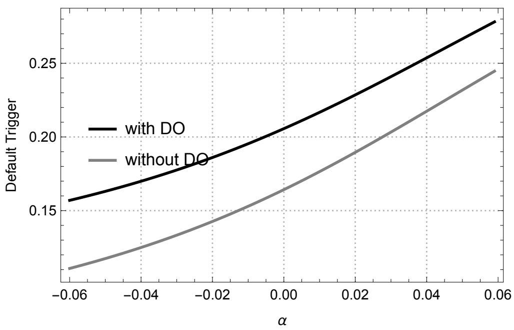
(e) Credit spreads

Parameter values as in Table 1. For leverage ratios and credit spreads $X = 2$.

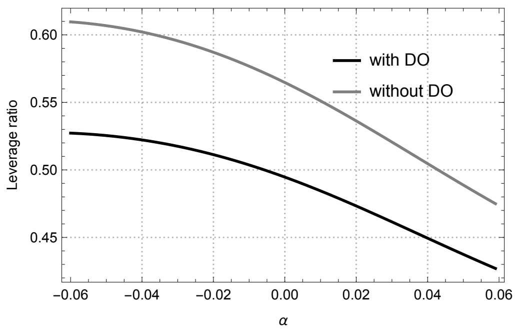
Figure 3: The effect of σ



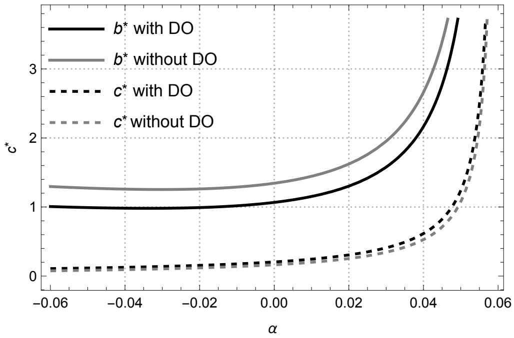
(a) Investment trigger



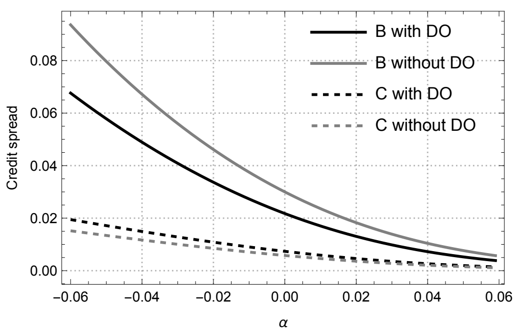
(b) Default trigger



(c) Leverage



(d) Optimal coupons



(e) Credit spreads

Parameter values as in Table 1. For leverage ratios and credit spreads $X = 2$.

Figure 4: The effect of α