Capital Structure & Corporate Finance Techniques to Maximize Firm Value & Investor Returns

Saïd Business School, University of Oxford, UK

Nicholas Burgess

nburgessx@gmail.com

September 2020

1. Introduction

A firm's capital structure describes the way in which a company is financed and how its free cash flows or net profits are distributed to investors. In what follows we review how capital structure can be organized to maximize firm value and investor returns.

Firstly we look at fundamental theory from corporate finance, namely the Modigliani and Miller propositions. The assumptions from this theory describe capital structure features that can be manipulated to benefit corporations and investors. Secondly we review trade-off theory and how corporations can exploit the tax advantages from issuing debt without exposing themselves excessively to bankruptcy risks. We discuss how firms use trade-off theory to optimize their capital structure to maximize firm value. This is a cyclical activity that is greatly influenced by the state of the economy, the company's beta and financial health.

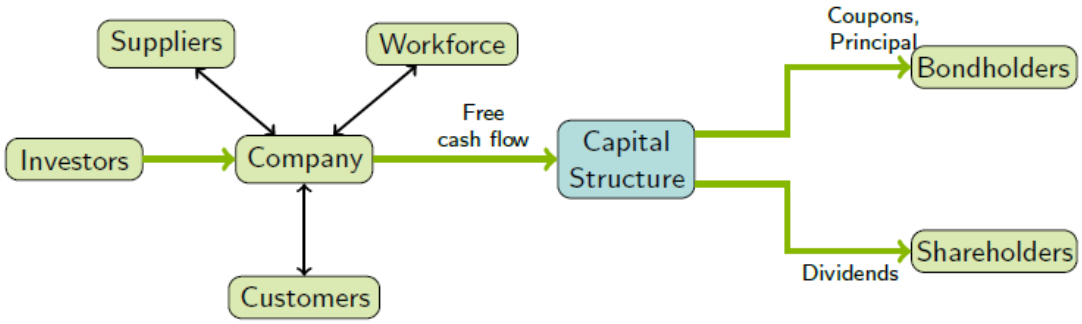
Finally we present two case studies where we firstly create a replicating portfolio to demonstrate Modigliani and Miller capital structure irrelevance and secondly show how debt financing can increase firm value and equity beta.

2. Capital Structure

Corporations and projects can be financed in many ways. Typically corporations employ a mixture of equity and debt financing. The mixture of financing used is called the **Capital Structure** and determines the distribution of free cash flows and investor returns.

In exchange for company or project financing investors share the profits and free cash flows of the company or project. **Debt** holders are prioritised and receive fixed regular coupon payments. **Equity** holders share the remaining company profits and / or losses (P&L). **Hedging** is considered a tool to reorganise the free cash flows of a project and is consequently also part of the capital structure.

Figure 1 **Free Cash Flow Illustration**



Failure to pay bond coupons and meet obligations to debt holders is termed a **default** and leads to **bankruptcy**. Equity holders control the company until default, upon which debt holders have a senior claim on company assets.

3. Modigliani & Miller Propositions

The Modigliani-Miller propositions of Franco Modigliani and Merton Miller, see (Sheridan, 2002), provide important insights into economic theory and form the basis for modern thinking on capital structure.

3.1 Modigliani Miller Proposition I (MM1)

This proposition is often referred to as the **capital structure irrelevance principle** and states that capital structure does not influence the value of the firm or its free cashflows.

MM1 can be described mathematically using the formula 1, which states that the value of a levered company is the same as the value of an unlevered company.

Formula 1 **MM1 without Taxes**

$$V_L = V_U$$

This formula indicates that the value of a levered firm is the same as that of an unlevered firm, where V_L denotes the value of a levered company and V_U an unlevered company.

Modigliani and Miller extended the capital structure formula to incorporate tax-shield benefits and bankruptcy cost factors as outlined in formula 2. The value of bankruptcy is estimated as the expected overall cost multiplied by the discounted probability of default or risky discount factor.

Formula 2 **MM1 with Taxes**

$$V_L = V_U + PV(Tax - Shield) - PV(Bankruptcy\ Costs)$$

This formula indicates that the value of a levered firm is the same as that of an unlevered firm accounting for tax-shield and bankruptcy costs, where V_L denotes the value of a levered company and V_U an unlevered company.

3.2 Modigliani & Miller Assumptions

MM1 is subject to the following assumptions, which conversely tell us exactly what capital structure features can impact the value of a firm and it's free cash flows. For example a firm's capital structure can be used to balance tax rebate benefits against bankruptcy costs (assumptions 1 and 2) to maximize firm value.

1. **Tax Benefits**

   Debt financing and bond issuance provides a tax-shield benefit, since bond interest coupons are tax deductible. It is assumed that corporation tax is zero and therefore there are no tax rebates, benefits or other incentives to issuing debt. Tax-shield benefits can account for 9.7% of firm value (Graham, 2020)

2. **Bankruptcy Costs**

   There are no bankruptcy costs associated with the issuance of debt and the likelihood of default. Bankruptcy costs can be as high as 20% of a firm's value (Andrade & Kaplan, 1998) and typically include direct costs from legal and accounting fees and indirect costs from the selling of distressed assets, the loss of key employees and customers.

3. **Issuance Fees**

   It is also assumed that there are no equity or debt issuance fees. Typically it is cheaper to issue debt than equity. Agency issuance costs are estimated 1-3% for debt and at 6-11% for equity (Allen Consulting Group, 2004).

4. **Market Completeness**

   The market is assumed to be complete, meaning that market instruments exist with sufficient liquidity to replicate the capital structure, see case study 5.1 below. In the absence of replication instruments, such as in the case of private placements the market is said to be incomplete and illiquid capital structures can have a higher value.

5. **Information Asymmetries**

   MM1 assumes the managers and investors have equal knowledge. Managers often have more information than investors and therefore capital structure decisions may be perceived by local investors negatively or positively.

   Financing a project by issuing debt and guaranteeing coupon payments can be perceived as a sign of strength, whereas equity finance and sharing

project profits and losses with investors is seen as risky and a sign of weakness.

6. **Competitive Distortions**

   It is assumed that there are no competitive distortions. In some markets there can be liquidity shortages, monopolies, government restrictions and market penalties limiting or preventing investment in equity and / or debt.

7. **Effort Effects**

   Managers are assumed to make the same effort regardless of capital structure. However often managers work harder, reduce waste and cut company perks when the company issues debt, has to meet financial obligations to bond holders and make regular coupon payments.

3.3 Modigliani Miller Proposition II (MM2)

MM2 states, a firm's capital structure does not change its weighted average cost of capital. The weighted average cost of capital (WACC) is calculated as the pro-rated equity and debt capital costs and can be calculated using formula 3 below.

Formula 3 **Weighted Average Cost of Capital, WACC**

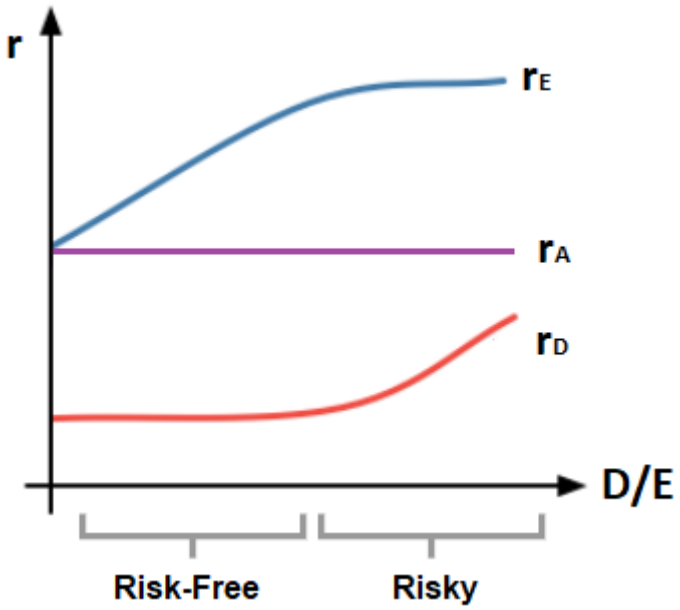
$$WACC = r_A = \left(E/V\right)r_E + \left(D/V\right)r_D$$

The weighted average cost of capital does not change with capital structure, where r_A is the weighted cost of capital or WACC, r_E the cost of equity capital and r_D the cost of debt capital, E represents the equity value, D the debt value and V the total firm value, V = E + D.

As illustrated in figure 2 below the WACC remains constant for all levels of debt financing. When there is sufficient equity to cover defaults i.e. when the D/E ratio is less than one, then debt is considered risk-free and the cost of debt is relatively constant, once there is insufficient equity collateral, the cost of debt increases to compensate debt holders for accepting this risk.

Furthermore as debt levels increase equity holders require higher returns to compensate for increasing debt holder claims on company equity and assets in the event of a default. Beyond the risk-free zone there is insufficient equity to collateralize debt at which point equity holders do not require additional returns.

Figure 2 Cost of Capital: Weighted Average, Equity & Debt



4. Trade-Off Theory

The Modigliani & Miller propositions form the basis of Trade-Off theory, which describes the process of balancing equity and debt financing to maximize firm value.

4.1 Capital Structure Debt/Equity Trade-Off

We know from MM1 with taxes the value of a levered firm can be calculated using formula 2 above as follows,

$$V_L = V_U + PV(Tax - Shield) - PV(Bankruptcy\ Costs)$$

Debt financing and bond issuance provides a tax-shield benefit, since bond interest coupons are tax deductible. This reduces the firm's tax obligations and therefore increases firm value. However debt issuance also increases the probability of default

and expected bankruptcy costs. The tax-shield only benefits equity holders since bond coupons are fixed. We outline how to evaluate the tax shield and bankruptcy, in formulae 4 and 5 below.

Formula 4 **Present Value of Tax-Shield**

$$PV(\text{Tax-Shield}) = D\,\tau$$

This formula assumes that the tax-shield is perpetual and that debt will be constantly replenished and rolled on expiry, where D represents the amount of debt issued and τ the corporation tax rate.

Proof

Using the perpetuity formula see (Burgess 2020a) we have,

$$PV(\text{Tax-Shield}) = PV(\text{Perpetuity}) = \left(C/r\right) = Bond\ Tax\ Rebate/r_D = (D\,\tau\,r_D)/r_D = D\,\tau$$

giving the result quoted above.

Formula 5 **Bankruptcy Costs**

$$PV(\text{Bankruptcy Costs}) = \text{Expected Cost} \cdot P(\text{Default}) \cdot \text{Discount Factor}$$

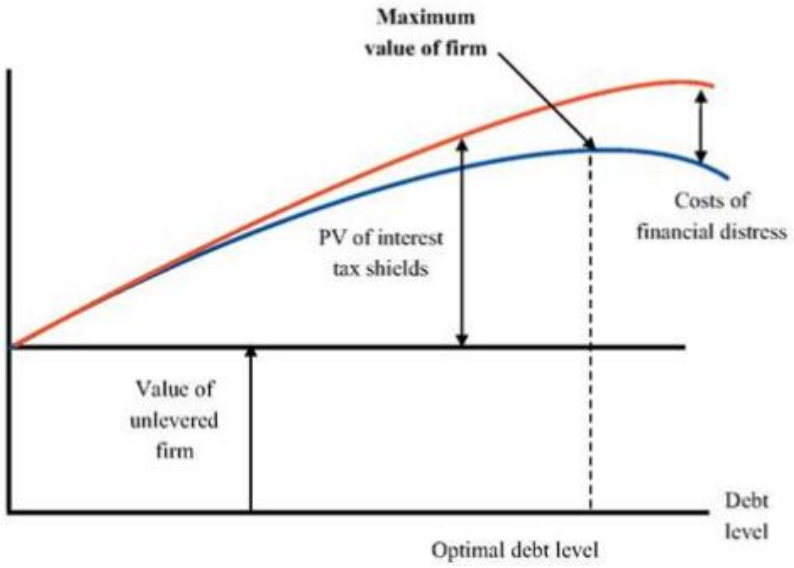
This formula assumes we can accurately estimate the total cost of bankruptcy, its likelihood and the time of default using statistical methods or otherwise and where P(Default) represents the probability of default.

4.2 Optimal Capital Structures

For any given capital structure there is an optimal balance of debt and equity finance that maximizes the value of a firm as suggested by the MM1 proposition with taxes and outlined in figure 3 below.

The value of an unlevered firm **(black line)** remains constant regardless of the level of debt. The levered firm value **(red line)** increases with debt as a result of the tax rebate contribution to the firm's free cash flows, however as debt levels increase potential bankruptcy costs reduce the value of the firm. The net effect **(blue line)** shows that there is an optimal level of debt and equity that maximizes firm value.

Figure 3 **Capital Structure Optimal Level of Debt and Equity**



Corporations regularly review their capital structure to maximize firm value and make a trade-off between the tax-shield benefits and increased bankruptcy costs associated with debt financing. Naturally they also monitor agency issuance costs estimated at 6-11% for equity and 1-3% for debt (Allen Consulting Group, 2004).

4.3 Bankruptcy Costs

Bankruptcy costs can be as high as 20% of a firm's value (Andrade & Kaplan, 1998). Direct bankruptcy costs include legal and accounting fees, but in many cases indirect bankruptcy costs can be much higher with the primary costs arising from the loss of key staff and customers.

Bankruptcy costs are typically lower for companies with large portfolios of fixed assets and tangibles, such as those in the auto & truck sector, which when in distress can be sell-off assets to pay debts. However firms such as software companies, whose assets are primarily human skills and resources have high bankruptcy costs, as the loss of key staff and customers would damage operating revenues should the company enter financial distress.

Companies with lower bankruptcy costs typically have higher debt to total asset ratios and benefit most from tax rebates from debt financing, as shown in table 1.

Table 1 **Average Capital Structures for US Companies by Sector**

Industry	Debt ÷ Assets
Advertising	35%
Auto & Truck	66%
Bank (Money Center)	67%
Biotechnology	15%
Brokerage & Investment Banking	75%
Homebuilding	38%
Oil/Gas Distribution	50%
Semiconductor	11%
Software (Internet)	17%
Utility (General)	41%

Source: NYU Stern

4.4 Impact of Market Cycle on Capital Structure

In times of market crisis and economic downturn firms are at increased risk of bankruptcy and market liquidity is low. Cyclical high beta companies are at greater risk since they are more sensitive to market movement and the economic cycle.

Consequently at such times it is more prudent to build excess cash reserves, reduce debt issuance and avoid equity buy-backs. This is the trend we have been observing since the start of the current coronavirus pandemic see (FT, 2020a) and (FT, 2020b), which is quite expected (Stienen, 2017). The decreased level of bond issuance and equity buy-backs was also observed in Europe and the U.S. during the financial crisis of 2008-2009 (Bliss et at, 2015) and (Floyd et at, 2015).

Contingent Convertibles (CoCo Bonds) were introduced after the 2008 financial crisis and may have reduced the need for buy-backs during a crisis, since they convert debt to equity when debt-value capital levels are breached (Seeking Alpha, 2016).

Interestingly it is common to see a rebound in buy-back activity post-crisis, since tax-shield benefits can account for 9.7% of firm value (Graham, 2020) which is too large to leave on the table.

5. Case Studies

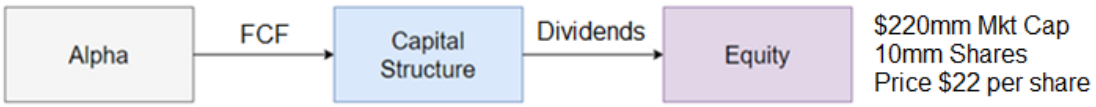
In this section we present two case studies to summarize and demonstrate discussion points. The first case study shows how we can use portfolio replication concepts to give a light proof of the Modigliani and Miller propositions. In the second case study we perform a detailed analysis of how utilising debt financing in one's capital structure a firm can increase its value and equity beta.

5.1 Case Study, Capital Structure Replication

This case study gives a light proof of the MM1 proposition and capital structure irrelevance. Consider two companies Alpha and Omega, as shown below. They have the same free cash flows (FCF) but different capital structures. Let's consider their day 1 values.

Alpha Initial Value

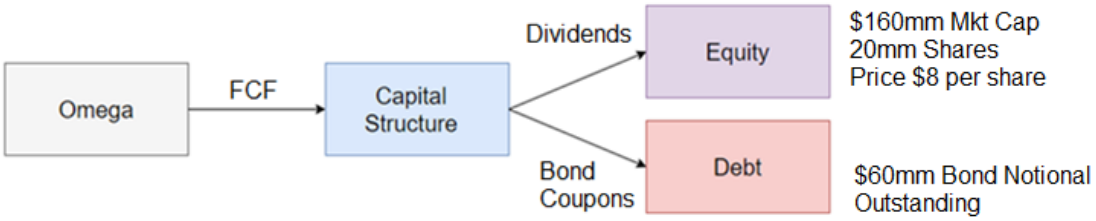
Alpha is fully equity financed as follows,



Equity Value: 10mm shares x $22 = $220mm Market Capitalisation

Omega Initial Value

On the other hand Omega is equity and debt financed as follows,



Equity Value: 20mm shares x $8 = $160mm Market Capitalisation

Debt Value: $60mm

Arbitrage & Replication

The fair value of Omega is $8, if Omega trades at any other price the open market we can create a replication portfolio to exploit the arbitrage opportunity.

If Omega share price is trading at $10, fair value (+$2), we can create a replication portfolio as follows and keep the $40mm profit.

1. **Buy** Alpha equity @ $22, to receive same cash flows as Omega (-$220mm)
2. **Sell** $60mm of Omega Debt (+$60mm)
3. **Sell** 20mm of Omega Shares @ $10 (+$200mm)

Similarly if Omega is trading at $6, fair value (-$2), we can use the reverse strategy to also make a profit of $40mm

1. **Sell** Alpha equity @ $22, to receive same cash flows as Omega (+$220mm)
2. **Buy** $60mm of Omega Debt (-$60mm)
3. **Buy** 20mm of Omega Shares @ $6 (+$120mm)

5.2 Case Study, Debt Financing

LogoLand is a British advertising and marketing company. LogoLand expects to generate an annual EBIT of £1.3 million in year one and this figure is not expected to change. LogoLand makes fixed capital investments of £200,000 every year, its depreciation expense is constant at £50,000 per year, working capital balances are expected to stay constant at £100,000 and the firm's cost of capital is 7%. LogoLand's equity beta is 1.2, the risk-free rate is 1% and the market risk premium is 5%. The corporate tax rate is 35%.

The firm currently has no debt, 250,000 shares outstanding. It decides to borrow £1 million at 5%, by issuing a perpetual bond, and it uses the proceeds to repurchase shares at a price that renders shareholders indifferent between selling.

i) What is the value and share price of LogoLand before the debt issue?

We know from (Burgess 2020b) and formula 4 that the free cash flows of a company can be evaluated as follows,

FCF = EBIT (1 – Tax) + Depreciation – CapEx – Change in NWC

Therefore the free cash flows for LogoLand can be evaluated as,

FCF = 1,300,000 (1 - 0.35) + 50,000 – 200,000 – 0
= £695,000

We know from (Burgess, 2020a) that the free cash flows and components are constant and can be evaluated as a perpetuity using formula 5,

PV(Perpetuity) = C / r

Therefore the PV for LogoLand is,

PV = 695,000 / 7% = £9,928,571

and hence the fair share price is,

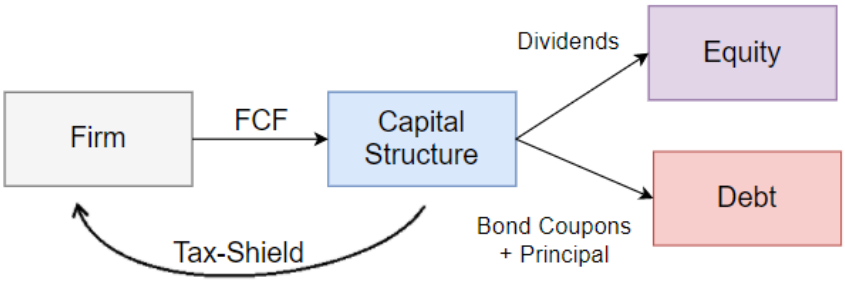
Share Price = Market Capitalization / No. Shares

= 9,928,571 / 250,000

= £39.71

ii) What effect does the debt issue have on LogoLand's valuation?

Issuing debt increases the firm value. Bond coupons are tax deductible and create a tax-shield, which increases the firm free cash flows (FCF). Only equity holders benefit from the tax-shield as bond coupons are fixed.



As shown in formula 4 the PV of the tax-shield can be computed as follows,

PV(Tax-Shield) = $D\tau$ = 1,000,000 x 35% = £350,000

Therefore the firm value increases by £350,000. With an equity only capital structure and no debt the firm value is £9,928,571, however after issuing debt the firm value increases to £10,278,571.

iii) At what price will they buy back the shares?

A repurchase equity value that renders shareholders indifferent would be the equity fair value.

New Share Price = New Firm Value / No. Shares

= 10,278.571 / 250,000

= £41.11

iv) What effect does this transaction have on LogoLand's cost of capital and cost of equity?

We know from Modigliani-Miller Proposition II (MM2) that a firm's weighted-average cost of capital (WACC) is unchanged by capital structure. This implies the WACC remains constant at 7% and using formula 3 we have,

$$WACC = r_A = 7\% = \left({}^{E}/_{V}\right)r_E + \left({}^{D}/_{V}\right)r_D$$

Furthermore using the market data given and realizing that the debt cost of capital is the bond par-yield of 5%, we have,

$$7\% = \left({}^{10.278mm - 1mm}/_{10.278mm}\right)r_E + \left({}^{1mm}/_{10.278mm}\right)5\%$$

Giving an equity cost of capital of,

$r_E = 7.22\%$

In summary,

$r_A = 7\%,\ r_D = 5\%\ and\ r_E = 7.22\%$

v) What is LogoLand's equity beta after the bond issue and share repurchase?

The CAPM pricing model gives the relationship between the cost of capital and the beta as below, see (Burgess 2020a).

$r_E = r_F + \beta\ (r_M - r_F)$

Rearranging for beta we have,

$$\beta = \left(\frac{r_E - r_F}{r_M - r_F}\right) = \left(\frac{7.22\% - 1\%}{5\%}\right) = 1.24$$

The bond issue has the effect of increasing the equity beta from 1.20 to 1.24

6. Conclusion

In summary capital structure describes a firm's financing structure, which is typically a mixture of debt and equity. Interestingly hedging activities are typically considered a part of the capital structure. The capital structure of a firm also determines the distribution of free cash flows and returns to investors.

Firstly we looked at the Modigliani and Miller propositions and fundamental theory from corporate finance. The assumptions from this theory describe capital structure features that can be manipulated to benefit corporations and investors.

Firms use trade-off theory to optimize their capital structure to maximize firm value. We have seen that the capital structure dynamics and the tax-shield benefits arising from debt financing can account for as much as 10% of firm value. However debt financing also has a detrimental effect in that it increases the probability of default and potential bankruptcy costs.

The benefits and disadvantages of debt financing have to be carefully and dynamically managed. This is a cyclical activity that is greatly influenced by the state of the economy, the company's beta and financial health. In times of crisis and economic downturn when liquidity and bankruptcy risks are high many corporations refrain from debt issuance and in times of prosperity firms employ increasing levels of debt leverage to exploit tax-shield benefits and revenue, which increases firm beta.

Finally we presented two case studies where we created a replicating portfolio to demonstrate capital structure irrelevance and Modigliani and Miller theory and where we also show how debt financing can increase firm value and equity beta.

References

(Allen Consulting Group, 2004)

Debt and Equity Raising Transaction Costs. Final Report to the Australian Competition and Consumer Commission.

(Andrade & Kaplan, 1998)

How Costly is Financial (Not Economic) Distress? Evidence from Highly Leveraged Transactions that Become Distressed. Journal of Finance Vol 53 (5) 1443-1493

(Berk and DeMarzo, 2016)

Book: Corporate Finance, Global Edition, 2016. Published by Pearson

(Bliss et at, 2015)

Corporate Payout, Cash Retention and the Supply of Credit. Evidence from the 2008-2009 Credit Crisis. Journal of Financial Economics 115 (3) 521-540

(Brealey et al, 2014)

Book: Principles of Corporate Finance, Global Edition, 2014. McGraw Hill Education.

(Burgess, 2020a)

Corporate & Project Finance Valuation Techniques for Maximizing Returns & Superior Growth Strategies.

Available at https://papers.ssrn.com/ sol3/papers.cfm?abstract_id=3679413

(Burgess, 2020b)

Transforming Projects into Superior Investment Strategies using Cash Flow Statement Analysis

Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_ id=3692778

(Floyd et at, 2015)

Payout Policy Through Financial Crisis: The Growth of Repurchases and the Resilience of Dividends. Journal of Financial Economics 118 (2) 299-316

(FT, 2020a)

Pandemic Sparks Surge in Equity Fundraisings, Financial Times, June 2020

Available at https://www.ft.com/content/8bd1c466-b7b5-4d36-89d0-7e714737491b

(FT, 2020b)

Cash-Rich Companies Halve Corporate Bond Issuance, Financial Times, July 2020

Available at https://www.ft.com/content/b0c65256-6d06-4df1-9e97-534870661a07

(Graham, 2020)

How Big are the Benefits of Debt? Journal of Finance 55 (5) 1901-1941

(Seeking Alpha, 2016)

Contingent Convertible Bonds (CoCos): An asset class worth looking at?

Available at https://seekingalpha.com/article/4006619-contingent-convertible-bonds-cocos-asset-class-worth-looking

(Sheridan, T. 2002)

The Modigliani and Miller Theorem and the Integration of Financial Markets. Financial Management. 31 (1): 101–115 doi:10.2307/3666323

(Stern, 2018)

Average Capital Structures for US Companies by Sector, NYU Stern. Available at http://people.stern.nyu.edu/adamodar/New_Home_Page/datafile/wacc.htm

(Stienen, 2017)

The effect of the financial crisis on the share repurchase activity in Europe. Tilburg University, School of Economics & Management