

## Capital Structure

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### SECTION 01

## What Is This Tool?

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The **Capital Structure Analyzer** is a quantitative finance model that helps you find a firm's optimal mix of debt and equity. It implements the **Modigliani-Miller (MM) framework** with **corporate taxes** – one of the cornerstones of modern corporate finance – and extends it with **realistic financial distress costs** to produce the complete trade-off theory picture of firm value.

At its core, the tool answers: how much debt should a firm take on to maximise its total value and minimise its cost of capital? It models the tax shield benefit of debt (which increases firm value) against the escalating costs of financial distress (which destroy value above a critical leverage threshold), and plots both firm value and WACC continuously across every possible D/E ratio.

### Who should use this tool?

MBA students studying corporate finance and capital structure theory, CFOs and financial analysts evaluating a firm's target leverage ratio, investment bankers modelling optimal debt capacity for a transaction, and any professional who needs a rigorous, visual answer to "how much debt is too much – and where is the sweet spot?"

### The theoretical framework

Modigliani and Miller (1958, 1963) showed that in a world with corporate taxes, a levered firm is worth more than an all-equity firm because interest payments are tax-deductible – creating a **tax shield** that accrues entirely to shareholders. In the pure MM world, firms should take on as much debt as possible to maximise the tax shield.

The real world, however, imposes **financial distress costs**: legal fees, management distraction, loss of customers and key employees, and the destruction of intangible franchise value that materialise as debt rises beyond a critical threshold. The **trade-off theory** balances these two

forces – debt's tax benefit versus distress cost – to identify an interior optimal capital structure where firm value is maximised and WACC is minimised.

### What the tool models precisely

Below the Critical D/E threshold:  $V_L = V_U + \text{Tax Shield}$  (pure MM with taxes). Above the threshold: a quadratic distress premium is added to WACC and subtracted from firm value, growing as the square of how far leverage exceeds the threshold. This produces a smooth, realistic trade-off curve with a clearly identifiable optimal point.

## SECTION 02

### Quick Start

You can model your firm's capital structure and read the optimal D/E ratio in under a minute.

#### 1 ENTER YOUR FIRM'S CORE PARAMETERS

Set EBIT (operating earnings), the corporate tax rate, and the unlevered firm value ( $V_U$  – the value of the firm if it had zero debt). These three inputs define the MM foundation of the model. Use the base input fields for precise values, or drag the sliders for quick sensitivity analysis across  $\pm 100\%$  of the base value.

#### 2 SET YOUR DESIRED D/E RATIO AND COST OF DEBT

Enter the target D/E ratio you want to analyse in the results box. Drag the D/E slider to see results update in real time. Set the cost of debt ( $r_d$ ) to the firm's current or expected borrowing rate. The tool instantly recomputes all nine output metrics.

#### 3 CONFIGURE BANKRUPTCY RISK PARAMETERS

Set the Critical D/E threshold – the leverage point beyond which financial distress begins. Then enter the direct and indirect bankruptcy cost percentages. The tool paints the D/E badge green, orange, or red to show whether your current D/E is safe, near the threshold, or already in the distress zone.

#### 4 READ THE CHART AND EXPORT

The canvas chart plots firm value (teal line, left axis) and WACC (red line, right axis) against all D/E ratios from zero to  $2.5\times$  the critical threshold. The optimal D/E is at the peak of the teal curve and the trough of the WACC curve. Export to PDF for presentations or save the model for future sessions.

## SECTION 03

### Core Parameters

These five inputs form the MM foundation of the model. Each has a numeric base input and a paired slider that adjusts the value from  $0\%$  to  $200\%$  of the base (i.e.,  $\pm 100\%$ ). Dragging the

slider immediately updates all outputs, enabling live sensitivity analysis.

#### EBIT

**Earnings Before Interest and Tax.** The firm's operating profit – revenue minus operating expenses, before any interest charges or taxes are deducted. EBIT is the pre-financing profit that accrues to all capital providers (both debt and equity holders).

EBIT directly drives Free Cash Flow (FCF), which in turn sets the firm's unlevered earning power. A higher EBIT raises firm value at every D/E ratio.

$$FCF = EBIT(1-t) - Capex + Depreciation - \Delta NWC$$

Default: ₹10,00,000. Slider range: 0-200% of base value.

#### TAX RATE

**Corporate income tax rate (t).** The marginal tax rate the firm pays on its taxable income. This is the key parameter in the MM tax shield formula: a higher tax rate means each rupee of interest deduction saves more tax, making debt more valuable.

$$Tax\ Shield = t \times Debt$$

In India, the standard corporate tax rate is approximately 25.17% (including surcharge and cess). The concessional new-regime rate for manufacturing companies is 17.01%. Use the effective marginal rate applicable to your firm.

Default: 17.5%. Slider range: 0-75% (absolute, not ± base).

#### D/E RATIO (DESIRED)

**Target Debt-to-Equity ratio.** The specific leverage level you want the results box to evaluate. Setting D/E = 1.0 means the firm has equal debt and equity. Setting D/E = 2.0 means debt is twice the equity value.

This input is independent of the chart, which always plots the full range from D/E = 0 to D/E = 2.5× Critical. The desired D/E is simply the point highlighted in the results box. The D/E badge shows whether this level is safe, near the distress threshold, or in the distress zone.

$$D/C = D/E \div (1 + D/E)$$

Default: 0. Slider range: 0-200% of base value.

#### UNLEVERED EQUITY (V\_U)

**All-equity firm value.** The total value of the firm if it were financed entirely with equity and carried zero debt. This is the MM baseline – the firm's value before any tax shield or distress effects are applied.

In practice, V\_U is estimated as the present value of unlevered free cash flows discounted at the unlevered cost of equity (also called the asset cost of capital or r\_A). It represents the firm's core operating value stripped of financing effects.

$$V_L = V_U + Tax\ Shield\ (below\ distress\ threshold)$$

Default: ₹60,00,000. Slider range: 0-200% of base value.

#### COST OF DEBT (R\_D)

**Pre-tax interest rate on debt.** The rate the firm pays on its borrowings. This feeds into interest expense (Interest = Debt × r\_d), which is then used to compute FCFE (Free Cash Flow to Equity). It is also a component of WACC.

Use the firm's current borrowing rate or the yield on its outstanding bonds. For investment-grade Indian corporates, typical rates range from 7-10%. Below-investment-grade (high yield) borrowers may pay 12-18%.

$$\text{Interest} = \text{Debt} \times r_d$$

Default: 7%. Slider range: 5-30% (absolute).

The sliders on every input field are the fastest way to understand sensitivity. Set your base case values first, then drag each slider individually to see which parameter has the most impact on WACC and firm value. This is the core analytical workflow for any capital structure decision.

#### SECTION 04

## Cash Flow Parameters

These three inputs adjust EBIT-based earnings into true free cash flow measures. They capture the gap between accounting profit and actual cash generation – the difference that matters for firm valuation and equity returns.

#### CAPEX

**Capital Expenditure.** Cash spent on acquiring or upgrading tangible fixed assets (property, plant, equipment) or intangible assets. Capex represents a cash outflow that is not captured in EBIT (which deducts only depreciation, not the cash cost of investments).

Capex reduces both FCF and FCFE equally. High-capex businesses (infrastructure, heavy manufacturing, telecom) have significantly lower free cash flows relative to EBIT than asset-light businesses (software, financial services).

$$\text{FCF} = \text{EBIT}(1-t) - \text{Capex} + \text{Depreciation} - \Delta\text{NWC}$$

Default: ₹1,00,000. Slider range: 0-200% of base value.

#### DEPRECIATION

**Annual depreciation charge.** The non-cash accounting charge that allocates the cost of fixed assets over their useful lives. Since EBIT already deducts depreciation (it reduces taxable income), adding it back in the FCF formula converts EBIT to a cash basis.

When Capex equals Depreciation, the firm is simply maintaining its existing asset base (steady state). When Capex exceeds Depreciation, the firm is growing its asset base, which is a larger drag on free cash flow.

Default: ₹1,00,000. Slider range: 0-200% of base value.

#### ΔNET WORKING CAPITAL

**Change in net working capital.** The increase in current assets (receivables, inventory) minus the increase in current liabilities (payables). Growth businesses typically have positive ΔNWC – they need to tie up more cash in working capital as revenue rises.

A positive ΔNWC reduces free cash flow. A negative ΔNWC (e.g., if payables grow faster than receivables, common in retail) adds to free cash flow. Use the firm's annual working capital build as the input.

$$\text{FCF} = \text{EBIT}(1-t) - \text{Capex} + \text{Depreciation} - \Delta\text{NWC}$$

Default: ₹75,000. Slider range: 0-200% of base value.

### FCF vs FCFE — the key distinction

FCF (Free Cash Flow to Firm) is the cash available to all capital providers – both debt holders and equity holders – before any financing payments. It is discounted at WACC to value the entire firm.

FCFE (Free Cash Flow to Equity) is the cash available only to equity holders, after servicing the debt. It equals FCF minus after-tax interest (or more precisely, EBIT less interest, taxed, then adjusted for Capex, Depreciation, and  $\Delta\text{NWC}$ ). FCFE is discounted at the cost of equity to value the equity stake. The tool computes and displays both in the results box.

## SECTION 05

# Bankruptcy Risk Parameters

These three inputs define the distress cost side of the trade-off. Their sliders are rendered in **danger red** to signal that these parameters govern the zone where excessive leverage starts destroying firm value. All three have base inputs and  $\pm 100\%$  sliders.

### CRITICAL D/E

**The distress threshold.** The D/E ratio above which financial distress costs begin to materialise. Below this threshold, the firm operates normally and only the MM tax shield formula applies. Above this threshold, the distress premium grows quadratically, compressing firm value and inflating WACC.

The critical D/E is shown as a red dashed vertical line on the chart. The D/E badge on the desired D/E display turns orange at 80% of the threshold ("Near Threshold") and red above the threshold ("In Distress Zone").

Empirically, investment-grade firms rarely exceed D/E ratios of 1.5-2.0x. Capital-intensive industries (utilities, infrastructure) can sustain higher leverage; cyclical or asset-light businesses typically maintain lower D/E. Set this to the leverage level at which you believe lenders, rating agencies, or customers would begin to impose costs on the firm.

Default: 3.0. Slider range: 0-200% of base value.

### MAX DIRECT BK COST %

**Maximum direct bankruptcy cost as a percentage of firm value.** Direct bankruptcy costs are the hard, quantifiable costs of formal financial distress: legal fees, investment banking fees for restructuring, court costs, and administrative expenses of receivership or insolvency proceedings.

Academic studies estimate direct costs at approximately 3-5% of pre-distress firm value for large public companies, and higher for smaller firms. This is the **ceiling** value – the cost at extremely high leverage. The actual cost at any given D/E above the threshold scales quadratically from zero at the threshold to this maximum.

$$\text{Distress premium} = (\text{excess}/\text{threshold})^2 \times (\text{direct}\% + \text{indirect}\%)$$

Default: 5%. Slider range: 0-200% of base value.

#### MAX INDIRECT BK COST %

**Maximum indirect bankruptcy cost as a percentage of firm value.** Indirect costs are often much larger than direct costs and include: loss of customers who fear the firm will not honour warranties or service contracts; loss of key employees who leave for more stable employers; inability to invest in profitable projects due to debt overhang; suppliers tightening credit terms; and management distraction from running the business.

For firms with strong brand value, long-term customer relationships, or knowledge-intensive operations, indirect distress costs can reach 10-30% of firm value. Airlines and retailers that enter formal bankruptcy often suffer 20-30% revenue losses from customer defection alone before restructuring is complete.

Default: 30%. Slider range: 0-200% of base value.

### The Bankruptcy Warning Box

When the desired D/E ratio exceeds the Critical D/E threshold, a red warning box appears below the results. It shows the distress premium currently being applied – broken down into the direct cost component and the indirect cost component – so you can see exactly how much value is being destroyed by the excess leverage at the current D/E setting.

The quadratic distress formula means small exceedances above the critical threshold have relatively modest cost, but as leverage climbs well beyond the threshold, the distress premium accelerates rapidly. Drag the D/E slider past the critical threshold and watch the teal firm-value line on the chart slope steeply downward to see this dynamic in action.

## SECTION 06

# Reading the Results Box

The results box appears below the input panel with a dark background and gold text. It displays nine metrics computed at the desired D/E ratio entered above. All values update instantly when any slider or input changes.

#### D/C RATIO

**Debt-to-Capitalization ratio.** The fraction of total capital (debt + equity) that is financed by debt. More intuitive than D/E for comparing capital structures across firms of different sizes.

$$D/C = D/E \div (1 + D/E)$$

A D/C of 0.50 means debt is 50% of total capital (D/E = 1.0). A D/C of 0.67 means debt is two-thirds of capital (D/E = 2.0). D/C is bounded between 0 and 1, making it easier to communicate to non-finance audiences.

#### DEBT

**Absolute debt level (₹).** The rupee amount of debt implied by the desired D/E ratio and the unlevered firm value. Derived from the MM framework where the firm's total value (V<sub>L</sub>) and the D/E ratio jointly determine the debt quantum.

$$\text{Debt} = (D/E \times V_U) \div (1 + D/E \times (1-t))$$

Note that this formula accounts for the circularity in MM: as more debt is added, the tax shield raises firm value, which in turn supports more debt. The equation solves for the consistent equilibrium debt level.

#### LEVERED FIRM VALUE ( $V_L$ )

**Total value of the levered firm (₹).** The sum of the market values of debt and equity. Below the distress threshold, this equals  $V_U$  plus the tax shield. Above the threshold, distress costs reduce  $V_L$  below this level.

$$V_L = V_U + \text{Tax Shield (safe zone)}$$

$V_L$  represents the total value a buyer of the entire firm would pay – or equivalently, the enterprise value (EV) of the firm at the current capital structure.

#### VALUE OF EQUITY

**Market value of equity (₹).** The residual claim after subtracting debt from the total firm value. This is what equity holders collectively own.

$$\text{Equity Value} = V_L - \text{Debt}$$

As D/E rises from zero, equity value first increases slightly (tax shield benefit exceeds the cost of higher debt) and then falls sharply once distress costs dominate.

#### TAX SHIELD

**Present value of interest tax deductions (₹).** The value created by the tax-deductibility of interest payments. Equals the tax rate multiplied by the absolute debt level, assuming the tax shield is permanent and certain (MM assumption).

$$\text{Tax Shield} = t \times \text{Debt}$$

The tax shield is the entire source of value in the MM-with-taxes model. Without it (i.e., in the original MM 1958 no-tax world), capital structure is irrelevant.

#### FCF

**Free Cash Flow to Firm (₹).** The cash generated by operations that is available to all capital providers before any financing payments. Displayed in **green** when positive (the firm generates cash) and **red** when negative (the firm consumes cash – a warning sign).

$$\text{FCF} = \text{EBIT}(1-t) - \text{Capex} + \text{Depreciation} - \Delta\text{NWC}$$

FCF does not vary with capital structure in the MM model – it is a function of operations only. It is the numerator in the WACC valuation:  $\text{WACC} = \text{FCF} \div V_L$

#### FCFE

**Free Cash Flow to Equity (₹).** The cash available specifically to equity holders, after the firm has serviced all its debt (interest payments). Displayed in **green** when positive and **red** when negative.

$$\text{FCFE} = (\text{EBIT} - \text{Interest})(1-t) - \text{Capex} + \text{Depreciation} - \Delta\text{NWC}$$

As leverage rises, interest charges grow, reducing FCFE. Very high leverage can make FCFE negative even when FCF is positive, signalling that the firm cannot sustain its dividend or reinvestment capacity from equity cash flows alone.

#### COST OF EQUITY (R\_E)

**Implied cost of equity.** Derived as FCFE divided by the equity value. This is the rate of return required by equity holders given the firm's current leverage. As D/E increases,  $r_e$  rises because equity holders bear greater financial risk (they are residual claimants and absorb the volatility of interest charges).

$$r_e = \text{FCFE} \div \text{Value of Equity}$$

In MM with taxes, the cost of equity rises with leverage according to the MM Proposition II relationship. This is reflected implicitly in the model through the FCF-based WACC.

#### WACC

**Weighted Average Cost of Capital.** The blended required return across all capital providers (debt and equity), weighted by their proportions in the capital structure. The tool displays WACC derived cleanly from the FCF/V\_L relationship.

$$\text{WACC} = \text{FCF} \div V_L$$

Displayed in **teal** when the D/E is below the critical threshold (safe zone) and in **red** when D/E exceeds the threshold (distress zone). The optimal capital structure is where WACC is at its global minimum.

#### SECTION 07

## Reading the Firm Value & WACC Chart

The chart is rendered on an HTML5 Canvas element and plots two metrics simultaneously across the full range of D/E ratios. It gives an immediate visual answer to the trade-off theory: there is a single optimal leverage point where firm value peaks and WACC troughs.

### Teal Solid Line — Levered Firm Value (V\_L)

Plotted against the left Y-axis (rupee values). Starting from  $V_U$  at  $D/E = 0$ , the teal line rises as the tax shield accumulates with increasing leverage. It reaches a peak at the optimal D/E ratio, then slopes steeply downward as distress costs overwhelm the tax benefit above the critical threshold. The peak of this curve is the optimal capital structure — the D/E ratio that maximises total firm value.

### Red Solid Line — WACC with Distress

Plotted against the right Y-axis (percentage). The WACC line falls as leverage increases (because cheap, tax-deductible debt replaces expensive equity in the capital mix) and reaches a minimum at the same optimal D/E that maximises firm value. Above the critical threshold, the distress premium inflates WACC, causing it to rise sharply. The trough of this curve is the optimal capital structure — the same point as the peak of the  $V_L$  curve.

### Teal Dashed Line — Pre-Distress (Clean) WACC

A faint dashed version of the WACC line that shows what WACC would be if there were no distress costs — the pure MM-with-taxes WACC that continues declining monotonically with leverage. The gap between the red solid WACC line and this dashed baseline above the critical threshold represents the pure distress cost component being added to the cost of capital.

### Red Dashed Vertical Line — Critical D/E Threshold

A vertical dashed red line at  $D/E = \text{Critical } D/E$ . This is the boundary between the safe zone (to the left) and the distress zone (to the right). The  $V_L$  curve peaks near this line (slightly to its left in most parameterisations, depending on how steeply distress costs grow). The WACC curve troughs at or near this line as well.

Hover

### Hover Tooltip

Hovering anywhere on the chart surface displays a tooltip showing the exact values at that D/E ratio: the D/E ratio itself, the Levered Firm Value ( $V_L$ ), the WACC with distress, and the clean WACC without distress. Use the tooltip to precisely identify the D/E ratio at which  $V_L$  peaks or WACC troughs – this is your optimal capital structure.

### How to read the optimal capital structure

Hover along the teal firm-value curve until the tooltip shows the maximum  $V_L$  value. Note the D/E ratio at that point – this is the theoretically optimal capital structure given your inputs. Then verify on the WACC line: WACC should be at its minimum at the same D/E. The two optima are mathematically equivalent (maximising  $V_L$  is the same as minimising WACC when FCF is held constant).

### X-axis scale

The chart always plots from  $D/E = 0$  to  $D/E = 2.5 \times$  the Critical D/E threshold. If you set Critical D/E = 3.0, the chart plots from 0 to 7.5. This ensures the full arc of the trade-off – rise, peak, and decline – is always visible regardless of where the threshold is set. The desired D/E input does not affect the chart's horizontal range.

SECTION 08

## Core Concepts Explained

The following concepts are the theoretical foundations of everything the tool computes. Understanding them turns the chart from a set of lines into an actionable strategic framework for capital structure decisions.

### MM Proposition I (with Taxes)

Modigliani and Miller's 1963 correction to their 1958 theorem. With corporate taxes, the value of a levered firm equals the value of an all-equity firm plus the present value of the tax shield. Unlike the original irrelevance proposition, MM with taxes implies firms should maximise debt to maximise the tax shield – which is why distress costs are essential to model.

$$V_L = V_U + t \times \text{Debt}$$

### MM Proposition II (with Taxes)

The cost of equity rises with leverage in a predictable way: as the firm takes on more debt, equity holders bear greater financial risk (earnings volatility and residual seniority risk), demanding higher returns. However, the tax shield partially offsets this effect, so WACC still falls with leverage below the distress threshold – cheaper debt plus the tax benefit outweighs the rising cost of equity.

$$r_e = r_A + (r_A - r_d)(1-t)(D/E)$$

### Trade-Off Theory

The dominant practical theory of capital structure. Firms balance the tax benefits of debt (which rise with leverage) against the expected costs of financial distress (which also rise with leverage, but non-linearly). The optimal capital structure is the interior D/E ratio where the marginal tax benefit of adding one more unit of debt exactly equals the marginal increase in expected distress costs.

### FCF vs FCFE

FCF (Free Cash Flow to Firm) measures the firm's total cash generation independent of financing. FCFE (Free Cash Flow to Equity) is the residual after debt service – the cash that belongs to shareholders. As leverage rises, FCFE shrinks because more of FCF is consumed by interest payments. If FCFE turns negative, the firm is effectively transferring value from equity to debt holders.

### WACC and Firm Value

WACC is the discount rate applied to FCF to derive firm value:  $V = FCF / WACC$  (in perpetuity). Minimising WACC is therefore equivalent to maximising firm value. Each unit of debt added below the distress threshold reduces WACC (the cheaper, tax-sheltered debt is substituting for expensive equity), but above the threshold, the distress premium reverses this relationship and WACC rises again.

$$V_L = FCF \div WACC$$

### Distress Costs: Direct vs Indirect

Direct costs (legal fees, restructuring advisors, court costs) are the out-of-pocket expenses of formal insolvency – typically 3-5% of firm value. Indirect costs (lost customers, key employee departures, forgone investment, supplier credit tightening) are often much larger – 10-30% for customer-facing or knowledge-intensive firms. Both scale with how far leverage exceeds the critical threshold, growing quadratically in this model.

### Why the distress cost grows as a square of excess leverage

The quadratic scaling –  $(\text{excess} / \text{threshold})^2 \times \text{max\_cost\%}$  – captures the empirical observation that distress costs are not a step function at default, but a smooth escalation. Small exceedances above the critical threshold trigger early warning signals (credit rating downgrades, supplier nervousness) that impose limited costs. Large exceedances trigger formal distress events with much larger costs. The squared term means costs accelerate disproportionately with each incremental unit of excess leverage, consistent with observed credit spread and default cost dynamics in corporate bond markets.

SECTION 09

## Business Applications

The Capital Structure Analyzer is applicable across a wide range of real-world corporate finance and investment decisions:

→ **Setting a target** CFOs use trade-off analysis to establish a target D/E ratio that the firm actively manages toward – borrowing to add leverage when below target, issuing equity to reduce leverage when above. This tool quantifies exactly where the optimum is under any set policy. of tax, distress, and cash flow assumptions.

→ **LBO and leveraged recapitalisation analysis.** Investment bankers modelling a leveraged buyout or a debt-funded share buyback can stress-test how much debt a firm can absorb before distress costs dominate. Set the critical D/E to the estimated covenant trigger or rating agency downgrade threshold to find the maximum value-enhancing leverage.

→ **Rating agency and covenant headroom analysis.** By setting Critical D/E to the leverage level that would trigger a credit rating downgrade or covenant breach, the tool shows the WACC premium that accompanies approaching that threshold – helping treasurers and CFOs maintain an appropriate buffer.

→ **Industry capital structure benchmarking.** Compare two scenarios with different Critical D/E and distress cost assumptions to model a capital-intensive industry (utilities: high critical D/E, low indirect costs) versus an asset-light industry (technology: low critical D/E, high indirect costs from customer trust). The tool makes the structural differences in optimal leverage tangible.

→ **Tax reform analysis.** Change the tax rate slider to model the effect of a change in the corporate tax rate on the optimal capital structure. A lower tax rate reduces the value of the interest tax shield, shifting the optimal D/E to the left – consistent with observed corporate deleveraging following the US 2017 Tax Cuts and Jobs Act.

→ **Valuing the interest tax shield in M&A.** In acquisition analysis, the buyer can model the incremental firm value created by adding leverage to a target company post-acquisition.  $V_L - V_U$  gives the exact tax shield value, which should be included in the buyer's maximum willingness to pay.

→ **Distressed company turnaround planning.** For a company already above its Critical D/E, the tool quantifies how much firm value is being destroyed by the excess leverage. This provides the financial logic for a debt restructuring: the value created by reducing leverage back to the optimal point is the "restructuring gain" that accrues to all stakeholders.

→ **MBA coursework and studies.** The tool brings the theoretical MM framework to life with real numbers. Students can set up a case (e.g., an Indian FMCG firm with EBIT of ₹50 crore, tax rate 25%,  $V_U$  of ₹300 crore) and immediately see the trade-off curve, identify the optimal leverage, and export a PDF for submission.

## SECTION 10

# Interpreting Your Results

## Finding the optimal capital structure

The optimal D/E ratio is at the peak of the teal firm-value curve and the trough of the red WACC curve. Hover along the teal line to find the exact D/E at which  $V_L$  is maximised. Then set the desired D/E input to that value and read all nine metrics in the results box. This is the capital structure the firm should target to maximise total enterprise value.

## Understanding the D/E badge

The badge next to the desired D/E display has three states that signal your current leverage risk profile at a glance:

- **Safe (green):** D/E is below 80% of the Critical D/E threshold. The firm is well within its debt capacity and the tax shield is the dominant effect.
- **Near Threshold (orange):** D/E is between 80% and 100% of the Critical D/E. The firm is approaching its distress zone – this is the natural location of the optimal capital structure in most parameterisations.
- **In Distress Zone (red):** D/E exceeds the Critical D/E. Distress costs are actively destroying firm value. The bankruptcy warning box appears with the premium breakdown.

## When FCF or FCFE is negative

Negative FCF (shown in red) means the firm's operations and investment cycle consumes more cash than it generates – before any financing. This is common for high-growth firms with large capex programs. In this case, WACC will be negative or undefined (the tool still computes it from  $FCF/V_L$ , which will be negative). Negative FCF firms should interpret the tool as a structural analysis rather than a valuation.

Negative FCFE (shown in red) at high leverage levels signals that interest charges exceed after-tax operating cash flows available to equity holders. While the firm as a whole may still generate positive FCF, equity holders are in a deficit position. This is a strong warning sign in the distress zone.

## When both optimal points look identical

If the  $V_L$  curve continues rising monotonically and never peaks within the chart range, it means either (a) the Critical D/E is set too high relative to the visible chart range, or (b) the distress costs are set very low. Try reducing the Critical D/E or increasing the max distress cost percentages to see the trade-off emerge. A truly flat  $V_L$  curve across all leverage ratios would imply the firm has no meaningful distress costs – the pure MM world where ever-more debt is always value-accretive.

### Model caveat – steady-state perpetuity assumption

The  $WACC = FCF / V_L$  formula assumes a perpetuity: the firm generates the same FCF forever. Real firms grow, shrink, and face cyclical earnings. The tool is best used for structural analysis and directional insight – "where is the approximate optimal leverage zone?" – rather than precise valuation. For DCF-based valuation, use the WACC derived here as the discount rate in a multi-period model.

## SECTION 11

# Saving Models & Exporting PDFs

Two productivity features – Save Model and Export PDF – are available to Trial and Premium users. Free users can run the full analysis and read every result on-screen; saving and exporting require an account.

Run Analysis	✓ Unlimited	✓ Unlimited	✓ Unlimited
Export PDF	✗ Not available	✓ Unlimited	✓ Unlimited
Save Model	✗ Not available	Up to 3 models	✓ Unlimited
Load Saved Model	✗ Not available	✓ All saved models	✓ All saved models
Delete Saved Model	✗ Not available	✓ All saved models	✓ All saved models

## Exporting a PDF Report

Click the **Export PDF** button after setting your parameters. The tool generates a formatted A4 landscape PDF entirely in your browser using jsPDF – no data is transmitted to a server – and downloads it immediately.

### HEADER BAND

A dark header band at the top of the PDF shows the FinMBA brand, the tool name ("Capital Structure Analyzer"), and the export date. This provides clear provenance for the report.

### PARAMETERS BAR

A summary bar lists all key inputs: EBIT, Tax Rate, D/E Ratio, V\_U, Cost of Debt, Capex, Depreciation,  $\Delta$ NWC, Critical D/E, and the two distress cost percentages. The report is fully self-contained – a reader can reproduce the analysis without access to the tool.

### CHART IMAGE

A snapshot of the canvas chart – the teal V\_L curve, the red WACC curve, the dashed clean-WACC baseline, and the critical D/E threshold line – is embedded at full width. The chart captures the complete trade-off curve as displayed on-screen at the time of export.

### FOOTER

The footer carries the FinMBA brand mark and the tool description. The PDF is suitable for inclusion in board presentations, investment committee reports, or MBA course submissions without any editing after download.

## Saving and Loading Models

A **model** is a named snapshot of all current inputs. Saving a model lets you return to a previous capital structure scenario in any future session with a single click – without re-entering all eleven parameters.

### 1 CLICK "SAVE MODEL"

The Save Model button is available to Trial and Premium users. Click it after configuring all parameters for the scenario you want to preserve.

### 2 ENTER A MODEL NAME (UP TO 10 CHARACTERS)

Choose a short, descriptive name – for example TATA-BASE, HIGHLEVR, or LBO-SCEN. Names are unique per account; saving under an existing name updates the existing record.

### 3 LOAD OR DELETE FROM THE DROPDOWN

Select any saved model from the Load saved model dropdown. All parameters are restored instantly. Use the Delete button to remove models you no longer need (Trial users: freeing a slot allows saving a new model without upgrading).

### Trial — up to 3 saved models

During a Trial, you can save up to three distinct capital structure scenarios. Overwriting an existing model (saving under the same name) updates the record without consuming an additional slot. When all three slots are used, overwrite an existing model or upgrade to Premium to save more scenarios.

### Premium — unlimited saves

Premium users can save as many scenarios as needed. This is especially valuable for sensitivity analysis across multiple tax rate environments, distress cost assumptions, or industry comparisons – saving each parameterisation and switching between them instantly for presentation or comparison.

### What exactly is stored in a saved model?

EBIT · Tax Rate · D/E Ratio (Desired) · Unlevered Equity (V<sub>U</sub>) · Cost of Debt (r<sub>d</sub>) · Capex · Depreciation · ΔNet Working Capital · Critical D/E · Max Direct BK Cost % · Max Indirect BK Cost %. All values are stored as set at the time of saving. Slider positions and base values are preserved so the analysis is exactly reproducible on reload.

## SECTION 12

# Glossary of Terms

A quick-reference table of every technical term used in the tool and this guide.

TERM	DEFINITION	IN THIS TOOL
EBIT	Earnings Before Interest and Tax. The firm's operating profit before financing costs and taxes. It is the pre-leverage, pre-tax measure of the firm's income-generating power.	Core input. Drives FCF and all downstream cash flow calculations.
Tax Rate (t)	The corporate income tax rate applied to taxable profits. The higher the tax rate, the more valuable each rupee of interest deduction, and the stronger the incentive to use debt financing.	Core input. Slider range 0-75%. Controls the tax shield magnitude.
D/E Ratio	Debt-to-Equity ratio. The total market value of debt divided by the total market value of equity. A ratio of 1.0 means equal debt and equity; 2.0 means twice as much debt as equity.	Desired D/E input drives all results. Chart plots full D/E range from 0 to 2.5× critical.
D/C Ratio	Debt-to-Capitalization ratio. Debt as a fraction of total capital (debt + equity). Bounded between 0 and 1, making it more intuitive than D/E for communication. $D/C = D/E \div (1 + D/E)$ .	Displayed in the results box as the first metric.
V <sub>U</sub> (Unlevered Firm Value)		Core input. The

	The total value of the firm if it were financed entirely with equity and had zero debt. It is the MM baseline – the firm's value before any tax shield or distress effects. Also called the all-equity value.	starting point of the $V_L$ curve at $D/E = 0$ .
$V_L$ (Levered Firm Value)	The total value of the levered firm – the sum of debt and equity market values. In MM with taxes: $V_L = V_U + \text{Tax Shield}$ (below distress). Enterprise Value (EV) in valuation terminology.	Key output metric. Teal line on the chart (left Y-axis).
Tax Shield	The present value of the interest tax savings generated by carrying debt. Equals $t \times \text{Debt}$ in the MM perpetuity model (assuming constant, permanent debt). The source of all capital structure benefit in the MM framework.	Displayed in the results box. Equals $t \times \text{Debt}$ .
FCF	Free Cash Flow to Firm. Cash generated by operations available to all capital providers (debt + equity), before any financing payments. $\text{FCF} = \text{EBIT}(1-t) - \text{Capex} + \text{Depreciation} - \Delta\text{NWC}$ . Capital-structure neutral.	Displayed in results box. Green if positive, red if negative.
FCFE	Free Cash Flow to Equity. Cash available to equity holders after debt service. $\text{FCFE} = (\text{EBIT} - \text{Interest})(1-t) - \text{Capex} + \text{Depreciation} - \Delta\text{NWC}$ . Falls as leverage rises because interest absorbs more cash.	Displayed in results box. Green if positive, red if negative.
WACC	Weighted Average Cost of Capital. The blended required return of all capital providers, weighted by their proportions. Minimising WACC is equivalent to maximising firm value. $\text{WACC} = \text{FCF} \div V_L$ .	Red line on the chart (right Y-axis). Displayed in results box; teal if safe, red if in distress.
Cost of Equity ( $r_e$ )	The rate of return required by equity holders given the firm's operating risk and financial leverage. Derived here as $\text{FCFE} \div \text{Equity Value}$ . Rises with leverage as equity risk increases.	Displayed in the results box as the eighth metric.
Cost of Debt ( $r_d$ )	The pre-tax interest rate on the firm's debt. Determines the interest expense ( $\text{Interest} = \text{Debt} \times r_d$ ) and feeds into FCFE. The after-tax cost of debt is $r_d \times (1 - t)$ .	Core input. Default 7%. Slider range 5-30%.
Critical D/E	The leverage threshold above which financial distress costs begin to materialise. Below this threshold, only the MM tax shield formula applies. Above it, a quadratic distress premium is added to WACC and subtracted from $V_L$ .	Bankruptcy risk input. Red dashed vertical line on the chart.
Direct Bankruptcy Costs	The hard, quantifiable costs of formal financial distress: legal fees, court costs, restructuring advisory fees. Typically 3-5% of pre-distress firm value for large public companies. This is the ceiling value in the model.	Max Direct BK Cost % input. Part of the distress premium formula.
Indirect Bankruptcy Costs	The soft, often-larger costs of financial	Max Indirect BK

	<p>distress: customer defection, employee departures, forgone investment (debt overhang), tighter supplier terms, and management distraction. Typically 10-30% of firm value for knowledge-intensive or customer-facing businesses.</p>	<p>Cost % input. Part of the distress premium formula.</p>
<p><b>Distress Premium</b></p>	<p>The additional WACC penalty imposed when D/E exceeds the critical threshold. Grows as the square of how far D/E exceeds the threshold, multiplied by the sum of the direct and indirect cost percentages. Distress premium = <math>(\text{excess}/\text{threshold})^2 \times (\text{direct}\% + \text{indirect}\%)</math>.</p>	<p>Shown in the bankruptcy warning box when <math>D/E &gt; \text{Critical } D/E</math>.</p>
<p><b>Trade-Off Theory</b></p>	<p>The dominant practical theory of capital structure. Firms optimally balance the tax shield benefit of debt (increasing with leverage) against expected financial distress costs (also increasing with leverage) to find an interior optimal D/E where firm value is maximised.</p>	<p>The entire conceptual framework of this tool. The chart is a visual representation of the trade-off.</p>
<p><b>Capex</b></p>	<p>Capital Expenditure. Cash spent on acquiring or upgrading fixed assets. Reduces both FCF and FCFE. Not expensed in EBIT (only depreciation is); hence it must be deducted in the FCF formula to get to actual cash flow.</p>	<p>Cash flow input. Default ₹1,00,000.</p>
<p><b>Depreciation</b></p>	<p>The non-cash charge that allocates the cost of fixed assets over their useful lives. Added back in the FCF formula because EBIT already deducted it as an expense, but no cash actually left the business.</p>	<p>Cash flow input. Default ₹1,00,000.</p>
<p><b>ΔNet Working Capital (ΔNWC)</b></p>	<p>The annual increase in current assets (receivables, inventory) minus the increase in current liabilities (payables). Positive ΔNWC consumes cash (growth firms). Negative ΔNWC releases cash (retail, subscription businesses).</p>	<p>Cash flow input. Default ₹75,000.</p>