



Dupont Model and Forecasting Growth Methodologies

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Dupont Model Basics

- **What Is It?**

- **Accounting Ratio Formula**
- **Way to Decompose Return on Equity**
- **Growth Forecasting Tool**

- **Why Use It?**

- **Simple to Implement**
- **Relatively Easy to Interpret**
- **Illustrates Financial Interrelationships**
- **Permits Comparative Analysis**
- **Accepted Method**
- **Understandable**

Two Ratio Approach

- **Return on Assets (ROA) = Net Income Available to Common Shareholders ÷ Total Assets**
- **Equity Multiplier (EM) = Total Assets ÷ Common Equity**
- **Return on Common Equity (ROE) = ROA * EM**



Note: Equity Multiplier, Leverage Factor, and Financial Leverage Multiplier are different names for the Total Assets to Common Equity ratio.

Three Ratio Approach

- **Net Profit Margin (NPM) = Net Income Available to Common Shareholders ÷ Net Sales**
- **Total Asset Turnover (TAT) = Net Sales ÷ Total Assets**
- **Equity Multiplier (EM) = Total Assets ÷ Common Equity**
- **ROE = NPM * TAT * EM**



Source: *Investment Analysis and Portfolio Management*, 7th edition, by Frank K. Reilly and Keith C. Brown, 2003, pages 334-335

Five Ratio Approach

- **Operating Profit Margin (OPM) = EBIT ÷ Net Sales**
- **Total Asset Turnover (TAT) = Net Sales ÷ Total Assets**
- **Interest Expense Ratio (IE) = Interest Expense ÷ Total Assets**
- **Tax Retention Rate (TR) = [1.00 - (Income Taxes ÷ Net Before Tax)]**
- **Equity Multiplier (EM) = Total Assets ÷ Common Equity**
- **ROE = [(OPM * TAT) – IE] * EM * TR**

Source: *Investment Analysis and Portfolio Management*, 7th edition, by Frank K. Reilly and Keith C. Brown, 2003, pages 335-337

Side Bar: Capital Structure Ratios

Ratio	Company A	Company B
EM = TA ÷ Equity	1.7 X	2.0 X
DR = Debt ÷ TA Or DR = 1 – (1 ÷ EM)	DR = 1 – (1 ÷ 1.7) DR = 1 – 0.59 DR = 0.41 or 41%	DR = 1 – (1 ÷ 2.0) DR = 1 – 0.50 DR = 0.50 or 50%
D/E = DR ÷ (1 ÷ EM) D/E = DR ÷ (TA ÷ CE)	D/E = 0.41 ÷ 0.59 D/E = 0.69	D/E = 0.50 ÷ 0.50 D/E = 1.00



CE: Common Equity

DR: Debt Ratio

D/E: Debt to Equity Ratio

EM: Equity Multiplier

Interpretation: Three Ratio Approach

Ratio	Net Profit Margin	Total Asset Turnover	Equity Multiplier
Directional Move	Higher Profitability Leads to Higher ROE	Higher Asset Utilization Leads to Higher ROE	Higher Debt Levels May Lead to Higher ROE
Possible Indicators	(1.) Competitive Position in Market (2.) Cost Structure	(1.) Asset Productivity (2.) Asset Base	(1.) Debt Capacity (2.) Tax Benefits (3.) Investor Base



Note: Higher interest expense may offset the benefits of the debt-related tax shield, something that would be reflected in the five-ratio variation of the Dupont Model.

Example: Three Ratio Approach

Manufacturing Company	Net Profit Margin	Total Asset Turnover	Equity Multiplier	Return On Common Equity
A	10%	1.4 X	1.7 X (59% Equity) (41% Debt)	23.8%
B	14%	1.4 X	2.0 X (50% Equity) (50% Debt)	39.2%
Comments	NPM_B is 40% bigger than NPM_A	No Difference	DR_B is 22% bigger than DR_A	ROE_B is 65% bigger than ROE_A

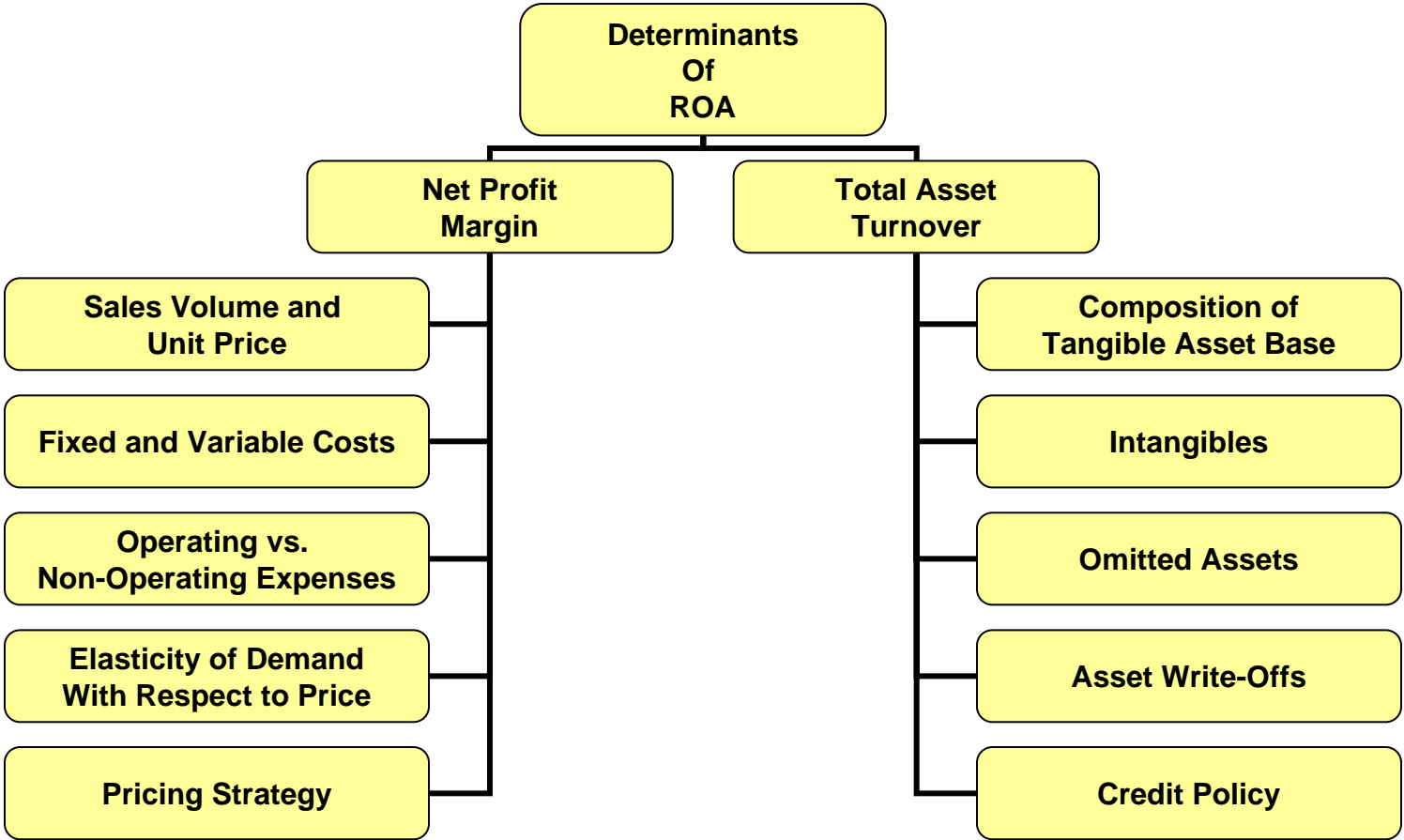
DR, Debt Ratio, = Debt divided by Assets

Financial Detection

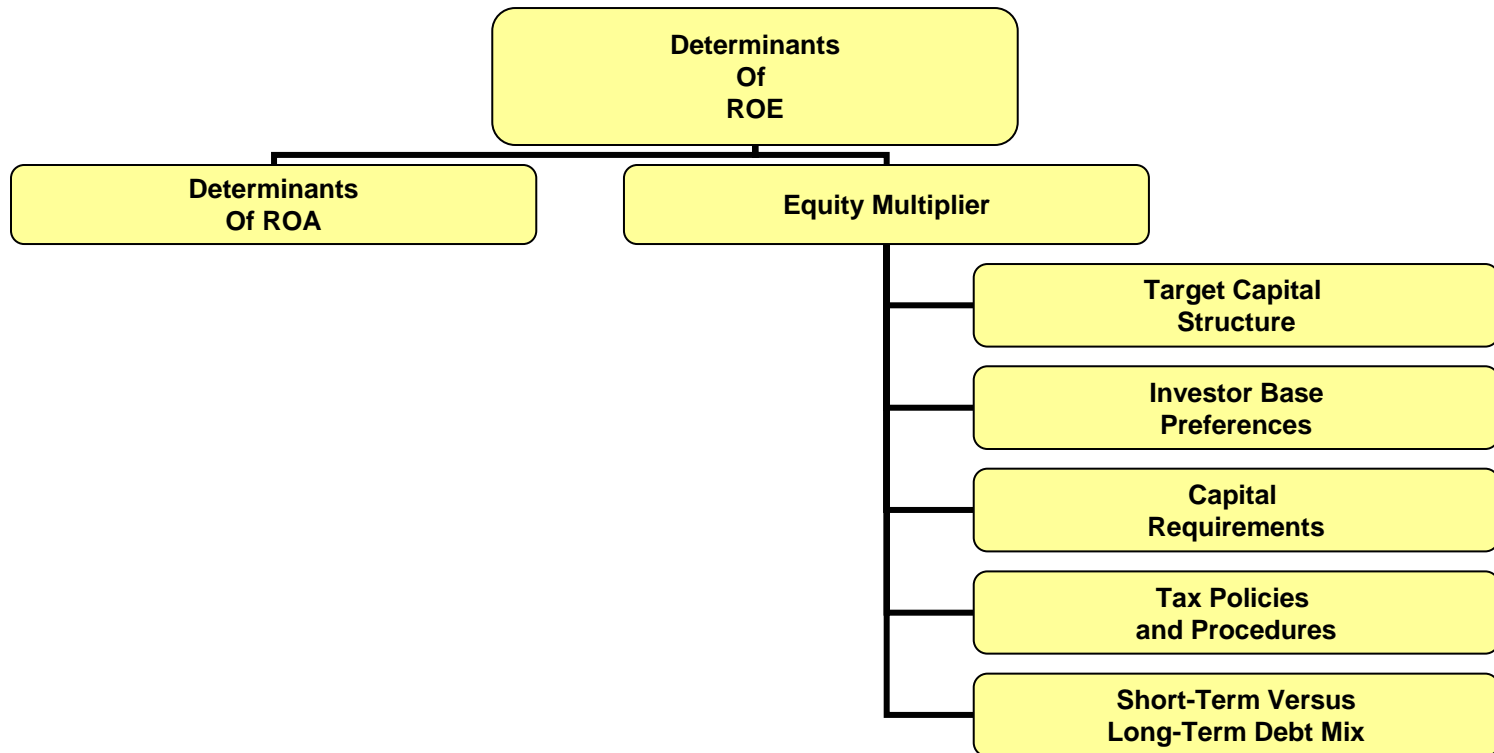
- Ratios – Only the Beginning
- Identify Missing Information
- What Influences Ratio Inputs?
- Which Ratio Input Dominates?
- How Does a Ratio Change Over Time?
- Look at Compound Relationships
- Ask Questions
- Review Raw Data and Operating Environment



Drill Down: Return on Assets



Drill Down: Return on Common Equity



Limitations of Dupont Model

- **Flawed Inputs**
 - **Low Quality of Earnings**
 - **Tax Deferrals**
 - **Invisible Assets**
 - **Asset Composition**
 - **Snap Shot Assessment**
 - **Asset Obsolescence**

- **Comparability**
 - **Interest Expense and Market Conditions**
 - **Segmented Reporting**
 - **Structural Change and Industry Competitiveness**
 - **Data Integrity**

Forecasting Sustainable Growth

- **Formula Variations:**
 - $g^* = \text{ROE} * \text{Retention Ratio}$
 - $g^* = \text{ROE} * (1 - \text{Dividend Payout Ratio})$
 - $g^* = \text{Profit Margin} * \text{RR} * \text{Asset Turnover} * \text{EM}$

- **Assumptions:**
 - **Stable Input Values**
 - **Typically Applied to Sales**

Growth Analysis

Relationship Between Sustainable Growth (g^*) and Realized Growth (G)	Slow Growth ($G < g^*$)	Fast Growth ($G > g^*$)
Interpretation	Sales Are Growing Too Slowly	Sales Are Growing Too Quickly
Possible Action Steps	(1.) Buy Growth (2.) Return Idle Funds to Shareholders	(1.) Borrow More (2.) Raise Prices (3.) Outsource to Shrink Asset Base

Example: Growth Assessment

Manufacturing Company	Return On Common Equity	Retention Ratio, RR	Sustainable Growth Rate, g^*	Realized Growth Rate, G
C	20%	60%	12%	10%
D	20%	40%	8%	10%
Comments	No Difference	RR_C is 50% bigger than RR_D	g^*_C is 50% bigger than g^*_D	Company C: Slow Growth Company D: Fast Growth

Caveat Emptor: Sustainable Growth Rate

- **Variability in Sustainable Growth Rate – Realized Growth Rate Relationship**
- **Sales Growth May Not Be Good Predictor of Growth in Future Profit or Free Cash Flow**
- **Peer Analysis Comparability Problems:**
 - Artificial Dividend Payout Policy
 - Accounting ROE Issues
 - Consolidated Versus Segmented Reporting
- **Drawbacks of Sustainable Growth Rate Analysis:**
 - Limitations of ROE
 - Variability in Dividend Payout and Industry Life Cycle
 - Interest Expense and Business Cycle
 - Structural Change and Impact on Industry Competitiveness
 - Data Integrity



Other Forecasting Tools

- **Consensus**
- **Naïve Approach**
- **Random Walk**
- **Regression**
- **Sensitivity Analysis**
- **Scenario Analysis**
- **Simulation**
- **Stress Testing**
- **Time Series Model**

Biographical Information

Dr. Mangiero has conducted business analysis, valuations and deal evaluation and structuring for over fifteen years. A Chartered Financial Analyst and Accredited Valuation Analyst, she is certified by the Global Association of Risk Professionals as a Financial Risk Manager and is a member of the Financial Risk Manager Exam Committee. She holds a Ph.D. in finance (minor in math), an MBA in finance, an M.A. in economics and a B.A. in economics and has done post-graduate computational finance work at Carnegie Mellon University.

She has written extensively about valuation and risk measurement for publications such as *Investment Lawyer*, *RISK*, *Risk Review*, *Valuation Strategies*, *Journal of Forensic Accounting*, Institute of Internal Auditors newsletter, *Expert Evidence Report*, and the *Litigation Services Handbook: The Role of the Financial Expert*. Her book entitled *Risk Management for Pensions, Endowments and Foundations* for John Wiley & Sons, Inc. is due out in the fall of 2004.

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