

## Merger and Acquisition Valuation

**Objective:** The purpose of this project is to reinforce the concepts that you have been exposed to through readings, lectures, and mini-cases as well as financial concepts that you should have learned in your prior finance classes. In essence, you will learn how to value a merger using discounted cash flow techniques. The data for this project can be downloaded from my website. The file is called ip\_merger\_spr2006.xls. The data is current as of June 6, 2005.

**The Deal:** On January 28, 2005, Procter & Gamble announced that it has agreed to buy Gillette in a \$57 billion deal which combines some of the world's top brands. Executives for both firms expect the combined firm to grow faster than each individual operating separately. Faster growth is anticipated to arise in part from operational synergies such as P&G opening doors for Gillette in markets such as China and Japan. For its part, Gillette brings to P&G some product segments that are growing faster than Procter and Gamble's current portfolio of products. As a result of these expectations, P&G raised its annual revenue growth outlook to 5 to 7 percent, from its earlier target of 4 to 6 percent (pre-merger). Procter and Gamble also expects to achieve cost synergies at a present value of about \$14 to \$16 billion (US Dollars), mainly through the scale of the combined company applied to leveraging P&G's unique organization structure, removing duplicate costs and driving further efficiencies. In particular, P&G said it anticipates enrollment reductions of approximately 6,000 employees, or about four percent of the combined work force of 140,000. Most of these reductions should come from eliminating management overlaps and consolidation of business support functions. P&G CFO Clay Daley said the companies expect to see more than \$1 billion a year in cost savings by the third year after the merger. Some of the staff cuts will come from the



P&G side of combination, not just the Gillette side. Procter and Gamble expects the effective tax rate for the fiscal year post-merger to come in at about 30.5%.

According to the terms of the deal, Gillette shareholders will receive .975 shares of P&G for each share of Gillette that they hold. According to the press release, P&G plans to repurchase approximately 40% of that newly issued stock (valued at between \$18 and \$22 billion) within the next 12-18 months to avoid dilution of shares to existing PG shareholders. In essence, the repurchase program should be the equivalent as if the deal were structured as 60 percent stock and 40 percent

cash. The \$53.94 per share price (.975 shares \* \$55.32 (PG's closing price)) came at a 18% premium over Gillette's closing price of \$45.85 on January 27th. Gillette's chief executive James Kilts is to join the board of the merged company, becoming P&G vice chairman. Because P&G is expected to borrow to finance repurchase of up to \$22 billion of its stock to help pay for the deal, three credit rating agencies - Moody's, Standard & Poor's and Fitch Ratings - put both companies under a review for a possible downgrade.



The merger will make P&G the world's biggest household goods maker, pushing Unilever into second place. The tie-up of the two US giants creates a company with group sales topping \$60 billion a year. Between them, they share 21 brands that each boast annual sales of more than \$1 billion per brand - five of Gillette's brands and 16 of P&G's are blockbusters. The merger, management specialists say, combines two companies in similar markets requiring complementary skills. Both are companies with storied brands that work the same distribution channels. Procter sees untapped potential in Gillette, as its products can now be pushed hard by Procter's renowned marketers, both in the United States and abroad. Procter, in particular, sees great opportunity abroad. In a conference call last month, Procter executives said the total market in developing countries for its lines of consumer goods would reach nearly \$100 billion by 2010. "For our top brands, there are still lots of markets where we don't compete," Robert A. McDonald, vice chairman for global operations, said in the conference call. In talks leading up to the merger, Procter and Gillette executives say they have also identified more strategic advantages than merely the greater size, buying power and efficiencies from combining two similar enterprises. In many ways, they say, the companies have complementary skills. Procter's executives regard their company as a master at marketing to women, given its long history in household, hygiene and food products. Gillette, whose name is synonymous with shaving for millions of men, sees itself as an expert in the male market. In addition, Procter has established a strong sales network in fast-growing foreign markets like China and Russia, while Gillette has not. Tapping that distribution network, the executives say, should lift Gillette's worldwide sales at little added cost to the combined enterprise.

The friendly transaction reflects just how much the balance of power has shifted from consumer-products makers to giant discount retailers, mainly Wal-Mart, in recent years. The move represents a bid by two consumer-products giants to strengthen their bargaining position with the likes of Wal-Mart. Giant discount retailers can now squeeze even the largest suppliers for lower prices. Besides this, both firms have faced growing pressure on profits from private labels as consumers have become more price-conscious and less brand-conscious. Analysts say the combined company will also have more power in its negotiations with media companies - television, magazines, newspapers and billboards - to buy billions of dollars a year in advertising. Last year, Procter spent \$5.5 billion on advertising.

Both Gillette, based in Boston, and Procter and Gamble, based in Cincinnati, have started down this road at least once before. Five years ago, when Procter's sales

were temporarily stagnating as new products floundered, Durk Jager, then the chief executive, broached the possibility of a merger with Gillette executives and was rebuffed. In the current round of talks, the overture came from Gillette. In December, Mr. Kilts approached Procter, according to executives close to the negotiations. Mr. Lafley will continue as the chief executive of Procter. In the late 1990's, the leveraged buyout firm Kohlberg Kravis Roberts & Company took a large holding in Gillette, but sold its shares after Gillette's profits slipped in 1999.



Regulators are expected to look closely at the Gillette-Procter merger and could force Procter to divest itself of some businesses that overlap with Gillette's. The greatest overlaps are in the deodorant and oral health care segments. In deodorants, Procter owns Old Spice and Gillette owns Right Guard; in oral health, Procter owns Crest toothpaste and Gillette owns Oral-B.

Gillette is advised by UBS and Goldman Sachs and receives legal counsel from Davis Polk & Wardwell. Procter is advised by Merrill Lynch and receives legal counsel from Cadwalader, Wickersham & Taft<sup>1</sup>.

### The Participants:

- Procter and Gamble (The Acquirer): (<http://www.pg.com/main.jhtml>) Two billion times a day, P&G brands touch the lives of people around the world. The company has one of the strongest portfolios of trusted, quality, leadership brands, including Pampers(R), Tide(R), Ariel(R), Always(R), Whisper(R), Pantene(R), Bounty(R), Pringles(R), Folgers(R), Charmin(R), Downy(R), Lenor(R), Iams(R), Crest(R), Actonel(R), Olay(R), Clairol Nice 'n Easy(R), Head & Shoulders(R), and Wella. The P&G community consists of almost 110,000 employees working in over 80 countries worldwide.
- Gillette (The Target): (<http://www.gillette.com/homepage.asp>) Gillette, founded in 1901 and headquartered in Boston, Mass., markets a number of category-leading consumer products such as Gillette(R) razors and blades including the Mach3(R) and Venus(R) brands, Duracell(R) CopperTop(R) batteries, Oral-B(R) manual and power toothbrushes, and Braun shavers and small appliances.

**Competitors (Publicly Traded):** Avon Products (AVP), Clorox (CLX), Colgate-Palmolive (CL), Johnson & Johnson (JNJ), and Kimberly-Clark (KMB). These are competitors for both Procter and Gamble (PG) and Gillette (G).

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<sup>1</sup>According to Business Week, each investment bank is expected to make \$30 million from this deal.

**Assignment/Tasks:** Download the file ip\_merger\_spr2006.xls and then given the assumptions on page 7 of this mini-case, perform the following tasks using this spreadsheet. Please refer to the section entitled “Valuation Assumptions” (page 7 of this case) for assumptions in doing your calculations. Observe that we are valuing the merger using Free Cash Flow to the Firm.

1. Co-movement of Prices for Procter and Gamble and Gillette (5 points): Plot the daily closing price of PG against the daily closing price of G starting from December 1, 2004 until June 6, 2005 using the graphing option in Excel. Daily prices for both firms are located in the “Price (PG & G)” worksheet. Discuss what happens to the price movement of Gillette relative to the price movement of Procter and Gamble after the announcement of the merger on January 28, 2005. Why does the price of Gillette tend to co-move in tandem with the price of Procter and Gamble once the merger is announced? More specifically, why does the spread between the price of Gillette and the price of Procter and Gamble tend to remain relative constant between the definitive merger announcement on January 28, 2005 until the time that this case was written (around) June 6, 2005?

2. Cost of Debt (5 points):

- a. Imputed Debt Rating using Altman Model: Use the Altman EM score model to calculate an imputed bond ratings for Procter & Gamble and Gillette pre-merger as well as the merged firm using the respective 10Qs<sup>2</sup>. Appendix B of this case contains a discussion of the Altman EM score model and how to use it. A template is provided for your Altman EM score calculations in the worksheet named “2a. Altman Z (PG & G)”.
- b. Calculate the current before tax and after tax cost of debt for P&G and G using the worksheet template “2b. Cost of Debt (PG & G)” together with information contained in the worksheets labeled “Bond Spreads 20050606” and “Treas Rates 20050606”. Use the actual bond rating for each firm (see assumption page of this case) in calculating the cost of debt.

3. Present Value of Operating Leases (5 points):

- a. Calculate the present value of the operating leases and the imputed interest on its operating leases for Procter and Gamble (PG) using the “3a. PV OpLease (PG)” worksheet. Assume that for PG, year 0 = 2005, year 1 = 2006, and so on and assume that operating lease payments are paid at the *end* of the year. This is because we are using PG’s fiscal year ends in June and we are near the end of its fiscal year. Thus, we will assume that the operating lease payments have already been paid for the year 2005. **The date of our valuation is June 6, 2005.**
- b. Calculate the present value of and the imputed interest on Gillette’s operating leases using the worksheet labeled “3b. PV OpLease (G)”. In doing this

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<sup>2</sup>We use the 10Qs because the information in it is “fresher” than the financial information in the 10Ks.

calculation, assume for Gillette that year 0 = 2005 and year 1 = 2005 given that we are in the middle of Gillette's fiscal year and also our assumption that operating lease payments are paid at the *end* of the year.

4. Terminal Value (5 points): Calculate the Sales, EBITDA, and EBIT multiples for the consumer goods industry based on the competitors (AVP, CLX, CL, JNJ, and KMB) of Procter and Gamble and Gillette. Please use the "4. TermVal (PG & G)" worksheet in doing your calculations. These competitors represent some of the more mature firms in the industry. We use these firms to calculate the Sales, EBITDA, and EBIT multiples since we assume that the multiples for both PG and G will revert to the average (median) of the Sales, EBITDA, and EBIT multiples of its closest competitors in the intermediate term to long run. In calculating each multiple, we will strip out cash from the Total Enterprise Value (TEV)<sup>3</sup>. For example, the Sales multiple is calculated as

$$\frac{\text{TEV}}{\text{Sales}} = \frac{\text{Market Cap} + \text{On Balance Sheet Debt} - \text{Cash \& Equivalents}}{\text{Sales}}$$

where TEV is the Total Enterprise (firm) value.

5. Built-Up Beta: (5 points): Calculate the built-up beta for Procter and Gamble and also for Gillette using the "Returns (PG G)" and "5. BuiltUp Beta (PG & G)" worksheets. To calculate beta, use the SLOPE function in Excel<sup>4</sup>. Use the book value of debt and the market value of equity in calculating the debt-to-equity ratio for the comparable firms (your comparables firms should not include either PG or G). Please round your answer to two decimal places. Use the marginal tax rate for the last twelve months for PG and G in calculating their respective built-up betas. The debt for Procter & Gamble and Gillette should include the present value of operating leases, if any. However, we will not include the present value of operating leases in the debt for the comparable firms<sup>5</sup>. If any cell in a financial statement has an "NA", assume that NA is equal to zero. Please make sure that whatever market index you use to calculate beta should include the stock in its index. For example, we use the S&P500 as our market index if we are calculating the beta for Coke (KO) because Coke is a component of the S&P500 index. Do Procter & Gamble and Gillette have similar built-up levered betas? Does the merger change the systematic risk of the Procter and Gamble, the acquirer? Are the built-up betas for both firms similar to their historical betas?

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<sup>3</sup>The reason that cash is netted out of firm value for this calculation is that since the interest income from the cash is not counted as part of the EBITDA, not netting out the cash will result in an overstatement of the true value to the EBITDA multiple. The asset (cash) would be added to value, but the income from the asset is excluded from the income measure (EBITDA).

<sup>4</sup>To use the slope function in excel, enter =SLOPE(y values, x values) and for y values, use the cursor to highlight the returns to the stock. For the x values, use the cursor to highlight the returns associated with the appropriate market index. Remember that the stock should be included or be a part of whatever market index you choose. The resulting beta that you obtain is a *levered* beta ( $\beta_L$ )

<sup>5</sup>We don't have to include the PV of Operating Leases for our comparable firms because we are trying to calculate the unlevered beta. Next, we will use re-lever this unlevered "imputed" beta for our firms by using their total debt (balance sheet and off-balance sheet debt).

6. Cost of equity and weighted average cost of capital (5 points): Calculate the cost of equity for Procter and Gamble and also for Gillette using their respective built-up betas. Next, calculate the before-tax WACC and also the after-tax weighted average cost of capital for Procter and Gamble and for Gillette using market value weights.

7. Margin analysis (5 points):

- a. Construct an aggregate financial statement for the peer group consisting of AVP, CLX, CL, JNJ, and KMB using the worksheet labeled “7a. Agg FinStmt (PEERs)”. This worksheet aggregates the 10K financial statements for Avon Products (AVP), Clorox (CLX), Colgate-Palmolive (CL), Johnson & Johnson (JNJ) and Kimberly Clark (KMB). For example, you add up the Cash for these 5 firms to obtain the CASH reported. Use the same logic process for the other line items in the balance sheet, income statement, and statement of cash flows. We will use the ratios obtained vis-à-vis margin analysis in calculating “constant growth” ratios for both PG and G in year 6 assuming mean reversion will exist e.g. both PG and G’s ratios will revert to the average of the ratios for the peer group (competitors). We choose these 5 firms because they are *matured* firms and are also the closest competitors to Procter and Gamble and Gillette (according to Hoovers Online and the Investext reports for various Investment Banks).
- b. Do a margin analysis for Procter and Gamble using the “7b. Margin Analysis (PG)” worksheet in conjunction with the 10Q and 10K for PG. This analysis is a prelude to forecasting the cash flows.
- c. Do a margin analysis for Gillette using the “7c. Margin Analysis (G)” worksheet in conjunction with the 10Q and 10K for G. This analysis is a prelude to forecasting the cash flows.
- d. Do a margin analysis for PG and G’s peer group using the “7d. Margin Analysis (Peer)” worksheet and the worksheet labeled “7a. Agg FinStmt (PEERs)” that you completed in part a above.

8. Valuation of Procter and Gamble as an Independent firm (17.5 points): Calculate the pre-merger value of Procter and Gamble as if it were a standalone firm by performing a discounted cash flow valuation on the free cash flow to the firm (FCFF). Use the valuation template “8. PG Value (Stand Alone)”. In particular, based on PG’s management projections reported in the press, in the conference call with analysts, and in its 10K which is located in the Valuation Assumptions section at the back of this case, what is the value of the operating assets? What is the value of the firm? What is the justified price per share? Do a sensitivity analysis using the data table command in Excel by completing the two-way table in the worksheet. This sensitivity table shows how the justified price per share for PG changes with a change in the assumption regarding varying revenue growth relative to WACC and TEV/Sales multiples. Please observe that in the valuation of PG, we are using market value weights in calculating their WACC.

9. Valuation of Gillette as a Standalone firm (17.5 points): Calculate the pre-merger value of Gillette as if it were a standalone firm based on the assumptions given in the Valuation Assumptions section of this case. Use the “9. G Value (Stand Alone)” worksheet provided to calculate the value of the operating assets, the value of the firm, and the justified price per share for Gillette using the FCFF valuation model. Do a sensitivity analysis using the data table command in Excel by completing the two-way table in the worksheet. This sensitivity table shows how the justified price per share for Gillette changes with a change in the assumption regarding varying revenue growth relative to WACC and TEV/Sales multiples.

10. Weighted average cost of capital of the Combined Firm (10 points): Calculate the beta of the combined firm using your calculations in questions 5, 6, 8 and 9 above. Using this new levered beta, calculate the cost of equity for the combined firm. Next calculate the cost of debt and then the weighted average cost of capital on a before-tax WACC and after-tax WACC for the combined firm. The debt for each firm should include the present value of operating leases.

11. Financial Statement of Combined Firm (10 points): Calculate the various line items in the balance sheet, income statement, and statement of cash flows for the combined firm using the template in the “11. Combined FinStmnt (No Syner” worksheet. In the same worksheet, perform a margin analysis for the merged firm. We use this margin analysis to derive the appropriate assumed ratios for year 1-5 in valuing the combined firm with synergy (see next question).

12. Value of the Combined Firm with Synergy (10 points): Calculate the value of the combined firm with top line growth and cost saving synergies using the valuation template labeled “12. Merged Firms Value” provided. What is the firm value and justified price per share of Procter and Gamble post-merger? How does your justified price per share compare to the \$55.31 per share price of Procter and Gamble on June 6, 2005? Do a sensitivity analysis using the data table command in Excel by completing the two-way table in the worksheet. This sensitivity table shows how the justified price per share for Procter and Gamble changes with a change in the assumption regarding varying revenue growth relative to WACC and TEV/Sales multiples. According to Yahoo (<http://finance.yahoo.com/q/ao?s=PG>), the average target price for PG assuming Gillette is merged into it is \$61.50 per share with a low of \$58 and a high of \$68. Some of the individual analyst recommendations are reported in the “Analyst Rcmd” worksheet. How close is your price to that of the analysts? Be sure to look at your data table in answering these questions because your any valuation is based on assumptions and the two-way data table allows you to stress test these assumptions and see what the resulting valuation is. Please discuss.

Please turn in a hard copy of your solutions. This is an individual project. As such, anyone caught cheating will be given an F on this assignment.

## Valuation Assumptions

Item	Assumption
TTM or LTM (Trailing twelve months)	Use the last twelve months of data (LTM)/last 4 quarters of data in the 10Q. Remember that only “flow” items are added for the last 4 quarters while only the most current quarter is used for “stock” items.
Operating Leases and Imputed Interest on Operating Lease	<p>Assume that year 1 for operating leases for PG in the “3a. PV OpLease (PG)” worksheet is 2006 since we are close to PG’s fiscal year end. For Gillette, we assume that year 1 is 2005 since G’s fiscal year ends in December and your valuation is as of June 2005. This means that year 0 is also 2005. We assume that all operating lease payments are made at the end of each fiscal year. To calculate the number of years remaining on the operating leases for both PG and G, use the Thereafter amount and divided the Operating Lease payment for year 2009 and divide it into this Thereafter amount.</p> <p>Yrs Remaining on OpLease = Thereafter \$/ Year 9 OpLease</p> <p>Next, divide the Thereafter amount into the number of years remaining on the operating lease (see formula above) to obtain the rent per year starting from year 2010+. Round the imputed Number of Years Remaining on the Operating Lease (e.g. how many years does the Thereafter amount represent) to the nearest integer using =ROUND(B13/B14,0)</p> <p>Since an operating lease is a type of debt, we use the pre-tax cost of debt to discount back all operating lease payments (cash flows to the debtholder). The pre-tax cost of debt is also the interest rate on debt.</p>
Firm's Bond Rating	Both P&G and G currently have the same bond rating of Aa3/AA- from Moody’s and S&P respectively. However, both Moody’s and S&P have put both companies on their credit watch list since P&G is expected to borrow to finance repurchase of up to \$22 billion of its stock to help pay for the deal.
Maturity of Long Term Debt	10 years
Market Value of Debt	Assume that the Market Value of Debt = Book Value of Debt <sup>6</sup> ; Total debt includes the PV of Operating Leases only for Gillette and Proctor and Gamble.

<sup>6</sup>This isn’t the case from a theoretical perspective although many analysts make this assumption.

Item	Assumption
Pre-tax Cost of Debt	<p>Pre-tax Cost of Debt = Nominal Risk-free yield + Default spread</p> <p>The Nominal risk-free yield is found in the “Treas Rates 20050606” worksheet and the default spreads are reported in the worksheet labeled “Bond Spreads 20050606”. Assume that the maturity of debt is 10 years.</p>
Terminal Enterprise Value (Value of the Firm)	<p>Assume that the mean of the TEV/Sales multiple that you calculated in the “4. TermVal (PG &amp; G)” worksheet is used to obtain the Terminal Value of the Firm. Apply this multiple to Procter and Gamble and Gillette’s sales in the constant growth period (T+1) to obtain TEV in year T e.g.,</p> $TEV_T = [\text{Mean of (TEV/Sales)}] * \text{Sales}_{T+1}$ <p>where T = 5 (years)  TEV = Debt + Market Cap – Cash – Marketable Securities</p>
Market risk premium	5.5% ( $R_M - r_F$ )
Unlevered Beta	$\beta_L = \beta_U(1 + ((1 - \tau)D/E))$ <p>where <math>\beta_L</math> = levered beta (using slope function in Excel)  <math>\beta_U</math> = unlevered beta  <math>\tau</math> = marginal tax rate = TTM tax rate  D = Balance sheet debt (book value)  E = market value of equity; market cap</p>
Cost of Preferred Equity	<p>Assume that the cost of preferred equity is the preferred dividend divided by the book value of preferred equity.</p> $k_{Pfd} = \text{Preferred dividends} / \text{Book Value of Preferred Equity}$ <p>Note: This is a simplistic view of things since PG's preferred stock is convertible. The book value of preferred stock is used since PG's 10K and 10Q is silent on the number of shares outstanding for preferred stock. Preferred stock is used for PG's ESOP (employee stock option plan). Assume that preferred dividends are \$124,000 (in 000s)</p>
Non-cash Working Capital (NWC)	$\text{NWC} = (\text{Current Assets} - \text{Cash} - \text{Marketable Securities}) - (\text{Current Liabilities} - \text{Notes Payable} - \text{Current Portion of LT Debt} - \text{Current Portion of Capital Leases}) = \text{Non-cash Current Assets} - \text{Non-debt Current Liabilities}.$

Item	Assumption		
Procter and Gamble Valuation (pre-merger or prior to the merger): perspective of PG's management	Annual Growth Rate in Sales COGS(exclu Depr & Amort)/Sales SGA/Sales Depreciation & Amortization/Sales Capital Expenditures/Sales Non-cash Working Capital/Net Sales Marginal tax rate ( $\tau$ ) TEV/Sales Multiple  Our underlying assumption for Year 6 and onwards (year 6+) is that the margins for PG will revert to the mean of their peers (see question 7, especially the "7d. Margin Analysis (Peer)" worksheet that you completed)	Years 1–5	Year 6+
Gillette Valuation (Stand Alone): perspective of G's management	Annual Growth Rate in Sales COGS(exclu Depr & Amort)/Sales SGA/Sales Depreciation & Amortization/Sales Capital Expenditures/Sales Non-cash Working Capital/Net Sales Marginal tax rate ( $\tau$ ) TEV/Sales Multiple  Our underlying assumption for Year 6 and onwards (year 6+) is that the margins for Gillette will "mean" revert to the average margin of its peer group.	Years 1–5	Year 6+
Post-merger synergies	<u>Years 1-5:</u> <ul style="list-style-type: none"> <li>▪ <u>Revenue:</u> P&amp;G expects that its annual revenue growth outlook will be in the 5% to 7% range. As such, we use a 6% growth per year.</li> <li>▪ <u>PV of Cost Savings:</u> P&amp;G expects to achieve cost synergies at a present value of about \$14 to \$16 billion (US Dollars). We assume a PV of Cost Savings of \$16 billion.</li> <li>▪ <u>Margins:</u> COGS/Sales = 43.7%, SGA/Sales = 32.5%, Depr &amp; Amort/Sales = 3.7%, CapEx/Sales = 4%, Noncash WC/Sales = 2.5%, Marginal tax rate = 30.5%, TEV/Sales = 2.4X</li> </ul> <u>Year 6+:</u> Use the same ratios as for Gillette and Procter and Gamble (Stand Alone) Valuations.		

Item	Assumption
Marginal tax rate for the merged firm	<p>Assume that the marginal tax rate for the merged firm is 30.5% for year 1 through year 5. In year 6, we assume that this marginal tax rate will increase to 35%.</p> <p>Intuition: Procter and Gamble announced that it expects the effective tax rate for the fiscal year post-merger to come in at about 30.5%. For year 6, we assume that the tax rate will revert to the average tax rate of their peer group (competitors) which is 35%. This is known as “mean reversion”.</p>
Shares Outstanding	<p><u>Pre-Merger</u>: Use the trailing twelve months (TTM) shares outstanding numbers (10Q) for each firm.</p> <p><u>Merger</u>: Procter &amp; Gamble will pay 0.975 share of its common stock for each share of Gillette common stock. It will then repurchase 40% of the newly issued stock to avoid dilution of shares to existing PG shareholders.</p> $\text{ShsOut} = \text{PG ShsOut} + \text{Gillette's ShsOut} * 0.975 * (1 - 0.4)$ <p>where ShsOut = Existing Shares Outstanding</p>
Value of Equity Options (000s)	<p>Assume that the value of equity options is \$81,015 (stated in 000s) for Procter and Gamble and \$15,905 (stated in 000s) for Gillette.</p>

## Appendix: Altman Z-Score Model

There are several versions of the Altman z-score model. We will use the EM version of his model. Professor Edward Altman of NYU developed this model using multiple discriminant analysis in conjunction with financial ratios to predict the probability of business failure leading to bankruptcy.

The EM-score (emerging markets) model is defined as

$$\text{EM Score} = 3.25 + 6.56(X_1) + 3.26(X_2) + 6.72(X_3) + 1.05(X_4)$$

where  $X_1$  = Working Capital/Total Assets = (Current Assets - Current Liabilities)/TA  
 $X_2$  = Retained Earnings/Total Assets  
 $X_3$  = EBIT/Total Assets  
 $X_4$  = Book Value of Equity/Total Liabilities

Bond Rating	Altman Z-Score	Bond Rating	Altman Z-Score
AAA	8.15	BB+	5.25
AA+	7.60	BB	4.95
AA	7.30	BB-	4.75
AA-	7.00	B+	4.50
A+	6.85	B	4.15
A	6.65	B-	3.75
A-	6.40	CCC+	3.20
BBB+	6.25	CCC	2.50
BBB	5.85	CCC-	1.75
BBB-	5.65	D	0.00



Ed Altman, NYU

Note: if the EM Score falls between 2 bond ratings use the bond rating associated with the closest EM Score. For example, suppose that you calculate an EM Score of 6.5 for your firm. This score lies between a bond rating of A = 6.65 and A- = 6.40. The midpoint between these two scores is 6.525  $((6.65+6.40)/2)$ . If the score is greater than or equal to 6.525 then we will assign it an A and if it is less than 6.525 then we will assign the firm a debt rating of an A-. Since the calculated score is 6.5 we assign it an A- bond rating.