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NEVER FORGET THE GOLDEN RULE: PURSUE STRATEGIES WITH POSITIVE NPV

"Cash flow is a fact, earnings an opinion."

—written on a subway wall

KEY LEARNING POINTS

- Rational investors prefer more value to less.
- The responsibilities of corporate financial managers are varied but revolve around making decisions that increase economic value.
- Accounting value is what's been put into a business while economic value is what can be taken out in future cash flows. Don't confuse earnings and cash flow.
- The golden rule of finance is to pursue strategies and projects with a positive net present value.

- The growing annuity equation is useful for back-of-the-envelope valuations.
- Decision trees help visualize and value the outcomes from decisions and chance events.
- The price of short-termism can be high. Investors pay for the long term.
- The Law of Conservation of Value specifies that if expected cash flows don't change, then the intrinsic value shouldn't change.

INTRODUCTION

If we offered you the chance to buy a crisp $100 bill for $80, you would undoubtedly accept the deal since its immediate profit, or net present value (NPV), is $20 in your favor. You would surely decline an opportunity to purchase a $100 bill for $120. The NPV would be a loss of $20, resulting in an immediate decline in your wealth. Simply stated, rational investors prefer more value to less.

This statement might strike you as blindingly obvious, but there is no shortage of corporate examples where it has been violated. A National Bureau of Economic Research study estimated that shareholders lose $5.90 for every $100 spent on acquiring public companies.[1] Sprint, a U.S. telecommunications company, paid $36 billion in 2005 to acquire Nextel in a deal many thought was richly valued. It proved disastrous. They failed to integrate their networks and cultures. Sprint wrote off $30bn on the purchase in 2008, and the name Sprint Nextel became extinct in 2013 after years of very poor performance relative to the S&P 500.

Hewlett-Packard (HP), the famed Silicon Valley pioneer, paid $10.3 billion for the UK software company Autonomy in 2011, and wrote off $8.8 billion of the value one year after the acquisition. The premium it paid was 79% and considered excessive at the time. How did HP get it so wrong? According to Bloomberg, "One former HP executive who worked

[1] S.B. Moeller, F.P. Schlingemann, and R.M. Stulz. "Do Shareholders of Acquiring Firms Gain from Acquisitions?" NBER Working Paper No. 9523, March 2003.

there at the time says it appeared that Apotheker (HP's CEO) and the board didn't know what to do and were trying anything they could think of. 'It wasn't a strategy,' he says. 'It was total chaos.'"[2] HP paid $100 for a $10 bill.

Fund investors are also guilty of forgetting that rational investors prefer more value to less. Andrew Ang provides ample evidence in his excellent book on asset management that mutual funds, hedge funds, and private equity investments don't pay off for most investors after all the fees and risks are taken into account.[3] The fees are lower and your odds of better relative performance are higher when buying an S&P 500 ETF rather than an actively managed fund with the S&P 500 as its benchmark. Active funds are suffering massive outflows from their portfolios into those of passive funds.

Despite different opinions and time frames, all shareholders will agree that they are better off if a company's managers make decisions that increase the value of their shares. Rational investors prefer corporate managers to invest in wealth creating projects and to increase the value of their company.

One reason managers and investors forget this simple rule is because they confuse earnings and cash flow. An obsessive fixation with earnings influences markets from closing in Tokyo to opening on Wall Street. Earnings and accounting-based performance metrics are easily gamed and can destroy shareholder value when executives get rewarded for hitting them as targets. CEOs who are rewarded for growing earnings per share (EPS) can do it quite easily by repurchasing shares instead of paying dividends.

There is an antidote. Modern finance provides ample evidence that stock prices are based on long-term cash flow expectations, not short-term caprice. HOLT's cash flow return on investment (CFROI) framework pierces the veil of accounting gimmickry and attempts by corporate executives at window dressing, and offers a reliable system for investment analysis.

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[2]Aaron Ricadela, "Why Hewlett-Packard's Impulse Buy Didn't Pay Off," *Bloomberg*, November 30, 2012. According to the article, Larry Ellison, the CEO of Oracle, described Autonomy's asking pricing as "absurdly high."

[3]Andrew Ang, *Asset Management: A Systematic Approach to Factor Investing*, Oxford University Press, 2014.

Cash is king and discounted cash flow (DCF) analysis is the appropriate way to value projects and corporations. There is a clear connection between decisions that managers make and the value of their company. Both corporate and fund managers can use the same tools to estimate the intrinsic value of their decisions.

WHAT DO CORPORATE FINANCIAL MANAGERS DO DURING THE DAY?

To appreciate how equity investors value companies, it helps to understand how companies value their decisions. The main responsibilities of corporate financial managers are:

- Deciding what investments to make
- Deciding how the corporation is financed
- Managing the corporation's cash needs
- Reporting the health of the business to its stockholders

Financial managers help decide in which strategies and projects the firm invests. Projects include expansion, outsourcing, licensing, R&D, business or product development, mergers, acquisitions, and disposals.

Financial managers report the firm's operating results to stakeholders and offer guidance on its prospects. This requires an estimate of the likely value of present and future projects. Risks, opportunities, and alternate scenarios need to be assessed so that corporate executives can make high-quality, rational decisions.[4] The purpose of the firm is to prosper by building a sustainable competitive advantage and selecting the most valuable portfolio of projects, strategies, and businesses from its palette of choices. Shareholder value will be maximized if the firm and its directors remain vigilant in this pursuit.

[4]For an excellent introduction to the art and science of decision analysis, and how to improve decision quality, see Peter McNamee and John Celona (2007), *Decision Analysis for the Professional*, 4th edition, SmartOrg, Inc.

Financial managers decide on and manage the firm's capital structure—its mix of equity, debt, and hybrid instruments such as convertible debt to fund the firm's investments. In a perfect capital market of no taxes or market frictions, Modigliani and Miller demonstrated that a firm's market value is independent of capital structure.[5] The value of a firm cannot be altered by changing capital structure or dividend policy in a perfect capital market. Any effects on value from changes in capital structure or dividend policy are due to frictions such as taxes, government policy, and transaction costs. Because interest payments on debt are tax deductible in many countries, it is valuable for firms to use debt. Unfortunately, there's no such thing as a free lunch. As the proportion of debt increases, the firm's ability to service its debt is threatened due to the rising possibility of default. A corporate finance team manages the issuance of debt and equity to fund investment, as well as the firm's overall debt level. It is vital to consider the trade-off between the tax benefits of debt and the costs of financial distress.

Financial managers must cope with the need for cash to run the business. The terms and conditions extended to customers and negotiated with creditors must be directed and administered. Short-term financing to buy inventory and respond to seasonal spikes in sales is an important task. The intelligent management of working capital is a key contributor to a firm's profitability, return on capital, and value.

Executives and line managers require management reports to monitor operations and remind themselves of targets. The results of individual projects are consolidated into the firm's aggregate financial reports. These management accounts are confidential and remain inside the firm to provide timely and critical information about the company's performance. Publicly listed firms provide investors four main financial statements on an annual basis:

[5]For more on Modigliani and Miller's Propositions I and II, see Jonathan Berk and Peter DeMarzo (2014), *Corporate Finance*, 3rd edition, Pearson, 478–501. For the ground-breaking original paper, see F. Modigliani and M. Miller (1958), "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review* 48(3), 261–297.

- The balance sheet, or what's officially termed the *statement of financial position*
- The income statement, now known as the *statement of comprehensive income*, and commonly called the profit and loss account, or simply the P&L
- The *statement of cash flows*, or more commonly, the cash flow statement
- The *statement of changes in shareholders' equity*

Performance metrics should align employees and managers with the goal of building a sustainable competitive advantage and maximizing the value of the firm.[6] Metrics matter because they influence behavior. As the old medical saying goes, "What gets measured, gets managed." Financial managers play a central role in communicating operating results to both internal and external stakeholders. Investors and analysts will be confused and less interested in owning stock if the chief financial officer (CFO) can't clearly connect the firm's decisions and operating performance to its intrinsic value when communicating the firm's results, plans, and expectations. Meaningful financial metrics indicate the economic performance of the firm and help judge the plausibility of its expectations. The best place to look for what drives executive behavior is the annual financial statement's section on remuneration. Are reward metrics aligned with value creation or accounting shenanigans?

WHAT IS VALUE?

Suppose you have a chance to buy a new car from Cash Is King Motors or Royal Earnings Carport. You have agreed on a price of $50,000 for the

[6]It is our view that maximizing shareholder value is best positioned not as the purpose of the firm, but as the result of achieving the firm's purpose (see Madden). However, to gauge performance and assess the potential of alternate strategies, the NPV rule dominates all other methods by linking *opportunity cost* to *net value creation*. It is incumbent upon business managers to carefully weigh the value potential of short-term investments versus long-term bets whose value effects may be meaningfully larger but more difficult to quantify. Real options and decision models can be helpful in quantifying and visualizing them.

same model, but the salesman from Royal Earnings is under pressure to hit his sales target and throws in a sweetener. He says you can have the car for $50k if you sign now and pay within 365 days. That's a no brainer, right? If you have cash, you place $50k in a savings account, pay for the car in 364 days, and pocket the interest. The time value of money makes this deal attractive to you, and you would wait until the last minute to complete the transaction.

How does this deal work its way through Royal Earnings financial reports? Their income statement reports a profit after the sale despite no cash in the till. Thus, earnings are up, but so are accounts receivable on the balance sheet, which have to be collected at a future date. Let's assume the salesman is paid a commission of 2% and the cost of the car is $47,000. The recorded gross profit is plus $2,000, and managers congratulate themselves when they see it reported on the P&L statement:

$$\textit{Gross Profit} = \$50{,}000 - \$47{,}000 - 0.02 \times \$50{,}000 = \$2{,}000$$

But not everyone is happy. The financial manager gets a headache because she has profit but no cash. To top it off, she is losing the time value of money and is exposed to credit risks and the possibility of losing any profit if you are unable to pay. Assuming a 10% cost of capital, we can calculate today's cash equivalent of receiving $50k in 364 days by discounting this amount. The net present value (NPV) in today's cash would be:

$$NPV = \frac{\$50{,}000}{1.10} - \$47{,}000 - 0.02 \times \$50{,}000 = -\$2{,}545.45$$

Accounting earnings are up (+$2,000), but the economic value of Royal Earnings is down (−$2,545). Economic value represents the residual value after imposing a charge on capital that could have earned a return by being invested elsewhere. In this case, Royal Earnings suffers a current dollar loss of value. To make matters worse, Royal Earnings might have to pay tax on the reported earnings before being paid in cash by the customer.

This example highlights a fundamental difference between financial economics and accounting. The former concerns itself with cash and the

timing of those cash flows while the latter attempts to match revenue and expenses in an income statement, and tallies the net value in a balance sheet. Warren Buffett explains that "book value is an accounting concept, recording the accumulated financial input from both contributed capital and retained earnings. Intrinsic business value is an economic concept, estimating future cash output discounted to present value. Book value tells you what has been put in; intrinsic business value estimates what can be taken out."[7] Cash receipts and accounting income are rarely the same. Following the money is the best way to understand value since you want to be paid in cash, not promises.

The difference between a firm's assets and liabilities is shareholders' equity, which can be found on the balance sheet. This is also known as book value of equity. It is an accounting measure of the net worth of the firm. It is not an economic or market value of the firm's equity. While shareholders' equity is measured strictly in dollars, many of the firm's most valuable assets are not captured on the balance sheet:

- The expertise of employees
- The firm's reputation
- Relationships with customers and suppliers
- The value of future projects
- Quality of management and corporate culture
- The value of its brands

The market value of a company does not depend on the cost of its assets, which is a sunk cost. It depends on the present value of cash flows that investors expect those assets to produce in the future. Exhibits 1.1 and 1.2 show how a balance sheet differs from the perspective of a financial accountant and that of a financial economist.

Let's consider the case of Amazon from both an accounting and economic point of view. Amazon may trade in books but it certainly does not trade at book. Its price-to-book ratio (P/B) is 21 compared to 2 for an

[7]Warren E. Buffett, "1983 Letter to Shareholders," Berkshire Hathaway 1983 Annual Report.

EXHIBIT 1.1 **The accountant's balance sheet equation is Total Assets equals Total Liabilities plus Shareholders' Equity. The latter is what remains in book terms.**

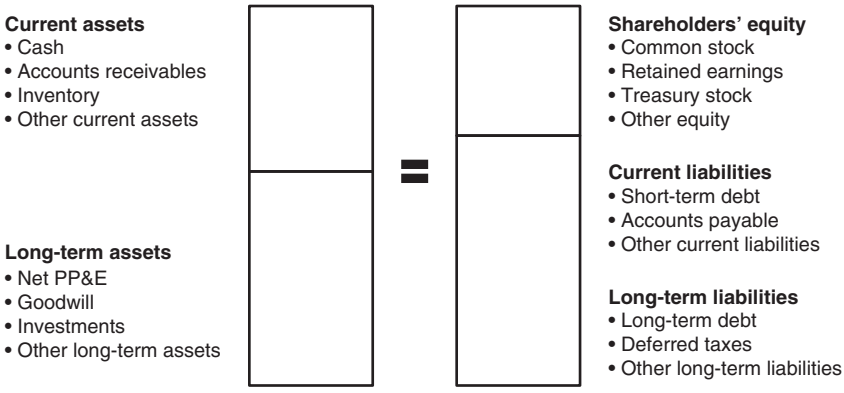
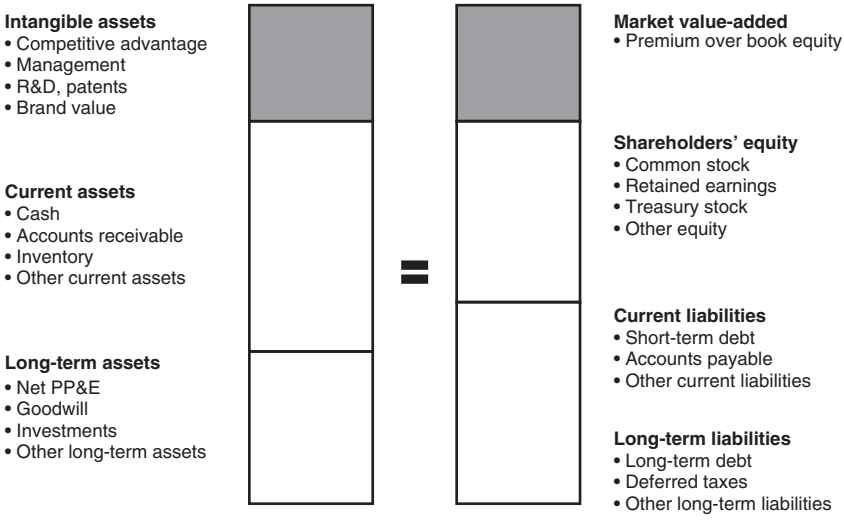


EXHIBIT 1.2 **The financial economist's balance sheet equation is Market Value of Assets equals Market Value of Total Liabilities plus Market Value of Shareholders' Equity. The latter is better known as market capitalization, or market cap.**



average U.S. company because investors expect the company to generate attractive cash flows well into the future.[8] You might be shocked to learn that Amazon reported negative shareholders' equity from 2000 to 2004 and paltry operating earnings, yet investors never considered the company insolvent. Shareholders weren't bothered by the seemingly dreadful state of Amazon's accounting statements. Jeff Bezos has maintained since his 1997 Letter to Shareholders that, "When forced to choose between optimizing the appearance of our GAAP accounting and maximizing the present value of future cash flows, we'll take the cash flows."

Let's shift from ratios to absolute amounts to bring home this essential point. Amazon's equity book value was $11.8bn on June 30, 2015, and its market cap was $252bn on September 17, 2015. It was priced to generate $240bn of economic value in current dollars on its existing and future businesses (market premium equals market cap minus equity book value ($252 - 12 = 240$)).

The market value of equity can also be less than its book value. This occurs in depressed industries where profitability is low and there is excess capacity, or for firms with grim prospects.

THE GOLDEN RULE OF FINANCIAL DECISION MAKING

Hindustan Unilever's guiding maxim is "what is good for the people of India is good for Hindustan." Similarly, what is good for the sustainable competitive advantage of a firm is good for the investors of a firm. And, what is good for investors is to increase their economic wealth since they have a choice of investment opportunities. A business decision whose benefits exceed its costs is valuable. Comparing benefits and costs is often complicated because they occur at different points in time, could be in different currencies, or may have different risks associated with them. At its essence, value is the money you make minus the total cost of making

[8] P/B ratio for Amazon on September 17, 2015, based on the most recent quarter.

that money, or simply what's left in the cash box after the transaction is complete. Paying additional charges for interest, collection fees, refunds, and product recalls reduces the cash in the till that can be paid as dividends to shareholders. Shortsightedness is not in the best interest of long-term investors.

Corporate finance is concerned with the present value of an investment, which represents today's cash value of future cash flows. To compare cash flows at different points in time, we need to state them in a single period's cash-equivalent value. It is standard to state cash flows in today's value. As an example, consider exchanging a bond that matures in six months for cash today, or an oil futures contract that matures in one year. In either case, discussing the value of the bond or futures contract in today's dollar value allows for comparison between investments and instant appreciation of their relative merit.

The fundamental measure of value creation is net present value (NPV), which is the present value of all future and present cash inflows and outflows related to a strategy or project. Cash outflows are negative and inflows are positive.

$$NPV = PV\ of\ Benefits - PV\ of\ Costs$$

If the expected NPV of an investment is negative, it should be rejected. You wouldn't trade £10,000 for $10,000 if the exchange rate were $1.60 per £, nor would you invest £10,000 in a risky venture if you were only guaranteed £10,000 in one year's time. A decision increases the value of a firm when its expected NPV is positive. **The Golden Rule of Finance is to pursue projects that are NPV positive**. This objective necessarily includes a comprehensive examination of all the costs and profits associated with the project, those that occur today as well as those that may occur many years into the future, such as cleanup costs and the probability of stranded assets.

This is important because investment decisions and their associated NPVs are related to the market value of a company's equity. The market

cap of a company equals its book value plus the NPV of *all* its present and future projects, even those yet to be imagined:[9]

$$\textit{Market Value of Equity} = \textit{Book Value of Equity} + \textit{Market Premium}$$

$$\textit{Market Premium} = \textit{NPV of All Projects}$$

If a company is growing but all its growth is into projects that create zero NPV, then growth is irrelevant and the company should trade at its book value. Growth can decrease the value of a firm if investments are poured into negative NPV projects. You will be reminded of this point throughout the book. Growth is not always value additive.

The *Law of One Price*—or the absence of arbitrage—is central to modern finance. Investments that offer the same payoff must trade at the same price in well-functioning markets. In a perfect market, the NPV of financial transactions will be zero. Exchanging currencies, commodities, or financial instruments at a discount suggests arbitrage (risk-free profit), which is rapidly eliminated whenever it appears. It is rare to find a $100 note lying on the ground because anyone seeing it is instantly wealthier after picking it up.

By extension, the NPV decision rule states that when considering investments, take the alternative with the highest NPV.[10] Choosing this alternative is equivalent to receiving its NPV in cash today. Because present value is additive, the NPV of a firm is the sum of its strategies' NPVs. This is precisely what connects project economics to the value of the corporation and is properly known as the *value additivity principle*. The NPV decision rule helps maximize the value of the firm by aligning management's goals with strategies best suited for commercial and long-term financial success. Decisions and their expected values matter.

[9]We are assuming that the book value of equity is a fair estimate of its liquidation value in this formulation.

[10]We stress, again, that the NPV decision rule must be guided by an honest and ethical assessment of all associated costs, those that occur now and many years into the future. For instance, the decision to extract coal from a profitable mine cannot ignore the potentially damaging long-term effects on the local geography and the significant costs that might be associated with cleanup and restoration.

Investment projects are either mutually exclusive or independent. A mutually exclusive decision involves choosing one project from among a group of projects. Examples include choosing one plant or product design; in-house manufacturing instead of outsourcing; or acquiring one company rather than another. The NPV rule for mutually exclusive decisions is to choose the one with the highest NPV because that is the investment that will maximize the corporation's total value. Though this statement seems blatantly obvious, it often eludes corporate executives when they make investment decisions. For example, there is significant evidence that acquisitions tend to destroy economic value for the acquiring shareholders. Hubris and nebulous "strategic reasons" often result in an overly optimistic assessment of synergies and the expected value creation from mergers and acquisitions. Directors of the firm choose unwisely when they seek to diversify the firm's risk on behalf of its investors, who are capable of doing it at a far lower cost and with far more relevance to their individual portfolios.

Independent projects are trickier, but the rules remain the same. To maximize the value of the entire firm, managers should make decisions that maximize NPV. All positive NPV projects should be accepted until reasonable constraints such as lack of skilled employees interfere. When budget constraints get in the way of accepting all of them, then projects should be ranked and those with the lowest net present value should be rejected or delayed. Metrics such as profitability index (PI) help with the ranking but the rule is clear. If management is convinced that an investment will generate positive net present value, then the CFO should pick up the phone and raise capital.[11]

BACK-OF-THE-ENVELOPE BASICS

By converting all cash flows to a common point in time, we can compare the costs and benefits of an investment, and calculate its NPV, which is the

[11] Just because NPV is positive doesn't necessarily mean that a project should be commenced immediately. A project might be worth more if waiting is valuable. Decision analysis and real options are useful for understanding the value implications of waiting, gathering more information, and flexibility.

net benefit of the project in terms of cash today.

$$NPV = \sum_{n=0}^{N} \frac{CF_n}{(1+r)^n} \tag{1.1}$$

The variable CF_n is the cash flow in year n, N is the life of the project, and r is the discount rate, or opportunity cost of the funds provided.

Three basic rules apply when translating cash flows:

1. Only cash flows occurring at the same point in time can be compared or combined.
2. To move cash flow forward in time, you must compound it.

$$FV_n = PV \times (1+r)^n$$

3. To move cash flow backward in time, you must discount it.

$$PV = \frac{FV_n}{(1+r)^n}$$

To compound the value of cash (move it forward in time), apply an interest rate. If you wish to know a company's expected total shareholder return in one year's time, then compound today's share price by the company's cost of equity. To discount the value of cash (move it backward in time), apply a discount rate. If you wish to know the present value of a special dividend in one year's time, then discount it by the company's cost of equity.

At this stage, it is useful to derive a few simple relationships. A constant annual payment that lasts forever is called a *perpetuity*. It has a surprisingly simple solution called the *perpetuity equation*.[12]

$$PV = \sum_{n=1}^{\infty} \frac{CF}{(1+r)^n} = \frac{CF}{r} \tag{1.2}$$

If DivCo pays a constant dividend of $2bn into perpetuity and its risk-adjusted cost of equity is 10%, then its market cap should trade at

[12]This can be proved by multiplying PV times $(1 + r)$ and then subtracting PV from it. $PV \times (1 + r) - PV = r \times PV$. The summation times $(1 + r)$ equals $CF + PV$, thus $r \times PV = CF + PV - PV$, which simplifies to $PV = CF/r$.

$20bn in a competitive market. Similarly, if DivCo could take out $2bn in after-tax costs on a sustainable basis, its market cap would rise by $20bn minus the investment needed to take out the costs. Let's assume an investment of $5bn is necessary. The NPV of the investment would be $15bn:

$$NPV = -\$5bn + \frac{\$2bn}{0.10} = \$15bn$$

The value of the firm would increase to $35bn based on the value additivity principle. Because it is a positive NPV project, the firm should invest. It can issue $5bn worth of equity to pay for it. Assuming the firm starts with 1 billion shares, its market cap would immediately jump to $35bn after the announcement ($20bn + $15bn = $35bn). Existing shareholders would pocket the full gain as the share price jumps from $20 to $35 ($20bn/1bn shares = $20/share to $35bn/1bn shares = $35/share). The firm would only have to issue 143 million shares to pay for the investment ($5bn/($35/share) = 143m shares). The dividend per share would increase to $4bn divided by the total number of shares outstanding, 1.143bn, which equals $3.50 per share, or according to the perpetuity equation, a share price of $35 (P = $3.50/0.10 = $35 per share) (Exhibit 1.3).

The value of clear communication to investors should not be underestimated. In this example, announcing the savings initiative is critical. If the potential upside of an investment is properly communicated, existing shareholders will get all the additional expected value. If DivCo were to issue shares without announcing the savings, the share price would remain at $20 instead of immediately jumping to $35. Existing shareholders would share the gain with those who bought the issued shares, i.e., 250m shares would be issued at $20 per share and the share price would eventually settle at $32, costing existing shareholders $3 per share in potential gain due to poor communication. New shareholders would delight in their luck and the blunder of management in failing to publicize the savings.

An important equation to remember is the formula for valuing a growing annuity in which cash flow grows at a constant rate g for N years, and then stops. An annuity is a fixed sum. The growing annuity formula meets

EXHIBIT 1.3 DivCo has an opportunity to save $2bn per year and increase its dividend. It issues shares to fund a $5bn investment to generate the savings.

Timeline	Start	Announce	Reaction	Issue	Result
Dividend ($bn)	2		2		4
Shares (bn)	1		1		1.143
DPS ($/share)	2.00		2.00		3.50
Cost of equity	10%		10%		10%
Market cap ($bn)	20		35		40
Share price ($/share)	20.00		35.00		35.00
Savings announcement					
After-tax savings ($bn)		2			
PV of savings ($bn)		20			
Investment ($bn)		−5			
NPV ($bn)		15			
Share issuance					
Issue shares ($bn)				5	
Issue price ($/share)				35.00	
Shares (bn)				0.143	

the requirements of Herbert Stein's law, "If something cannot go on forever, it will stop."

$$PV = \sum_{n=1}^{N} \frac{CF_1 \times (1+g)^n}{(1+r)^n} = \frac{CF_1}{(r-g)}\left[1 - \frac{(1+g)^N}{(1+r)^N}\right] \qquad (1.3)$$

This equation should be permanently stamped into your memory or placed on standby in your tablet! The first term is simply a growing perpetuity. The compound term accounts for the truncation of cash flow after N years. If N is infinity, it simplifies to the growing perpetuity equation, $PV = CF_1/(r-g)$. If g is zero and N is infinity, it simplifies to the perpetuity equation, $PV = CF_1/r$. From the growing annuity equation, we can quickly determine the perpetuity, growing perpetuity, and annuity equations. This opens a whole new world to performing back-of-the-envelope calculations!

Suppose Bad Karma Pharma has just learned that it will have to pull a valuable cash cow product from the market. The CEO calls you in, the eager financial analyst sporting a pen, envelope, and calculator. He is clearly upset and asks you to calculate the hit on the share price, explaining that

after-tax cash flow will be reduced by $800m a year forever and the cost of equity is 10%. In a jiffy, you realize this is a perpetuity and tell him the market cap will take a hit of $8bn once the news is public. There goes the yacht he planned to buy with stock options.

$$PV = \frac{CF_1}{(r-g)}\left[1 - \frac{(1+g)^N}{(1+r)^N}\right] = \frac{CF}{r} = \frac{-\$800m}{0.10} = -\$8bn$$

The CFO interjects that it might be worse since the product's cash flow has been growing with inflation at 2%, which is expected to persist. No problem, plenty of space on your envelope. This is a growing perpetuity.

$$PV = \frac{CF_1}{(r-g)}\left[1 - \frac{(1+g)^N}{(1+r)^N}\right] = \frac{CF_1}{(r-g)} = \frac{-\$800m}{(0.10-0.02)} = -\$10bn$$

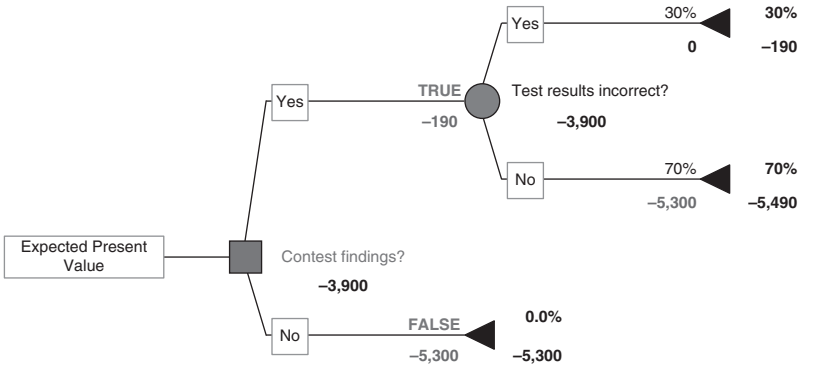
The CEO turns pale when you quickly respond that this increases the total hit to the market cap to $10bn. The Sales Director says it won't be that bad since she expects only 10 more years of cash flow before the product becomes uncompetitive. You mutter to yourself, "No sweat," but this will require a calculator and the envelope.

$$\begin{aligned} PV &= \frac{CF_1}{(r-g)}\left[1 - \frac{(1+g)^N}{(1+r)^N}\right] \\ &= \frac{-\$800m}{(0.10-0.02)}\left[1 - \frac{(1+0.02)^{10}}{(1+0.10)^{10}}\right] = -\$5.3bn \end{aligned}$$

The CEO sighs with relief when you say the total hit reduces to $5.3bn. The Director of Research adds with an air of authority that there is a 30% chance the findings were incorrect and that the product won't have to be pulled, but that it will cost $190m to contest the findings. The CEO winces at the expense and asks if it is a wise decision to contest the findings. You sketch a probability tree and calculate an expected loss of $3.9bn (Exhibit 1.4).[13] You add that he can pay up to $1.59bn to contest the findings, which is the value of perfect information, making the $190m

[13]A decision tree is useful for mapping and valuing decisions, uncertainties, and real options. Squares represent decision points such as invest, delay, or kill. Circles represent uncertainties such as the likelihood of success or potential values.

EXHIBIT 1.4 **Bad Karma Pharma NPV Tree. Squares represent decision points, and circles represent uncertainties and their probabilities. The path with the greatest expected value should be chosen.**



expenditure seem like a bargain.[14] The CEO realizes the news is bad but now knows what he can expect when the market opens. He authorizes the expenditure to contest the findings and thanks you profusely for making such complicated financial calculations under fire and in a pinch.

IS THE NPV RULE FOOLPROOF?

Don't let the rule fool with your head. Let's take the case of Woody Rock, a music impresario, who combs the clubs of London looking for up-and-coming bands. He wears an easy smile and possesses that rare quality of understanding the music business. You meet him at a club and wonder if the NPV rule applies to the music business. He tells you that one out of ten bands he signs has a successful first release. He typically invests £10,000 to record a band. Nine turn out to be duds that claw back

[14]The value of perfect information is the maximum amount that should be paid for the decision maker to be indifferent to contesting the findings. An expense greater than $1.59 would lead to a negative expected value: Value of perfect information = 5.3bn – (0.3 × 0 + 0.7 × 5.3bn) = 1.59bn. It is worthwhile to contest the findings unless it costs more than $1.59bn, thus a cost of $190m is a wise expenditure.

half of the investment and one band proves to be commercially successful, grossing £55,000 for his production company. You run the numbers in your head and conclude that it is breakeven. He explains that it takes a year until he sees any cash flow. You scribble the NPV on a napkin, assuming a 10% discount rate.

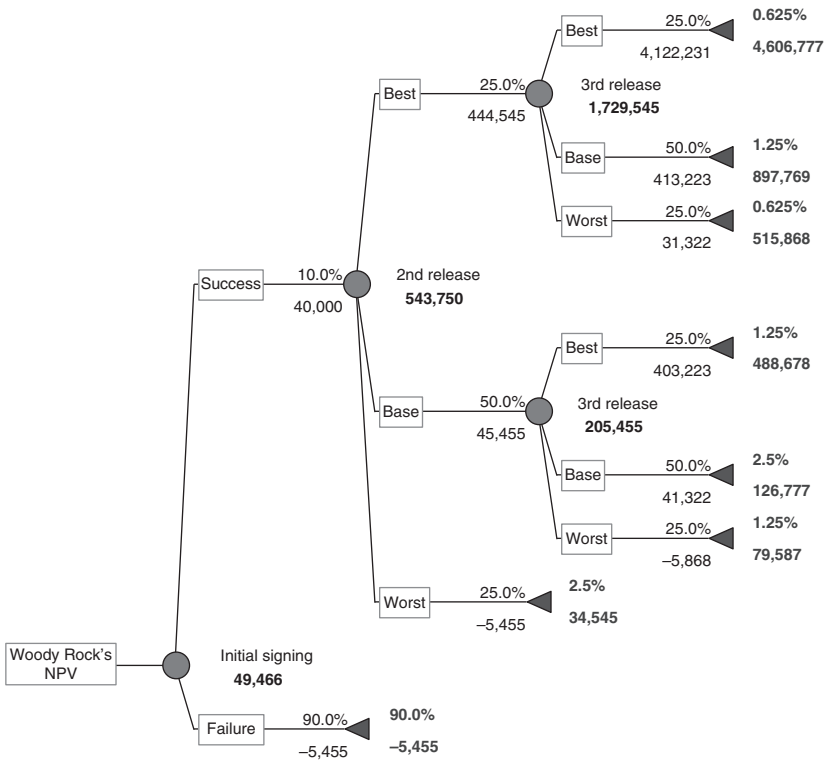
$$NPV = -10 \times 10{,}000 + \frac{9 \times 5{,}000}{1.10} + \frac{1 \times 55{,}000}{1.10} = -£9{,}091$$

You're scratching your head. The more he invests in bands, the more value he destroys, yet Rock's wearing the best money can buy on Bond Street. This is not making sense and perhaps a fitting occasion to give up on modern finance.

You decide to explain the NPV rule and show him the napkin. Rock has no idea what you're babbling about but is intrigued because he likes making money while messing with the establishment. "Mate, when I sign a band, I have an option to produce the next two albums." You press ahead with a few questions about probabilities and expected earnings. "I only continue with bands that succeed with their first album. Most get the same result with the second album, but 25% of the time the next album grosses 10 times as much while another 25% turn out to be flash-in-the-pans that gross one-tenth as much." You draw the probability tree in your tablet and re-commit yourself to the NPV rule. Despite the poor odds (90% of his signings generate a negative NPV), Rock's expected NPV per signing is £49,466 for the first three releases (Exhibit 1.5). With a committed team and a lot of luck, he'll win at the start, scale up, and watch his options pay off!

Options have value and should be part and parcel of investment analyses. Just because a project has a negative NPV doesn't mean that subsequent contingent options don't have attractive value. Just like record companies, pharmaceutical firms bet on many potential products but have few actual winners. When the investments succeed, the payoff can be huge.

EXHIBIT 1.5 Woody Rock's NPV. Real options have value. All values shown are net present values.



THE PRICE OF SHORT-TERMISM

According to David Larcker of Stanford University, "Companies want long-term shareholders in particular because it allows them to implement their corporate strategy and make long-term investments without the distraction and short-term performance pressures that come from active traders."[15] Most companies believe their share price would trade 15% higher on average with a volatility that is 20% lower if they were able to attract their ideal shareholder base. This is an extraordinary finding.

[15]Anne Beyer, David F. Larcker, and Brian Tayan, "2014 Study on How Investment Horizon Expectations of Shareholder Base Impact Corporate Decision-Making," Rock Center for Corporate Governance at Stanford University and NIRI.

It implies that corporate investor relations professionals have recognized the connection between decisions, value, and communication but are unsuccessful in convincing investors of the merits of their companies' long-term plans. Is the market so shortsighted or inefficient that it prefers accounting gimmicks and short-term earnings over decisions that increase NPV over the long term? Numerous studies point to the opposite, namely that the market sees through actions intended to increase accounting earnings without increasing cash flow.[16]

We wonder who is responsible for this specious issue of having the wrong shareholders. In a famous survey, Graham, Harvey, and Rajgopal found that 80% of CFOs would cut spending on discretionary future-oriented activities such as marketing and R&D to meet short-term earnings targets.[17] We have personally experienced situations where group executives pressure managers to book revenue and earnings within the artificial constraint of a financial year even if it means offering better terms and discounts. Financial analysts will spot this trick by comparing net income to operating cash flow. This is uneconomic behavior and not doing the "right thing" for long-term shareholders.

Academic research has shown that R&D intensive firms have generated substantial future risk-adjusted shareholder returns.[18] Cutting the R&D budget to boost short-term earnings would hurt the share prices of most successful technology and pharmaceutical companies. Paradoxically, successful firms can often surprise the market by an unexpected increase in their R&D expenditure and increase their share price while earnings drop.[19]

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[16]Tim Koller, Marc Goedhart, and David Wessels (2010), *Valuation: Measuring and Managing the Value of Companies*, Chapter 16, John Wiley & Sons. The authors point out numerous examples.

[17]John R. Graham, Cam Harvey, and Shiva Rajgopal, "The Economic Implications of Corporate Financial Reporting," *Journal of Accounting and Economics*, 40 (2005), 3–73.

[18]Mustafa Ciftci, Baruch Lev, and Suresh Radhakrishnan, "Is Research and Development Mispriced or Properly Risk Adjusted?" *Journal of Accounting, Auditing & Finance* 26(1) (January 2011), 81–116.

[19]For an interesting case study on how an improved decision analysis process shifted SmithKline Beecham from cutting R&D to increasing it, see Paul Sharpe and Tom Keelin, "How SmithKline Beecham Makes Better Resource-Allocation Decisions," *Harvard Business Review*, March-April 1998.

As Mauboussin and Callahan point out in their study "A Long Look at Short-Termism," "concerns about short-termism have been around for a long time."[20] Here is a recent example that they cite:

> "… the shadow of short-termism has continued to advance—and the situation may actually be getting worse. As a result, companies are less able to invest and build value for the long term, undermining broad economic growth and lowering returns on investment for savers.
>
> The main source of the problem, we believe, is the continuing pressure on public companies from financial markets to maximize short-term results."[21]

Contrast this sentiment with Amazon's pitiful accounting earnings and superlative market rating, and what Jeff Bezos said in 1997 and reiterates every year, "We believe that a fundamental measure of our success will be the shareholder value we create over the long term." Amazon's average return on equity over the past five years is a meager 1.4% yet it trades at a price-to-book (P/B) multiple of 21.[22] It doesn't have a trailing price-to-earnings (P/E) ratio since it reported negative earnings in 2014. Its forward P/E is an astronomical 112 compared to a longer-term average of around 14 for most firms.

In Apple's release of its third quarter 2015 results, the world's most valuable and followed company beat analysts' expectations, yet its share price dropped 8%.

The *Financial Times* reported, "Revenues for the three months ending in June were up 33 per cent to $49.6bn with earnings up 45 per cent to $1.85—the ninth consecutive quarter that Apple has beaten earnings forecasts."[23]

Although Apple beat quarterly sales and earnings expectations, concerns about the iPhone's longer-term growth, and prospects for revenue growth

[20] Michael J. Mauboussin and Dan Callahan (2014), "A Long Look at Short-Termism: Questioning the Premise," Credit Suisse Global Financial Strategies.
[21] Dominic Barton and Mark Wiseman, "Focusing on the Long Run," *Harvard Business Review*, January 2014.
[22] Amazon's ROE based on average book equity from 2010 to 2014 was respectively: 4.8%, 2.2%, −0.1%, 0.8%, and −0.6%. The P/B and forward P/E values are as of September 17, 2015.
[23] Tim Bradshaw. "Apple Shares Tumble after Third Quarter Results," *Financial Times*, July 21, 2015.

from China and the Apple Watch, brought down the share price. Apple lost $30bn in market cap despite posting stellar numbers. Apple is expected to generate $525bn in NPV on its present and future as-yet-unknown businesses![24] The market is already paying for enormous value creation and growth. It is no wonder that investors get twitchy when it appears future growth engines might disappoint.

Mauboussin defines short-termism as "the tendency to make decisions that appear beneficial in the short term at the expense of decisions that have a higher payoff in the longer term." Although short-termism is often cited by the press as a plague infecting the investment and corporate community, it is difficult to prove. We maintain that investors prefer more value to less, and that they prefer decisions that increase the long-term NPV of the firm over short-term antics and accounting manipulation meant to fool investors. In fact, companies that frequently restate their financial reports tend to underperform the stock market.[25]

Corporate valuation is based on the present value of a firm's future cash flows. Fledgling companies that are burning cash and not yet making profits may trade at rich P/E and P/B ratios because investors are willing to pay juicy premiums for future growth and profitability that they expect from projects that have yet to break ground. High valuations relative to book value indicate that the market is paying for the long term. When investors have a short-term horizon, they are unwilling to pay much for the future. Most investors take a longer-term view, and are willing to pay for many years of cash flow when they purchase the shares of highly successful firms that demonstrate durable competitive advantages.

A simple example illustrates the connection between time and value (Exhibit 1.6). Franck Dangereux is an extraordinary chef from France who moved to Cape Town in the 1990s. His Foodbarn has been a favorite restaurant of this section's author for over a decade (mainly as a tourist

[24] On September 17, 2015, Apple's market cap was $650bn, and its book equity value was $126bn as of June 30, 2015. Apple is presently feeling pressure from activist shareholders since it holds $201bn in short- and long-term investments, and cash.

[25] Conversations with and studies performed by Ron Graziano of Credit Suisse HOLT.

EXHIBIT 1.6 A simple example connecting time and value with the culinary delights of Cape Town's Foodbarn.

Year	1	2	3	4	5	6	7	8	9	10
Gross Profit	2,500	2,700	2,916	3,149	3,401	3,673	3,967	4,285	4,627	4,998
x PV factor	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386
= PV of Gross Profit	2,273	2,231	2,191	2,151	2,112	2,073	2,036	1,999	1,962	1,927
PV of Cumulative GP	2,273	4,504	6,695	8,846	10,958	13,031	15,067	17,066	19,028	20,955

but now as a resident).[26] What is the financial value of my visits to the restaurant?

Let's say I visit the Foodbarn four times a year with three other people. In the next year, the total bill for each visit will average R2,500 before tip and VAT. Let's assume a gross margin of 25% for Foodbarn, which is the difference between the price of the meals to me and the cost of the food and its preparation to Chef Dangereux. If I further assume a discount rate of 10%, the present value for the next year's gross profit is R2,273, which is stated in the currency of South African rand, R.

$$PV\ Gross\ Profit = \frac{4\ visits \times R2{,}500\ per\ visit \times 25\%}{1.10} = R2{,}273$$

The present value for five years of loyal dining is R10,958 if Franck can increase prices 8% annually due to demand. If he continues to inspire and delight customers for ten years, the present value leaps to R20,955. Every time I walk into Foodbarn, I am greeted as warmly as R21,000 in today's cash. And the free round of port at the meal's conclusion is a sound investment on Franck's part.

Five hundred like-minded foodies are worth R10.5m in today's cash. If every visit leads to enthusiastic recommendations and new customers for Franck, then Foodbarn's value multiplies and marketing is free. Let's assume that out of 4 visits per a year, a new loyal customer is smitten by Franck's culinary skill. Starting with me, the family tree grows to 16 in

[26] David Holland lived in Cape Town from 1995 to 2002 and moved back to Cape Town in 2012.

5 years for a present value of R66,497 and 512 in 10 years for a present value of R2m. The network effect compounds handsomely.

Loyal Customer Tree	1	2	4	8	16	32	64	128	256	512
Loyal Gross Profit	2,500	5,400	11,664	25,194	54,420	117,546	253,900	548,424	1,184,595	2,558,726
PV of Loyal GP	2,273	4,463	8,763	17,208	33,790	66,352	130,291	255,844	502,384	986,500
PV of Cumulative Loyal GP	2,273	6,736	15,499	32,707	66,497	132,849	263,140	518,983	1,021,368	2,007,867

If Franck's attention wanders, and food quality and service deteriorate, then the value of my visits drops to R2,273, and he loses a loyal, long-term fan. He'll have to spend money on advertising and offer discounted specials to attract new customers. Profits will shrink. His wallet will wither. Short-term tricks such as overbilling, using poorer quality ingredients, or reduced service will hurt long-term value. Aggressive expansion, which means taking his eye off his franchise restaurant, can easily backfire.

In addition to creating long-term value, Franck must also be socially responsible. If Franck were to begin treating his staff in a repulsive manner or expressing odious views in the local paper, patronage of his restaurant would fall. It is in his long-term interest to behave in a socially responsible manner.

A company can suffer tremendous economic loss when its reputation is damaged. The British public relations firm Bell Pottinger declared bankruptcy in 2017 after it was linked to a racially derisive PR campaign in South Africa. In 2015, Chipotle suffered share price losses totaling more than $10bn due to contamination of its chicken through *E. coli* bacteria. In 1993, when four people died from *E. coli* bacteria after eating hamburgers at Jack-in-the-Box, the firm's market value fell more than 30%. In 1982, someone put potassium cyanide in Tylenol capsules and placed the bottles back on the shelf. Seven people who took those capsules died. Johnson & Johnson, the maker of Tylenol, suffered a loss of two billion dollars in market value. Its direct costs to recall the product and in litigating lawsuits were a tenth of that. These firms all suffered a direct hit to the value of their long-term cash flows.

From a fundamental point of view, the long term clearly matters to investors. Because valuations are highly sensitive to changes in expectations about long-term profitability and growth, it is little wonder that share prices can be quite volatile. Essentially, investors make short-term bets on long-term outcomes. If your analysis leads you to conclude a stock is selling at the wrong price during the short term, there is an opportunity to create value for yourself in the long term by purchasing it today.

THINKING CLEARLY ABOUT ACTIONS, REACTIONS, AND VALUE

How can you digest everything from company announcements to government policy changes in a clear, uncluttered way without getting lost in distractions and abstractions? We find the *Law of Conservation of Value* to be enormously beneficial and an appropriate way to end this chapter. This law states that anything that doesn't change an asset's *expected* cash flows, or the riskiness of those cash flows, doesn't change the intrinsic value of the asset.

$$Value = \sum_{n=1}^{N} \frac{E[CF_n]}{(1+r)^n} \tag{1.4}$$

The term $E[CF_n]$ is the expected cash flow in year n.

When an announcement is made or an event occurs, you should ask two simple questions about how the new information affects the numerator and denominator of this equation:

- Will the expected cash flows change?
- Will the riskiness of those cash flows change?

If the answer is no to both questions, then the intrinsic value shouldn't change no matter what an army of investment bankers or television pundits armed with P/E ratios might suggest. **If an action does not increase expected cash flows, then it should not increase value.**

Equipped with this law, you can disentangle countless arguments and sleights of hand:

- If a company axes R&D to increase next quarter's earnings—and the expected NPV from the R&D is positive—then future expected cash flows will be lower.
- Idle (excess) cash destroys value, and should be distributed to shareholders. Activist shareholders know this and press for it to extinguish the temptation of value-destroying acquisitions and investments. Yet according to Larcker et al. 87% of companies agree or strongly agree that activist shareholders are undesirable. Why should they be feared if they are presenting ideas to increase the share price? Activists are unlikely to attack companies that act in shareholders' best long-term interests. Companies get the shareholders they deserve.
- Don't be fooled by whether earnings are accretive or dilutive in a company takeover. If the expected increase in cash flow does not exceed the premium paid for the acquisition, then intrinsic value will be lower and destroy value for shareholders. Don't fall for arguments that hail diversification as a key benefit when mergers and acquisitions are promoted. As Brealey, Myers, and Allen point out, "Value additivity also means that you can't increase value by putting two whole companies together unless you thereby increase the total cash flow. In other words, there are no benefits to mergers solely for diversification."[27]
- Don't get suckered by the *sunk cost fallacy*. If the NPV of future cash flows is negative, it doesn't matter how much was invested—the project should be stopped at once and written off. It is for this reason that the market shrugs when companies write off billions in bad investments if the market has already taken a negative view on those investments. Mining giants BHP Billiton, Rio Tinto, and Anglo American made big bets during the commodity super cycle of the mid-noughties that were later written off when commodity prices crashed. Despite totaling

[27] Richard A. Brealey, Stewart C. Myers, and Franklin Allen, *Principles of Corporate Finance*, McGraw-Hill Education, 2014.

tens of billions of dollars, the write-offs didn't alter expected cash flows and share prices on their dates of announcement. Expectations for future cash flow and shares prices had already dropped in line with sinking commodity prices.

- If you wish to understand the impact of government policy on a company's value or country's wealth, follow the change in expected cash flow. Will the policy increase expected cash flow, or reduce uncertainty in any of the firm's projects? Margaret Thatcher earned a degree in chemistry and probably recalled scientific and economic conservation principles when she observed, "The problem with socialism is that you eventually run out of other people's money."

We suggest that you commit the Law of Conservation of Value and its two simple questions to memory. They will save you time, breath, and money.

When in doubt on how to think about or value a decision or strategy, always remember that the NPV rule is the golden rule of finance. Countless managers and investors live to regret forgetting it. Here's what the new CEO of the once mighty South African mining giant Anglo American had to say while the company was struggling to survive calamitous acquisitions, onerous debt obligations, and devastating shareholder returns: "The flaw in the strategy was growth that was not pinned to returns or affordability. You have to protect your balance sheet."[28] That is an astonishing admission of value destruction.

[28] Mark Cutifani, CEO of Anglo American, quoted in the *Financial Times* on February 14, 2016. In an earlier interview with *The Globe and Mail* in 2014, the article stated, "Today, the new focus is on boring but worthy pursuits, like capital discipline and shareholder value, not the fun but destructive activities like growth for the sake of growth. 'We were forcing growth through the system and that's partly how we got into trouble,' Mr. Cutifani says." The ignominious acquisition of Brazilian iron ore assets was over $10bn of trouble, but it was made on the previous CEO's account. See Eric Reguly, "The Lunch: At Helm of Anglo American, Consummate Miner Digs Deep for Savings," *The Globe and Mail*, April 25, 2014.