
INSIGHTS

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FREE CASH FLOWS, VALUATION AND GROWTH OPPORTUNITIES BIAS

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Analysts who base valuations on expected free cash flows are vulnerable to making biased assessments of terminal value because they fail to take into account the implications of disappearing growth opportunities during the terminal period. This leaves their valuations subject to “growth opportunities bias” (GOB). There are two sets of issues addressed in this paper; one narrow and the other broad. The narrow issues pertain to the basis for GOB, a technique for addressing it, and examples to illustrate the debiasing technique. The broader issues pertain to group psychology in respect to the manifestation of GOB in the analyst community, including the CFA Institute which certifies analysts.



1 Introduction

PVGO is a well-known acronym for the “present value of growth opportunities.” This paper has a straightforward goal: to provide analysts, or anyone doing security valuation, with a simple new tool to incorporate the zero PVGO condition into terminal valuations associated with free cash flow forecasts.¹

Analysts who base valuations on expected free cash flows are vulnerable to making biased assessments of terminal value. In this paper, I explain the bias, which I call “growth opportunities bias”

(GOB), propose a technique for addressing the bias, at least in theory, and present examples to illustrate the debiasing technique in practice.

This paper addresses two sets of issues, one narrow and the other broad. The narrow issues addressed pertain to technical issues associated with GOB. The broader issues pertain to group psychology in respect to the manifestation of GOB in the analyst community including the CFA Institute which certifies analysts. I begin with the narrow issues.

GOB is important because it can lead analysts to make large errors when computing fundamental values. I suggest that one reason analysts are vulnerable to GOB is that the discussion of

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terminal value in traditional books does not incorporate a condition on a firm's growth rate during the terminal period.

The zero PVGO terminal value growth condition is easy to state and easy to compute. The condition stipulates that during the terminal period, the ratio of a firm's long-term growth rate to its cost of capital must equal the ratio of the sum of its Net Capex and change in net working capital to its after-tax EBIT (defined as EBIT-tax). Clearly, the condition is easy to compute and can be done on the back of an envelope.

The condition is also easy to interpret, and pertains to the level of net investment in which a firm must engage in order to generate the required long-term growth. Put differently, the assumption that free cash flows will grow at a specific long-term rate, such as the growth rate of the economy, requires the appropriate level of spending on net investment relative to after-tax EBIT. When PVGO is zero, the growth rate is not a free variable in the analysis.

Although the terminal value condition applies generally, it is especially applicable to stocks with high Baker–Wurgler sentiment betas, where sentiment is understood as optimism about stocks (Baker and Wurgler, 2006, 2007). Baker and Wurgler suggest that the returns to stocks which are difficult both to value and to arbitrage will be more sensitive to sentiment than stocks which are both easier to value and easier to arbitrage. They argue that when sentiment is high, speculative difficult-to-arbitrage stocks become overvalued, and safe easy-to-arbitrage stocks become undervalued.

In respect to GOB, Baker and Wurgler tell us that the perception of unlimited growth opportunities allows unsophisticated investors to defend, with equal plausibility, a wide spectrum of valuations, from much too low to much too high, as suits their sentiment. In practice, stocks hardest to arbitrage

are the most difficult to value. I illustrate Baker and Wurgler's contention by examining analyst reports on Twitter, which had its IPO in November 2013.

The broader issues I discuss in this paper pertain to debiasing in the context of group psychology. In Shefrin (2008) I discuss reasons why groups behave in ways that perpetuate bias. In this paper, I apply those ideas to explain why analysts, through their certifying body the CFA Institute, resist calls to engage in debiasing.

The remainder of the paper is organized as follows. Section 2 explains GOB. Section 3 develops the condition on free cash flow growth that addresses GOB. Section 4 provides examples from analyst reports to illustrate the manifestation of GOB, and how it can be addressed in practice. Section 5 raises broader issues about the use of free cash flow analysis for valuation. Section 6 discusses the example of Twitter to illustrate issues raised by Baker and Wurgler. Section 7 discusses several cases of mainline stocks that are easier to value than Twitter. Section 8 discusses the nature of debiasing as it relates to financial analysts, in the context of how this paper has evolved. Section 9 concludes. In Appendix A, I discuss the theoretical basis underlying the use of free cash flow for valuation. In Appendix B, I discuss details associated with the resistance to recognizing and addressing biases in analysts' valuations.

2 What is GOB?

Growth opportunities bias stems from the failure to take explicit account of growth opportunities during a firm's mature phase.

No firm should expect to sustain a competitive advantage into perpetuity, unless there are exceptional circumstances involving barriers to entry stemming from technological, geographic,

or regulatory factors. And without a competitive advantage, there is no reason for a firm to expect to generate returns that exceed its cost of capital. In other words, all firms should expect that at some stage they will mature, and not expect their projects to generate positive net present value (NPV). Therefore, we should expect that for most mature firms aggregate NPV, otherwise known as the present value of growth opportunities (PVGO), is zero (Brealey *et al.*, 2013).

Typically, the computation of firm valuation using free cash flows divides the future into two periods, a short-term that in practice is often taken to be between 5 and 15 years, and a terminal period that begins immediately after the short-term period. A firm's valuation is typically computed as the sum of its cash position, the valuation of the expected free cash flows during the short-term, and terminal value, meaning the present value of the expected free cash flows during the terminal period (Damodaran, 2012; Higgins, 2011; Pinto *et al.*, 2010).²

In theory, all firms reach maturity before or during the terminal period. In practice, a substantial fraction of firms have positive PVGO for decades. Damodaran (2012) suggests that a minority, about 20%, of firms fall into this category.³ The question I pose in this paper concerns the majority, the 80%: How can the zero PVGO condition be explicitly incorporated into terminal value computed as the present value of the expected future free cash flow stream?

3 GOB in theory

This section develops a framework for taking explicit account of the zero PVGO condition in the computation of terminal value based on the expected free cash flow stream. I begin by reviewing traditional valuation formulas, expressed through Equations (1) through (7), which I then use to develop a new equation, Equation (8).

Readers who are very familiar with standard valuation equations might wish to skip from Equation (1) directly to Equation (8).

In practice, several techniques are used to compute terminal value, with most based on some forms of multiple such as price-to-free cash flow, price-to-earnings, and price-to-EBITDA. Implicit in the multiple-based approach is the assumption that expected free cash flows *to the firm* will commence at a value of FCF_{T+1} in year $T + 1$ and grow at some constant rate g into perpetuity. These assumptions allow the use of the constant growth present value formula to determine the terminal value TVF_T of firm at date T :

$$TVF_T = \frac{FCF_{T+1}}{k - g} \quad (1)$$

where k is the firm's weighted average cost of capital. Here $1/(k - g)$ serves as the multiple in a price-to-free cash flow ratio (Higgins, 2011).⁴

For sake of argument, assume that the firm is all-equity financed, and that all cash flows to investors during the terminal period are cash dividends. With this simplifying assumption, the value of a firm's equity is the same as the value of the entire firm, and the cost of equity is the same as the cost of capital. Later on in this section, I relax the simplifying assumption and show how the analysis generalizes to a firm using both debt and equity.

As review, recall that in the traditional Gordon formula valuation for an all equity firm that is expected to grow at constant rate g , firm value is the present value of the expected dividend stream. That is:

$$TVF_T = \frac{D_{T+1}}{k - g} \quad (2)$$

where D_{T+1} is the expected dividend payout at $T + 1$, given information at T , k is the firm's cost

of capital, and g is the expected growth rate of dividends.

Suppose that the firm expects to maintain its dividend payout ratio d over time, so that for all t during the terminal period, $D_t = dE_t$, which I write as:

$$d = \frac{D_t}{E_t} \quad (3)$$

Bearing in mind that the sustainable growth rate of such a firm, g^* , is given by the traditional formula

$$g^* = (1 - d)ROE \quad (4)$$

where ROE is the firm's expected return on equity.

The condition defining a zero PVGO all-equity-financed firm is that its expected ROE coincides with its cost of capital k (Brealey *et al.*, 2013).⁵ By substituting dE_t for D_t and Equation (4) for g , into the valuation Equation (2), Equation (2) becomes

$$TVF_T = \frac{E_{T+1}}{k} \quad (5)$$

Equation (5) stipulates that for a zero PVGO firm, the price-to-earnings (PE) multiple is $1/k$.

Using Equation (5) implicitly factors in the zero PVGO condition into terminal value. In practice, the question is whether using a PE multiple equates the multiple to the inverse cost of capital.

Free cash flow in a given period is what remains from a firm's after-tax EBITDA after it has spent money on investment in fixed assets and working capital during the period.⁶ In practice, cash flow from investment is usually taken to be its component capital expenditure. In a no growth situation, the firm's net assets do not grow, so that capital expenditure just equals depreciation and amortization. Moreover, working capital does not change, and therefore the change in working capital is zero. It follows that in a no growth situation,

a firm's free cash flow is just EBIT-tax, which we can write as EBI, the sum of after-tax earnings and interest.⁷ For an all-equity-financed zero growth firm, free cash flow is just earnings (after tax). Therefore, for a zero growth all-equity-financed firm, the terminal value Equation (1) reduces to the simple PE multiple Equation (5).

Of course, some all-equity-financed firms will grow at a strictly positive rate, not at a zero rate. In this case, free cash flow need not equal earnings, and of course g will be positive. However, Equation (5) does not just apply to zero growth firms. It applies to all zero PVGO firms, whether their cash flows grow at nonzero rates over time or not. This means that the value of a zero PVGO all-equity-financed firm with nonzero growth rate g will satisfy the condition:

$$TVF_T = \frac{FCF_{T+1}}{k - g} = \frac{E_{T+1}}{k} \quad (6)$$

The preceding discussion easily generalizes to firms that are financed both by debt and equity. This is because earnings in all-equity-financed firm correspond to the sum of earnings and interest, after tax, in a firm financed with both equity and debt. Consequently, the extension of Equation (6) to firms that are both debt and equity financed is just

$$TVF_T = \frac{FCF_{T+1}}{k - g} = \frac{EBI_{T+1}}{k} \quad (7)$$

We now come to the main point of this paper. Equations (1) through (7) are standard, but imply an equation which is new.⁸ What is especially important about Equation (7) is that it provides an expression for g , when all the other variables are given, and the firm satisfies the zero PVGO condition. Solving Equation (7) for g implies that for a zero PVGO firm,

$$g = \frac{k[EBI_{T+1} - FCF_{T+1}]}{EBI_{T+1}} \quad (8)$$

Consider the definition that Higgins (2011) provides for free cash flow FCF as $EBIT(1 - \text{tax rate}) + \text{depreciation} - \text{Capex} - \Delta\text{NWC}$, where Capex is capital expenditure and ΔNWC is change in net working capital.⁹ Rearranging the definition of FCF implies that

$$EBI - FCF = \text{Capex} - \text{depreciation} + \Delta\text{NWC} \quad (9)$$

where all variables are subscripted by $T + 1$. Define Net Capex as capital expenditures minus depreciation and amortization. Equations (8) and (9) imply that g is the product of the cost of capital k and the ratio of the sum of Net Capex and change in net working capital to after-tax EBIT.¹⁰

In view of Equation (9), the economic meaning of condition Equation (8) is as follows: the achievement of zero PVGO terminal value for a firm requires a critical level of net investment, the sum of Net Capex and change in net working capital, during the terminal period, relative to its after-tax EBIT.

In order that a constant growth perpetuity with strictly positive values has a finite present value, it is necessary for the growth rate g to be strictly less than the discount rate k ; i.e., $g < k$. Notice that Equation (8) expresses g as a fraction of k . In this regard, Equation (8) indicates the value which the fraction must take in order to satisfy the condition $PVGO = 0$.

GOB bias is manifest in the implementation of Equation (1) for a zero PVGO firm, when the value of the terminal growth rate g assumed by analysts does not equal the value given by Equation (8). Therefore, addressing GOB requires that in computing terminal value Equation (1), g needs to satisfy Equation (8).¹¹ Put differently, the above analysis tells us that the condition $PVGO = 0$ during the terminal period creates a constraint involving the relationship among forecasts of earnings, forecasts of free cash flows, and

forecasts of the growth rate. This means that when $PVGO = 0$, one cannot independently forecast earnings and free cash flow, and also independently select the growth rate of one's choice. Two of these variables can be independently selected, but then the third is determined by the condition $PVGO = 0$.

In the remainder of this paper, I present a series of examples derived from the reports of security analysts. In most of these examples, the assumed terminal growth rates exceed the values implied by Equation (8). This means one of two things: first that terminal period PVGO is positive. Or second, analysts mistakenly believe that PVGO is zero, but underestimate the amount of net investment firms need to make during the terminal period. In this regard, underestimating net investment implies overestimating free cash flow, and therefore terminal value.

4 Example using Morgan Stanley reports on eBay

In Shefrin (2007a) I presented a case study involving a 2003 analyst report by Morgan Stanley on the firm eBay, and suggested that the computations in the report suffered from GOB. In this section, I review the main features of that case study, and update it to illustrate the application of Equation (8).

In April 2003, a Morgan Stanley report on eBay used a free cash flow analysis, along with other techniques, to develop a target price for eBay. In this analysis, the terminal period began in 2011. In applying Equation (1), the input values were $T = 2010$, $FCF_{T+1} = \$3.27\text{B}$, $k = 12\%$, and $g = 7\%$, resulting in a terminal value of $\$65.3\text{B}$.

In Shefrin (2007a), I suggested using Equation (6) instead of Equation (1), as the basis for terminal value, and arrived at an alternative value of $\$24.9\text{B}$. The difference in terminal values is

economically significant, with the earnings-based terminal value (from Equation (6)) being just 38% of the free cash flow-based terminal value (from Equation (1)).

Terminal value is extremely important in the April 2003 Morgan Stanley eBay report, in that it represents 81% of the present value of eBay's expected free cash flows for 2004 on. In my alternative computation, the counterpart to the 81% is a much lower 62%. From the perspective of 2003, my alternative estimate of the value of the eBay's free cash flow stream is approximately 50% of its counterpart in the Morgan Stanley report.

In Shefrin (2007a), I suggested that the Morgan Stanley terminal value was upwardly biased because of GOB. Keep in mind that a firm only has positive growth opportunities in the sense of $PVGO > 0$ when its expected ROIC exceeds its cost of capital k . In Shefrin (2007a), I pointed out that from the time eBay went public in 1998, its ROIC had not exceeded its cost of capital k , and that nothing in the report provided support for ROIC exceeding k going forward.¹²

The 2003 Morgan Stanley report estimates that eBay's EBITDA will be \$5B in 2010, its taxes will be \$1.8B, and its capital expenditures will be \$190M. For the purpose of this section, which is to compute g , I take these as given. The report does not forecast depreciation and amortization through to the terminal horizon. Nevertheless, the depreciation to Capex ratio is stable enough in the early forecast period that one can multiply this ratio by the forecasted Capex series to arrive an implicit forecasted value for depreciation and amortization. I use a value of 52% for the depreciation-to-Capex ratio, which leads me to compute a value for g from Equation (8) that is about 0.3%.¹³

That is, imposing the condition that eBay's PVGO is zero during its terminal period implies that its

growth rate will be far less than the 7% assumed in the report.

Of course, it is entirely possible to have made an argument in 2003 that eBay would have positive PVGO both during the short-term before 2010, and during the terminal period beginning in 2011. This would certainly permit an expected growth rate above 0.3%. At the same time, if there are growth opportunities during the terminal period, then it seems to me inappropriate to assume that the terminal period be characterized by a constant growth rate. Remember that terminal value often has the lion's share in the present value of expected cash flows. In that case, it simply might make more sense to extend the short-term,¹⁴ and leave the terminal period for when the firm reaches maturity and has lost its competitive advantage.¹⁵

By the time that 2010 arrived, eBay had undertaken at least two major acquisitions of well-known targets that dramatically impacted its free cash flows. The two acquisitions were PayPal and Skype, with the first working out well and the second not. eBay's average ROE between the end of 2003 and the end of 2010 was 12.5%, which is consistent with positive, though small, PVGO.

Morgan Stanley's 2010 report on eBay defined the short-term to extend through 2019, and so the terminal period began in 2020. Notably, the assumption for g in the 2010 report is for 4.5%, and the assumption for k is for 12.5%. An analysis of the data presented in the 2010 report, which applies Equation (8) for the terminal period beginning in 2020, results in a value for g of approximately 1%.¹⁶ This of course is below the assumed 4.5%.

Returning to the issue of GOB-based optimism that is imbedded in the choice of g , consider Figure 1 which contrasts the free cash flow streams in the two reports, and shows that the

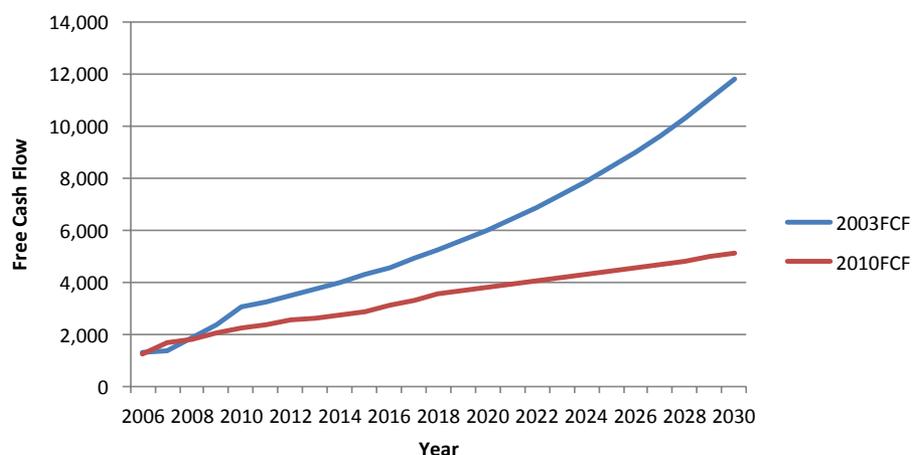


Figure 1 Comparison Morgan Stanley forecast of eBay free cash flow 2003 vs 2010.

long-term estimates in the 2003 report were much more favorable than those in the 2010 report.¹⁷

Morgan Stanley's October 2013 report on eBay indicates that the free cash flow forecasts made in 2010 for 2011 through 2013 were higher than the actual amounts by 62% in 2011, 117% in 2012, and what appears to be 22% in 2013. Yet, for 2020, the beginning of the terminal period in the 2010 report, the free cash flow estimate made in 2013 is 74% higher in the 2013 report than in the 2010 report. Although questionable, for the purpose of this section, I take the forecasts as given.

In the 2013 report, the terminal horizon begins in 2023, the cost of capital k is 12%, and the expected growth rate g during the terminal period is 4%. In addition, this report gives 2,022 estimates for EBITDA to be \$17.1B, taxes to be \$2.8B, Capex to be \$5.2B, and FCF to be \$7.8B.

If the expected growth rate g is computed using Equation (8), based on Morgan Stanley's 2013 estimates, the value of g so computed is approximately 4%. Given that the assumed value for g in the report is 4%, I conclude that the 2013 report implicitly assumes that PVGO for the terminal period beginning in 2023 will indeed be zero. It may have taken Morgan Stanley analysts 10 years of reports on eBay, but finally no GOB.

5 Extension of example: Other analysts' reports on eBay

How typical is the free cash flow approach used by Morgan Stanley? I examined the reports on eBay of 31 different analysts, all of which were released during the month of October 2013. Of these, 18 mention free cash flows, and the following eight explicitly use free cash flows to arrive at a valuation: Credit Suisse, Morningstar, Cantor Fitzgerald, Jeffries, The Benchmark Company, S&P Capital IQ, Evercore, and of course Morgan Stanley.¹⁸

In 2013, Morgan Stanley's terminal value multiples were approximately 12.4 for price-to-free cash flow, 6.7 for price-to-EBIT, and 5.7 for price-to-EBITDA. In contrast, Credit Suisse used 13.4 for terminal value price-to-free cash flow. Morningstar applied multiples of 10.7 for price-to-EBITDA and 15.0 for price-to-EBIT, but to 2014 values, not to first year terminal values. Both Credit Suisse and Morningstar use assumptions about multiples that are more optimistic than does Morgan Stanley, and are consistent with GOB.

Cantor Fitzgerald applied a terminal value multiple for price-to-EBITDA of 10.4, giving an implied PE multiple of 15.7. Cantor Fitzgerald also tells us that they use a cost of capital of 10%,

and their terminal period begins in 2020. Implicit in Equation (6) is the fact that for a zero PVGO firm, $PE = 1/k$, which for Cantor Fitzgerald is 10. The higher PE of 15.7 indicates very high assumed PVGO for the terminal period beginning in 2020, and therefore GOB.

Jeffries employs a terminal period beginning in 2023, a cost of capital of 12%, and applies a price-to-EBITDA multiple of 8.2. The multiple is higher than the corresponding multiple of 5.7 used by Morgan Stanley, and therefore is consistent with GOB.

Similarly, The Benchmark Company uses a price-to-free cash flow multiple of 20, and a price-to-EBITDA multiple of 10. S&P IQ uses a terminal growth rate of 2%. Evercore uses a price-to-free cash flow multiple of 16.8. Except for S&P IQ, the assumptions used by the other analysts are consistent with GOB.¹⁹

6 Baker–Wurgler sentiment and Twitter

Baker and Wurgler (2006, 2007) argue that lack of an earnings history combined with the presence of apparently unlimited growth opportunities allows unsophisticated investors to defend, with equal plausibility, a wide spectrum of valuations, from much too low to much too high, as suits their sentiment. In 2003, eBay fits the description of a company with these characteristics.

The well-known social media firm Twitter provides a recent example. At the time of its IPO on Thursday November 7, 2013 the firm had yet to generate positive earnings. On Wednesday evening, November 6, Twitter set its offer price at \$26 a share. The next morning, Twitter's stock opened at \$45.10, peaked at \$50.09 a share, and closed at \$44.90, slightly below the opening price.

The literature in behavioral finance identifies three phenomena associated with IPOs in general. They are: (1) initial underpricing (large price pops

on the first day of trading); (2) hot issue markets (in which IPOs are clustered in time); and (3) long-term underperformance (where after six months on average, the stocks of IPO firms underperform the stocks of similar firms matched by market capitalization and book-to-market equity) (Shefrin, 2007a). The first two phenomena appear to apply to the Twitter IPO (Streitfeld, 2013). As for the third, the situation after six months does not look promising. On August 4, 2014, Twitter stock had fallen by 3.2% from the date of its IPO, during which time the S&P 500 gained 11.0%.

On November 27, 2013 I examined the reports of 12 sell-side analysts who were following Twitter. The closing price for the stock that day was \$40.90. Table 1 displays their 12-month target prices. The mean target price was \$36 and the standard deviation was \$9, which implies a coefficient of variation of 25%. In contrast, the concurrent mean target price for eBay was \$61 and the standard deviation was \$5, implying a coefficient of variation of 8%. The larger coefficient of variation for Twitter conforms with Baker and Wurgler's characterization. Continuing with Twitter, the median target price was \$34, and the range was \$24–\$54. Three-quarters of these

Table 1

	Analyst reports on twitter	Target price
1	Cantor Fitzgerald	\$32
2	Wunderlich	\$34
3	Trefis	\$26
4	S&P Capital IQ	\$30
5	Topeka	\$54
6	SIG-Susquehanna	\$38
7	SunTrust	\$50
8	RBC	\$33
9	Evercore	\$43
10	Pivotal	\$30
11	Wedbush	\$37
12	Sterne-Agee	\$24

analysts provided a target price below the closing price on November 27.

Of the 12 analyst reports, six mentioned free cash flow. Only two, Cantor Fitzgerald and Wunderlich used the present value of a forecasted free cash flow stream to arrive at a target price. Cantor Fitzgerald's target price for Twitter was \$32 and Wunderlich's was \$34, placing both below the mean.

Consider the question of whether the free cash flow analysis in either of these two reports features a zero PVGO assumption for the terminal horizon.²⁰ Table 2 displays the computations for Equation (8). Cantor Fitzgerald provides enough detail to make the computation directly. Notice from Table 2 that although the report assumes a growth rate g of 4% during the terminal period, the value of g associated with Equation (8) is 0.7%.

Wunderlich provides all variables but one, depreciation, necessary for the computation of Equation (8). Their report discusses depreciation

forecasts through 2016, featuring depreciation-to-Capex ratios that lie between 69% and 100%. Applying these ratios to the terminal period, which begins in 2024, leads to growth rates that range from below zero to 1.6%. Achieving a growth rate of 4% in the terminal period, as Wunderlich assumes, requires a depreciation-to-Capex ratio of 20%, which is very low.

GOB is positive when the value of g implied by Equation (8) is less than the value of g assumed in the analysis. Therefore, given the free cash flow estimates before the terminal period, the above discussion suggests that the estimates of fundamental value developed by Cantor Fitzgerald and Wunderlich are upward biased and reflect excessive optimism.²¹

7 Easier-to-value stocks

Twitter is a high sentiment beta speculative stock. Baker and Wurgler suggest that the returns to stocks which are difficult both to value and to arbitrage will be more sensitive to sentiment than stocks which are both easier to value and easier to arbitrage. They argue that when sentiment is high, speculative difficult-to-arbitrage stocks become overvalued, and safe easy-to-arbitrage stocks become undervalued.

At the other end of the sentiment beta spectrum are stocks from 20 mainline well-established companies such as Aetna, Apple, Cisco Systems, Coca Cola,²² Consolidated Edison, Exxon Mobil, Ford Motor Company, Google, Hecla Mining, Hewlett-Packard, IBM, Intel, J.P. Morgan, Merck Pharmaceuticals, Microsoft, Sony, Time-Warner, Tyson Foods, United Continental Airlines, and Wal Mart.²³ These companies are drawn from a variety of different (SIC coded) industries. Based on the same November 2013 Thomson database search strategy that I used in conjunction with eBay and Twitter, I find that although some of the analysts who cover these mainline companies

Table 2

Twitter	Cantor Fitzgerald	Wunderlich
g	4%	4%
k	12%	13%
$T + 1$ —date terminal horizon begins	2020	2024
EBIT : T	3,600.2	2,393.2
Taxes : T	1,260.1	815.0
FCF : T	2,200.3	1,387.0
EBIT(1 - t) : T	2,340.1	1,578.2
EBIT(1 - t) - FCF : T	139.8	191.2
EBIT(1 - t) - FCF : $T + 1$	145.4	198.9
[EBIT(1 - t) - FCF]/ EBIT(1 - t) : $T + 1$	6.0%	12.1%
k [EBIT(1 - t) - FCF]/ EBIT(1 - t) : $T + 1$	0.7%	1.6%

use free cash flow analysis to value stocks, few base their valuations on the present value of an expected free cash flow stream that includes a terminal value component.²⁴

Reports that use free cash flow-based DCF²⁵ valuation methodology for these traditional companies are rare. Even rarer are reports containing enough information to compute Equation (8). However, they do exist. For example, BMO applies free cash flow-based DCF methodology to compute the value of Merck.²⁶ BMO assumes the long-term growth rate for the terminal period to be 1.5%, which is quite conservative. Although the structure of BMO's forecasted financial statements do not make the inputs required to compute Equation (8) easy to find, it is nevertheless possible to piece together variables that allow for a computation. By my calculations, the value of Equation (8) implied by BMO's forecasted values is about -0.5% , which suggests the presence of GOB.²⁷

Another example of free cash flow-based DCF valuation comes from a Leerink Swan report on Aetna, dated November 18, 2013. In this report, the terminal period begins in 2020, and the assumed growth rate for the terminal period in the report is 1.5%.

The terminal period forecast for EBI is significantly less than for FCF, much more so than in the above example involving Merck. According to Equation (8), unless EBI is negative, the inequality $FCF > EBI$ necessarily implies negative growth during the terminal period, and therefore provides another example of GOB.

The examples involving Merck and Aetna bolster the case for why it is important for analysts to use Equation (8).

One last example comes from the Morgan Stanley report on Google, dated October 18, 2013. This report features the same methodology as the

October 2013 Morgan Stanley report on eBay, and has the same lead analyst. The terminal horizon is assumed to begin in 2021, with $k = 11\%$ and $g = 3.5\%$. The value for g implied by Equation (8) is 2.8%, which is less than 3.5% but within range. A Credit Suisse report on Google, dated November 1, 2013, makes the assumption that $k = 10.5\%$ and $g = 3\%$, but unlike the Morgan Stanley report does not provide details of its DCF computation.

8 Group psychology, the perpetuation of bias, and the CFA institute

The views that financial analysts express, especially about valuations, receive a great deal of attention by markets, and carry a lot of weight. If there are systematic biases in analysts' valuations, there is reason to suspect that these biases will be reflected in market prices. Proponents of behavioral finance argue that there are limits to arbitrage which prevent smart money from eliminating mispricing. In this regard, keep in mind that my cursory examination of analyst reports of 22 firms in Sections 4 through 7 points to optimism stemming from GOB in free cash flow-based DCF valuation.

The CFA Institute provides the most effective channels to help analysts identify and mitigate the biases to which they are prone. The CFA Institute is the main body that certifies security analysts. It has a global reach. It provides educational materials, administers examinations, provides certification, and offers continuing education programs. Nevertheless, in its actions the CFA Institute has tended to perpetuate bias by resisting efforts to help analysts identify and mitigate major biases to which they are prone. In the remainder of this section, I discuss some general principles associated with group debiasing. Appendix B provides details that specifically pertain to GOB and the CFA Institute.

To be sure, people generally find it difficult to mitigate bias, even when they recognize the bias and are aware of what steps they can take to engage in debiasing (Kahneman, 2011). In respect to the adage “you can’t teach an old dog new tricks,” most people may well be like old dogs.

Shefrin (2008) discusses several obstacles to debiasing at the level of groups and organizations. A major obstacle is confirmation bias, which at the collective level is known as groupthink.²⁸ As a general matter, people will not engage in efforts to debias when they refuse to accept the presence of bias; that is, when they exhibit confirmation bias about suffering from other biases.

As an example, consider the issue of physicians and hand washing. In the mid-1800s, physicians Oliver Wendell Holmes, later dean of the Harvard Medical School, and Ignaz Philipp Semmelweis, who worked at the Vienna Medical School, provided compelling evidence to suggest that the failure of physicians to wash their hands was a major cause for the transmission of disease between patients. In line with confirmation bias, their professional colleagues at the time dismissed the evidence, as it was inconsistent with the prevailing theory of disease. So strong is confirmation bias, that even 150 years after Holmes and Semmelweis provided their initial arguments, physicians were still needing encouragement to wash their hands more thoroughly (Yoffe, 1999).

Confirmation bias can often occur in connection with ego, in that the acknowledgment of bias is viewed as an admission of imperfection or fault. When ego is involved, confirmation bias can emerge as the manifestation of cognitive dissonance.²⁹ That is why the first step in a traditional 12-step program for fighting addiction is to admit to having a problem.

Economists emphasize that people act in their own perceived self-interest. Therefore, they will

engage in debiasing only if they perceive it to be in their self-interest. On the flip side, people will circle the wagons and deny susceptibility to bias if they perceive that denial is in their self-interest. Needless to say, perceptions and reality often differ, and those differences drive behavior in both the short-term and the long-term.

Coming back to the example of physicians, the road from Holmes and Semmelweis has been long. Despite years of documented research about the importance of physicians routinely washing their hands, Yoffe (1999) makes the point that it might actually take pressure from patients to increase physician compliance, and suggests that they ask their doctors “‘Did you wash your hands?’” Indeed, some physicians now display signs in their offices, next to sinks, suggesting that patients ask this question outright.

There are lessons to be learned by all, including analysts, from the experiences of the medical community’s dealing with biases. An example is a Ted conference talk given by Goldman (2011) who discusses the importance of physicians being willing to discuss their mistakes openly, despite their natural reluctance to do so. This is the first step in a 12-step procedure: one down, eleven to go.

9 Conclusion

Analysts who base valuations on expected free cash flows are vulnerable to making biased assessments of terminal value because they fail to take into account the implications of disappearing growth opportunities during the terminal period. The main point of this paper is to provide analysts with a new technique for encapsulating the zero PVGO condition into their free cash flow-based estimates of terminal value.

This paper analyzes the basis for GOB, proposes a technique involving the long-term growth rate for

addressing it, and presents examples to illustrate the incidence of GOB along with the debiasing technique. The specifics of the technique center on computing a long-term expected growth rate for the terminal period that is consistent with zero PVGO.

The zero PVGO terminal value growth condition is easy to state and easy to compute. The condition stipulates that during the terminal period, the ratio of a firm's long-term growth rate to its cost of capital must equal the ratio of the sum of its Net Capex and change in net working capital to its after-tax EBIT.

Judging from the examples discussed in this paper, it appears that more analysts avoid using free cash flow-based analysis, or any type of DCF-based analysis, than those who use it. Part of the reason for this state of affairs might be that forecasting future cash flows is difficult. Nevertheless, there is no alternative basis for making judgments about fundamental values than forecasted future cash flows. Those who believe that markets are efficient might counter that market prices provide such a basis. However, if that were true, then there would be no need for security analysts to undertake valuations or establish target prices.

The behavioral perspective allows for the possibility that market prices do not coincide with fundamental values. The behavioral perspective also suggests that prices move to fundamental values in the long-term, but not necessarily in the short-term. Therefore, short-term target prices need not coincide with corresponding predicted future fundamental values. It is nonetheless important to estimate the gap between market price and fundamental value, because the speed with which the difference converges to zero in the future depends on their difference in the present. For this reason I would recommend that more analysts make the

effort to estimate fundamental value. And in making the effort, they should be aware of biases, such as GOB, and take steps to mitigate those biases.

The examples in this paper suggest that GOB is an issue that applies across companies. However, GOB is especially germane for the stocks of companies that feature high Baker–Wurgler sentiment betas. As Baker and Wurgler argue, for such companies the lack of an earnings history combined with the presence of apparently unlimited growth opportunities allows unsophisticated investors to defend, with equal plausibility, a wide spectrum of valuations, from much too low to much too high, as suits their sentiment.

In short, recommendations from this paper are that in their reports, analysts make greater use of free cash flow-based DCF analysis, incorporate explicit discussions about the magnitude of PVGO alongside their valuations, and explicitly incorporate Equation (8).

Debiasing is challenging, but can be made easier if there is strong institutional support. To this end, the CFA Institute can use its programs and networks to assist analysts in a debiasing campaign. By mitigating bias in their valuation judgments, analysts can help investors to make better decisions, help market prices to reflect information more accurately, and help improve the allocation efficiency of the overall economy.

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Appendix A: Definition and derivation of free cash flow

This portion of the Appendix describes the connection, from first principles, between valuation and free cash flow streams. Consider an investor who thinking about entering into a financial transaction, on which he wishes to attach a valuation. A good question for him to ask is: "what is the stream of forecasted cash flows to me from this arrangement?" At some dates, the arrangement might call upon him to pay cash. At other dates, the arrangement might entail him receiving cash. The value of entering the transaction can then be regarded as the present value of the net cash flow stream.

For the sole owner of a firm, the value of maintaining ownership is based on the forecasted net cash flow stream from the firm. Those cash flows might be in the form of interest or dividends, which the owner receives from the firm. They might also be in the form of repayment of principal or share repurchases, which the owner receives from the firm. Or they might be new loans or new equity, which the owner pays to the firm. If for a given moment in time, we add up all of the cash flows the owner receives from the firm, and subtract all the cash flows the owner pays to the firm, we will arrive at the net cash flow from the firm to the owner. If we do this for all time periods, we obtain the owner's stream of net cash flows received from the firm.

Being the sole owner, the value to him of the firm is the present value of the expected net cash flow stream to him from the firm. And of course, the net

cash flows are after corporate tax. There are also personal income taxes to factor in to the analysis, but for simplicity let us put those aside.

The same principle applies when a group of investors owns a firm. The value of the firm is the present value of the net cash flow stream from the firm to them. And of course, the net cash flows are after corporate tax.

The definition of net cash flow to investors is not the same as the definition of free cash flow (either to the firm or to equity). However, if free cash flow is to serve as the basis for valuation, it must have a very close connection to net cash flow to investors. In order to develop this connection, consider a firm's sources and uses of funds. By funds I mean long-term securities, long-term debt and equity (including preferred shares). The traditional sources of funds are:

Sources of funds

- Net Income
- Depreciation
- Change in long-term debt
- New stock issue

where net income and depreciation correspond to internal financing, reflecting cash flows from operations after interest and tax, while the change in long-term debt and equity corresponds to external financing. The traditional uses of funds are:

Uses of funds

- Change in net working capital
- Investment (defined as the change in net fixed assets plus depreciation)
- Dividend payout

Notably, change in working capital includes all current assets and liabilities, including short-term debt and cash. Investment effectively corresponds

to cash flow from investment in the firm's statement of cash flows. Dividend payouts refer to all equity, both common and preferred.

In the above arrangement of sources and uses of funds, the various items are implicitly treated as having a positive sign. However, a negative sign alters an item's designation. For example, if new stock issue is negative, then the item denotes share repurchase rather than share issue, and so becomes a use of cash rather than a source of cash.

In order to balance its budget, total sources of funds must equal total uses of funds. This means that the sum of the items in the sources of funds group must equal the sum of the items in the uses of funds group, regardless of the signs of the items in these groups.

A little algebra will serve to transform the equality between sources and uses of funds into free cash flow to the firm. Doing the algebra will result in two groups, a top group that I will call "sources of free cash flow" and a bottom group that will turn out to be net cash flow to investors. So, here is the associated sequence of algebraic steps: Move "Investment" and "Change in net working capital" from uses to sources, and move "Change in long-term debt" and "New stock issue" from the sources group to the uses group, inserting minus signs. Then add "Interest" and "–Change in short-term debt" to both sources and uses. The end result of these operations is as follows:

Sources of free cash flow

Net Income

Depreciation

Interest

- Investment
- Change in net working capital
 - Change in short-term debt

Net cash flow to investors

Interest

Dividend payout

- Change in long-term debt
 - Change in short-term debt
 - = –Change in total debt
- New stock issue

The sum of Net Income, Depreciation, and Interest effectively corresponds to EBITDA(1–tax). Most importantly, notice that sources of free cash flow must equal net cash flow to investors; and the present value of the stream of expected net cash flow to investors is the fundamental value of the firm.

The concept sources of free cash flow is not quite the same concept as free cash flow to the firm. But it is close. The sum of net income and depreciation minus the operating working capital items represents the cash flow from operations (plus items pertaining to cash flows not related to operations). The addition of interest and subtraction of investment leads to terms that appear when defining free cash flow to the firm. Change in short-term debt cancels out, as it also appears with the opposite sign in the negative of change in net working capital. The only working capital item not yet mentioned is change in cash balance. This item is part of sources of free cash flow. Therefore, to obtain free cash flow to the firm from sources of free cash flow, simply sum the sources of free cash flow and the firm's cash balance. Effectively, free cash flow to the firm (FCF) is computed in the same way as sources of free cash flow, but leaves cash out of change in net working capital.

The present value of the FCF-stream is the sum of two present values. Specifically,

$$\begin{aligned} &PV(\text{expected FCF} - \text{stream}) \\ &= PV(\text{expected sources of free cash flow} - \\ &\quad \text{stream}) + PV(\text{change in cash-stream}) \end{aligned}$$

Implicit in this equation is that these streams are uncertain, and therefore the present value operator is applied to expected streams, discounted at a rate that reflects their associated risk. Because

sources of free cash flow equal net cash flow to investors, the present value of the sources of free cash flow-stream is the value of the firm. If the firm manages its cash efficiently over the course of its life, and eventually pays out all of its cash to investors, then the present value of its change in cash is just the negative of its initial cash position. Therefore,

$$\begin{aligned} &\text{Value of the firm} \\ &= \text{PV}(\text{expected FCF-stream}) \\ &+ \text{firm's initial cash holding} \end{aligned}$$

An important reason for developing the above relationships is to be clear about how the present value of the expected free cash flow stream relates to the fundamental value of the firm, with the latter being determined as the present value of the stream of expected net cash flow to investors. In this respect, notice that Investment refers to the change in all fixed assets, and therefore corresponds to cash flows from investment, not just its component Capex. In practice, Capex is often used in place of cash flow from investment to define free cash flow. This assumption can be problematic if the net present value associated with the expected incremental cash flows associated with other types of investments, such as mergers and acquisitions, is nonzero. Of course, this raises the issue of an altogether different type of bias than GOB.

Appendix B: A case study of two interactions

B.1 General issues

The existence of bias and the resistance to debiasing are part of human nature. Understanding how these issues apply to financial decision makers and financial markets is central to the study of behavioral finance.

In Section 8, I describe general impediments to debiasing at both the level of the individual and

the level of the organization. In particular, I suggested that these impediments apply to debiasing by security analysts, although certainly not to analysts alone. In this part of the Appendix, I describe two of my interactions with the CFA Institute which I suggest illustrate how resistance to debiasing, both generally and specifically with reference to GOB, has occurred in practice. These interactions are intended to serve as a case study for identifying different facets in the bias/debiasing dynamic, such as confirmation bias, groupthink, and cognitive dissonance.

B.2 First set of interactions

The first set of interactions occurred in conjunction with a CFA Institute educational conference, titled *Equity Research and Valuation Techniques*, which took place in Boston, MA on December 7–8, 2006. I was invited to make a presentation at that conference, and chose to describe a series of behavioral issues about asset pricing and valuation techniques that were part of my research, including biases in analysts' use of specific techniques.

The subject of biases in the use of free cash flows was the first topic in my presentation. I drew the material for this discussion from Shefrin (2007a), including my remarks about GOB. As an illustration, I discussed the 2003 Morgan Stanley analyst report on eBay. In this regard, I pointed out that the lead analyst on eBay was Mary Meeker, one of the most admired analysts on Wall Street.

My case study on eBay discussed the fact that besides the free cash flow-based DCF methodology, the Morgan Stanley analyst team had used a number of price multiple-based valuation heuristics. In my CFA presentation, I mentioned my having documented in Shefrin (2007a) a series of biases in the Morgan Stanley team's application of these valuation techniques. In noting

that Mary Meeker was the lead analyst on this report, I suggested that if someone of her caliber and reknown produced a report that reflected important biases, then there was reason to ask whether analysts were generally vulnerable to these biases, with GOB among them.³⁰ I also discussed the academic literature suggesting that analysts' target prices were inconsistent with particular features in the Fama–French multifactor pricing model.

The CFA Institute records and publishes conference presentations, and my December 2006 presentation appeared as Shefrin (2007b). In the course of preparing the manuscript of my contribution, the CFA Institute included the discussion about the Fama–French model, but chose to omit the portion of my discussion about biases in the use of free cash flows and heuristics based on price multiples. The omission surprised me, and when I asked about it, was directed to one of the authors of the AIMR³¹ volume on equity valuation (Stowe *et al.*, 2002), henceforth SRPM, whose cover states was produced for the general CFA program.

As far as I could tell, the SRPM author contended that biases pertaining to free cash flows and price multiples which I described in my presentation did not apply to the discussion in SRPM.³² Although I was unfamiliar with SRPM, the CFA Institute sent me a copy. I noticed that the volume contained no discussion of the Fama–French multifactor model, but did have an extensive discussion about free cash flows and price multiples. I also noticed that the relevant portions of SRPM did not discuss the connection between PVGO and free cash flow-based valuation analysis, and therefore did not address GOB.

In the end, the SRPM author and I had a cordial exchange about the nuances of free cash flow-based valuation, but I was unsuccessful in my goal of raising awareness about recognizing and

addressing biases such as GOB. In my view, the CFA Institute circled their wagons and excluded from Shefrin (2007b) my comments about valuation biases associated with free cash flow analysis and price multiples. I suggest that confirmation bias and cognitive dissonance prevailed.

B.3 *Second set of interactions*

The second set of interactions came seven years later, when I began to update the Morgan Stanley case on eBay from Shefrin (2007a). I discovered that more recent Morgan Stanley reports had abandoned the bias prone ratio-based techniques that I discussed in Shefrin (2007a). However, the technique Morgan Stanley analysts were using for free cash flow-based DCF valuation, with its susceptibility to GOB, was largely unchanged. This led me to think about writing the present paper, to focus on GOB.

I considered submitting the paper to the *Financial Analysts Journal (FAJ)*, as a way of communicating the ideas about GOB efficiently and directly to the analyst community. By this time, the AIMR equity valuation volume had been updated (Pinto *et al.*, 2010), henceforth PHRS. I noticed that still absent was a discussion about how to mitigate GOB in free cash flow-based valuation methodology.

I wrote an initial draft of this paper and circulated it among a few academic colleagues for comments. In particular Aswath Damodaran, a well recognized expert on valuation, read the draft, agreed with the main points, and made a series of suggestions about what I might improve, which I incorporated. Damodaran had also identified a series of biases in the use of valuation techniques by analysts (Damodaran, 2013). See also Bradshaw (2004), Bradshaw and Brown (2006), Gleason, Johnson and Li (2013), and Dechow and You (2014).

Recalling my previous interactions with the CFA Institute on the topic of biases associated with free cash flow-based DCF valuation, I sent a draft of the paper to the (then) editor of the *FAJ*. I reminded him of these interactions, writing:

“[B]ecause there is strong evidence that analysts continue to exhibit the same biases I described seven years ago, I’ve decided to write a short paper on one specific aspect of this issue.”³³

Recalling that the editor had responded to my past inquiries about Shefrin (2007b) by directing me to the author of SRPM where I felt resistance (if not stonewalled), I explained that I was requesting direct engagement on his part in respect to the argument. To lay the groundwork for future dialogue, I indicated that I was “planning to submit” the paper to the *FAJ*, which I thought was a logical outlet, asked for his help in securing a high quality referee should I choose to submit, and concluded by writing: “[M]y main request is that you have a full understanding of this paper in order to judge the quality of referee reports that come in. I would like to be sure that if negative reports do come in, and I am convinced that the reports are in error, that you and I can have an honest, detailed exchange about the merits of the case.”

The editor responded to say: “Thanks for sharing your article. I appreciate that you’ve taken such great care to build your case. I will have a look and get back to you in a few days with any guidance.”

When the editor did get back to me, his message read: “Here are comments from an *FAJ* EB member. As you can see, the reviewer is rather cool to it for *FAJ*. Not sure how to suggest you proceed with it. Perhaps a revision could address the concerns.” The reviewer’s comments were attached to the message.

I found the editor’s reply to be peculiar, in that I had not submitted the paper for review. Instead I had sent a rough draft and was seeking guidance

about laying the groundwork for a future submission. I began to wonder about whether this message reflected the first step in a wagon circling process that aimed to resist acknowledging the presence of GOB, and the need to engage in debiasing.

I responded to the editor’s message, pointing out I had not intended for the paper to be sent to a reviewer, but instead to serve as the basis for a discussion between the two of us about laying groundwork for a submission. Nevertheless, I did communicate my reaction to the issues raised by the reviewer in his (or her) “cool” review.

The reviewer was critical of Section 3, which develops the zero PVGO growth rate condition, Equation (8). In respect to Equation (7) for the terminal value of a firm at date T , the reviewer stated that this claim “is inadequately demonstrated.” Because Equation (8) follows immediately from Equation (7), this last issue is clearly central to the main point of the paper. The reviewer also objected to comments I had made about the failure of SRPM and PHRS, the CFA volumes on equity valuation, to attach sufficient emphasis to GOB.

Equations (1) through (7) are standard textbook relations. I include them in the paper partly as review, and partly to develop the argument leading to Equation (8). I note that the relation that the reviewer characterizes as being inadequately demonstrated actually appears in Damodaran (2012). See Footnote 8.

The fact that the reviewer is a member of the editorial board of the *FAJ* struck me as worrisome. Specifically, the reviewer’s comment about Equation (7) supports, if not proves, my point that analysts generally lack a thorough understanding of valuation principles.

I wrote back to the editor expressing these concerns about the reviewer’s comments, but also

to say the following: “I have a pretty good idea about how to proceed. But first, I want to hear from you. Do you disagree with anything I have said? If so, please tell me what, so we can engage in an exchange. If not, how would you handle a revised version of what I sent you previously, which addresses points made by the reviewer that are germane ...”

Several days later I received the following message from the editor: “I thank you for your willingness to put pen to paper and we do value your thinking of *FAJ* as an outlet for your work. I am sorry that our decision is not what you expected. The referee (a different one than before) raises valid concerns that I am not comfortable overruling. We truly thank you for considering *FAJ* as an outlet for your research and we wish you all the best your research effort.” This message arrived without an attachment or a description of specific concerns raised by the second reviewer.

Not having formally submitted the paper to the *FAJ*, I found this message to be peculiar. In an email response, to which I received no reply, I wrote the following: “The draft I sent to you was for discussion purposes only, between us, not for submission. Can you help me to understand why you sent the paper out instead of engaging with me directly on the issues? Can you also help me to understand why you chose to send the paper out to a second referee, and why you chose not to communicate to me the concerns that you are not comfortable overruling?”

In a last attempt at communication, I approached a highly respected professional who has long been associated with AIMR and the CFA Institute. He is also the CEO of an asset management firm that employs analysts. We briefly discussed my interaction with the editor, I expressed my concern about being stonewalled, he read the paper, and was kind enough to contact the editor. I received back the following message from him:

I had a fairly long phone conversation with [the editor]. He walked me through the governance process, which seemed very thorough and fair. Naturally, he was adamant about keeping the specific names of reviewers private. I was convinced that you got a fair treatment by the review process.

While knowing that my expertise on DCF and the intricacies of calculating it is less than sophisticated, I did go through the piece and proved to myself just how basic my knowledge is. So, I passed it on to an analyst here and he came back with the comment, “not much to argue with here, perhaps other than nitpicking.”

So, that’s where it stands. Sorry I was so long getting back to you. I did not hit the proverbial brick wall; [the editor] was very congenial, but firm.

Keep in mind that cognitive dissonance involves the reaction to holding simultaneous and conflicting views. Confirmation bias involves overweighting evidence that confirms one particular view; and groupthink involves overweighting evidence that supports the views of a group leader. These psychological concepts came to my mind as I read the above message discussing my attempt to raise issues concerning analysts’ understanding of valuation methodology along with their collective resistance to debiasing by circling the wagons.

In an email response, to which I received no reply, I mentioned the following:³⁴ “[O]n the issue of governance, I’m confused. Why was there a review process, when I didn’t submit the paper to the *FAJ*? I only sent [the editor] a rough draft for his personal guidance about framing the paper. That draft was in no shape to be formally reviewed.”

B.4 Lessons learned and going forward

The general themes involving bias and impediments to debiasing are easy to state. People are imperfect and are subject to a series of cognitive biases. Such biases are deep and persistent. Professionals and experts are not immune to biases. Mitigating bias is easier said than done. Professionals might be especially resistant to debiasing

if they feel that recognizing bias is a threat, calling into question their expertise. It is on this last point that the forces of confirmation bias, cognitive dissonance, and perceived self-interest converge with the goal of resisting debiasing.

The main topic of this paper, GOB, is but one bias affecting security analysts. Analysts are experts in valuation, and therefore I would argue highly susceptible to confirmation bias and groupthink, cognitive dissonance, and perceived self-interest. Together these phenomena impact group psychology in the analyst community generally, and the CFA Institute in particular.

In describing the interactions above, my intention is to help analysts recognize their susceptibility to bias, and to motivate them to begin the process of debiasing. Applying Equation (8) to their free-cash flow-based valuations would be a good first step.

Notes

- ¹ For completeness, Appendix A defines free cash flow and explains how to compute the value of a firm based on its expected free cash flow stream.
- ² Higgins (2011) defines free cash flow as $EBIT(1 - \text{tax rate}) + \text{depreciation} - \text{capital expenditure} - \text{change in net working capital}$. An alternative definition of free cash flow is cash flow from operations + interest - cash flow from investment (where the latter term being positive means cash outflow).
- ³ I thank Aswath Damodaran for this point and for the following comment: "Many companies hit stable growth before they hit zero excess returns. Coca Cola, Exxon Mobil and Toyota are all mature, stable growth companies with positive excess returns. You can always stretch out growth periods until you hit zero excess returns but that would require growth periods of 30 years or longer. I think it does make sense to allow for some excess returns. (I have a rule of thumb of no more than 4–5%)." The latter comment about positive excess returns applies to the 20% of firms with positive PVGO during the terminal period.
- ⁴ Equation (1) is a generalization of the Gordon formula for the value of a firm's equity as the present value of

its expected dividend stream, assuming that expected dividends grow at a constant rate.

- ⁵ For a firm financed with both debt and equity the condition underlying $PVGO > 0$ is that expected $ROIC > k$.
- ⁶ EBITDA is an acronym for earnings before interest, tax, depreciation, and amortization. Defining free cash flow as the sum of cash flow from operations, interest, and cash flow from investment (which is negative for cash outflows) leads to the valuation of the firm as the present value of the expected free cash flow stream and existing cash balance.
- ⁷ Interest is zero for an all equity firm, but I use this notation for consistency. Below, I generalize the analysis to firms financed by both debt and equity.
- ⁸ See Damodaran (2012) for a good discussion of the preceding equations and issues pertaining to growth rates. Damodaran uses the notation $EBIT(1 - t)$ for EBI, where t is the tax rate, with the right-hand side of Equation (7) expressed as $EBIT(1 - t)/\text{Cost of Capital}$, with the numerator time stamped at date $n + 1$, and the denominator time stamped at date n . This discussion appears in Chapter 4 in the section entitled "I. Characteristics of Stable Growth Firm," in subsection "d. Reinvestment and Retention Ratios."
- ⁹ Here working capital is understood as referring to operating items, meaning items that appear in Cash Flow From Operations.
- ¹⁰ Higgins (2011) points out that a firm whose growth rate is zero in the terminal period has zero values both for Net Capex of zero and the change in net working capital. Equation (8) confirms that when these two terms are zero, the value of g will also be zero.
- ¹¹ A common assumption in practice is that a firm will grow at the same rate as the economy during the terminal period, a condition that can be consistent with zero PVGO. In this regard, keep in mind that growth opportunities are conceptually different from earnings growth. Earnings can grow at the same rate as the overall economy without implying anything in particular about PVGO. For an all-equity-financed firm, $PVGO > 0$ when expected $ROE > k$. Moreover as indicated by Equation (4), sustainable growth is the product of ROE and the retention (plowback) ratio. Therefore, for a sufficiently low retention ratio, g can be below the growth rate of the economy even though PVGO is positive.
- ¹² eBay was almost entirely equity financed, and therefore the discussion focused on ROE and the cost of equity capital.

- ¹³ In the 2003 report, the forecasted 2010 value of EBITDA was \$4.92B. For 2010, forecasted tax was \$1.74B and forecasted Capex was \$1.9M. Because the report does not provide a forecast for depreciation and amortization, for sake of illustration I take forecasted 2010 depreciation and amortization to be 52% of Capex, which is \$95M. Therefore $EBI = EBIT - tax = EBITDA - tax - depreciation \text{ and amortization} = 4.92B - 1.74B - 95M = 3.14B$. The 2010 forecast of FCF was \$3.05B. To compute Equation (8), $g = k[EBI - FCF]/EBI$, use $k = 12\%$; the values for EBI and FCF should be for 2011, not 2010. However, both FCF and EBI are assumed to be 7% higher in 2011 than in 2010, so that for 2011 $EBI = \$3.36B$ and $FCF = \$3.26B$. Computing g using Equation (8) gives $g = 12\%[3.36 - 3.26]/3.36 = 0.3\%$. Although the above assumption about depreciation is for illustrative purposes, I note that lower values of depreciation lead to increased values for EBI. But even with depreciation assumed to be zero, g still computes out at 1%. Terminal value at the end of 2010, associated with $g = 0.3\%$, is as follows: $FCF \text{ in } 2011/k - g = 3.26B/(0.12 - 0.003) \approx \$28B$. The terminal value in this illustration, \$28B, is a bit higher than the value I used in Shefrin (2007a). The same terminal value, \$28B, is achieved using Equation (5), with EBI as the numerator. That Equations (5) and (8) provide the same terminal value serves as a consistency check.
- ¹⁴ Doing so would permit an explicit specification for the rate of decay in growth opportunities.
- ¹⁵ The Morgan Stanley valuation is actually closer to the April 2003 market valuation than to my illustrative zero PVGO illustration. In this regard, proponents of behavioral finance point out that it might take a long time for the difference between market price and fundamental value to converge to zero. And the free cash flow-based DCF methodology focuses on estimating fundamental value. The 2003 report also relies on other ratio-based valuation heuristics, for example, involving PE and PEG. However, these two ratio-based techniques actually implied that eBay's stock was overpriced at the time, not underpriced as the free cash flow-based valuation implied. In Shefrin (2007a) I suggest that the 2003 Morgan Stanley free cash flow forecasts for eBay were excessively optimistic, which naturally leads to upward bias in the estimate of terminal value and therefore the value of the firm. In April 2003, I noted that *The Wall Street Journal* ran an article criticizing the Morgan Stanley forecasts as being excessively optimistic. Figure 1 illustrates the point.
- ¹⁶ A comparison of the 2003 report and 2010 report shows that the 2003 estimates of Capex for the period beginning in 2006 were about one-third of their actual values. The 2010 report does not provide clear details about forecasts for depreciation and amortization. Because of the acquisitions of PayPal and Skype, the ratio of depreciation and amortization to Capex was above 1 for 2008 and 2009, a ratio which was non-sustainable in the long-term. Therefore, I continue to apply the same 52% value for the depreciation-to-Capex ratio as the 2003 analysis. Notably, the analysis for 2013 below uses 52% for the ratio, which is consistent with the forecasts made in 2013. For completeness, I would point out that the forecasts of Capex in the 2010 report for the period 2011–2012 were about 57% of the actual values. The forecasts of Capex in the 2010 report for the period 2013–2013 were about 34% of the forecasted values in the 2013 report.
- ¹⁷ In Shefrin (2007a) I discussed the comments of analyst Safa Rashtchy, who in 2005 revised downward the overly optimistic forecasts that he made for eBay in 2003. His revision is supported by Figure 1, illustrating Morgan Stanley analysts' 2010 revisions of the overly optimistic long-term free cash flow forecasts they made in 2003.
- ¹⁸ I also examined all reports on eBay available on the Thomson database for the 90 days prior to November 28, and reach the same general conclusions.
- ¹⁹ My use of eBay is intended to illustrate the application of Equation (8). Below I discuss GOB in respect to other firms.
- ²⁰ Although not the key issue under discussion, it strikes me as interesting that the target prices for both groups of analysts are in the vicinity of the median and mean target prices.
- ²¹ Target prices are not necessarily the same as fundamental value. As I mentioned above, proponents of behavioral finance argue that although price reverts to fundamental value in the long run, the convergence might be slow.
- ²² Coca Cola is one of the firms in Damodaran's 20% group.
- ²³ I chose these firms as random representatives of different industries. A separate file listing all the reports I downloaded from the Thomson database for this paper is available from the author upon request.
- ²⁴ Morningstar covers almost all of these firms, and provides estimates of future free cash flows. Their reports have a section on valuation methodology which states "our estimate of the stock's intrinsic value based on a

- discounted cash-flow model ...” Although the reports describe Stage I, Stage II, and Stage III components for DCF valuation, I was unable to locate details of the computations, and could not ascertain whether the DCF methodology was applied to free cash flows, at what point the terminal period begins, and what are the assumptions that underlie terminal value.
- ²⁵ DCF stands for discounted cash flow. Some analyst reports provide partial information about their DCF methodologies. For example, an S&P IQ report dated November 7, 2013 on Sony states: “Our 12-month target price of \$20, about 22X our FY 15 EPS estimate, is derived from our discounted cash flow model, which assumes a weighted average cost of capital of 10.4% and a terminal growth rate of 3.0%.”
- ²⁶ This is one of the several examples of a free cash flow-based DCF valuation I could find in the Thomson search for reports on the list of mainline companies mentioned above. Also discussed in this section are a Leerink Swan Report on Aetna dated November 18, 2013, an Indigo report on Microsoft dated October 27, 2013, an Indigo report on Hewlett-Packard dated November 27, 2013, an Indigo report on Cisco Systems dated November 14, 2013, an RBC report on Cisco Systems dated November 14, 2013, and a J.P. Morgan report on Microsoft dated November 8, 2013. None of these reports provide information on EBI during the terminal period, which is necessary for the computation of Equation (8). The J.P. Morgan report on Microsoft assumes a terminal growth rate of 5%, and a cost of capital of 10%. The RBC report on Cisco Systems, dated November 14, 2013, mentions a DCF valuation with $k = 12%$ and $g = 2%$, but does not provide details. A J.P. Morgan report on Hewlett-Packard, dated November 18, 2013 is titled “Making Minor Cuts but Keeping Dec 2014 Price Target of \$29; Free Cash Flow Remains Key Topic,” but does not provide a free cash flow-based DCF valuation.
- ²⁷ In the BMO valuation, the terminal period begins in 2024, $FCF = \$8,887M$, $k = 8.4%$, and $g = 1.5%$. The report does not provide a direct forecast for EBI. However, it does provide estimates for net income, and debt, which allows for EBI to be imputed subject to an assumption about the prevailing long-term rate of interest on Merck debt. For sake of argument, take this to be 10%, which is relatively high, and therefore biases the estimate of g from Equation (8) also to be high. Terminal value net income (at $T + 1$) is forecasted to be \$7,431M, and total debt is forecasted to be \$8,475M.
- ²⁸ Confirmation bias is the tendency for people to overweight evidence that offers confirmation of views they either hold or are testing, and to underweight evidence that offers disconfirmation. In groupthink, members of a group feed each other views and information to confirm a particular option, usually one being promoted by a single member such as the group leader.
- ²⁹ Cognitive dissonance is experienced by individuals who simultaneously hold two or more contradictory beliefs. Cognitive dissonance theory predicts that people experiencing cognitive dissonance will choose to hold beliefs or take actions to minimize the discomfort associated with dissonance. In particular, people are predicted to avoid situations and information that would likely result in increased dissonance.
- ³⁰ My sense is that this statement from my presentation drew the most resistance.
- ³¹ AIMR is the Association for Investment Management and Research, the research arm affiliate of the CFA Institute.
- ³² Confirmation bias is to be understood with reference to evidence confirming or disconfirming the statement I mentioned in Footnote 30. I think about this line of reasoning in terms of an analogy to physician hand washing. The analogy would feature a debate between me and medical school faculty about physicians washing their hands between patients. My point would be that physicians have a bias against washing their hands between every pair of patients. The medical faculty response would be that medical textbooks mention hand washing, so that my criticism is invalid. I would agree somewhat, but contend that confirmation bias is at work because the textbooks do not describe the cost of failing to wash, do not urge physicians to wash between every pair of patients, and do not provide techniques to help overcome natural biases against washing. In respect to SRPM, I inferred that the author was suggesting that analysts could not be subject to the systematic biases in respect to free cash flow-based valuation which I had identified because the topics are well covered in SRPM.
- ³³ My sense is that this statement met with resistance by the then editor at the *FAJ* and the reviewers he asked to read my draft. Confirmation bias is to be understood with reference to evidence confirming or disconfirming this statement, and is related to the point I made in Footnote 32.
- ³⁴ In the context of confirmation bias, this statement pertains to disconfirming information.

