Mark Mitchell
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Using NPV to Make Investment Decisions

"Our ultimate financial measure, and the one we most want to drive over the long-term, is free cash flow per share. Why not focus first and foremost, as many do, on earnings, earnings per share or earnings growth? The simple answer is that earnings don't directly translate into cash flows, and shares are only worth the present value of their future cash flows, not the present value of their future earnings."[1]

Measuring Cash Flows

Cash flows versus some measure of revenue, profits, etc., is what ultimately matters to shareholders. As Jeff Bezos stresses in Amazon's *2004 Letter to Shareholders* that I have excerpted above, "shares are worth only the present value of their future cash flows, not the present value of their future earnings." In contrast, corporate management, and the business media, among others, often tend to fixate on earnings per share as the optimal metric for corporate financial performance. This lecture note highlights differences between cash flows versus earnings, and shows that while these measures are generally the same in terms of direction, they can yield starkly divergent recommendations about which projects to move forward on.

Having a focus on cash flows, and then discounting them correctly, is essential for a company. The point is not about a company's ability to proceed mechanically through the formulas and mathematics -- it is

[1] *2004 Amazon Annual Letter to Shareholders*. Bezos' annual shareholder letters are a great read. They are available on the investor relations section of Amazon's website. Two of Amazon's shareholder letters are included at the end of this lecture note, the 2004 letter and the inaugural 1997 letter. The 2004 letter discusses a fictional project which this lecture note focuses on. The 1997 letter is a must read for a variety of reasons.

about understanding the risk and return. On the risk side, it is about disentangling the systematic risk from the idiosyncratic risk, in order to compute the cost of capital. This is not to downplay idiosyncratic risk -- it is relevant to corporate management in their decision making. It's just that idiosyncratic can be diversified away for free by the investor base and thus should not enter the cost of capital calculations.[2] On the return side -- the expected future cash flows -- the keyword is ***EXPECTED***. The point is that companies do not merely estimate cash flows, they estimate expected, or unbiased, cash flows. In other words to properly value a project, we need to provide our best estimates of probabilities associated with all future states of the world, positive and negative. The NPV calculation is useless if forecasts of cash flows are biased, either high or low. While it is important as a corporate manager to optimally respond and have contingencies in place for both good and bad outcomes, one should not think of certain states of the world as the only likelihood.

In practice, the estimating cash flows is a difficult assignment, as the financial models can be overly complicated, with dozens of assumptions which can end up influencing the resulting valuation. For example, it is important to have estimates of product demand, of supply costs, of competitor behavior, of macro influences, etc., and these estimates can all involve considerable error. It is difficult to estimate even one year out. But the difficulty in estimating cash flows compounds as one looks at even more distant time frames. It is crucial to keep this complexity in mind as you look at the simple example below illustrating the calculation of cash flows. The objective is to provide an intuitive and basic framework. But keep in mind that it is far more complicated in practice to obtain realistic and unbiased estimates.

Corporate finance textbooks tend to be overly simplistic in their illustration of NPV. But at the other extreme, a full-blown coverage of NPV via a real-world example provides way too many complexities. These may be important for the decision maker, but they can detract in terms of presenting a clear illustration of the material in a textbook. It is impossible to achieve both simplicity and yet capture the complexity of a real world example. Below, I adopt a fictional example used by Jeff Bezo in Amazon's *2004 Annual Letter to Shareholders*, with additional modifications to add some additional features into the analysis. Though the Amazon NPV example is fictional, note that it is the sole focus of the 2004 shareholder letter, and thus was seen as high priority by Bezos. Below is my adaptation of the example.

The Amazon shareholder letter considers a firm that invents a machine which can quickly transport people from one place to another.[3] While the machine has already been invented, it will cost $160 million to

[2] This is a critical point. Idiosyncratic risk is important in a lot of contexts, just not that important with respect to calculating the cost of capital for corporations with well-diversified investors. Of course, this does not mean that corporate managers in the real world ignore idiosyncratic risk with respect to the cost of capital and many managers employ fudge factors which increase their cost of capital estimates due to idiosyncratic risk, say the risk of drilling a dry well in oil exploration.

[3] While it is not obvious what kind of travel machine Jeff Bezos had in mind, the example reminds us of his intense interest in space travel. Interestingly, while the world is now starting to pay more attention to Blue It is worth noting that Bezos founded his Blue Origins space travel firm over twenty years ago in 2000. At some point, Bezos expects Blue Origin to generate positive cash flows, but that could easily be another decade or two away -- perhaps even longer.

build. On the other hand, it can generate revenues immediately. The machine will have the capacity to transport 100,000 people annually. It has a useful life of only four years, as it will become surpassed by newer and better machines. Amazon further assumes that to grow earnings, it will invest more capital to buy additional machines in Years 2 through 4, each of which will have the same attributes as the initial travel machine.

Amazon believes there will be high demand for the new travel machine, and management forecasts it will sell at full capacity of 100,000 customer trips annually, at a price of $1,000. Each trip will cost Amazon $500 -- $450 for energy and materials and $50 for labor and other expenses. For accounting purposes, Amazon will depreciate the machine via the straight-line method over its four-year useful life. Assume a corporate tax rate of 25% (Bezos assumed a world without taxes). Also assume that net working capital (NWC) is necessary to operate Amazon's new travel machine, whereas Bezos simplified the process and assumed zero NWC.[4]

Table 1 displays the income statement for Amazon's travel machine. The profits before taxes are $10 million in Year 1 and increase to $80 million by Year 4.

> "It's impressive: 100% compound earnings growth and $150 million of cumulative earnings. Investors considering only the above income statement would be delighted. However, looking at cash flows tells a different story." *2004 Amazon Letter to Shareholders*.

The Amazon shareholder letter makes the point that while earnings accelerate at a rapid rate during the first four years, cash flows over the same period are sharply negative. (Note: by focusing on only the first four years, the Amazon letter overstates the divergence between earnings and cash flows, as a major reason for the divergence is simply a timing issue.[5] In order to compute the overall NPV of the space travel project, it is important also to include Years 5-7, which capture the benefit of subsequent investments in the new machine.)

[4] To be clear, Bezos does not downplay the notion of accounting for net working capital, rather, stresses the importance of Amazon's cash generative operating cycle. Bezos points out that Amazon turns its inventory quickly, thus maintaining relatively low levels of inventory, and receives payments from customers before paying vendors. In contrast, many corporations maintain high levels of inventory and pay their suppliers before receiving payment from their customers.

[5] Note, this is not a criticism of the Amazon letter. Rather, Bezos was attempting to make an important point in terms of comparing cash flows to profits, with the goal of simplifying his explanation as much as possible, given the wide readership base of Amazon stockholders.

Table 1 – Discounted Cash Flow Analysis (in millions)

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Revenue		100.0	200.0	400.0	800.0	700.0	600.0	400.0
- Energy & Materials		45.0	90.0	180.0	360.0	315.0	270.0	180.0
- Labor & Other		5.0	10.0	20.0	40.0	35.0	30.0	20.0
- Depreciation		40.0	80.0	160.0	320.0	280.0	240.0	160.0
= Profit Before Taxes		10.0	20.0	40.0	80.0	70.0	60.0	40.0
- Corporate Taxes		2.5	5.0	10.0	20.0	17.5	15.0	10.0
= Profit After Taxes		7.5	15.0	30.0	60.0	52.5	45.0	30.0
+ Depreciation		40.0	80.0	160.0	320.0	280.0	240.0	160.0
- CAPX	160.0	160.0	320.0	640.0				
- Change in NWC	5.0	5.0	10.0	20.0	-5.0	-5.0	-10.0	-20.0
= CF	-165.0	-117.5	-235.0	-470.0	385.0	337.5	295.0	210.0
FVF	1.00	1.12	1.25	1.40	1.57	1.76	1.97	2.21
	-165.0	-104.9	-187.3	-334.5	244.7	191.5	149.5	95.0

The revenue doubles in Year 2, Year 3, and Year 4, respectively, due to Amazon's investment in additional travel machines. Given the assumptions in the Amazon stockholder letter, the after-tax profits also double in Year 2 through Year 4. Starting in Year 5, the profits decline annually due to the decommissioning of the machines at the end of their four-year life. The last period of profits is Year 7. In total, the space-travel project yields $240 million of after-tax profits.

While the travel machine investment is expected to generate attractive earnings growth, investors are unable to reinvest or spend earnings; rather, cash flows are the ultimate driver of shareholder wealth creation. A few adjustments are needed to convert after-tax profits to cash flows. The first adjustment is for the depreciation of the underlying investment. As noted above, Amazon assumes the equipment has a four-year useful life and employs straight-line depreciation over that period. Thus, the depreciation is $40 million in Year 1 with respect to the initial $160 million space-travel investment and we add this $40 million in depreciation expenses back to the Year 1 after-tax profits. Depreciation is added back to after-tax profits since it is not a cash flow per se; instead it impacts cash flow via a reduction in taxes, given that depreciation is treated as an expense for accounting purposes.[6]

Amazon used the straight-line method of depreciation to simplify the analysis. In practice straight-line depreciation is often employed for the accounting statements, but corporations use accelerated depreciation to maximize the present value of the tax benefits from depreciating capital expenditures (CAPX) such as the travel machine investment. The Tax Reform Act of 1986 allows corporations to accelerate depreciation over a period which is less in length than the actual projected life of the investment, allowing them to frontload the depreciation. Since the Tax Reform Act of 1986, and typically in response to a recessionary period, Congress has provided bonus deprecation, which is even more

[6] Rather than calculating profit after taxes and then adding back depreciation, one can compute an operating cash flow in which depreciation is not deducted. Here, the operating cash flow is equal to revenue – cash expenses – taxes. Either way ends up at the exact same answer of the underlying cash flows.

accelerated. Most recently, the Tax Cuts and Jobs Act of 2017 allows corporations to deduct 100% of the investment cost for property with an expected life of 20 years or less. It ran through 2022, and began to sunset afterward, reverting in 2027 back to the permanent tax rulesstipulated by the 1986 Tax Reform Act.

The second adjustment in Table 1 is to subtract the CAPX from the after-tax profits. As indicated above, CAPX is a cash outflow that doesn't fully hit the income statement simultaneous with the investment. I asssume that the CAPX takes place at the beginning of the year for discounting purposes, which in effect occurs at the end of the prior year. Thus, for the $160 million machine which generates revenue in Year 1, assume the actual CAPX occurs in Year 0, which is effectively the beginning of Year 1. Table 2 provides the depreciation schedule for the investment in travel machines. Though not required, I find it useful to create a depreciation schedule which tracks the book values of CAPX over its useful life. As shown in Table 2, the book value of the travel machines increases to $1 billion at the end of Year 3 and is completely written off by the end of Year 7, with the final cash flows.

Table 2 – Depreciation Schedule (in millions)

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Beginning of Year Book Value	0.0	160.0	280.0	520.0	1000.0	680.0	400.0	160.0
+ CAPX	160.0	160.0	320.0	640.0				
- Depreciation		40.0	80.0	160.0	320.0	280.0	240.0	160.0
End of Year Book Value	160.0	280.0	520.0	1000.0	680.0	400.0	160.0	0.0

The third adjustment in converting after-tax profits to cash flows is to account for changes in net working capital (or NWC). For our purposes, NWC consists of cash required for operations, accounts receivable, and inventory, minus accounts payable. Increases in cash required for operations, accounts receivable and inventory result in higher net working capital, whereas increases in accounts payable reduce NWC. The income statement does not capture changes in NWC, so we adjust for changes in NWC below the net income line. For example, suppose the first-year revenue for a company was solely in accounts receivable, none of which had been converted to cash by the end of the company's fiscal year. While the income statement treats the accounts receivable as revenue for the year, an adjustment to net income is necessary to reflect the fact that the accounts receivable had not yet been paid since the cash had not yet been received. Likewise, the payment for purchased inventory is a negative cash flow which doesn't hit the income statement. Typically, NWC increases as revenue climbs in subsequent years and converts to cash flow when the project or venture terminates. As discussed in the *Financial Forecasting* lecture note, extraordinary increases in revenue can cause sharp short-run reductions in cash, and thus the need for new financing due to the additional NWC.

Most cash flow models prepared by investment bankers and other Wall Street professionals tend not to include cash in their NWC estimates. That is, they assume all cash held by the corporation is excess cash when computing estimates of firm value. This assumption is often reasonable, in that the required cash for operations tends to be low relative to the total cash held in the corporate coffers. However, conceptually, and in those cases where a relatively high level of cash is necessary to maintain existing operations, we should think of the required cash on hand as being part of NWC.

As noted earlier, the Amazon shareholder letter omitted changes in NWC in its adjustment from after-tax profits to cash flows, most likely to simplify the analysis. I assume the travel machine will require 5% of revenue for NWC. Thus, for revenue of $100 million in Year 1, the NWC requirement is $5 million, in advance of the revenue realized. We can think of this $5 million as an up-front investment in Year 0, along with the $160 million CAPX, for a total negative cash flow in year 0 of $165 million. Table 3 below displays the NWC, and the change in NWC, for the travel machine investment. As with the CAPX schedule, I find it is often helpful to have a separate NWC schedule, which then feeds into the cash flow schedule. As shown below in the travel machine example, the NWC increases through Year 3, resulting in negative cash flows over this period, leading to a reduction in NWC. And it increases in cash flows for the remainder of the project's life. And as of the end of Year 7, the NWC reverts back to zero.

Table 3 – Net Working Capital Schedule (in millions)

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
NWC	5.0	10.0	20.0	40.0	35.0	30.0	20.0	0.0
Change in NWC	5.0	5.0	10.0	20.0	-5.0	-5.0	-10.0	-20.0

The three adjustments (adding back depreciation, subtracting CAPX, and subtracting the change in NWC) to the after-tax profits yields cash flows. For example, the cash flow in Year 1 is -$117.5 million, versus profit-after-taxes of $7.5 million. Here, the major source of the difference between profits and cash flows is the purchase of additional machines at a cost of $160 million at the end of Year 1, which generates revenues in Years 2-5. The cash flows are negative through Year 3, during the investing phase, and positive during Years 4-7.

The total net cash flows during Years 0-7 is $240 million, the same as the total for after-tax profits over the same period. However, the timing of the cash flows over the life of the travel machines is far different than that of the after-tax profits. The next step is to discount the cash flows through time. The discount rate reflects the time value of money, for which we used the risk-free rate, and a risk premium, accounting for the fact that the travel machine cash flows are not known with certainty. In this case I used a discount rate of 12.0%, the rate used in the Amazon shareholder letter. We will focus on the computation of the discount rate in *The Cost of Capital* lecture note.

The next step is to convert the cash flows over time to discounted cash flows, using the discount rate of 12.0%, by dividing the cash flow in each year by the corresponding future-value factor. For Year 0, which is the equivalent of today, the future-value factor is simply 1.0. The Year 1 future-value factor is 1.12. Due to compounding, the Year 2 future-value factor is 1.25, and so forth.[7] The total of the discounted cash flows for the travel machine project yields a net present value (NPV) of -$111.2 million. In other words, the project is expected to reduce overall shareholder wealth by $111.2 million. And this is the important point

[7] Alternatively, we could divide 1.0 by the future-value factor to obtain the present-value factor. Thus, for Year 1, the present-value factor would be 0.89 (1 / 1.12). The present-value factor measures the present value of a dollar received in a future year. If we take this approach, we then multiply the cash flow each year by the corresponding present-value factor.

made by Jeff Bezos in his *2004 Amazon Letter to Shareholders* -- that a seemingly good project which might lead to high earnings growth does not necessarily increase wealth for the corporation's shareholders.

The travel project, as discussed above, is representative of many projects that are sold over multiple periods. If you are valuing a project or investment that has a perpetual, or unlimited life, specifically when you are valuing an entire corporation, the discounted-cash-flow analysis will consist of two stages. The first stage is a forecast period, with year-by-year cash flows for a specified number of years, usually five to ten years. The second stage is a terminal value calculation based on cash flows which begins the year after the forecast period ends, and extends forever, with cash flows growing, flat or even negative, at a constant rate. This terminal value is then discounted back to the current date to obtain the overall value of the project or corporation.

NET PRESENT VALUE VERSUS OTHER INVESTMENT PERFORMANCE METRICS

NPV analysis is widely accepted today as the superior methodology for assessing the forecasts of the financial impact of a project, at least conceptually, notwithstanding the concerns by many CEOs who believe that shareholders sometimes favor short-term profits over long-term cash flow and profits. Putting those concerns aside, given that shareholders prefer greater wealth to less wealth, they instruct the management team to accept all +NPV projects and reject all –NPV projects. The basic approach to computing NPV is straightforward:

(1) Estimate all expected future cash flows
(2) Obtain the opportunity cost of capital, that is, the return investors would expect to receive on equivalent-risk investments
(3) Discount all future expected cash flows and compare to the initial investment.

While the basic approach to calculating NPV is straightforward, it can often be difficult to calculate for a number of reasons, such as calculating the correct cost of capital, or estimating cash flows, etc. We will spend considerable time in the course building on the basic approach to gain a better understanding of the issues which influence the calculations. Of course, even when all inputs are estimated correctly, this does not guarantee a project's success, as actual profits and cash flow can differ sharply from forecast expectations. Indeed, the Amazon travel machine project, if undertaken, could end up delivering cash flows at far higher, or lower, rate than expected. And even projects which are expected to generate a high +NPV can end up being disastrous mistakes.

Another method which can be used to evaluate projects is the internal rate of return (or IRR); it tends to provide the same conclusion as NPV in many scenarios. Moreover, the IRR can be used in conjunction with NPV, as it provides an estimate of the expected return on the project. In a simple one-period world, where there is an investment at the beginning of the period and a single payoff at the end of the period, the IRR is straightforward to calculate.

Eq. 7

$$NPV = -CF_0 + \frac{E[CF_1]}{[1+r]}$$

In the lecture note, *Introduction to Corporate Finance*, we showed that the NPV was $12.14 million for the $125 million project by PCM&C, which generated a future cash flow of $144 million, discounted at the 5% cost of capital. The IRR is given by the equation which sets the NPV equal to zero as below:

Eq. 8

$$0 = -CF_0 + \frac{E[CF_1]}{[1+IRR]}$$

Solving for IRR yields:

Eq. 8a

$$IRR = \frac{E[CF_1]}{CF_0}$$

In the PCM&C example, the IRR is equal to 15.2%; since that exceeds the 5% cost of capital, the IRR rule makes the same recommendation as the NPV rule -- that is, if the IRR exceeds the opportunity cost of capital, then the NPV is positive. Given there are only two cash flows, the calculation of the IRR is straightforward. However, if there are two periods to be accounted for, and thus three cash flows, one would have to use the quadratic formula, the cubic formula for four cash flows, the quartic formula for five cash flows, and numerical methods for periods greater than five. In practice, we generally use numerical methods, solving iteratively using Excel or similar software applications.

The NPV for a multi-period model is given by:

Eq. 9

$$NPV = -CF_0 + \frac{E[CF_1]}{[1+r]} + \frac{E[CF_2]}{[1+r]^2} + \frac{E[CF_3]}{[1+r]^3} + \ldots \frac{E[CF_T]}{[1+r]^T}$$

And thus, setting the NPV equal to 0, the IRR for the multi-period model is given by:

Eq. 10

$$0 = -CF_0 + \frac{E[CF_1]}{[1+IRR]} + \frac{E[CF_2]}{[1+IRR]^2} + \frac{E[CF_3]}{[1+IRR]^3} + \ldots \frac{E[CF_T]}{[1+IRR]^T}$$

The IRR for Amazon's fictional travel machine project is 6.92%.[8] With Amazon's recommended discount rate of 12.0%, the IRR rule indicates the project should not be pursued. In other words, if shareholders of Amazon can expect to generate annualized returns of 12.0% on other investments and projects of identical risk, it would be wealth reducing for its investors for corporate management to recommend the travel machine project yielding a positive IRR of 6.92%, even if the firm has excess cash invested in lower

[8] To drive the NPV to exactly zero, the IRR is 6.9224937%. The NPV is $65,681.77 at an IRR of 6.92%, which is sufficiently close to zero given the size of the project.

interest rate Treasury bills.

One nice attribute of the IRR estimate, used in conjunction with NPV, is that it informs us how far off from the true cost of capital we can be with our estimate used in the NPV calculations. In the Amazon case, the difference is quite large. The cost of capital would have to be 5.08 percentage points less than the 12.0% cost of capital for it to be wealth maximizing. While we show in the *Additional Considerations in Computing the Cost of Capital* lecture note that the cost of capital estimates are especially noisy. Nonetheless, it is unlikely in the case of the Amazon travel machine that the estimate would be as low as 6.92%.

Conceptually, the IRR is an elegant method for assessing projects. But it does have numerous pitfalls. In practice, it is not always calculable; it also sometimes produces multiple estimates and can give misleading recommendations. Most corporate finance textbooks provide several examples of these pitfalls, and they are worth understanding, even though we don't have time to address them all here. According to McKinsey, only about 20% of finance managers are aware of the deficiencies that involve IRR calculations. For example, corporate managers often choose to maximize the IRR, which can lead to underinvestment.[9] But as we will show throughout this course, NPV always provides an unambiguous and correct recommendation.

There are other measures which many managers use to evaluate projects, such as the payback rule, but we will spend less time covering these methods. The payback period defines how long it takes before the cumulative cash flows offset the initial investment. In the case of the travel machine project, the payback period is roughly three and a half years. We can calculate that by comparing the initial investment of $165 million (CAPX + initial NWC) for the first travel machine and then estimating the cash flows resulting from this single machine. It yields cash flows of $47.5 million in each of Years 1-3 and cash flows of $52.5 million in Year 4. Note the Year 4 cash flows are higher by $5 million as a result of the recovery of the NWC that was set aside in Year 0.

If the payback rule indicates that the payback period should be a maximum of four years, for instance, it would recommend acceptance of the project. There are a couple of obvious problems, however, when corporate management places a lot of weight on the payback rule. First, the payback rule ignores cash flows after the cut-off date (though I find it doubtful that many corporate managers would simply ignore cash flows after that date). Second, the payback treats all cash flows before the cut-off date as the same, ignoring any discounting. Of course, management could compute a

[9] Consider two mutually exclusive projects, SMALL and LARGE, with each lasting one year and the same discount rate of 10.00%. Project SMALL requires an upfront investment of $100 million (versus $400 million for project LARGE) and expects to generate cash flows of $120 million (versus $455 million for project LARGE) at the end of the year. Project SMALL will deliver an IRR of 20.00%, versus 13.75% for Project LARGE. However, Project LARGE delivers the highest NPV at $13.6 million, versus $9.1 million for Project SMALL. Corporate management should go with Project LARGE. And if the projects are not mutually exclusive, then we should advise management to accept both projects.

discounted payback period to reflect the project's cost of capital. In effect, this method conveys how long it takes for the company to recover the initial investment on a risk-adjusted basis. I haven't often seen this calculation used in practice, but it could be constructive in conjunction with computing the NPV.

Imagine the way corporate management would explain the travel machine project on a conference call with equity analysts. Management would not just state that the travel machine project would have a NPV of -$111.2 million and leave it at that.[10] Instead, it would likely convey the IRR of 6.92% and the payback period of about three and a half years. Also, it would probably indicate when the project would be accretive on an earnings basis, as analysts who build equity models tend to focus on the accretive/dilutive aspects associated with new projects and ventures.

CONCLUDING REMARKS

NPV analysis is the workhorse for deciding whether a project merits an investment.[11] There is no close runner-up. Its beauty lies in the fact that if the NPV is positive, management should advance the project for one straightforward reason: it is always consistent with maximizing shareholder wealth. And if the NPV is negative, management should reject the project.

The textbook framework to compute the NPV of a project is clearcut. The analyst forecasts expected cash flows on a timeline and discounts the expected cash flows corresponding to each period back to the current time. Conceptually, there is nothing more to it than that. Nonetheless, NPV analysis is not well understood at a deep level, even by many successful corporate managers. The meaning of "expected" in expected cash flows seems to be a difficult concept for many practitioners to grasp. And typically, the same practitioners have trouble understanding what the cost of capital represents. They recognize it is used to capture the risk of a project, yet they fail to comprehend what determines the risk of a project when it comes to computing the systemic risk of the cost of capital.

Obviously, having a strong understanding of NPV analysis does not make a great manager, per se. But it can certainly help a good manager improve their decisions and communicate their actions and decisions better to equity analysts, the business media, and shareholders. Indeed, a good CEO who fully understands NPV analysis will do a far better job at handling angry activist investors than a good CEO with less than a complete understanding.

[10] Obviously, corporate management would not announce the project as having -NPV if they deemed it as value reducing.

[11] At the end of the day, finance is about assessing the risk and returns of cash flows on a timeline, and NPV analysis is a prime example.

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To our shareholders:

Our ultimate financial measure, and the one we most want to drive over the long-term, is free cash flow per share.

Why not focus first and foremost, as many do, on earnings, earnings per share or earnings growth? The simple answer is that earnings don't directly translate into cash flows, and shares are worth only the present value of their future cash flows, not the present value of their future earnings. Future earnings are a component—but not the only important component—of future cash flow per share. Working capital and capital expenditures are also important, as is future share dilution.

Though some may find it counterintuitive, a company can actually impair shareholder value in certain circumstances by growing earnings. This happens when the capital investments required for growth exceed the present value of the cash flow derived from those investments.

To illustrate with a hypothetical and very simplified example, imagine that an entrepreneur invents a machine that can quickly transport people from one location to another. The machine is expensive—$160 million with an annual capacity of 100,000 passenger trips and a four year useful life. Each trip sells for $1,000 and requires $450 in cost of goods for energy and materials and $50 in labor and other costs.

Continue to imagine that business is booming, with 100,000 trips in Year 1, completely and perfectly utilizing the capacity of one machine. This leads to earnings of $10 million after deducting operating expenses including depreciation—a 10% net margin. The company's primary focus is on earnings; so based on initial results the entrepreneur decides to invest more capital to fuel sales and earnings growth, adding additional machines in Years 2 through 4.

Here are the income statements for the first four years of business:

	Earnings			
	Year 1	Year 2	Year 3	Year 4
		(in thousands)		
Sales	$100,000	$200,000	$400,000	$800,000
Units sold	100	200	400	800
Growth	N/A	100%	100%	100%
Gross profit	55,000	110,000	220,000	440,000
Gross margin	55%	55%	55%	55%
Depreciation	40,000	80,000	160,000	320,000
Labor & other costs	5,000	10,000	20,000	40,000
Earnings	$ 10,000	$ 20,000	$ 40,000	$ 80,000
Margin	10%	10%	10%	10%
Growth	N/A	100%	100%	100%

It's impressive: 100% compound earnings growth and $150 million of cumulative earnings. Investors considering only the above income statement would be delighted.

However, looking at cash flows tells a different story. Over the same four years, the transportation business generates cumulative negative free cash flow of $530 million.

	Cash Flows			
	Year 1	Year 2	Year 3	Year 4
	(in thousands)			
Earnings	$ 10,000	$ 20,000	$ 40,000	$ 80,000
Depreciation	40,000	80,000	160,000	320,000
Working capital	—	—	—	—
Operating Cash Flow	50,000	100,000	200,000	400,000
Capital expenditures	160,000	160,000	320,000	640,000
Free Cash Flow	$(110,000)	$ (60,000)	$(120,000)	$(240,000)

There are of course other business models where earnings more closely approximate cash flows. But as our transportation example illustrates, one cannot assess the creation or destruction of shareholder value with certainty by looking at the income statement alone.

Notice, too, that a focus on EBITDA—Earnings Before Interest, Taxes, Depreciation and Amortization—would lead to the same faulty conclusion about the health of the business. Sequential annual EBITDA would have been $50, $100, $200 and $400 million—100% growth for three straight years. But without taking into account the $1.28 billion in capital expenditures necessary to generate this 'cash flow,' we're getting only part of the story—EBITDA isn't cash flow.

What if we modified the growth rates and, correspondingly, capital expenditures for machinery—would cash flows have deteriorated or improved?

Year 2, 3 and 4 Sales and Earnings Growth Rate	Number of Machines in Year 4	Year 1 to 4 Cumulative Earnings	Year 1 to 4 Cumulative Free Cash Flow
		(in thousands)	
0%, 0%, 0%	1	$ 40,000	$ 40,000
100%, 50%, 33%	4	$100,000	$(140,000)
100%, 100%, 100%	8	$150,000	$(530,000)

Paradoxically, from a cash flow perspective, the slower this business grows the better off it is. Once the initial capital outlay has been made for the first machine, the ideal growth trajectory is to scale to 100% of capacity quickly, then stop growing. However, even with only one piece of machinery, the gross cumulative cash flow doesn't surpass the initial machine cost until Year 4 and the net present value of this stream of cash flows (using 12% cost of capital) is still negative.

Unfortunately our transportation business is fundamentally flawed. There is no growth rate at which it makes sense to invest initial or subsequent capital to operate the business. In fact, our example is so simple and clear as to be obvious. Investors would run a net present value analysis on the economics and quickly determine it doesn't pencil out. Though it's more subtle and complex in the real world, this issue—the duality between earnings and cash flows—comes up all the time.

Cash flow statements often don't receive as much attention as they deserve. Discerning investors don't stop with the income statement.

Our Most Important Financial Measure: Free Cash Flow Per Share

Amazon.com's financial focus is on long-term growth in free cash flow per share.

Amazon.com's free cash flow is driven primarily by increasing operating profit dollars and efficiently managing both working capital and capital expenditures. We work to increase operating profit by focusing on improving all aspects of the customer experience to grow sales and by maintaining a lean cost structure.

We have a cash generative operating cycle[1] because we turn our inventory quickly, collecting payments from our customers before payments are due to suppliers. Our high inventory turnover means we maintain relatively low levels of investment in inventory—$480 million at year end on a sales base of nearly $7 billion.

The capital efficiency of our business model is illustrated by our modest investments in fixed assets, which were $246 million at year end or 4% of 2004 sales.

Free cash flow[2] grew 38% to $477 million in 2004, a $131 million improvement over the prior year. We are confident that if we continue to improve customer experience—including increasing selection and lowering prices—and execute efficiently, our value proposition, as well as our free cash flow, will further expand.

As to dilution, total shares outstanding plus stock-based awards are essentially unchanged at the end of 2004 compared with 2003, and are down 1% over the last three years. During that same period, we've also eliminated over six million shares of potential future dilution by repaying more than $600 million of convertible debt that was due in 2009 and 2010. Efficiently managing share count means more cash flow per share and more long-term value for owners.

This focus on free cash flow isn't new for Amazon.com. We made it clear in our 1997 letter to shareholders—our first as a public company—that when "forced to choose between optimizing GAAP accounting and maximizing the present value of future cash flows, we'll take the cash flows." I'm attaching a copy of our complete 1997 letter and encourage current and prospective shareowners to take a look at it.

As always, we at Amazon.com are grateful to our customers for their business and trust, to each other for our hard work, and to our shareholders for their support and encouragement.

Jeffrey P. Bezos
Founder and Chief Executive Officer
Amazon.com, Inc.

April 2005

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1 The operating cycle is number of days of sales in inventory plus number of days of sales in accounts receivable minus accounts payable days.

2 Free cash flow is defined as net cash provided by operating activities less purchases of fixed assets, including capitalized internal-use software and website development, both of which are presented on our statements of cash flows. Free cash flow for 2004 of $477 million is net cash provided by operating activities of $567 million less purchases of fixed assets, including capitalized internal-use software and website development costs, of $89 million. Free cash flow for 2003 of $346 million is net cash provided by operating activities of $392 million less purchases of fixed assets, including capitalized internal-use software and website development costs, of $46 million.

amazon.com

1997 LETTER TO SHAREHOLDERS

(Reprinted from the 1997 Annual Report)

To our shareholders:

Amazon.com passed many milestones in 1997: by year-end, we had served more than 1.5 million customers, yielding 838% revenue growth to $147.8 million, and extended our market leadership despite aggressive competitive entry.

But this is Day 1 for the Internet and, if we execute well, for Amazon.com. Today, online commerce saves customers money and precious time. Tomorrow, through personalization, online commerce will accelerate the very process of discovery. Amazon.com uses the Internet to create real value for its customers and, by doing so, hopes to create an enduring franchise, even in established and large markets.

We have a window of opportunity as larger players marshal the resources to pursue the online opportunity and as customers, new to purchasing online, are receptive to forming new relationships. The competitive landscape has continued to evolve at a fast pace. Many large players have moved online with credible offerings and have devoted substantial energy and resources to building awareness, traffic, and sales. Our goal is to move quickly to solidify and extend our current position while we begin to pursue the online commerce opportunities in other areas. We see substantial opportunity in the large markets we are targeting. This strategy is not without risk: it requires serious investment and crisp execution against established franchise leaders.

It's All About the Long Term

We believe that a fundamental measure of our success will be the shareholder value we create over the *long term*. This value will be a direct result of our ability to extend and solidify our current market leadership position. The stronger our market leadership, the more powerful our economic model. Market leadership can translate directly to higher revenue, higher profitability, greater capital velocity, and correspondingly stronger returns on invested capital.

Our decisions have consistently reflected this focus. We first measure ourselves in terms of the metrics most indicative of our market leadership: customer and revenue growth, the degree to which our customers continue to purchase from us on a repeat basis, and the strength of our brand. We have invested and will continue to invest aggressively to expand and leverage our customer base, brand, and infrastructure as we move to establish an enduring franchise.

Because of our emphasis on the long term, we may make decisions and weigh tradeoffs differently than some companies. Accordingly, we want to share with you our fundamental management and decision-making approach so that you, our shareholders, may confirm that it is consistent with your investment philosophy:

- We will continue to focus relentlessly on our customers.
- We will continue to make investment decisions in light of long-term market leadership considerations rather than short-term profitability considerations or short-term Wall Street reactions.
- We will continue to measure our programs and the effectiveness of our investments analytically, to jettison those that do not provide acceptable returns, and to step up our investment in those that work best. We will continue to learn from both our successes and our failures.

- We will make bold rather than timid investment decisions where we see a sufficient probability of gaining market leadership advantages. Some of these investments will pay off, others will not, and we will have learned another valuable lesson in either case.
- 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.
- We will share our strategic thought processes with you when we make bold choices (to the extent competitive pressures allow), so that you may evaluate for yourselves whether we are making rational long-term leadership investments.
- We will work hard to spend wisely and maintain our lean culture. We understand the importance of continually reinforcing a cost-conscious culture, particularly in a business incurring net losses.
- We will balance our focus on growth with emphasis on long-term profitability and capital management. At this stage, we choose to prioritize growth because we believe that scale is central to achieving the potential of our business model.
- We will continue to focus on hiring and retaining versatile and talented employees, and continue to weight their compensation to stock options rather than cash. We know our success will be largely affected by our ability to attract and retain a motivated employee base, each of whom must think like, and therefore must actually be, an owner.

We aren't so bold as to claim that the above is the "right" investment philosophy, but it's ours, and we would be remiss if we weren't clear in the approach we have taken and will continue to take.

With this foundation, we would like to turn to a review of our business focus, our progress in 1997, and our outlook for the future.

Obsess Over Customers

From the beginning, our focus has been on offering our customers compelling value. We realized that the Web was, and still is, the World Wide Wait. Therefore, we set out to offer customers something they simply could not get any other way, and began serving them with books. We brought them much more selection than was possible in a physical store (our store would now occupy 6 football fields), and presented it in a useful, easy-to-search, and easy-to-browse format in a store open 365 days a year, 24 hours a day. We maintained a dogged focus on improving the shopping experience, and in 1997 substantially enhanced our store. We now offer customers gift certificates, 1-Click℠ shopping, and vastly more reviews, content, browsing options, and recommendation features. We dramatically lowered prices, further increasing customer value. Word of mouth remains the most powerful customer acquisition tool we have, and we are grateful for the trust our customers have placed in us. Repeat purchases and word of mouth have combined to make Amazon.com the market leader in online bookselling.

By many measures, Amazon.com came a long way in 1997:

- Sales grew from $15.7 million in 1996 to $147.8 million – an 838% increase.
- Cumulative customer accounts grew from 180,000 to 1,510,000 – a 738% increase.
- The percentage of orders from repeat customers grew from over 46% in the fourth quarter of 1996 to over 58% in the same period in 1997.
- In terms of audience reach, per Media Metrix, our Web site went from a rank of 90th to within the top 20.
- We established long-term relationships with many important strategic partners, including America Online, Yahoo!, Excite, Netscape, GeoCities, AltaVista, @Home, and Prodigy.

Infrastructure

During 1997, we worked hard to expand our business infrastructure to support these greatly increased traffic, sales, and service levels:

- Amazon.com's employee base grew from 158 to 614, and we significantly strengthened our management team.
- Distribution center capacity grew from 50,000 to 285,000 square feet, including a 70% expansion of our Seattle facilities and the launch of our second distribution center in Delaware in November.
- Inventories rose to over 200,000 titles at year-end, enabling us to improve availability for our customers.
- Our cash and investment balances at year-end were $125 million, thanks to our initial public offering in May 1997 and our $75 million loan, affording us substantial strategic flexibility.

Our Employees

The past year's success is the product of a talented, smart, hard-working group, and I take great pride in being a part of this team. Setting the bar high in our approach to hiring has been, and will continue to be, the single most important element of Amazon.com's success.

It's not easy to work here (when I interview people I tell them, "You can work long, hard, or smart, but at Amazon.com you can't choose two out of three"), but we are working to build something important, something that matters to our customers, something that we can all tell our grandchildren about. Such things aren't meant to be easy. We are incredibly fortunate to have this group of dedicated employees whose sacrifices and passion build Amazon.com.

Goals for 1998

We are still in the early stages of learning how to bring new value to our customers through Internet commerce and merchandising. Our goal remains to continue to solidify and extend our brand and customer base. This requires sustained investment in systems and infrastructure to support outstanding customer convenience, selection, and service while we grow. We are planning to add music to our product offering, and over time we believe that other products may be prudent investments. We also believe there are significant opportunities to better serve our customers overseas, such as reducing delivery times and better tailoring the customer experience. To be certain, a big part of the challenge for us will lie not in finding new ways to expand our business, but in prioritizing our investments.

We now know vastly more about online commerce than when Amazon.com was founded, but we still have so much to learn. Though we are optimistic, we must remain vigilant and maintain a sense of urgency. The challenges and hurdles we will face to make our long-term vision for Amazon.com a reality are several: aggressive, capable, well-funded competition; considerable growth challenges and execution risk; the risks of product and geographic expansion; and the need for large continuing investments to meet an expanding market opportunity. However, as we've long said, online bookselling, and online commerce in general, should prove to be a very large market, and it's likely that a number of companies will see significant benefit. We feel good about what we've done, and even more excited about what we want to do.

1997 was indeed an incredible year. We at Amazon.com are grateful to our customers for their business and trust, to each other for our hard work, and to our shareholders for their support and encouragement.

Jeffrey P. Bezos
Founder and Chief Executive Officer
Amazon.com, Inc.