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Valuing Intel: A Strange Tale of Analysts and Announcements

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Abstract

This paper examines the market reaction to a press release issued by Intel on Thursday, September 21, 2000. In response to that release, Intel's stock price dropped 30 percent, erasing over $120 billion of shareholder wealth. By analyzing the press release in conjunction with analyst reports and by using a discounted cash flow valuation model, it is argued that the information conveyed by the announcement was not sufficient to explain the stock price drop. In an effort to explain this controversial conclusion, the paper documents the puzzling and procyclical role of analysts' recommendations regarding Intel. Surprisingly, analysts were more strongly recommending purchase of the stock in August at $75 than they were recommending purchase in September at $40. This suggests a positive feedback between stock price movements and analyst recommendations that may increase the volatility of prices.

1. Introduction

Intel is without question one of the world's premier corporations. The company, which is far and away the largest manufacturer of microprocessors, is also a diversified maker of semiconductor chips that are integral parts of boards, systems and software employed in the production of computers, servers and networking and communications products. Intel's success has been reflected in its stock price. At various times during the year 2000, it was the largest market capitalization company in the world. In addition, Intel is one of the most actively followed and widely held companies. Major institutions hold well over half of its stock. Dozens of analysts scrutinize every statement the company makes almost as carefully as they examine the pronouncements of Alan Greenspan. If there is one company to which the semi-strong form of the efficient market hypothesis ought to apply, it would be Intel.

This paper focuses on the market reaction to a press release issued by Intel on Thursday, September 21, 2000 at 4:16 pm Eastern time. The announcement, which is quoted in detail in the next section, stated, among other things, that the company expected revenue for the third quarter to be 3 to 5 percent higher than second quarter revenue of $8.3 billion. This fell short of the company's previous forecast of 7 to 9 percent growth and fell short of analysts' projections of 8 to 12 percent.

The market's response was astonishing. Although trading in Intel was halted for the remainder of day after the announcement at 4:16, the stock dropped in after-market trading from the "close" of $61.48 to $48.25 - erasing over $91 billion in market value. Over the next two days, the price continued to fall. By the close on September 26, 2000, the stock was down almost 30 percent to $43.31 and $122 billion in shareholder value had evaporated.

In response to the dramatic sell-off, some Intel executives were perplexed. A senior executive, in private conversation, expressed amazement that what appeared to him to be a relatively minor announcement had led to the destruction of over $120 billion in shareholder wealth. The announcement, in his view, reflected short-run developments in Europe, in particular the decline of the Euro, which made it more difficult for Intel to sell products there in the short term. However, it did not indicate any change in Intel's long-run strategy, its product mix, its competitive position, or even, in his opinion, the long-run demand for Intel's products. Consequently, he argued that while the stock should have dropped in response to the surprise, the decline should have been modest. In his view, the market was irrationally overreacting to a small dose of bad news. Several weeks following the announcement, Intel's chairman, Craig Barrett, adopted this position in a public question and answer session saying that, "I don't know what you call it but an overreaction and the market feeding on itself."

The Intel event is by no means unique. In the weeks that followed, Kodak dropped over 25 percent in response to an earnings warning and Apple plummeted a remarkable 51 percent after it issued a warning. What makes these events particularly surprising is that Kodak and Apple, like Intel, are established companies with long track records that are widely followed by dozens of analysts. What beliefs must analysts and investors have had about the value of the company such that information regarding the current quarter's earnings could cause the company's stock price to fall by as much as one-half?

In response to market reactions such as those experienced by Intel, Kodak and Apple, the view expressed by Craig Barrett - that the market overreacts to news, particularly bad news - has become common among practitioners. The overreaction hypothesis has also been actively studied by academic researchers for years without a clear consensus emerging. Uncertainty about the issue remains because overreaction is

so hard to measure. Without a metric for determining the "proper reaction", there is no

direct way to say whether or not the market has overreacted. For this reason, the

overreaction research in the academic literature has concentrated on the behavior of large

samples of companies over long-run. Empirical tests are based on the idea that if the

market overreacts, then investors should be able to earn superior risk-adjusted returns over

the long-term by taking positions in the direction opposite to the overreaction. This is the

approach taken, for example, by DeBondt and Thaler (1985), Zarowin (1989), and Chopra,

Lakonishok and Ritter (1992). However, as Fama (1998) observes, the statistical power of

the tests are weak and results are open to differing interpretation. Consequently, after

more than 15 years of research, the overreaction hypothesis remains controversial.

The huge reaction of Intel's stock price raises another question even more

fundamental than that of overreaction. Specifically, if the quanta of valuation information

contained in the announcement is small and the market reaction is large, then the stock

could not possibly be rationally priced both before and after the announcement. The most

famous example of this problem is the crash of October 1987 when the overall market

dropped more than 21 percent on what appeared to be minor news.[1] In the case of Intel,

company spokesman Tom Beerman adopted such a position arguing that the information

in the press release was not sufficient to explain the drop. The problem with this view, of

course, is that there is no unambiguous way to measure the quanta of information in an

announcement other than by observing stock price movement in response to the

announcement.

In an attempt to shed new light on these issues, this paper takes a clinical

approach. Rather than drawing statistical conclusions from the behavior of large samples,

it examines one company's response to one announcement in great detail. As part of the

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[1] See, for instance, the discussion in Shiller (2000).

examination, a complete discounted cash flow (DCF) valuation model of Intel is constructed to serve as a benchmark in evaluating the market reaction to the company's press release. In addition, analysts' reports, both before and after the announcement, are studied to understand how analysts responded to the press release and what role their reports and recommendations might have played in determining the magnitude of the market's reaction.

The remainder of the paper is organized as follows. The next section presents more detailed information on Intel's press release and the market's reaction to it. In section three, a detailed discounted cash flow valuation model is developed as a tool to determine whether the market reaction was a reasonable response to the information conveyed by the press release. The fourth section, analyzes the reaction of analysts to the announcement. It is argued that the failure of analysts to develop long-term valuation models and the procyclical nature of analysts' recommendations can potentially exacerbate market reactions to announcements such as Intel's. The conclusions are presented in the final section.

2. Intel's Announcement and the Market Response

In the nine months preceding September 2000, Intel had been one of the best performing large capitalization stocks in the market. As Figure 1 illustrates, between December 31, 1999 and August 31, 2000 Intel rose 82.3 percent, markedly out-performing the S&P 500 which increased 4.2 percent and the NASDAQ index which increased 4.3 percent. Figure 2 shows that the run-up in the stock price also pushed the market capitalization of Intel to record levels. In August 2000, Intel was the only company in the world with a market value exceeding $500 billion.

During the time the stock was running up, Intel was also a darling of the analysts. By the end of August, Bloomberg's summary index of analyst recommendations stood at

4.85 out of 5.0 compared to an average of 4.24 for the S&P 500.[2] A Bloomberg index of

that level indicates that virtually every analyst who followed Intel was highly recommending

purchase of the stock. These bullish recommendations were maintained in spite of the fact

that the run-up had made Intel's stock appear relatively expensive. The P/E ratio had risen

from under 30 in October 1999 to over 55 by August 2000.

In September 2000, Intel's stock price began to falter. It fell from a high of $74.88 on

August 31 to a low of $55.75 on September 18, before recovering to $61.48 on September

21. The drop of 17.9 percent from August 31 to September 21 markedly exceeded the 4.5

percent decline in the S&P 500 and the 8.9 percent decline in the NASDAQ index. The

financial press attributed the drop in Intel shares, at least in part, to statements by Piper

Jaffray analyst, Ashok Kumar, who downgraded the stock on September 5. Kumar based

the downgrade on his belief that PC sales growth in the third quarter would be, at best,

about half of the 12 percent estimated by most analysts and that Intel's growth would be

similarly affected.

After the market closed on September 21, Intel issued what was to be an

earthshaking press release regarding the financial results for the third quarter due to be

released at the end of October. Because of its importance, at least in the eyes of the

market, the financial information included in the press release is quoted in detail. The

company stated:

The following statements are based on current expectations. These statements are

forward-looking, and actual results may differ materially. These statements do not reflect

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[2] The Bloomberg index averages analyst recommendations on a scale of 1 through 5. For

a company to receive a rank of 5, a analyst must be giving the stock the strongest possible

purchase recommendation.

the potential impact of any mergers or acquisitions that may be completed after the date of this release.

- *The company expects revenue for the third quarter of 2000 to be approximately 3 to 5 percent higher than second quarter revenue of $8.3 billion.*

- *The company expects gross margin percentage for the third quarter to be 62 percent, plus or minus a point. Gross margin percentage for 2000 is expected to be 63 percent, plus or minus a few points. In the short term, Intel's gross margin percentage varies primarily with revenue levels and product mix as well as changes in unit costs.*

- *Expenses (R&D, excluding in-process R&D, plus MG&A) in the third quarter of 2000 are expected to be up 7 to 9 percent from second quarter expense of $2.2 billion, primarily due to higher spending on marketing programs and R&D initiatives in new business areas. Expenses are dependent in part on the level of revenue.*

- *R&D spending, excluding in process R&D, is expected to be approximately $4.0 billion for 2000.*

- *The company expects interest and other income for the third quarter of 2000 to be approximately $900 million. Interest and other income is dependent in part on interest rates, cash balances, equity market levels and volatility, the realization of expected gains on investments, including gains on investments acquired by third parties, and assuming no unanticipated items.*

- *The tax rate for 2000 is expected to be approximately 31.8 percent, excluding the impact of the previously announced agreement with the Internal Revenue Service and acquisition-related costs.*

- *Capital spending for 2000 is expected to be approximately $6 billion.*

- *Depreciation is expected to be approximately $790 million in the third quarter and $3.4 billion for the full year 2000.*

- *Amortization of goodwill and other acquisition-related intangibles is expected to be approximately $400 million in the third quarter and $1.5 billion for the full year 2000.*

A study of their reports reveals that in the eyes of analysts most of the information in the press release was innocuous. Statements regarding capital spending, amortization of goodwill, interest income, R&D expenses and depreciation were seen as in line with expectations. The critical exception was the statement regarding future revenues. The warning issued by Intel predicted revenue growth for the third quarter at 3 to 5 percent. This was well below the range of 8 to 12 percent forecast by Wall Street analysts and even below the number of 6 percent projected by Ashok Kumar. Furthermore, the lower revenue number implied that margins would decline slightly because of the fixed nature of some of Intel's short-run costs.

What is perhaps most striking about the press release is what it does not contain. There is no discussion of the company's long-run business outlook, of the quality of its products, of actions by competitors, of basic changes in technology or the demand for Intel's products, or of new government sanctions or regulations. In short, there is nothing to suggest that the fundamental long-run business conditions for Intel were much different on September 22 than they had been on September 21. Intel spokesman Tom Beerman stressed this point by arguing that the negative implications should not be exaggerated. According to Beerman, the problems Intel faced were limited both chronologically and geographically. More specifically, he stated that, "It's (the slowdown in revenue growth) demand related, and it is focused exclusively in Europe. The other geographies are coming in as expected."

Despite the ameliorative assessment presented by Beerman, the reaction of the market was immediate and dramatic. In after-hours trading Intel's stock price plummeted over 21 percent from $61.48 to $48.25. The next day's trading revealed that the drop was permanent. On September 22, Intel broke the NASDAQ volume record by over 100 million shares as 309 million shares changed hands. As the market further assessed the news, the stock price continued to drop. Intel fell 5.4 percent to $45.38 on Monday, September 25, 2000 and dropped another 4.6 percent to $43.31 on September 26. In total, the company's share price fell 29.6 percent over the three trading day window – erasing $122 billion in market value. Furthermore, in the weeks following the drop the stock price did not recover.

Figure 3 shows the three-day decline in Intel's stock price in comparison with the S&P 500, NASDAQ and major chip and computer companies.[3] The figure shows that most of the decline in Intel's price was unique to the company. The next largest drop in price, for Dell Computer, was 6.4 percent. Compaq Computer actually rose in price over the interval. This demonstrates that the news the market was reacting to was not primarily a general slowdown in the market for computers and semiconductors, signaled by Intel's warning, but was predominantly Intel specific.

The Intel specific nature of the drop in a sense deepens the mystery. Because competitive issues and governmental sanctions or regulations were not involved, the remaining long-run story is that the press release presaged a fundamental drop in the demand for the company's products. If such were the case, however, related firms, particularly computer manufacturers, should have been equally affected because Intel makes the chips that go into all their machines. Furthermore, there was no evidence in the release to suggest that the slowdown was specifically related to Intel's products.

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[3] Given Intel's size, a significant fraction of the drop in the S&P 500 and the NASDAQ Index on September 22 was due to the company's inclusion in those indices.

Finally, it should be noted that the information in the press release was probably partially anticipated by the market. By September 21 Intel's price was already down 15 percent from the high, largely on Kumar's warning about third quarter demand for the company's products. To the extent that the announcement was anticipated, the market response to the press release should be a *downward* biased estimate of the amount of information in the release.

3. The Market Response and the Valuation of Intel

To investigate further how the September 21 press release could have led to the destruction of $122 billion in Intel shareholder value a discounted cash flow (DCF) valuation model for Intel is employed.[4] Based on analysts forecasts developed prior to the announcement, the model is calibrated so that it yields a market value of equity equal to Intel's pre-announcement capitalization of $413 billion. Once calibrated, the model can then be used to gain insight into how expectations of future cash flows for the company must have changed to cause Intel's value to fall to $291 billion over the course of three trading days.

The valuation model

It should be stressed at the outset that the goal of the model is not to attempt to provide an estimate of the *true* value of Intel, either before or after the announcement. As a professor of finance, I do not have access to information that that would allow the production of unusually accurate cash flow projections. Nonetheless, by calibrating the model using pre-announcement cash flow projections, based to the greatest extent

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[4] An alternative would be to use a real options model of the type developed by Schwartz and Moon (2000).

possible on pre-announcement analyst reports, it is possible to calculate how much those forecasts must have changed in order to explain the movement in the stock price.

In performing this analysis, it is assumed that the discount rate does not change as a result of Intel's press release. Consequently, any movement in the stock price must be attributed to changes in cash flow expectations. This assumption is strongly supported by the data. First, examination of the Treasury yield curve reveals that it was unaffected by Intel's announcement. Second, the minor drop in the S&P 500 demonstrates that the equity market risk premium (ERP) was not significantly affected by Intel's warning. This means that any change in the discount rate would have to be caused by a change in the systematic risk of Intel. Because there is no clear reason to assume that the systematic risk would rise or fall in response to the announcement, it is assumed to remain unchanged.

The DCF model used here is based on the standard weighted average cost of capital (WACC) approach to valuation.[5] Because Intel has almost no debt, there is virtually no difference between the WACC approach, the adjusted present value approach, described by Kaplan and Ruback (1995), and the capital flows approach, advocated by Ruback (2000). Using Intel's lowest stock price in the year preceding September 22, debt still represents less than 1 percent of the company's capital structure. For simplicity, therefore, the valuation analysis proceeds as if the company were all equity financed. Under such circumstances, all the valuation approaches are identical.

Although the DCF model depends exclusively on expected future cash flows, not historical data, the past provides a benchmark to assess what can reasonably expected in the future. For that purpose, Table 1 presents five years of historical financial data drawn from Intel's 10Ks. The data in Table 1 differ from the standard income statement

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[5] See, for instance, Cornell (1993) for a description of the approach.

presentation in two ways designed to make them more comparable to the organization of data in DCF valuation models. First, Intel's income statement includes amortization of goodwill created by acquisitions. Unlike depreciation, this amortization is not tax deductible. From a valuation standpoint, therefore, the amortization can be ignored – it need not be deducted from operating income nor added back when calculating free cash flow. Second, the income earned on Intel's financial investments is excluded. Instead, the financial assets are treated as separate from the firm's operating assets and their value is added to the estimate of the firm's operating value.

The historical data show that that Intel's revenue grew at a geometric average rate of 16.1 percent during the years from 1995 to 1999. As revenues grew, moreover, gross margins improved, rising from approximately 50 percent to 60 percent. Because of rising research and development costs, operating margins fluctuated around 35 percent despite the improvement in gross margins. During the early part of the period capital expenditures, as a percent of revenues, were relatively high. They fell to an average of about 12.5 percent of revenues in the last two years. Depreciation averaged about 9.5 percent of revenues during the period. It was somewhat higher toward the end of the period, reflecting the relatively greater capital expenditures in the first three years. Cash flow as a percent of revenues rose throughout the period to a high of 22 percent in 1999.

The financial data used to calibrate pre-announcement valuation model are presented in Table 2. The cash flow projections are derived using a three-step procedure. For the first two years, the projections are based on detailed pro forma financial statements that are contained in the more complete analyst reports. The numbers selected are chosen to be representative, generally equal to the median, unless specific information was provided by Intel. For instance, in the September 21 release, Intel predicted that capital

spending for fiscal year 2000 would be approximately $6 billion. Therefore, $6 billion is used in the DCF model.

Beyond two years, only a few sporadic projections are available in the analyst reports. Because of the incomplete data in the reports, projections for the next three years are based on a combination of the long-run I/B/E/S forecasts and an analysis of the operating ratios during both the five-year historical period and the first two forecast years. The I/B/E/S data are the median five-year earnings growth forecasts from the universe of analysts that report to I/B/E/S. In the month before the announcement, the median forecast growth rate for Intel was 20 percent. Margins are assumed to remain constant in percentage terms during this period so that revenues also grow at 20 percent. The gross margin is assumed to be 62.5 percent and the operating margin is assumed to be 38.5 percent. These figures are greater than those achieved by Intel during the five-year historical period, but less than analysts' projections for the first two years of the forecast period. Capital expenditures, including investment in working capital, are assumed to be 13.5 percent of revenue, an estimate in line both with recent historical experience and with analyst forecasts for the first two years. Finally, depreciation is assumed to be 9 percent of revenues.

In the final five years, out to the terminal value at year ten, there are no external forecast data available. The task, therefore, is to develop reasonable projections, that when combined with an estimate of the discount rate, equate the DCF model value with Intel's market value. To achieve this objective, it is assumed that beginning in year five Intel's growth rate in revenue slows at a rate of one percentage point per year. In addition, it is assumed that capital spending will drop to 13 percent of revenues, but depreciation will remain unchanged at 9 percent of revenues through the terminal horizon. All the other

items remain the same percentage of revenues that prevailed during the preceding three years of the forecast period.

At the terminal horizon (year ten), a constant growth model is employed to estimate the remaining value. It is assumed that by year ten Intel will be so large that it cannot grow much faster than the aggregate U.S. economy. Accordingly, a 6 percent nominal growth rate is chosen representing inflation of 3.5 percent and long-run real growth of 2.5 percent. Combining these assumptions gives the cash flow projections presented in Table 2.

The discount rate for Intel is composed of two elements: the risk-free rate and the risk premium appropriate for the company. As has become common in valuation applications, a long-term Treasury rate is chosen as the risk-free rate.[6] Following Kaplan and Ruback (1995), among others, the 20-year Treasury rate is used here.

The determination of the risk premium is more important, but also more difficult and controversial. At the start, there is the issue of whether to use the CAPM or a more complex three factor model such as suggested by Fama and French (1992). As reported by Brunner, Eades, Harris and Higgins (1998) and Graham and Harvey (2000), the CAPM remains the model of choice in valuation practice. However, the evidence presented by Fama and French (1996), among others, indicates that the model does not adequately explain the cross-sectional distribution of equity returns. Despite these concerns, the standard practice of using the CAPM is followed here. That decision does not have a major impact on the results because the discount rate is assumed to remain unchanged by the Intel press release. To an extent, therefore, the discount rate becomes a plug that is adjusted to equate the projected cash flows with the market value of Intel's equity.

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[6] As Cornell (1999) reports, in corporate valuation contexts long-term Treasuries are chosen because their duration more closely matches that of the assets being valued, despite the fact that they are not risk-free securities over short horizons.

Application of the CAPM requires estimates both of Intel's beta and of the equity risk premium (ERP). Starting with beta, Intel is not immune from the measurement error problems that typically arise when applying the CAPM. Depending on the sample period, observation interval, estimation procedure and adjustment algorithm, estimates of beta range from a high of 1.65 (estimated using one year of daily data ending one week prior to the press release) to a low of 1.05 (estimated by BARRA using the company's proprietary technology). For the purposes of this paper, a beta of 1.25 is selected. This is close to Bloomberg's adjusted beta of 1.26 using two-years of weekly data for the 104 weeks preceding the press release.

The final piece of the discount rate is the equity risk premium. As noted in Cornell (1999), the values of technology companies, including Intel, are highly sensitive to the choice of the ERP for two reasons. First, they have betas greater than one so that different choices of the ERP produced magnified changes in the discount rate. Second, successful technology company are characterized by cash flows that are expected to grow rapidly. The large expected cash flows in the distant future make the present value of the stream very sensitive to changes in the discount rate.

To calibrate the model, an ERP of 3.9 percent is selected. Using a 3.9 percent ERP produces a discount rate that equates the present value of the pre-announcement cash flow projections in Table 2 to the market value of Intel on September 21 as shown at the bottom of the table. It should be noted that an ERP of 3.9 percent is well below the long-run average difference between the returns on the S&P 500 and 20-year Treasury bond returns. As reported by Ibbotson Associates (2000), the average difference from 1926 to 1999 was 7.8 percent. However, an ERP of 3.9 percent is consistent with recent research. Using a forward looking, clean accounting approach, Claus and Thomas (1999) estimate the ERP to be approximately 3 percent. Similarly, Fama and French (2000)

present evidence that the risk premium in recent years has been about 3.4 percent. Finally, Cornell (1999) argues that an ERP in the neighborhood of 3 percent is required to rationalize the level of the stock market at the end of 1999.

With all the pieces in place, it is worthwhile to take a step back and examine the broad characteristics of the assumptions necessary to calibrate the model to Intel's stock price on September 21. The most striking fact that emerges from Table 2 is how bullish the assumptions have to be. Even using a relatively low discount rate (due to choosing a beta toward the bottom of the range and an ERP of 3.9), Intel has to maintain a growth rate of nearly 20 percent in revenues for the next ten years to justify the stock price on September 21. This is higher than the growth rate averaged over the previous five years when the company was much smaller. It implies an increase in sales of more than five times from $34 billion to $162 billion in just nine years. (In terms of constant dollars, the increase is only to $119 billion assuming an inflation rate of 3.5 percent.) Furthermore, this growth must be achieved while maintaining gross margins of 62.5 percent, a level higher than that achieved in the past. Operating margins also must be higher, on average, over the next ten years than they were during the previous five years. Given Intel's massive size as of September 2000, achieving such rapid and profitable growth, is a tall order. Furthermore, these bullish assumptions are required to calibrate the model to a stock price of $61.50. If the model were calibrated to the $74 price that prevailed at the end of August, the assumptions would have to be more optimistic.

Cash flow forecast revisions and stock price changes

If Intel's spokesman is correct in stating that the press release should not be interpreted as signaling a fundamental change in the company's business outlook, then it is reasonable to conclude that the path of future revenues would respond to the shortfall in one of the three ways illustrated in Figure 4. First, the revenue shortfall could be purely

temporary in the sense that buyers were postponing, rather than permanently canceling, orders. In that case, revenues should converge back toward the pre-shock growth path as postponed orders are placed. This scenario is shown by red line in Figure 4. Second, the shock could lead to a permanent loss of short-term unit sales. In that case, the post-shock growth path, shown by the green line in Figure 4, would lie below the pre-shock path by an amount equal to the revenue associated with the lost sales. Finally, the shock could lead to a permanent reduction in the size of the business in percentage terms. Under this scenario, the difference between pre- and post-shock revenue grows over time in terms of dollars as shown by the black and blue lines in Figure 4.

By applying the DCF model, and using analysts forecasts, the three adjustment scenarios can be translated into implied stock price changes. The calculations are presented in Table 3. In Table 3, the projections for the first two years are median values taken from *post-announcement* analyst reports. Beyond the two-year horizon, all the revenue ratios used earlier in Table 2 are assumed to be applicable despite the lower projected revenues. This implies that by the end of two years Intel could have adjusted to a lower sales growth path in a fashion that allows the company to maintain its margins. The table shows the specific calculations for one future revenue path. For that path, post-announcement revenues in all the years after 2001 are assumed to fall short of the pre-announcement growth path the same percentage as they fell short in 2001.

Results for all three scenarios are presented in Table 4. Each of the scenarios starts with analyst forecasts for 2000 and 2001. For the temporary revenue drop, it is assumed that the revenue shortfall is reduced linearly in each year until it returns to the pre-announcement growth path in 2009. The permanent revenue drop assumes that sales lost in the first two years are never recovered so that dollar revenues in all years after 2001 are below the pre-announcement projections by the analyst revision for 2001. The permanent

drop in percent (the calculations shown in Table 3) assumes that the ratio of pre-announcement to post-announcement revenues remains constant at 2001 level.

Table 4 demonstrates that none of the scenarios produces anything close to the observed 30 percent drop in Intel's stock price. If the decline in revenues is temporary, the implied drop is less than 1 percent. Even if the decline in revenues is assumed to be permanent in percentage terms, the implied stock price drop is only 4.5 percent.

Table 4 makes it clear that to explain the decline in Intel's price it is necessary to assume that investors significantly changed their views regarding the long-run growth potential of the company. The final column of the Table 4 and Table 5 present one hypothetical revenue growth path consistent with the drop in the stock price. That path implies a dramatic change in Intel's long-run business outlook. Average growth over the next ten years falls from nearly 20 percent to well under 15 percent. As a result, by the final year of the forecast, 2009, revenues are over $50 billion below the projections necessary to calibrate the model prior to the press release. This is the type of major reassessment of a company's prospects that may result from a significant product problems, changes in government regulation, major innovations by competitors or a shift in the market away from the company's products to a different technology. However, it is virtually impossible to see how such a reassessment could have been precipitated by September 21 press release. Announcement of a cyclical slowing of revenue growth in Europe, does not amount to a major revision in the company's long-run outlook for its fundamental business.

The possibility of partial anticipation simply compounds the mystery. To the extent that the information in the press release was anticipated because of Kumar's warnings, the stock price response should be attenuated. That means that without partial anticipation the drop in response to the press release would have been even larger than 30 percent.

In short, the analysis indicates that Intel, despite being one of the most carefully followed and widely analyzed companies, could not have been efficiently priced both before and after the press release. This finding supports Summers' (1986) view that stock prices can deviate markedly from fundamental value over prolonged periods of time. It also has clear implications for corporate managers. If stock prices can deviate widely from informed estimates of fundamental value, then it is incumbent upon senior managers of the firm to develop and be familiar with a fundamental valuation model of their company. Such knowledge would prove useful not only in dealing with the investment community, but also in making important financial decisions such as repurchasing the stock, issuing new stock or using the company's stock for acquisitions. Rather than bemoaning market overreaction or misvaluation, managers should strive to exploit it. In fact, the literature on the response of stock prices to new issues is consistent with the view that astute companies are already doing so.[7]

The conclusion that that the quanta of information contained in the press release of September 21, 2000 is insufficient to explain the 30 percent drop in Intel's stock price does not necessarily imply that the stock was undervalued after the drop. It is equally likely, indeed it is more likely, that the company was overpriced before the release. Recall that Table 2 reveals that to support its pre-announcement stock price Intel's revenues had to grow to a massive $170 billion by 2009 assuming a equity risk premium of 3.9 percent. Had an ERP closer to the historical average been employed, revenues in 2009 would have to be expected to grow to well over $250 billion. Similarly, sales would have to rise to over $200 billion if the model were calibrated to end of August prices. Nonetheless, analysts were more enthusiastically recommending purchase of Intel at the end of August than after the price had dropped to $40. This situation is reminiscent of the results of Shiller's (1989)

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[7] See, for instance, Masulis and Korwar (1986) or Mikkelson and Partch (1986).

survey of institutional investors at the time of the crash of October 1987. Shiller found that prior to the crash a majority of the investors felt that the market was overvalued, but they were not selling because the recent price action had been favorable. Perhaps analysts had been taking a similar stance with regard to Intel. Even though the late summer price was too high to justify with reasonable fundamentals, analysts were still highly recommending purchase of Intel on the basis of the company's reputation and the huge run-up experienced from January through September. This suggests it would be informative to investigate the role played by analysts and their recommendations in the response of Intel's stock price to the September 21 press release.

4. The Role of Analysts

Stock market analysts play a critical role in collecting, analyzing and transmitting corporate information for investors. For the most part, academic research supports the view that they perform these functions quite well. For instance, there is a large literature which indicates that analysts' earnings forecasts are at least as accurate as statistical models in predicting future earnings.[8] That literature, however, focuses on short-term forecasts because most analyst reports do not contain point estimates of earnings beyond two years. Furthermore, more recent research, including DeBondt and Thaler (1990), Easterwood and Nutt (1999) and Lim (2000), finds evidence of bias in analyst forecasts.

There are some additional shortcomings in the work of analysts that are highlighted by the Intel experience. The most notable shortcoming is that virtually none of the analyst reports on Intel contained a DCF valuation analysis. What makes this surprising is that virtually every report contained a recommendation regarding potential purchase or sale of

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[8] See, for instance, Brown and Rozeff (1978), O'Brien (1988), and Givoly and Lakonishok (1984).

the stock. The mystery is how a purchase recommendation could be offered without an explicit comparison between price and estimated value. From a valuation perspective, attractive securities are those whose price is less than the present value of the expected future cash flows discounted at the appropriate risk-adjusted rate. Unlike bond ratings, which attempt to assess the credit quality of a company and, as a result, can be prepared independent of valuation considerations, equity recommendations are precisely a weighing of price versus fundamental value. One would presume, therefore, that analyst reports designed to help investors make investment decisions would focus on estimation of fundamental value. That is not the case. Short-run financial performance, not fundamental value, is the focus of the reports on Intel. Furthermore, discussions of fundamental value are often vague and nebulous, and rarely involve the presentation of a precise, quantitative model that can be dissected and critiqued. In addition, financial projections that are presented are typically limited to forecast horizons of two years or less. Such short horizons are not sufficient to construct a reasonable DCF valuation model. Because of the lack of explicit valuation models, it is difficult to understand how the analysts arrive at their estimates of fundamental value and to discern how and why those estimates might change in response to events such as Intel's press release.

Failure to present an explicit valuation models also makes it difficult to determine how analysts make a distinction between permanent and temporary shocks. For instance, following Intel's press release virtually every analyst report focused intensely on how forecasts of revenues and earnings should be revised for the forthcoming quarter and fiscal year. This short-run focus does not help an investor answer the critical investment question – does the press release represent a fundamental change in Intel's business outlook and, therefore, its value? More specifically, was the shock to revenue temporary, permanent in units, permanent in percent, or indicative of a basic shift in the long-run

demand for the company's products? As the previous section made clear, the valuation impacts are dramatically different depending upon which interpretation is accepted.

When analysts' purchase recommendations are considered, a more puzzling valuation issue arises. In the previous two sections of this paper, evidence was presented to support the view that the drop in Intel's stock price was too large to be explained by the information conveyed by the September 21 press release. If the stock price drop in response to the announcement was indeed "too large" in light of the underlying fundamentals, one would expect that, on average, analysts would have *upgraded* their investment recommendations following the announcement because Intel was now more attractively priced relative to its fundamental value. Even if market were efficient, so that the price drop was justified by the announcement, it should still be the case that as many analysts would upgrade their recommendations as would downgrade them because price and value would fall by equal amounts.

The actual recommendation revisions for Intel are markedly at odds with both of foregoing predictions. In the week following the Intel's press release, Bloomberg reported that 26 of the analysts who follow the company revised their recommendations. Of those 26, 12 decided to revise their previous recommendation. All 12 lowered their recommendations. Four of the analysts lowered their recommendation by more than one category. One dropped Intel from a strong buy to underperform. This is a striking finding. Prior to the announcement investors had to pay over $60 dollars to buy a share of Intel. Following the announcement, the same company, in the same competitive environment, with the same technology and management could be acquired for just over $40 dollars per share. Nonetheless, analysts, on average, found the company to be less attractive at the lower price. The results are more dramatic if one goes back to the end of August. At that

time, prior to Ashok Kumar's statements, analysts were giving Intel even more positive buy recommendations despite the fact that the stock price was over $74.

This finding strongly suggests that analysts recommendations are based on something other than a comparison of market price with fundamental value. One possibility is that analysts are in some sense rating the company, rather than the investment. When bad news is announced they "downgrade" the firm much in the fashion that bond rating agencies do. The problem with this hypothesis is that it makes no economic sense. Bond rating agencies are trying to assess credit quality, i.e. the probability of repayment. Such an assessment can be made independent of price. Equity investment decisions, however, do not depend on a company's "quality", but its quality in relation to price.

A political element may come into play as well. When a company's stock price is rising sharply and the firm is being touted in the financial press as a star, it seems to be difficult for an analyst to downgrade the company. Conversely, when the company's stock price falls sharply following a negative press release, such as Intel's, upgrading a recommendation on the company may to appear foolish to those who do not understand the underlying valuation issues, which unfortunately includes much of the financial media. Furthermore, investors who are not following the stock closely, may become confused about timing and think that the analyst upgraded the stock prior to the drop. Such a false belief would sully an analyst's reputation. Indeed, it is possible that analysts fear that recommending purchase of a stock that has just dropped 30 percent results in a kind of guilt by association. Another political complication arises from the fact that analysts do more than advise investors. Because most analysts are employed by investment banks, numerous commentators and researchers, including Dugar and Nathan (1995) and Lin and McNichols (1998), have suggested that analyst recommendations are tainted by the fact

that the investment banks who employ analysts compete for the business of the firms that the analysts are following.

Whatever the explanation, the Intel experience reveals that in the case of at least one company analyst recommendations are highly procyclical. As bad news is released and the price of a company's stock declines, analysts downgrade the company. The reverse effect occurs on the release of good news. As a result, a positive feedback loop of the type described by Shiller (1989) develops. If analyst recommendations affect investor behavior, then such a feedback loop could exacerbate price movements in both directions. This issue is of sufficient import that it invites future research to determine whether the Intel experience is common.

Finally, the failure to develop a DCF model also causes analysts to overlook, or at least downplay, the role of expected returns in investor decision making. In the case of Intel, it was necessary to assume a ERP of 3.9 percent and an associated expected return of 11.03 percent in order to calibrate the model prior to the announcement. Accordingly, analysts should have telling investors, to whom they recommended purchase of the stock, that if the company meets lofty growth projections, such as those presented in Table 2, then investors can expect to earn returns of only 11 percent. For returns to exceed that amount, in other words for Intel to outperform the market and justify a buy recommendation, future cash flows would have to be greater than the levels projected in Table 2.

4. Summary and Conclusions

This paper has investigated the stock market response to Intel's September 21, 2000 press release in which the company announced that its revenue growth for third quarter would be lower than analyst expectations. By examining the release in conjunction with analyst reports and by employing a DCF valuation model, it is argued that the press release did not contain sufficient information about the long-run business outlook for Intel to

justify the market's 30 percent drop in response to the announcement. This does not mean, however, that the market overreacted in the sense of unrealistically depressing Intel's stock price. On the contrary, the analysis presented here suggests that the misvaluation existed prior to the announcement. The DCF valuation model shows that even using a relatively low beta and a small equity market risk premium, Intel had to grow profitably at an implausibly rapid pace, from an already high base, to justify the pre-announcement stock price. The conclusion that emerges, consequently, is that the press release acted as a kind of catalyst that caused movement toward a more rational price, even though the release itself did not contain sufficient long-run valuation information to justify that movement.

This explanation is buttressed by the puzzling procyclical nature of analysts purchase recommendations. At the end of August, when the stock price was $75, Intel was one of the most highly recommended stocks in the Bloomberg analyst database. By the end of September, with the price less than $40, analysts had significantly downgraded their purchase recommendations. Such a reaction on the part of analysts would make sense only if the information that arrived in the interim was sufficient to cause the estimated fundamental value of the company to fall by more than $35 drop in the price. That conclusion is not supported by the analysis of the press release. The information provided by the release was short-term in nature and limited to a certain geographic region.

What the foregoing suggests is that historical price performance itself plays a critical role in influencing analyst recommendations. Strong buy recommendations were maintained into September, despite the fact that the DCF model shows that the high prices then were hard to justify, because the stock price had run up 85 percent since January. Similarly, it appears that many analysts reduced their recommendations following the press release precisely because the price had fallen 30 percent. Such behavior on the part of

analysts, if affects investors, would tend to exacerbate stock price volatility. This is clearly an exciting area for future research.

More generally, the paper points to a significant shortcoming in analyst reports. The most difficult task for investors is assessing the long-run implications of new information for a company's fundamental business. For instance, how does the Intel press release affect the long-run revenue growth stream and, therefore, the value of the company? By failing to focus on fundamental value, and by not presenting explicit DCF valuation models, analysts short change investors. Furthermore, if analysts developed explicit valuation models, then the procyclical nature of recommendations discussed above might well disappear because the recommendations would have to be based on a quantitative comparison of estimated value to price. Of course, such an approach would carry added risk for analysts because specific models, while more useful and precise than vague discussions, are also more open to criticism if the projections on which they are based fail to materialize.

Finally, the results reported here have important implications for financial managers. The huge price movement on relatively minor information implies that Intel could not have been efficiently priced both before and after the press release. This supports Summers' (1986) contention that stock prices can deviate markedly from fundamental value over prolonged periods of time, even for the most widely followed and carefully analyzed companies. If that is so, then it is incumbent upon senior managers of the firm to develop fundamental valuation models for their companies. Such models would prove useful not only in dealing with the investment community, but also in making important financial decisions such as issuing or repurchasing the company's stock.

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Table 1: Historical financial data for Intel

In terms of dollars

	1995	1996	1997	1998	1999
Net revenues (millions)	**16,202**	**20,847**	**25,070**	**26,273**	**29,389**
Cost of sales	7,811	9,614	9,945	12,088	11,836
Research and development	1,296	1,808	2,347	2,509	4,264
SG&A	1,843	2,322	2,891	3,076	3,872
Income from operations	**5,252**	**7,103**	**9,887**	**8,600**	**9,417**
Marginal tax rate	33.0%	33.0%	33.0%	33.0%	33.0%
Tax on operating income	1,733	2,344	3,263	2,838	3,108
NOPAT	**3,519**	**4,759**	**6,624**	**5,762**	**6,309**
Depreciation	1,371	1,888	2,192	2,807	3,186
Increase in working capital	1,700	(200)	(320)	40	(380)
Capital expenditures	3,550	3,024	4,501	3,557	3,403
Cash flow from operations	**(360)**	**3,823**	**4,635**	**4,972**	**6,472**

As a percent of revenues

	1995	1996	1997	1998	1999
Net revenues (millions)	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Cost of sales	48.2%	46.1%	39.7%	46.0%	40.3%
Gross Margin	**51.8%**	**53.9%**	**60.3%**	**54.0%**	**59.7%**
Research and development	8.0%	8.7%	9.4%	9.5%	14.5%
SG&A	11.4%	11.1%	11.5%	11.7%	13.2%
Income from operations	**32.4%**	**34.1%**	**39.4%**	**32.7%**	**32.0%**
NOPAT	**21.7%**	**22.8%**	**26.4%**	**21.9%**	**21.5%**
Depreciation	8.5%	9.1%	8.7%	10.7%	10.8%
Change in working capital	10.5%	-1.0%	-1.3%	0.2%	-1.3%
Capital expenditures	21.9%	14.5%	18.0%	13.5%	11.6%
Cash flow from operations	**-2.2%**	**18.3%**	**18.5%**	**18.9%**	**22.0%**

Growth rates

	1995	1996	1997	1998	1999
Net revenues (millions)		**29%**	**20%**	**5%**	**12%**
Cost of sales		23%	3%	22%	-2%
Research and development		40%	30%	7%	70%
SG&A		26%	25%	6%	26%
Income from operations		**35%**	**39%**	**-13%**	**10%**
NOPAT		**35%**	**39%**	**-13%**	**9%**
Depreciation		38%	16%	28%	14%
Change in working capital		-112%	60%	-113%	-1050%
Capital expenditures		-15%	49%	-21%	-4%
Cash flow from operations		**NA**	**21%**	**7%**	**30%**

Table 2: Discounted Cash Flow Valuation Model Calibrated to Pre-announcement Intel Stock Price

	2000*	2001*	2002	2003	2004	2005	2006	2007	2008	2009	Terminal
Net revenues (millions)	35,771	43,000	51,600	61,920	74,304	89,165	106,106	125,205	146,490	169,929	
Cost of sales	12,895	15,000	19,350	23,220	27,864	33,437	39,790	46,952	54,934	63,723	
Research and development	4,002	4,640	5,418	6,502	7,802	9,362	11,141	13,147	15,381	17,842	
SG&A	5,287	6,525	6,966	8,359	10,031	12,037	14,324	16,903	19,776	22,940	
Income from operations	13,587	16,835	19,866	23,839	28,607	34,328	40,851	48,204	56,399	65,422	
Marginal tax rate	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	
Tax on operating income	4,484	5,556	6,556	7,867	9,440	11,328	13,481	15,907	18,612	21,589	
NOPAT	9,103	11,279	13,310	15,972	19,167	23,000	27,370	32,297	37,787	43,833	
Depreciation	3,219	3,870	4,644	5,573	6,687	8,025	9,550	11,268	13,184	15,294	
Change in working capital	358	430	516	619	743	892	1,061	1,252	1,465	1,699	
Capital expenditures	5,992	5,375	6,450	7,740	9,288	11,146	12,733	15,025	17,579	20,391	
Cash flow from operations	5,973	9,344	10,988	13,186	15,823	18,988	23,126	27,288	31,928	37,036	39,258
Present value	5,819	8,199	8,684	9,386	10,145	10,965	12,029	12,784	13,472	14,076	

Terminal growth rate	6.00%	PV of cash flow (billions)		106	Total firm value		415
Risk-free rate	6.15%	PV of terminal value		297	Value of debt		1
Beta	1.25	Excess cash and short-term		13	Value of equity		414
Equity risk premium	3.90%	securities			Shares outstanding		6.71
WACC	**11.03%**				**Implied share price**	$	**61.77**

Operating assumptions

	2000*	2001*	2002	2003	2004	2005	2006	2007	2008	2009
Net revenues (growth rate)	21.7%	20.2%	20.0%	20.0%	20.0%	20.0%	19.0%	18.0%	17.0%	16.0%
Cost of sales (% of revenue)	36.0%	34.9%	37.5%	37.5%	37.5%	37.5%	37.5%	37.5%	37.5%	37.5%
Research and development	11.2%	10.8%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%
SG&A	14.8%	15.2%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%
Income from operations	38.0%	39.2%	38.5%	38.5%	38.5%	38.5%	38.5%	38.5%	38.5%	38.5%
Marginal tax rate										
Tax on operating income										
NOPAT	25.4%	26.2%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%
Depreciation	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Change in working capital	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Capital expenditures	16.8%	12.5%	12.5%	12.5%	12.5%	12.5%	12.0%	12.0%	12.0%	12.0%
Cash flow from operations	16.7%	21.7%	21.3%	21.3%	21.3%	21.3%	21.8%	21.8%	21.8%	21.8%

Table 3: Post-announcement revenue path consistent with the stock price decline

	2000*	2001*	2002	2003	2004	2005	2006	2007	2008	2009	Terminal
Net revenues (millions)	34,621	41,000	49,200	59,040	70,848	85,018	101,171	119,382	139,677	162,025	
Cost of sales	12,857	15,643	18,450	22,140	26,568	31,882	37,939	44,768	52,379	60,759	
Research and development	4,002	4,560	5,166	6,199	7,439	8,927	10,623	12,535	14,666	17,013	
SG&A	5,287	6,450	6,642	7,970	9,564	11,477	13,658	16,117	18,856	21,873	
Income from operations	12,475	14,347	18,942	22,730	27,276	32,732	38,951	45,962	53,775	62,380	
Marginal tax rate	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	
Tax on operating income	4,117	4,735	6,251	7,501	9,001	10,801	12,854	15,167	17,746	20,585	
NOPAT	8,358	9,612	12,691	15,229	18,275	21,930	26,097	30,795	36,030	41,794	
Depreciation	3,116	3,690	4,428	5,314	6,376	7,652	9,105	10,744	12,571	14,582	
Change in working capital	346	410	492	590	708	850	1,012	1,194	1,397	1,620	
Capital expenditures	5,799	5,125	6,150	7,380	8,856	10,627	12,141	14,326	16,761	19,443	
Cash flow from operations	5,329	7,767	10,477	12,573	15,087	18,104	22,050	26,019	30,443	35,313	37,432
Present value	5,191	6,816	8,280	8,950	9,673	10,455	11,469	12,190	12,846	13,421	

Terminal growth rate	6.00%	PV of cash flow (billions)	99	Total firm value	395
Risk-free rate	6.15%	PV of terminal value	283	Value of debt	1
Beta	1.25	Excess cash and short-term	13	Value of equity	394
Equity risk premium	3.90%	securities		Shares outstanding	6.71
WACC	**11.03%**			**Implied share price**	**$ 58.78**

Operating assumptions

	2000*	2001*	2002	2003	2004	2005	2006	2007	2008	2009
Net revenues (growth rate)	17.8%	18.4%	20.0%	20.0%	20.0%	20.0%	19.0%	18.0%	17.0%	16.0%
Cost of sales (% of revenue)	37.1%	38.2%	37.5%	37.5%	37.5%	37.5%	37.5%	37.5%	37.5%	37.5%
Research and development	11.6%	11.1%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%
SG&A	15.3%	15.7%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%
Income from operations	36.0%	35.0%	38.5%	38.5%	38.5%	38.5%	38.5%	38.5%	38.5%	38.5%
Marginal tax rate										
Tax on operating income										
NOPAT	24.1%	23.4%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%
Depreciation	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Change in working capital	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Capital expenditures	16.8%	12.5%	12.5%	12.5%	12.5%	12.5%	12.0%	12.0%	12.0%	12.0%
Cash flow from operations	15.4%	18.9%	21.3%	21.3%	21.3%	21.3%	21.8%	21.8%	21.8%	21.8%

Table 4: Stock price drops associated with various cash flow forecast revisions

Year	Pre-announcement projections	Temporary revenue drop	Permanent revenue drop in units	Permanent revenue drop in percent	Revenue drop consistent with stock price
2000	35,771	34,621	34,621	34,621	34,621
2001	43,000	41,000	41,000	41,000	41,000
2002	51,600	49,600	49,600	49,200	47,767
2003	61,920	60,206	59,920	59,040	55,172
2004	74,304	72,875	72,304	70,848	63,454
2005	89,165	88,022	87,165	85,018	72,344
2006	106,106	105,249	104,106	101,171	81,756
2007	125,205	124,634	123,205	119,382	91,574
2008	146,490	146,204	144,490	139,677	101,657
2009	169,929	169,929	167,929	162,025	111,833
Stock price	$ 61.77	$ 61.31	$ 60.66	$ 58.78	$ 43.31
Percent drop		0.74%	1.80%	4.84%	29.89%

Table 5: Post-announcement revenue path consistent with the stock price decline

|	2000*	2001*	2002	2003	2004	2005	2006	2007	2008	2009	Terminal
Net revenues (millions)	34,621	41,000	47,767	55,172	63,454	72,344	81,756	91,574	101,657	111,833	
Cost of sales	12,857	15,643	17,912	20,690	23,795	27,129	30,658	34,340	38,121	41,937	
Research and development	4,002	4,560	5,015	5,793	6,663	7,596	8,584	9,615	10,674	11,742	
SG&A	5,287	6,450	6,448	7,448	8,566	9,766	11,037	12,363	13,724	15,097	
Income from operations	12,475	14,347	18,390	21,241	24,430	27,852	31,476	35,256	39,138	43,056	
Marginal tax rate	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	
Tax on operating income	4,117	4,735	6,069	7,010	8,062	9,191	10,387	11,635	12,915	14,208	
NOPAT	8,358	9,612	12,321	14,232	16,368	18,661	21,089	23,622	26,222	28,847	
Depreciation	3,116	3,690	4,299	4,966	5,711	6,511	7,358	8,242	9,149	10,065	
Change in working capital	346	410	478	552	635	723	818	916	1,017	1,118	
Capital expenditures	5,799	5,125	5,971	6,897	7,932	9,043	9,811	10,989	12,199	13,420	
Cash flow from operations	5,329	7,767	10,172	11,749	13,512	15,406	17,819	19,959	22,156	24,374	25,836
Present value	5,191	6,816	8,039	8,363	8,664	8,896	9,268	9,350	9,349	9,264	

Terminal growth rate	6.00%	PV of cash flow (billions)	83	Total firm value	292
Risk-free rate	6.15%	PV of terminal value	195	Value of debt	1
Beta	1.25	Excess cash and short-term	13	Value of equity	291
Equity risk premium	3.90%	securities		Shares outstanding	6.71
WACC	11.03%			Implied share price	$ 43.31

Operating assumptions

	2000*	2001*	2002	2003	2004	2005	2006	2007	2008	2009
Net revenues (growth rate)	17.8%	18.4%	16.5%	15.5%	15.0%	14.0%	13.0%	12.0%	11.0%	10.0%
Cost of sales (% of revenue)	37.1%	38.2%	37.5%	37.5%	37.5%	37.5%	37.5%	37.5%	37.5%	37.5%
Research and development	11.6%	11.1%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%	10.5%
SG&A	15.3%	15.7%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%	13.5%
Income from operations	36.0%	35.0%	38.5%	38.5%	38.5%	38.5%	38.5%	38.5%	38.5%	38.5%
Marginal tax rate										
Tax on operating income										
NOPAT	24.1%	23.4%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%	25.8%
Depreciation	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Change in working capital	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Capital expenditures	16.8%	12.5%	12.5%	12.5%	12.5%	12.5%	12.0%	12.0%	12.0%	12.0%
Cash flow from operations	15.4%	18.9%	21.3%	21.3%	21.3%	21.3%	21.8%	21.8%	21.8%	21.8%

Pat	Pre-announcement p	Temporary drop	Permanent drop i	Permanent drop in percent
2000	100	98	98	98
2001	105	100	100	100
2002	110	105	105	105
2003	116	111	111	110
2004	122	118	117	116
2005	128	125	123	122
2006	134	132	129	128
2007	141	139	136	134
2008	148	147	143	141
2009	155	155	150	148

Figure 1: Path of Wealth for Intel, NASDAQ and the S&P 500 September 27, 1999 to September 28, 2000
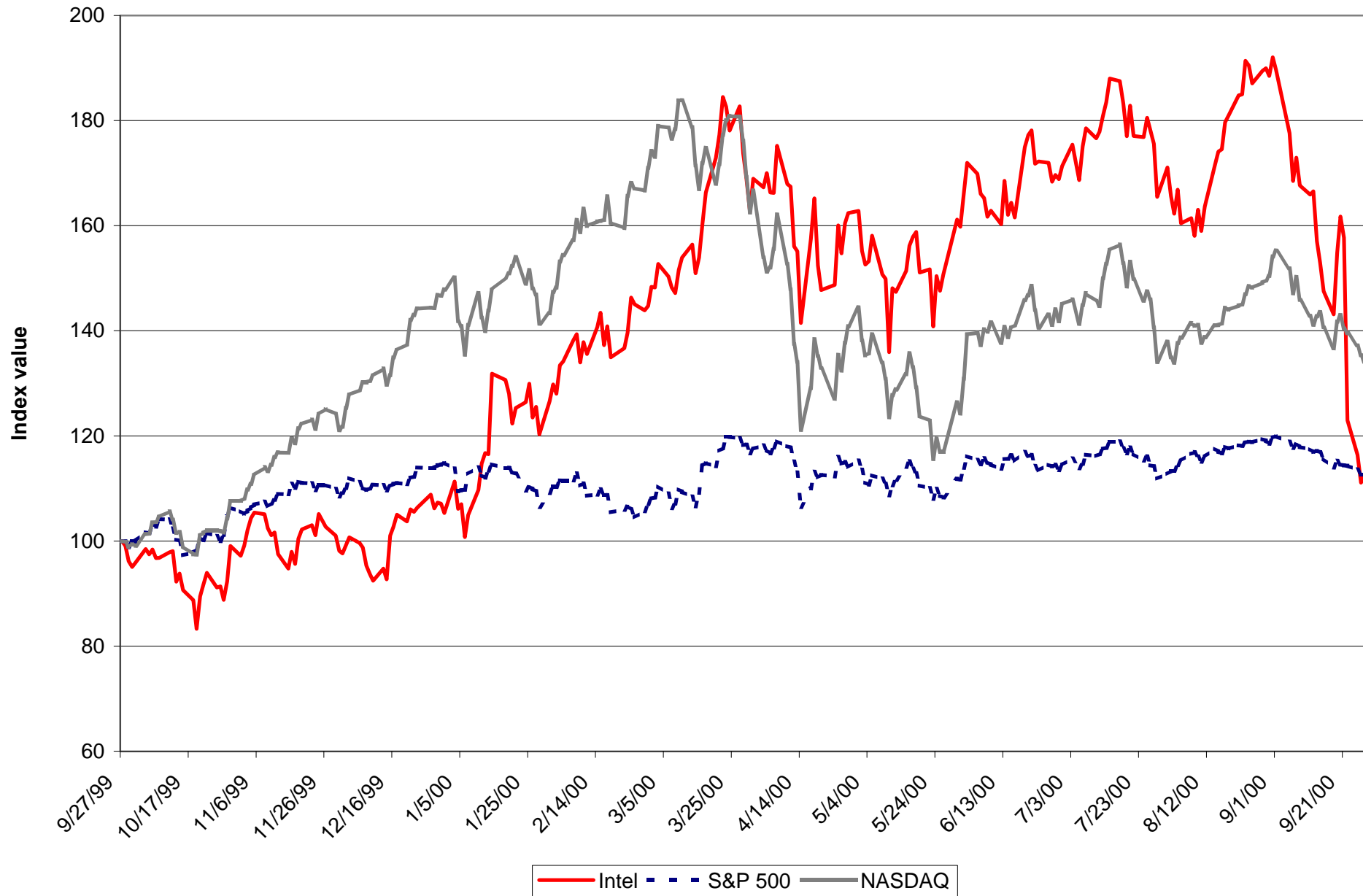
Figure 2: Intel's Market Value and Trading Volume
September 27, 1999 to September 28, 2000
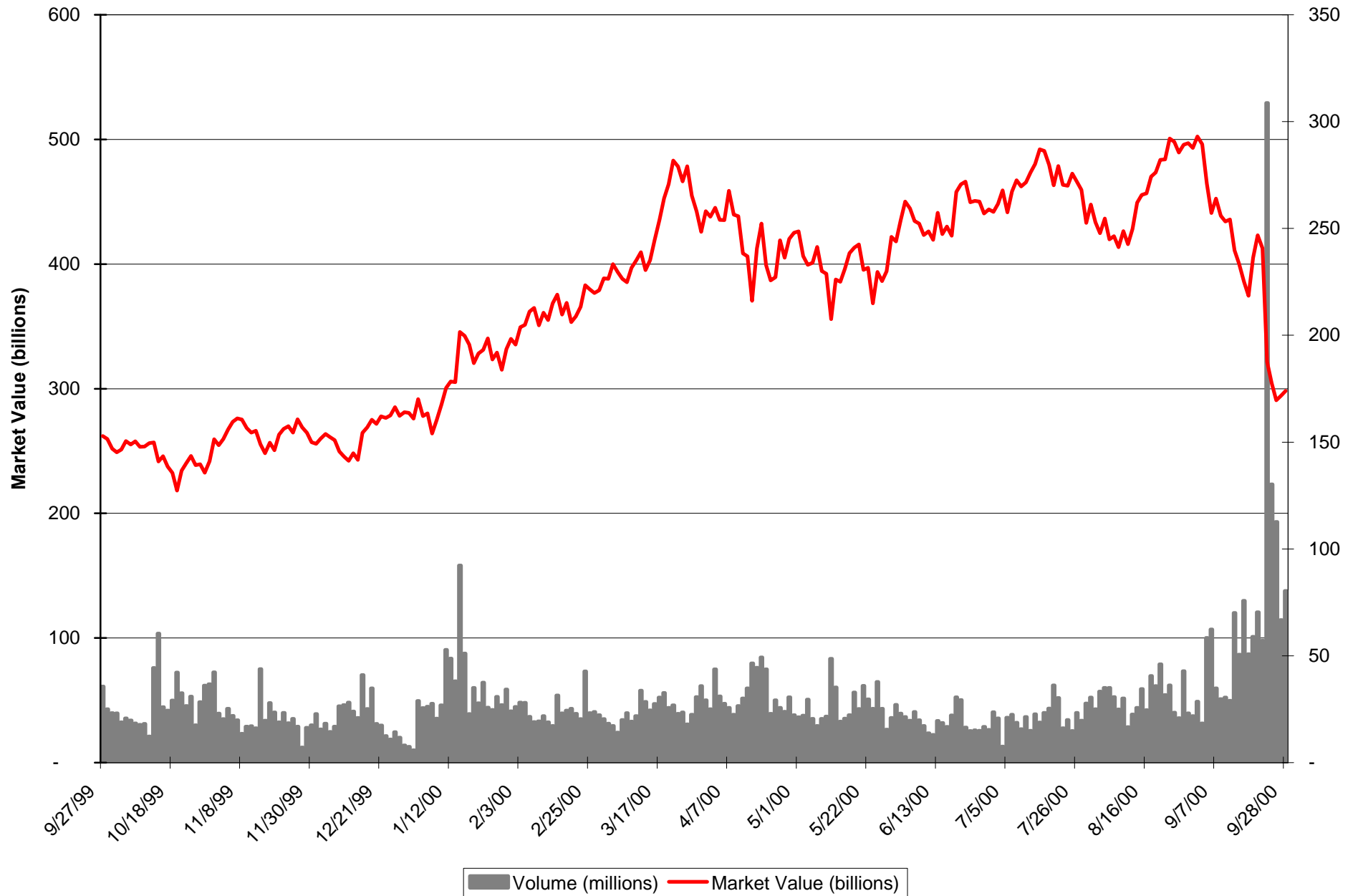
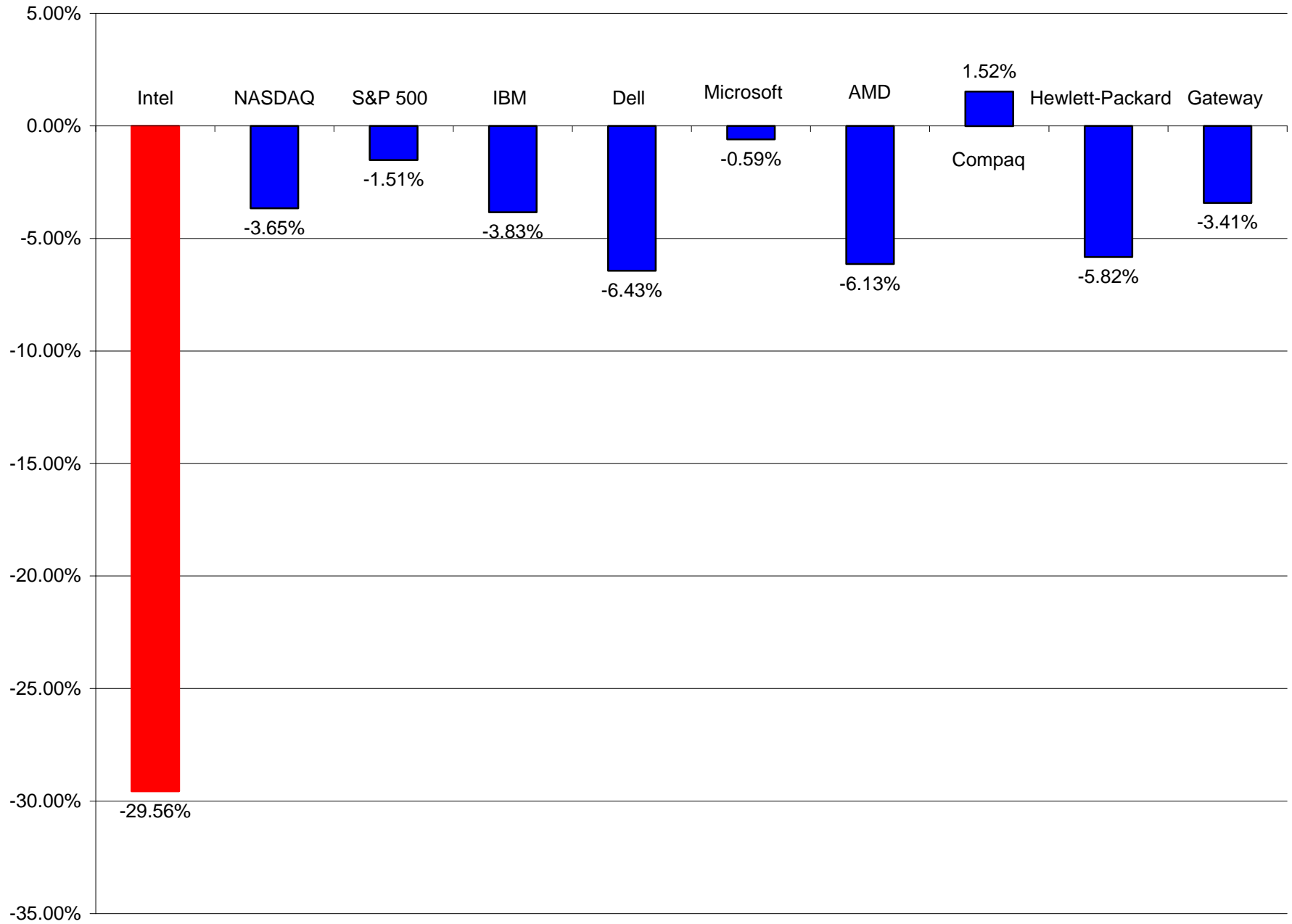**Figure 3: Price changes for selected companies and indices September 22, 2000 to September 26, 2000**

Figure 4: Three hypothetical reactions to Intel's revenue shock

Legend: Pre-announcement path — Temporary drop — Permanent drop in units — Permanent drop in percent