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# Atoms, Bits, and Cash

## The ABCs of Investing in the New Economy

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- **Detailed analysis of return on invested capital for the S&P 500 shows that the source of value creation is shifting from physical capital to intellectual capital—from atoms to bits.**
- **Given that our accounting system is poor at capturing intellectual capital, investors must focus on the source of value creation: cash.**
- **We find that the cash conversion cycle is an excellent measure of how well management is managing its tangible capital base.**
- **Our data show that new economy industries are improving their capital management better than old economy industries. Further, companies closest to the customer tend to do a better job of managing capital.**
- **The cash conversion cycle is a great way for growth and value investors to identify promise or trouble in their stock picks.**

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## Executive Summary

- *Aggregate return on invested capital data mask some profound trends.* Detailed analysis of return on invested capital for the S&P 500 show that the source of value creation is shifting from physical capital to intellectual capital—from atoms to bits. In fact, improved physical capital management has freed roughly $245 billion over the past decade. However, measures of improved physical capital management are offset by a surge in goodwill. Cash is investing's common denominator. Given that our accounting system is poor at capturing intellectual capital, investors must focus on the source of value creation: cash. There is a substantial and growing chasm between our accounting system and economic reality. Analysis of cash flow shrinks that gap, and allows investors to judge all companies on a universal and proven metric of performance.
- *The cash conversion cycle is a powerful tool*. We find that the cash conversion cycle is an excellent measure of how well management is employing its tangible capital base. In effect, an improving cash conversion cycle is often a triumph of brains over brawn—intellectual capital over physical capital.
- *Cash flow: out with the old, in with the new.* Our data show that new economy industries—including technology and communications services—are improving their capital management better than old economy industries such as basic materials and energy. Further, companies closest to the customer tend to do a better job of managing capital than those removed from the end market.
- *A stock picker's delight.* The cash conversion cycle is a great tool for growth and value investors to identify promise or trouble in their stock picks. Rising cash conversion cycles often indicate deterioration in cash flows, while declining cash conversion cycles generally signal improving cash flows. Neither rising nor falling cash conversion cycles are readily apparent from the income statement. Thus, changing cash conversion cycles are often a harbinger of stock price performance.

## Introduction

*"When I was a kid in the bank, the key economic indicator we looked at was freight car loadings. Who cares about that now? What we need is a way to measure the knowledge we bring to the work we do."*

-Walter Wriston[1]

Throughout most of history, our economy has centered on the production of tangible goods using physical assets. However, the economy is undergoing a fundamental shift. A new economy is emerging, where reliance on tangible capital is yielding to intellectual capital–from atoms to bits. Intellectual capital is intellectual material—knowledge, information, intellectual property, and experience—that can be put to use to create wealth.[2]

This atoms-to-bits transformation has not only spawned whole new businesses, it is reshaping the competitive landscape of traditional industries. It has also created significant shareholder value, supporting one of the biggest and longest bull markets in history.

Unfortunately, as ethereal bits eclipse concrete atoms, traditional financial measures become less reliable at capturing value. Our accounting system, designed to track the movement of physical capital, is inelegant in recognizing knowledge capital. The investment rules developed by Graham and Dodd for post-Depression companies have little to say about intangible assets. But none of this matters to the stock market, which clearly has rewarded brains over brawn.

Happily, there is a common denominator for valuing atoms and bits: cash. In fact, Graham and Dodd were right all along: the value of a business is the present value of future free cash flows. Debates about purchase versus pooling, expensing versus capitalizing, and income statement versus balance sheet all overlook a basic verity: the stock market follows cash. Increasingly, intellectual capital is replacing physical capital—freeing huge sums of cash and confounding traditional analysis.

This report is broken into four parts. First, we explore the shift from atoms to bits. Our analysis reveals clear evidence of a surge in intellectual capital that is not well captured in aggregate data. Second, we highlight the cash conversion cycle as a useful starting point in identifying companies that are successfully replacing tangible assets with intellectual capital. Third, we apply the cash conversion cycle to various sectors and companies. This analysis highlights shifts in the economy and provides critical insights about valuation. Finally, we show how the cash conversion cycle can be a great tool for stock picking.

## The Digital Economy: From Atoms to Bits

*"While the weight of current economic output is probably only modestly higher than it was a half century ago, value added, adjusted for price change, has risen well over threefold."*

-Alan Greenspan[3]

The Information Age is supplanting the Industrial Age. Knowledge is replacing physical things as both the primary input and the final output of the production process. The proof is everywhere, from radical new production processes to the booming software industry.[4]

Consider a beverage can. In 1958, Reynolds Metals developed a seven-ounce aluminum can to compete with the standard steel can.[5] The new container weighed a relatively hefty two-thirds of an ounce, and required costly chemicals or massive amounts of expensive electric power to produce.

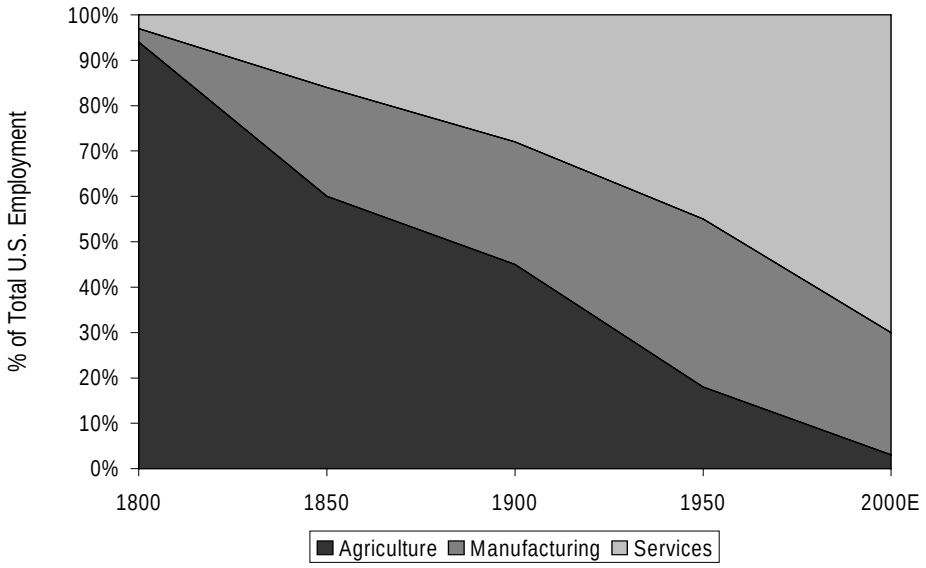
This all changed when aluminum producers and can manufacturers figured out how to make the aluminum can into a viable alternative to the steel can. Improved manufacturing know-how reduced the weight of the can to less than half an ounce. The creation of an expansive recycling network—recycled aluminum uses about 5% of the electricity needed to make ingot out of scratch—circumvented the massive power cost disadvantage. The technology took off.

By 1967, the year Coke and Pepsi started using the aluminum can, engineers had figured out how to reduce the material used by more than 25%. Yet another triumph of knowledge over nature.

Aluminum can production is a microcosm. For example, U.S. exports lost 50% of their physical weight per dollar of value from 1990 to 1996.[6]

The trend away from manufacturing and toward services and other nonphysical output has become pronounced. In 1800, only 3% of the domestic workforce held service jobs. By 1950, that number had jumped to 45%. We expect 70% of the domestic workforce to hold service jobs by the turn of the millennium (see Figure 1).[7]

**Figure 1**
**The Changing Economy**
as a percentage of the domestic workforce




Source: *Myths of Rich and Poor,* by W. Michael Cox and Richard Alm, and CSFB estimates.

All industries are affected by this shift. Moore's Law predicts the doubling of computing power every 18-24 months.[8] Gilder's Law foretells the tripling of bandwidth every year in the foreseeable future.[9] The continual shedding of mass and improvement in quality has spawned a generation of consumers that expects more and more for less and less. And they are getting it.

## *Not* Accounting for Bits

*"The good news is that there's a new item in the asset column, one you're probably not even accounting for: your information assets."*

-Downes and Mui[10]

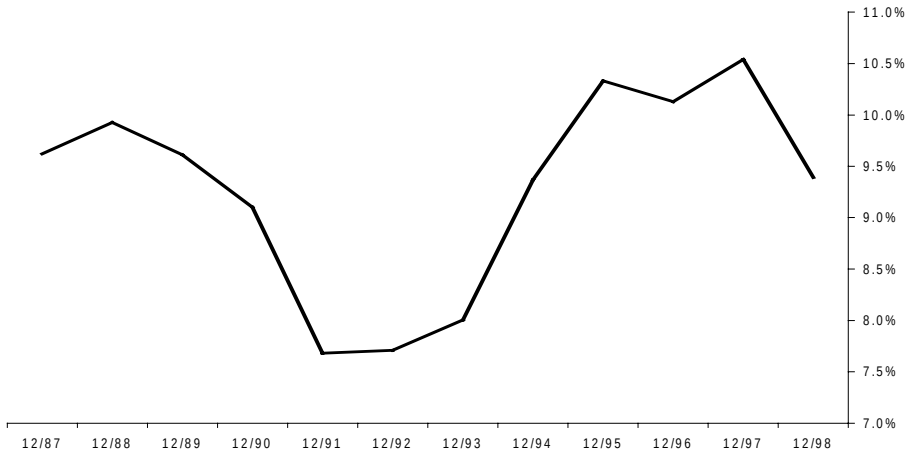
Replacing capital with knowledge should manifest itself in a reduced asset base, boosting commonly used return metrics such as return on operating assets. But, as Figure 3 shows, this does not appear to be the case. A detailed analysis of the S&P Industrials suggests that the world has not changed much in the past decade. Total operating return on assets is essentially the same as it was ten years ago.

**Figure 2**
**The Pretax Value Equation: Return on Operating Assets**

$$\text{Return on Operating Assets} = \underbrace{\frac{\text{Operating Profit}}{\text{Sales}}}_{\text{"Operating Margin"}} * \underbrace{\frac{\text{Sales}}{\text{Total Assets}}}_{\text{"Asset Turns"}}$$

Source: CSFB.

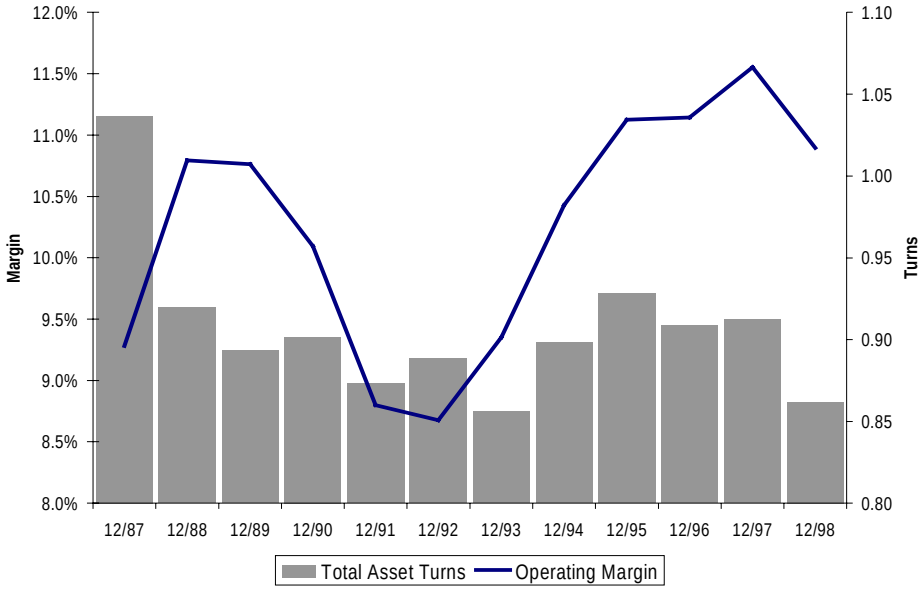
**Figure 3**
**Operating Return on Assets Unchanged since the End of the 1980s**
S&P Industrials; in percent




Source: CSFB estimates, company financials, and FactSet.

In fact, if we dissect operating return on assets into its components—operating margins and total asset turns—we still fail to find proof that bits have replaced atoms. Actually, we see just the opposite: overall asset efficiency appears to have deteriorated, with asset turns (sales/average total assets) falling from 1.04 in 1987 to 0.86 in 1998.[11] The apparent conclusion is that more assets are needed to generate the same amount of revenue. So what gives?

**Figure 4**
**Asset Turns Fall over the 1990s**
S&P Industrials; in percent and turns

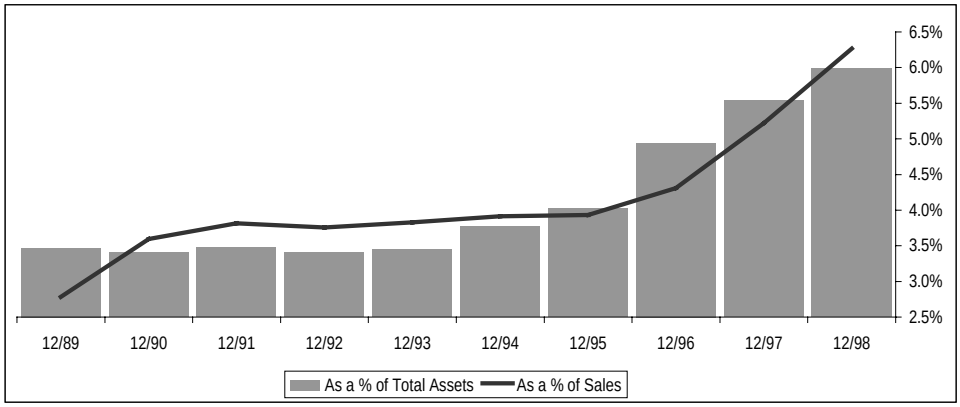



Source: CSFB estimates, company financials, and FactSet.

*As it turns out, significant improvements in physical asset efficiency have been masked by a substantial increase in goodwill.* Goodwill is the residual between the acquisition cost of a company and the sum of the fair values of all its identifiable assets and liabilities.[12] Our analysis of the S&P Industrials found that goodwill as a percentage of total assets jumped nearly 77% in the last eight years, from 3.4% in 1990 to 6.0% in 1998. Goodwill as a percentage of sales rose from 3.6% in 1990 to 6.3% in 1998. The very existence of goodwill is recognition that much of a company's assets are knowledge-based.

Further, these goodwill data are understated by the sizable write-offs taken in recent years. R.G. Associates estimates that 1,369 special charges were taken or announced during 1998 (charges for restructuring, in-process R&D, merger-related items, and write-downs), representing $72.1 billion.[13]

**Figure 5**
**Goodwill Grows on Balance Sheets**
S&P Industrials; in percent




Source: CSFB estimates, company financials, and FactSet.

Moreover, the surge in goodwill, while impressive, actually understates the rise in intangible assets.[14] Reported goodwill results only from a merger or acquisition. However, acquirors can choose to record transactions as either a "purchase" or a "pooling," with radically different accounting consequences.[15] Purchase accounting results in goodwill that is amortized, or expensed, against earnings for a period of up to 40 years. In contrast, there is no goodwill entry for pooling deals. As a result, a "pooling" deal leaves a company with a smaller asset base than a "purchase" deal, even though the economics are identical.[16]

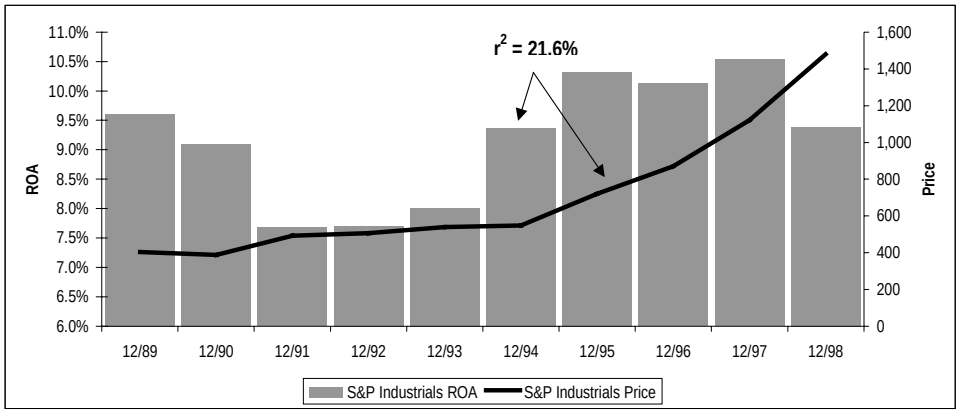
So while an active market for corporate control has forced goodwill onto balance sheets, goodwill is in no way a systematic or complete measure of intellectual capital. In 1998 alone, 45.3% of the total domestic deal value was treated as a pooling, leaving massive amounts of goodwill unreported.

**Table 1**
**Chosen Accounting Convention for M&A Deals Announced in 1998**

| | Total Value (in millions) | Number of Deals (in units) |
|---|---|---|
| **Accounting Convention:** | | |
| **Domestic** | $1,996,279.9 | 14,801.0 |
| *Pooling* | 45.3% | 3.8% |
| *Purchase* | 54.7% | 96.2% |

Source: Security Data Corp.

**Figure 6**
**Operating Return on Assets Does Not Explain Value**
S&P Industrials; in percent and turns




Source: CSFB estimates, company financials, and FactSet.

## Uncovering Tangible Asset Efficiency

Removing goodwill from the equation, we see that tangible asset efficiency is actually soaring. *Economy-wide productivity gains have reduced tangible asset needs by more than $245 billion in the 1990s.*[17] For the S&P Industrials, we see that:

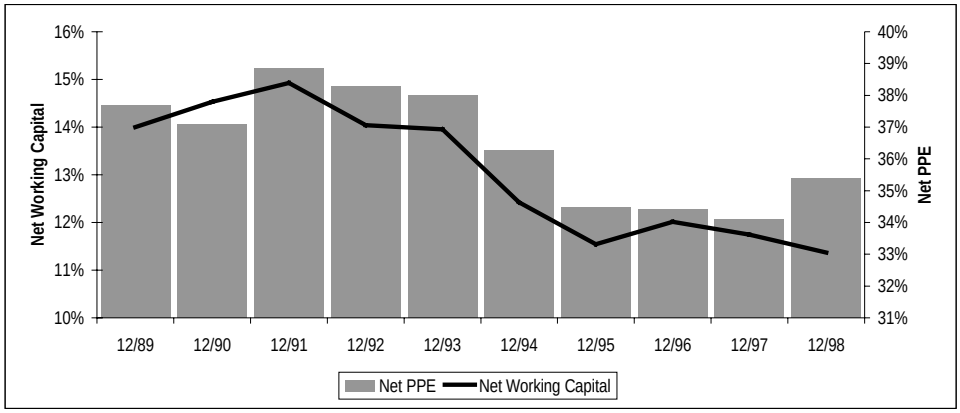
- *Net working capital* as a percentage of sales fell, in aggregate, from 14.5% in 1990 to 11.4% in 1998. Had working capital efficiency remained at 1990 levels*, an additional $124 billion would be tied up in net working capital alone.*
- *Net plant, property, and equipment* enjoyed a similar, albeit more modest, improvement over the decade. Net PPE as a percentage of sales fell from

37.1% in 1990 to 35.4% in 1998. *Without improved efficiency, managers would have been forced to inject an additional $121 billion into fixed assets.*

Several catalysts have triggered this improvement.

- *Advances in technology.* From software to computers to communications, technology has provided the tools to better manage physical capital. Bar codes allow close tracking of products at all stages, from inception to sale. Point-of-sale scanners transmit up-to-the minute data to all participants in the supply chain.[18] Enterprise and manufacturing resource-planning software provides managers with unprecedented information about their businesses. A myriad of management techniques have followed: just-in-time, total quality management, quick response, efficient consumer response, demand flow, and accurate response. As a result, supply chains have compressed to unprecedented levels.
- *A shift in compensation systems.* The adoption of value-based management systems and compensation schemes has shifted management's focus to the balance sheet. Compensation directly tied to asset efficiency provides a significant incentive to improve performance.
- *Active market for corporate control.* The robust M&A market has provided further impetus for tighter corporate control. Investors look for opportunities to exploit asset inefficiency. Managers who do not use their assets optimally risk losing their company to a third party.

**Figure 7**
**Fewer Tangible Assets Generated More Sales in the 1990s**
S&P Industrials; as a percentage of sales




Source: CSFB estimates, company financials, and FactSet.

## Capturing Change: The Cash Conversion Cycle

The cash conversion cycle is a powerful tool for assessing how well a company is managing capital. It not only highlights the drivers of working capital, but also sheds light on the dynamics of a supply chain. Interestingly, many industry supply chains are being altered by information technology. These supply chains are evolving from a system where goods are "pushed" from the vendor to the customer to one where goods are "pulled" by the consumer through a responsive chain. The result is reduced inventories, faster receivables collection, and extended payment terms with suppliers.

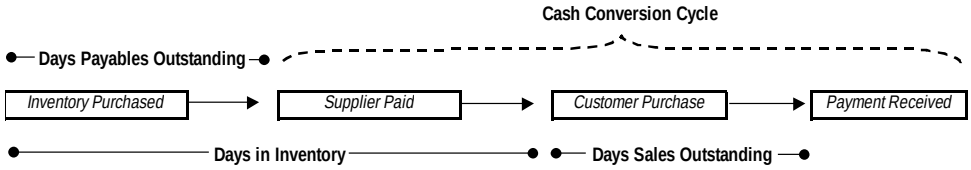
### The Mechanics of the Cash Conversion Cycle

The cash conversion cycle quantifies the time between cash payment to suppliers and cash receipt from customers.

The three components of the cash conversion cycle are:[19]

- *Days sales outstanding (DSO).*[20] The number of days between the sale of a product and the receipt of a cash payment.
- *Days in inventory (DII).*[21] The speed with which the stock of raw materials, work in progress and finished goods of a company are converted into product sales.
- *Days payables outstanding (DPO).*[22] The number of days between the purchase of an input from a vendor and cash payment to that vendor.

**Figure 8**
**Components of the Cash Conversion Cycle**




Source: CSFB.

Investors should look for a pattern of short or shortening DSO and DII. Both inventories and receivables tie up cash—every dollar freed from inventories or receivables translates into a one-time contribution to cash flow and a reduced need for product financing through the supply chain.[23]

Investors should look for a lengthening of days payables outstanding. The attraction of an account payable is similar to that of a charge card: enjoy the merchandise now, pay later. Payables are a flexible and cheap form of financing, with implicit sensitivity to product demand and order patterns.

Although payables lack explicit financing charges, the financing costs associated with them are passed along in the cost of goods sold. Earlier payment is usually rewarded with a discount that translates into higher margins. Thus, while late payment is better on a cash basis, investors must monitor the movement in margins that accompanies extended terms.

Some businesses lengthen days payables outstanding beyond the days in inventory and days sales outstanding combined, resulting in a negative cash conversion cycle. This strategy turns working capital into a source of cash as suppliers finance sales growth.[24] Increasingly, managements in both new and old economy businesses are looking at lengthening payables as a way of boosting the return on invested capital in their businesses.

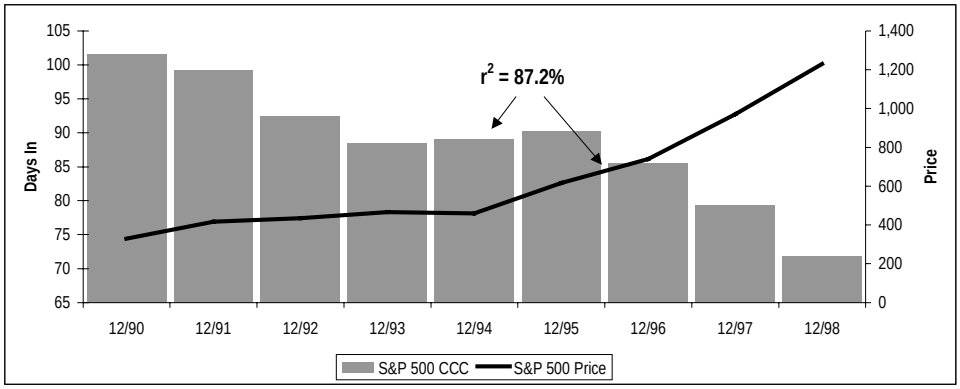
In fact, Wal-Mart recently announced its objective: “to sell merchandise before we pay for it.”[25] Currently, 63% of Wal-Mart’s inventory is sold before the bills are paid, up from 55% in 1998. Wal-Mart expects its entire inventory to be financed by suppliers within three years.

## The Cash Conversion Cycle Applied

### The Economy

As Figure 9 shows, the cash conversion cycle for the S&P 500 [26] fell from 101.6 days in 1990 to 71.3 days in 1998, a 29.8% drop. This change suggests an aggregate improvement in supply chain management. But, as we explain below, the spoils have not accrued to all industries evenly.

**Figure 9**
**S&P 500 Cash Conversion Cycle**
in days



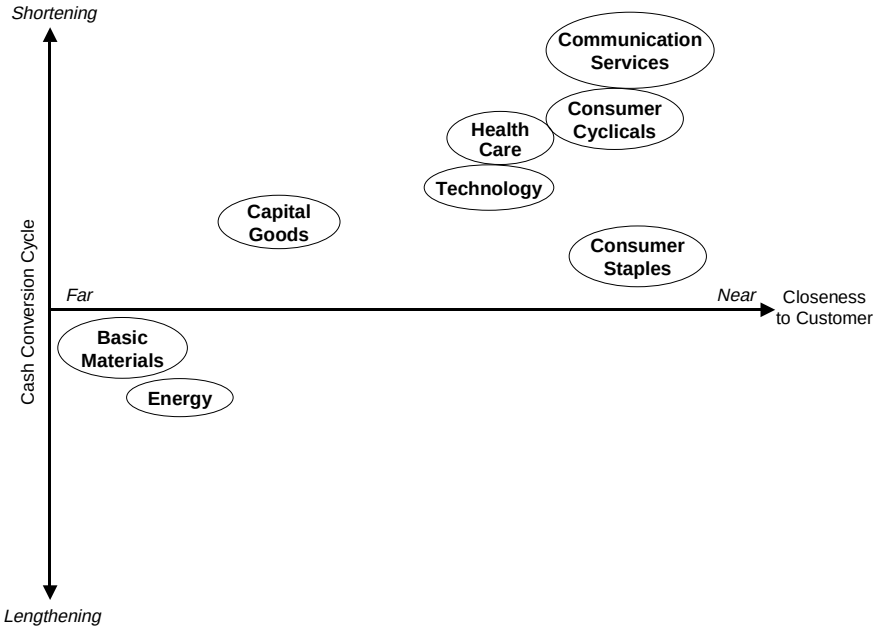

Source: CSFB estimates, company financials, and FactSet.

### Various Sectors

Two key trends emerge when we examine the sectors that compose the index.

First, within and across industries, position in the supply chain is critical in determining a firm's cash conversion cycle. Companies closest to the consumer generally enjoy better cash economics. Many consumer businesses are cash and carry, meaning that the typical 30- to 45-day terms extended in business-to-business transactions are not required. Furthermore, an abundance of real-time purchase information often gives these companies the ability to carry optimal levels of inventory.

**Figure 10**
**Sectors Closer to the Consumer Enjoy Better Cash Conversion Cycles**
S&P 500; in days




Source: CSFB.

Second, companies that deal primarily with tangible output produced by physical assets have been unable to enjoy the same improvements in cash conversion cycles as those that deal in bits. For example, as Figure 10 highlights, the foundation of the new economy, health care and technology, both posted impressive improvements in their cash conversion cycles.

Specifics for each sector are as follows:

- *Communication services.* Communication services companies posted the largest decline in cash conversion cycles, from an average of 24.6 days in 1991 to an average of 8.9 days in the first two quarters of 1999. Days in inventory were cut in half, falling from an average of 17.2 days in 1991 to an average of 7.8 days in the first half of 1999.
- *Health care.* Companies within the health care sector managed to reduce their cash conversion cycle by 27.7% in the 1990s, from an average of 112.4 days in 1991 to an average of 81.2 days in the first half of 1999. A 19.6% reduction in days in inventory, from an average of 121.4 days in 1991 to an average of 97.7 days in the first two quarters of 1999, drove this reduction.
- *Technology.* Technology companies' cash conversion cycle fell from an average of 89.5 days in 1991 to an average of 67.6 days in the first two quarters of 1999. Like the health care and communication services sectors, a 37.8% decline in inventory, from an average of 82.0 days in 1991 to an average of 51.0 days in the first two quarters of 1999, fueled the decline.
- *Consumer cyclicals.* Through aggressive management of terms, consumer cyclicals companies' cash conversion cycle fell 43.9%, from an average of 175.7 days in 1991 to an average of 98.5 days in the first half of 1999. While days in inventory were actually slightly higher over the period, days sales

outstanding were halved, from an average of 177.4 in 1991 to an average of 88.7 in the first half of 1999.

- *Capital goods.* Like consumer cyclicals, capital goods companies were able to improve their cash conversion cycle primarily by better managing receivables. The sector's cash conversion cycle fell 23.2%, from an average of 118.0 days in 1991 to an average of 90.7 in the first two quarters of 1999.
- *Consumer staples.* While the average cash conversion cycle in the sector dropped a mere 12.6%, from an average of 48.3 in 1991 to 42.3 days in the first two quarters of 1999, the absolute level is still less than half of its cyclical counterpart.
- *Basic materials.* The basic materials sector usually sits at the beginning of the supply chain and deals in physical goods. Consequently, it is one of only two sectors that actually showed a lengthening cash conversion cycle over the 1990s. Both DSOs and DIIs lengthened, driving the cash conversion cycle from an average of 73.7 days in 1991 to an average of 80.9 days in the first half of 1999.
- *Energy.* The energy sector posted the greatest lengthening in its cash conversion cycle, jumping 34.9% in the 1990s—from an average of 17.5 days in 1991 to an average of 23.6 days in the first two quarters of 1999.

**Table 2**
**Cash Conversion Cycle by Sector**
S&P 500 sector definitions; in days; percentage change

## Improved

| | | Average 1991 | Average year-to-date 1999 | Change |
|---|---|---|---|---|
| **Communication Services** | | | | |
| *Days:* | Sales Outstanding | 64.93 | 65.70 | *1.19%* |
| | in Inventory | 17.19 | 7.80 | *(54.61%)* |
| | Payables Outstanding | 57.52 | 64.56 | *12.24%* |
| | **CCC** | **24.60** | **8.94** | **(63.6)%** |
| **Consumer Cyclicals** | | | | |
| *Days:* | Sales Outstanding | 177.38 | 88.72 | *(49.98%)* |
| | in Inventory | 57.09 | 57.92 | *1.46%* |
| | Payables Outstanding | 58.81 | 48.14 | *(18.13%)* |
| | **CCC** | **175.66** | **98.50** | **(43.9)%** |
| **Health Care** | | | | |
| *Days:* | Sales Outstanding | 61.74 | 60.28 | *(2.36%)* |
| | in Inventory | 121.45 | 97.48 | *(19.74%)* |
| | Payables Outstanding | 72.13 | 76.84 | *6.52%* |
| | **CCC** | **111.05** | **80.92** | **(27.1)%** |
| **Technology** | | | | |
| *Days:* | Sales Outstanding | 89.54 | 70.06 | *(21.75%)* |
| | in Inventory | 81.98 | 51.48 | *(37.21%)* |
| | Payables Outstanding | 82.00 | 52.08 | *(36.49%)* |
| | **CCC** | **89.53** | **69.47** | **(22.4)%** |
| **Capital Goods** | | | | |
| *Days:* | Sales Outstanding | 93.11 | 72.41 | *(22.23%)* |
| | in Inventory | 69.79 | 63.00 | *(9.72%)* |
| | Payables Outstanding | 44.90 | 44.75 | *(0.33%)* |
| | **CCC** | **118.00** | **90.66** | **(23.2)%** |
| **Consumer Staples** | | | | |
| *Days:* | Sales Outstanding | 30.40 | 30.44 | *0.12%* |
| | in Inventory | 61.36 | 55.97 | *(8.77%)* |
| | Payables Outstanding | 43.28 | 44.07 | *1.84%* |
| | **CCC** | **48.49** | **42.34** | **(12.7)%** |

## Lagged

| | | Average 1991 | Average year-to-date 1999 | Change |
|---|---|---|---|---|
| **Basic Materials** | | | | |
| *Days:* | Sales Outstanding | 53.82 | 56.28 | *4.58%* |
| | in Inventory | 63.17 | 65.05 | *2.97%* |
| | Payables Outstanding | 43.24 | 40.44 | *(6.49%)* |
| | **CCC** | **73.74** | **80.89** | **9.7%** |
| **Energy** | | | | |
| *Days:* | Sales Outstanding | 36.76 | 42.29 | *15.03%* |
| | in Inventory | 27.88 | 24.65 | *(11.60%)* |
| | Payables Outstanding | 47.18 | 43.38 | *(8.06%)* |
| | **CCC** | **17.46** | **23.56** | **34.9%** |

Source: CSFB estimates, company financials, and FactSet.

**Table 3**
**Longest and Shortest Cash Conversions by Sector**
S&P 500 sector definitions; in days; percentage change

| Sector | Cash Conversion Cycle (in days) | | | | | |
|---|---|---|---|---|---|---|
| | *Shortest* | | | *Longest* | | |
| | Ticker | Name | Jun-99 | Ticker | Name | Jun-99 |
| ***Basic Materials*** | ABX | BARRICK GOLD CORP COM | (12.1) | SIAL | SIGMA ALDRICH CORP COM | 318.7 |
| | PDG | PLACER DOME INC COM | 21.8 | PHB | PIONEER HI BRED INTL INC COM | 308.8 |
| | EMN | EASTMAN CHEMICAL CO COM | 23.3 | MTC | MONSANTO CO COM | 229.2 |
| | LPX | LOUISIANA PAC CORP COM | 28.8 | IFF | INTL FLAVORS FRAGRANCE COM | 223.9 |
| | CHA | CHAMPION INTL CORP COM | 29.1 | GLK | GREAT LAKES CHEM CORP COM | 142.1 |
| ***Capital Goods*** | JCI | JOHNSON CTLS INC COM | 15.1 | DE | DEERE & CO COM | 313.8 |
| | WMI | WASTE MGMT INC DEL COM | 22.9 | CSE | CASE CORP COM | 238.3 |
| | FLR | FLUOR CORP COM | 23.2 | PLL | PALL CORP COM | 213.9 |
| | ETN | EATON CORP COM | 33.2 | TXT | TEXTRON INC COM | 201.4 |
| | IR | INGERSOLL RAND CO COM | 34.7 | IIN | ITT INDS INC IND COM | 177.6 |
| ***Consumer Cyclicals*** | DJ | DOW JONES & CO INC COM | (32.4) | F | FORD MOTOR CO DEL COM | 298.7 |
| | CCL | CARNIVAL CORP COM | (9.5) | SNA | SNAP ON INC COM | 211.4 |
| | CNS | CONSOLIDATED STORES CORP COM | (7.1) | KBH | KAUFMAN & BROAD HOME COM | 202.3 |
| | MIR | MIRAGE RESORTS INC COM | (3.7) | RML | RUSSELL CORP COM | 193.8 |
| | TRB | TRIBUNE CO NEW COM | (0.0) | FTL | FRUIT OF THE LOOM LTD ORD CL A | 184.5 |
| ***Consumer Staples*** | CMCSK | COMCAST CORP CL A SPL | (73.8) | UST | U S T INC COM | 328.4 |
| | YUM | TRICON GLOBAL RESTAURANTS COM | (46.5) | BF.B | BROWN FORMAN CORP CL B | 216.4 |
| | CCE | COCA COLA ENTERPRISES INC COM | (15.2) | FO | FORTUNE BRANDS INC COM | 168.0 |
| | DIS | DISNEY WALT COMPANY COM | (3.5) | G | GILLETTE CO COM | 167.0 |
| | MCD | MCDONALDS CORP COM | (1.2) | NWL | NEWELL RUBBERMAID INC COM | 128.1 |
| ***Energy*** | APC | ANADARKO PETE CORP COM | (20.5) | RDC | ROWAN COS INC COM | 129.0 |
| | XON | EXXON CORP COM | 3.0 | BHI | BAKER HUGHES INC COM | 109.4 |
| | BR | BURLINGTON RES INC COM | 9.1 | HAL | HALLIBURTON CO COM | 69.2 |
| | UCL | UNOCAL CORP COM | 14.2 | HP | HELMERICH & PAYNE INC COM | 65.2 |
| | P | PHILLIPS PETE CO COM | 14.6 | KMG | KERR-MCGEE CORP COM | 61.7 |
| ***Health Care*** | WLA | WARNER LAMBERT CO COM | (21.1) | BMET | BIOMET INC COM | 382.1 |
| | MRK | MERCK & CO INC COM | 15.9 | AHP | AMERICAN HOME PRODS CORP COM | 236.6 |
| | SGP | SCHERING PLOUGH CORP COM | 16.8 | PFE | PFIZER INC COM | 235.4 |
| | COL | COLUMBIA/HCA HEALTHCARE CORP COM | 24.8 | BOL | BAUSCH & LOMB INC COM | 193.5 |
| | HCR | HCR MANOR CARE INC COM | 36.8 | BCR | BARD C R INC COM | 189.5 |
| ***Technology*** | ADBE | ADOBE SYS INC COM | (97.8) | KLAC | KLA-TENCOR CORP COM | 261.1 |
| | MSFT | MICROSOFT CORP COM | (83.4) | XRX | XEROX CORP COM | 225.9 |
| | DELL | DELL COMPUTER CORP COM | (10.9) | ANDW | ANDREW CORP COM | 171.0 |
| | NOVL | NOVELL INC COM | (8.4) | LU | LUCENT TECHNOLOGIES INC COM | 143.5 |
| | GTW | GATEWAY INC COM | (4.8) | PRD | POLAROID CORP COM | 139.0 |

Source: CSFB estimates, company financials, and FactSet.

## Individual Companies

The cash conversion cycle is a robust tool when applied to individual companies. Overall, there is a remarkable correspondence between capital market valuation and a short cash conversion cycle.

First, the difference between individual companies across sectors is striking. For example, Microsoft, an icon of the Information Age, had a negative 83.0-day cash conversion cycle and traded at 83.1 times noncash assets at its 1999 fiscal year-end. On the same day, Exxon, the world's largest oil company, had a negative 0.7 day cash conversion cycle and traded at 2.1 times its noncash assets.

**Figure 11**
**Asset Values and Market Values Diverge in the New Economy**
in millions; ratios in units

| **Exxon Corp.** | |
|---|---|
| For the quarter ended | **6/30/99** |
| **Days In:** | |
| Sales | 28.37 |
| Inventory | 15.52 |
| Payables | 44.54 |
| **CCC:** | **(0.65)** |
| **Partial Balance Sheet -** *excluding cash & investments* | |
| in millions | |
| **Assets** | **6/30/99** |
| *Current Assets* | |
| Accounts receivable | 9,107 |
| Inventories | 4,787 |
| Other current assets | 1,187 |
| **Total current assets** | 15,081 |
| Property and equipment | 65,002 |
| Other assets | 9,804 |
| | 74,806 |
| **Total Operating Assets** | 89,887 |
| **Market Capitalization** | |
| Share price | $ 77.13 |
| Shares outstanding | 2,428 |
| | $ 187,259.50 |
| **Market Capitalization / Operating Assets** | **2.08** |

| **Microsoft Corp.** | |
|---|---|
| For the quarter ended | **6/30/99** |
| **Days In:** | |
| Sales | 35.05 |
| Inventory | 0.00 |
| Payables | 117.58 |
| **CCC:** | **(82.52)** |
| **Partial Balance Sheet -** *excluding cash & investments* | |
| in millions | |
| **Assets** | **6/30/99** |
| *Current Assets* | |
| Accounts receivable | 2,245 |
| Inventories | 0 |
| Other current assets | 752 |
| **Total current assets** | 2,997 |
| Property and equipment | 1,611 |
| Other assets | 940 |
| | 2,551 |
| **Total Operating Assets** | 5,548 |
| **Market Capitalization** | |
| Share price | $ 90.19 |
| Shares outstanding | 5,109 |
| | $ 460,767.94 |
| **Market Capitalization / Operating Assets** | **83.05** |

Note: annualized quarterly data.
Source: Company financials.

Second, even within a traditional industry such as steel, we see serious valuation mismatches based on different cash conversion cycles. Steel was the quintessential manufactured product of the early Twentieth Century. Once, sheer brawn added most of the value in the production of steel—extracting the ore, shipping it to the mills, and the like. Now, the revolutionary application of intellectual capital to the production process makes brains more important than brawn. Bethlehem Steel once required three to four man-hours of labor to make a ton of steel. Today, Nucor Steel can process the same ton in 45 minutes. This substitution of bits for atoms is immediately apparent in the cash conversion cycle. [27]

**Figure 12**
**The Market Values Intellectual Capital**
in millions; ratios in units

| **Bethlehem Steel Corp.** For the quarter ended | 6/30/99 |
|---|---|
| **Days In:** | |
| Sales | 26.48 |
| Inventory | 90.13 |
| Payables | 35.38 |
| **CCC:** | **81.22** |

| **Partial balance Sheet -** *excluding cash, investments and discontinued operations* in millions | |
|---|---|
| **Assets** | 6/30/99 |
| *Current Assets* | |
| Accounts receivable | 290 |
| Inventories | 980 |
| Other current assets | 6 |
| **Total current assets** | 1,276 |
| Property and equipment | 2,748 |
| Other assets | 1,284 |
| | 4,032 |
| **Total Operating Assets** | 5,309 |
| **Market Capitalization** | |
| Share price | $ 7.69 |
| Shares outstanding | 131 |
| | $ 1,005.53 |
| **Market Capitalization / Operating Assets** | **0.19** |

| **Nucor Corp.** For the quarter ended | 7/3/99 |
|---|---|
| **Days In:** | |
| Sales | 30.89 |
| Inventory | 39.09 |
| Payables | 21.69 |
| **CCC:** | **48.29** |

| **Partial Balance Sheet -** *excluding cash & investments* in millions | |
|---|---|
| **Assets** | 7/3/99 |
| *Current Assets* | |
| Accounts receivable | 342 |
| Inventories | 384 |
| Other current assets | 87 |
| **Total current assets** | 814 |
| Property and equipment | 2,093 |
| | 2,093 |
| **Total Operating Assets** | 2,907 |
| **Market Capitalization** | |
| Share price | $ 48.94 |
| Shares outstanding | 87 |
| | $ 4,272.24 |
| **Market Capitalization / Operating Assets** | **1.47** |

Note: annualized quarterly data.
Source: Company financials.

Third, different cash conversion cycles are apparent between the old and new economy business model within particular industries.

**Figure 13**
**Companies with Negative Cash Conversion Cycles are Rewarded**
in millions; ratios in units

| **Compaq Computer Corp.** For the quarter ended | 6/30/99 |
|---|---|
| **Days In:** | |
| Sales | 62.64 |
| Inventory | 26.75 |
| Payables | 49.93 |
| **CCC:** | **39.45** |

| **Partial Balance Sheet -** *excluding cash & investments* in millions | |
|---|---|
| **Assets** | 6/30/99 |
| *Current Assets* | |
| Accounts receivable | 6,556 |
| Inventories | 2,224 |
| Other current assets | 1,833 |
| **Total current assets** | 10,613 |
| Property and equipment | 3,018 |
| Other assets | 5,939 |
| | 8,957 |
| **Total Operating Assets** | 19,570 |
| **Market Capitalization** | |
| Share price | $ 23.69 |
| Shares outstanding | 1,693 |
| | $ 40,102.94 |
| **Market Capitalization / Operating Assets** | **2.05** |

| **Dell Computer Corp.** For the quarter ended | 7/30/99 |
|---|---|
| **Days In:** | |
| Sales | 35.52 |
| Inventory | 6.32 |
| Payables | 56.52 |
| **CCC:** | **(14.69)** |

| **Partial Balance Sheet -** *excluding cash & investments* in millions | |
|---|---|
| **Assets** | 7/30/99 |
| *Current Assets* | |
| Accounts receivable | 2,424 |
| Inventories | 336 |
| Other current assets | 588 |
| **Total current assets** | 3,348 |
| Property and equipment | 601 |
| Other assets | 44 |
| | 645 |
| **Total Operating Assets** | 3,993 |
| **Market Capitalization** | |
| Share price | $ 40.88 |
| Shares outstanding | 2,540 |
| | $ 103,822.50 |
| **Market Capitalization / Operating Assets** | **26.00** |

Note: annualized quarterly data.
Source: Company financials.

Finally, tracking a company's cash conversion cycle gives the best assessment of the dynamic capital needs of a business, making the measure a useful in anticipating stock price performance. The following case study illustrates this point.

## Dell Computer Corp.

*"The balance between profitable growth and liquidity management is all about velocity."*

Thomas Meredith, Chief Financial Officer, Dell Computer Corp.[28]

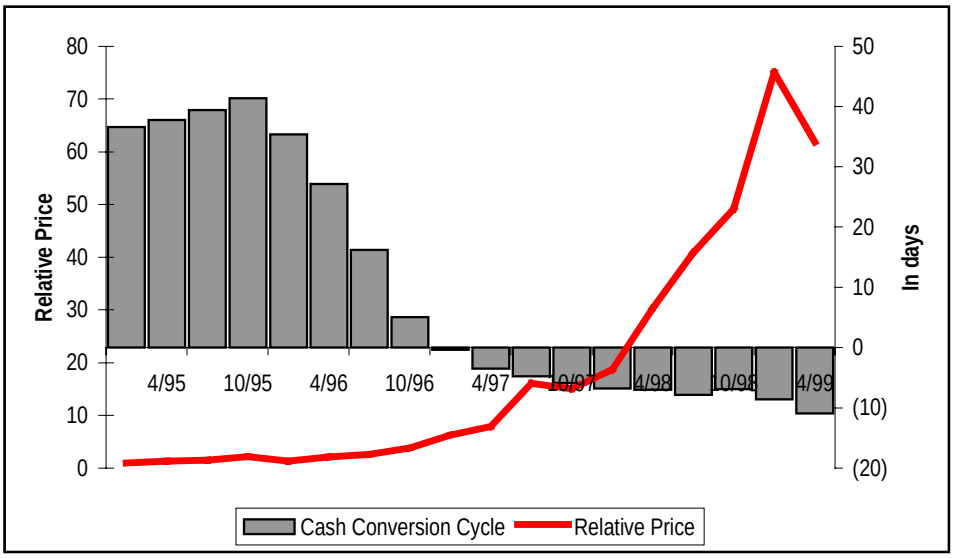
On January 3, 1995, Dell's stock fetched $0.623 per (split-adjusted) share. By June 30, 1999, Dell stock traded at $37.00 per share, almost sixty times the earlier value.

Over the period, Dell management made a deliberate effort to break out all internal activities into their operational components, isolating the essential drivers of return on invested capital. This process highlighted the importance of working capital requirements on invested capital totals.

Through the implementation of the direct model (build to order) and fast receivables collection, the company actually turned working capital into a source of cash. Dell's return on invested capital went from 37% in 1995 to 195% in 1998. Because so much of Dell's invested capital was tied up in working capital, we estimate that without the improvements in the cash conversion cycle, Dell's return on investment would be roughly two-thirds its current level.

The effective management of these assets over the period led to a dramatic rise in market value.

**Figure 14**
**Dell's Shortening CCC Translates into Market Value**
in millions; ratios in units




Source: Company financials, disclosure, and FactSet.

## Conclusion

The economy is in transition. As intellectual capital sucks tangible capital from businesses, cash is freed. We believe the cash conversion cycle allows investors to better pick winners in this New Economy.

**N.B.:** CREDIT SUISSE FIRST BOSTON CORPORATION may have, within the last three years, served as a manager or co-manager of a public offering of securities for or makes a primary market in issues of any or all of the companies mentioned. Closing prices are as of November 18, 1999.

| | | | | | |
|---|---|---|---|---|---|
| ALCOA INC | (AA, 62.6875) | CARDINAL HEALTH INC | (CAH, 50) | FREEPRT MCMOR COP&GLD -CL B | (FCX, 16.875) |
| APPLE COMPUTER INC | (AAPL, 90.25) | CATERPILLAR INC | (CAT, 55.375) | FEDERATED DEPT STORES | (FD, 41.4375) |
| ALBERTSONS INC | (ABS, 36.5) | COOPER INDUSTRIES INC | (CBE, 44.1875) | FIRST DATA CORP | (FDC, 45.4375) |
| ABBOTT LABORATORIES | (ABT, 37.3125) | CBS CORP | (CBS, 53.75) | FORT JAMES CORP | (FJ, 27.9375) |
| BARRICK GOLD CORPORATION | (ABX, 17.625) | CIRCUIT CITY STR CRCT CTY GP | (CC, 45.375) | FLEETWOOD ENTERPRISES | (FLE, 22.25) |
| ARMSTRONG WORLD INDS INC | (ACK, 35.6875) | COCA-COLA ENTERPRISES | (CCE, 21.9375) | FLUOR CORP | (FLR, 38.5) |
| ALBERTO-CULVER CO -CL B | (ACV, 24.1875) | CROWN CORK & SEAL CO INC | (CCK, 21.875) | FMC CORP | (FMC, 48.1875) |
| ADOBE SYSTEMS INC | (ADBE, 75) | CARNIVAL CORP | (CCL, 49.5625) | FORTUNE BRANDS INC | (FO, 33.25) |
| ADC TELECOMMUNICATIONS INC | (ADCT, 51) | CLEAR CHANNEL COMMUNICATIONS | (CCU, 85.5625) | SPRINT FON GROUP | (FON, 74.0625) |
| ARCHER-DANIELS-MIDLAND CO | (ADM, 14.125) | CENDANT CORP | (CD, 14.5625) | FRUIT OF THE LOOM LTD -CL A | (FTL, 2.875) |
| AUTODESK INC | (ADSK, 20.9375) | CERIDIAN CORP | (CEN, 21.8125) | FOSTER WHEELER CORP | (FWC, 11.125) |
| AETNA INC | (AET, 60.625) | CHAMPION INTERNATIONAL CORP | (CHA, 61.9375) | GILLETTE CO | (G, 36) |
| ALLERGAN INC | (AGN, 107.4375) | CHEVRON CORP | (CHV, 96.5625) | GREAT ATLANTIC & PAC TEA CO | (GAP, 26.9375) |
| AMERADA HESS CORP | (AHC, 62.9375) | COLGATE-PALMOLIVE CO | (CL, 57.375) | GANNETT CO | (GCI, 72.1875) |
| AMERICAN HOME PRODUCTS CORP | (AHP, 52.4375) | CLOROX CO/DE | (CLX, 49) | GENERAL DYNAMICS CORP | (GD, 53.4375) |
| AMERITECH CORP | (AIT, 68.25) | COMCAST CORP -CL A SPL | (CMCSK, 46.75) | GUIDANT CORP | (GDT, 56) |
| ALCAN ALUMINIUM LTD | (AL, 33.0625) | CONSOLIDATED STORES CORP | (CNS, 20.25) | GENERAL ELECTRIC CO | (GE, 141.1875) |
| ALLIEDSIGNAL INC | (ALD, 60.8125) | CONOCO INC | (COC.B, 28.375) | GENERAL INSTRUMENT CORP | (GIC, 66.25) |
| ALLEGHENY TELEDYNE INC | (ALT, 15.125) | COLUMBIA/HCA HLTHCR -VTG | (COL, 27.125) | GENERAL MILLS INC | (GIS, 40.3125) |
| AMERICAN GREETINGS -CL A | (AM, 25.3125) | 3COM CORP | (COMS, 38.5) | GREAT LAKES CHEMICAL CORP | (GLK, 34.625) |
| APPLIED MATERIALS INC | (AMAT, 110) | COSTCO WHOLESALE CORP | (COST, 86.0625) | CORNING INC | (GLW, 95.375) |
| ADVANCED MICRO DEVICES | (AMD, 26.6875) | CAMPBELL SOUP CO | (CPB, 46.5) | GENERAL MOTORS CORP | (GM, 71.0625) |
| AMGEN INC | (AMGN, 91.125) | COMPAQ COMPUTER CORP | (CPQ, 23.5625) | GEORGIA-PACIFIC GROUP | (GP, 42.9375) |
| ANDREW CORP | (ANDW, 15.25) | COMPUWARE CORP | (CPWR, 32.75) | GENUINE PARTS CO | (GPC, 26.5) |
| AMERICA ONLINE INC | (AOL, 156) | CRANE CO | (CR, 17.4375) | GAP INC | (GPS, 38.375) |
| APACHE CORP | (APA, 43.375) | CABLETRON SYSTEMS | (CS, 23) | GOODRICH (B F) CO | (GR, 22.9375) |
| ANADARKO PETROLEUM CORP | (APC, 35.4375) | COMPUTER SCIENCES CORP | (CSC, 62.125) | GRACE (W R) & CO | (GRA, 14.0625) |
| AIR PRODUCTS & CHEMICALS INC | (APD, 33.625) | CISCO SYSTEMS INC | (CSCO, 84.75) | GOODYEAR TIRE & RUBBER CO | (GT, 38.5) |
| ASARCO INC | (AR, 29.6875) | CASE CORP | (CSE, 54.8125) | GTE CORP | (GTE, 76.6875) |
| ATLANTIC RICHFIELD CO | (ARC, 97.5) | COOPER TIRE & RUBBER | (CTB, 16.5) | GATEWAY INC | (GTW, 77.875) |
| ASHLAND INC | (ASH, 35.6875) | CENTURYTEL INC | (CTL, 43.6875) | GRAINGER (W W) INC | (GWW, 45.4375) |
| ALLTEL CORP | (AT, 85.625) | CENTEX CORP | (CTX, 28.125) | HARCOURT GENERAL INC | (H, 36.1875) |
| AUTOMATIC DATA PROCESSING | (AUD, 50.6875) | CUMMINS ENGINE | (CUM, 42.3125) | HALLIBURTON CO | (HAL, 44.125) |
| AVON PRODUCTS | (AVP, 28.8125) | CVS CORP | (CVS, 40.375) | HASBRO INC | (HAS, 23.25) |
| AVERY DENNISON CORP | (AVY, 62) | CYPRUS AMAX MINERALS CO | (CYM, 19) | MANOR CARE INC | (HCR, 20.375) |
| ALLIED WASTE INDS INC | (AW, 8) | DANA CORP | (DCN, 26.75) | HOME DEPOT INC | (HD, 79.9375) |
| ALZA CORP | (AZA, 42.8125) | DU PONT (E I) DE NEMOURS | (DD, 62.25) | HARRAHS ENTERTAINMENT INC | (HET, 27.8125) |
| AUTOZONE INC | (AZO, 29.8125) | DILLARDS INC -CL A | (DDS, 19.3125) | HILTON HOTELS CORP | (HLT, 9.3125) |
| BOEING CO | (BA, 42.5625) | DEERE & CO | (DE, 39.75) | HOMESTAKE MINING | (HM, 8.375) |
| BAXTER INTERNATIONAL INC | (BAX, 67.625) | DELL COMPUTER CORP | (DELL, 39.75) | HEINZ (H J) CO | (HNZ, 42.5625) |
| BEST BUY CO INC | (BBY, 51.125) | DOLLAR GENERAL | (DG, 24.75) | HONEYWELL INC | (HON, 112.625) |
| BRUNSWICK CORP | (BC, 23.625) | DATA GENERAL CORP | (DGN, 22.25) | HELMERICH & PAYNE | (HP, 27.4375) |
| BOISE CASCADE CORP | (BCC, 38.8125) | DAYTON HUDSON CORP | (DH, 62.3125) | HERCULES INC | (HPC, 25.875) |
| BARD (C.R.) INC | (BCR, 55.8125) | DANAHER CORP | (DHR, 51.375) | BLOCK H & R INC | (HRB, 49) |
| BLACK & DECKER CORP | (BDK, 48.9375) | DISNEY (WALT) COMPANY | (DIS, 26) | HEALTHSOUTH CORP | (HRC, 5.875) |
| BECTON DICKINSON & CO | (BDX, 29.6875) | DOW JONES & CO INC | (DJ, 61.625) | HARRIS CORP | (HRS, 20.0625) |
| BELL ATLANTIC CORP | (BEL, 65.1875) | DELUXE CORP | (DLX, 25.5) | HERSHEY FOODS CORP | (HSY, 51.625) |
| BROWN-FORMAN -CL B | (BF.B, 66.6875) | DUN & BRADSTREET CORP | (DNB, 27.75) | HUMANA INC | (HUM, 7.4375) |
| BESTFOODS | (BFO, 58.25) | DONNELLEY (R R) & SONS CO | (DNY, 24.0625) | HEWLETT-PACKARD CO | (HWP, 78) |
| BRIGGS & STRATTON | (BGG, 57) | DOVER CORP | (DOV, 44.5625) | INTL BUSINESS MACHINES CORP | (IBM, 93.25) |
| BAKER-HUGHES INC | (BHI, 29.125) | DOW CHEMICAL | (DOW, 122.5) | INTL FLAVORS & FRAGRANCES | (IFF, 38.3125) |
| BALL CORP | (BLL, 39.5) | DELPHI AUTOMOTIVE SYS CORP | (DPH, 16.25) | ITT INDUSTRIES INC | (IIN, 34.375) |
| BELLSOUTH CORP | (BLS, 44.8125) | DARDEN RESTAURANTS INC | (DRI, 19.375) | IKON OFFICE SOLUTIONS | (IKN, 6.9375) |
| BMC SOFTWARE INC | (BMCS, 69.5) | ENGELHARD CORP | (EC, 17.3125) | INTEL CORP | (INTC, 74.75) |
| BIOMET INC | (BMET, 34.1875) | ECOLAB INC | (ECL, 37.625) | INTL PAPER CO | (IP, 54.9375) |
| BEMIS CO | (BMS, 34.25) | ELECTRONIC DATA SYSTEMS CORP | (EDS, 63.4375) | INTERPUBLIC GROUP OF COS | (IPG, 44.5) |
| BRISTOL MYERS SQUIBB | (BMY, 75.875) | EQUIFAX INC | (EFX, 26.0625) | INGERSOLL-RAND CO | (IR, 52) |
| BAUSCH & LOMB INC | (BOL, 59.4375) | PERKINELMER INC | (EGG, 42) | ILLINOIS TOOL WORKS | (ITW, 67.125) |
| BURLINGTON RESOURCES INC | (BR, 39) | EASTMAN KODAK CO | (EK, 66.625) | JOHNSON CONTROLS INC | (JCI, 58.8125) |
| BETHLEHEM STEEL CORP | (BS, 6.375) | EMC CORP/MA | (EMC, 83.1875) | PENNEY (J C) CO | (JCP, 22.3125) |
| BOSTON SCIENTIFIC CORP | (BSX, 21.8125) | EASTMAN CHEMICAL CO | (EMN, 38.875) | JOHNSON & JOHNSON | (JNJ, 105.625) |
| ANHEUSER-BUSCH COS INC | (BUD, 75.3125) | EMERSON ELECTRIC CO | (EMR, 57.75) | JOSTENS INC | (JOS, 19.8125) |
| COMPUTER ASSOCIATES INTL INC | (CA, 62.1875) | EATON CORP | (ETN, 79.3125) | NORDSTROM INC | (JWN, 22.375) |
| CONAGRA INC | (CAG, 25.625) | FORD MOTOR CO | (F, 52.625) | KELLOGG CO | (K, 36) |

KAUFMAN & BROAD HOME CORP (KBH, 25.0625)
KLA-TENCOR CORP (KLAC, 91.1875)
K MART CORP (KM, 9.375)
KIMBERLY-CLARK CORP (KMB, 68.0625)
KERR-MCGEE CORP (KMG, 60.5)
COCA-COLA CO (KO, 59.9375)
KROGER CO (KR, 23.1875)
KNIGHT-RIDDER INC (KRI, 58.5)
KOHLS CORP (KSS, 71.9375)
KING WORLD PRODUCTIONS INC (KWP, 42.25)
LONGS DRUG STORES INC (LDG, 27)
LAIDLAW INC (LDW, 5.8125)
LIZ CLAIBORNE INC (LIZ, 38.375)
LILLY (ELI) & CO (LLY, 75.0625)
LOCKHEED MARTIN CORP (LMT, 19.25)
LOWES COS (LOW, 55)
LOUISIANA-PACIFIC CORP (LPX, 12.8125)
LSI LOGIC CORP (LSI, 61.75)
LIMITED INC (LTD, 38.6875)
LUCENT TECHNOLOGIES INC (LU, 76.75)
LEXMARK INTL GRP INC -CL A (LXK, 78.625)
MARRIOTT INTL INC (MAR, 33.5)
MASCO CORP (MAS, 28.75)
MATTEL INC (MAT, 13.4375)
MAY DEPARTMENT STORES CO (MAY, 32.25)
MCDONALDS CORP (MCD, 46.125)
MCKESSON HBOC INC (MCK, 23.5)
MEREDITH CORP (MDP, 39.625)
MCDERMOTT INTL INC (MDR, 9.6875)
MEDTRONIC INC (MDT, 39)
MEAD CORP (MEA, 39.1875)
MCGRAW-HILL COMPANIES (MHP, 59.375)
MILLIPORE CORP (MIL, 34.3125)
MIRAGE RESORTS INC (MIR, 12.5)
MALLINCKRODT INC (MKG, 35.375)
MINNESOTA MINING & MFG CO (MMM, 101.5)
PHILIP MORRIS COS INC (MO, 25.9375)
MOBIL CORP (MOB, 105.3125)
MOTOROLA INC (MOT, 119)
MERCK & CO (MRK, 77.25)
USX-MARATHON GROUP (MRO, 29.8125)
MICROSOFT CORP (MSFT, 85)
MONSANTO CO (MTC, 45.5625)
MICRON TECHNOLOGY INC (MU, 63.625)
MAYTAG CORP (MYG, 45.625)
MILACRON INC (MZ, 15.1875)
INCO LTD (N, 19.5)
NAVISTAR INTERNATIONL (NAV, 38)
NACCO INDUSTRIES -CL A (NC, 48)
NEWMONT MINING CORP (NEM, 21.9375)
NABISCO GROUP HLDGS CORP (NGH, 12)
NIKE INC -CL B (NKE, 44.25)
NORTHROP GRUMMAN CORP (NOC, 55.375)
NOVELL INC (NOVL, 23)
NATIONAL SERVICE INDS INC (NSI, 31.8125)
NATIONAL SEMICONDUCTOR CORP (NSM, 35.8125)
NORTEL NETWORKS CORP (NT, 74.9375)
NETWORK APPLIANCE INC (NTAP, 124)
NUCOR CORP (NUE, 49.6875)
NEWELL RUBBERMAID INC (NWL, 36.5)
NEXTEL COMMUNICATIONS (NXTL, 97.25)
NEW YORK TIMES CO -CL A (NYT, 39)
QUAKER OATS CO (OAT, 69.875)
OFFICE DEPOT INC (ODP, 12.625)
OWENS-ILLINOIS INC (OI, 24.25)
OMNICOM GROUP (OMC, 90.875)
ORACLE CORP (ORCL, 71)
OWENS CORNING (OWC, 18.1875)
OCCIDENTAL PETROLEUM CORP (OXY, 23.75)
PHILLIPS PETROLEUM CO (P, 51.375)
PAYCHEX INC (PAYX, 41.5)
PITNEY BOWES INC (PBI, 49.8125)
PEP BOYS-MANNY MOE & JACK (PBY, 9.75)
PACCAR INC (PCAR, 42.25)
POTLATCH CORP (PCH, 44.125)
SPRINT PCS GROUP (PCS, 89.6875)
PHELPS DODGE CORP (PD, 54.625)
PLACER DOME INC (PDG, 11.75)
PE CORP (PEB, 80.5625)
PEPSICO INC (PEP, 34.125)
PFIZER INC (PFE, 33.8125)
PROCTER & GAMBLE CO (PG, 109)
PARKER-HANNIFIN CORP (PH, 47.875)
PIONEER HI-BRED INTERNATIONL (PHB, 39.9375)
PULTE CORP (PHM, 21.5625)
PALL CORP (PLL, 24.3125)
PARAMETRIC TECHNOLOGY CORP (PMTC, 22)
PHARMACIA & UPJOHN INC (PNU, 58.75)
PPG INDUSTRIES INC (PPG, 60.5)
POLAROID CORP (PRD, 19.9375)
PEOPLESOFT INC (PSFT, 18.5)
PRAXAIR INC (PX, 47.9375)
QUALCOMM INC (QCOM, 342.875)
RITE AID CORP (RAD, 6.625)
RALSTON PURINA CO (RAL, 31.3125)
REEBOK INTERNATIONAL LTD (RBK, 9)
ROYAL DUTCH PET -NY REG (RD, 64.6875)
ROWAN COS INC (RDC, 18.4375)
COORS (ADOLPH) -CL B (RKY, 52.125)
REYNOLDS METALS CO (RLM, 61.625)
RUSSELL CORP (RML, 13.9375)
ROHM & HAAS CO (ROH, 37.375)
ROCKWELL INTL CORP (ROK, 47.1875)
RAYTHEON CO -CL B (RTN.B, 31.375)
IMS HEALTH INC (RX, 26.875)
SEARS ROEBUCK & CO (S, 31.3125)
SBC COMMUNICATIONS INC (SBC, 51.625)
SEALED AIR CORP (SEE, 52.4375)
SEAGATE TECHNOLOGY (SEG, 35.9375)
SCIENTIFIC-ATLANTA INC (SFA, 57.5625)
SILICON GRAPHICS INC (SGI, 8.3125)
SCHERING-PLOUGH (SGP, 56.875)
SHERWIN-WILLIAMS CO (SHW, 21.375)
SIGMA-ALDRICH (SIAL, 28.3125)
SCHLUMBERGER LTD (SLB, 68.8125)
SARA LEE CORP (SLE, 26)
SOLECTRON CORP (SLR, 85.5)
SPRINGS INDUSTRIES -CL A (SMI, 40.125)
SHARED MEDICAL SYSTEMS CORP (SMS, 40.625)
SNAP-ON INC (SNA, 30.75)
STAPLES INC (SPLS, 24.25)
SERVICE CORP INTERNATIONAL (SRV, 7.75)
ST JUDE MEDICAL INC (STJ, 29.1875)
SUNOCO INC (SUN, 27)
SUN MICROSYSTEMS INC (SUNW, 124.9375)
SUPERVALU INC (SVU, 21.3125)
STANLEY WORKS (SWK, 32.6875)
SAFEWAY INC (SWY, 38.1875)
SYSCO CORP (SYY, 39.75)
AT&T CORP (T, 47.3125)
TANDY CORP (TAN, 66.3125)
TEKTRONIX INC (TEK, 32.5625)
TENNECO AUTOMOTIVE INC (TEN, 7.1875)
TENET HEALTHCARE CORP (THC, 24)
TEMPLE-INLAND INC (TIN, 63.75)
TJX COMPANIES INC (TJX, 22.9375)
TIMKEN CO (TKR, 19)
TELLABS INC (TLAB, 73.625)
TIMES MIRROR COMPANY -SER A (TMC, 67.8125)
THERMO ELECTRON CORP (TMO, 13.6875)
THOMAS & BETTS CORP (TNB, 44.8125)
TOYS R US INC (TOY, 17.75)
TRIBUNE CO (TRB, 53.5)
TRW INC (TRW, 52.625)
TUPPERWARE CORP (TUP, 18.875)
TIME WARNER INC (TWX, 67.5)
TEXACO INC (TX, 65.375)
TEXAS INSTRUMENTS INC (TXN, 94.9375)
TEXTRON INC (TXT, 73.5)
TYCO INTERNATIONAL LTD (TYC, 44.25)
UNOCAL CORP (UCL, 35.3125)
UNISYS CORP (UIS, 24.6875)
UNION CARBIDE CORP (UK, 61.5625)
MEDIAONE GROUP INC (UMG, 71.125)
UNILEVER N V -NY SHARES (UN, 56.1875)
UNITED HEALTHCARE CORP (UNH, 56.375)
UNION PACIFIC RESOURCES GRP (UPR, 15.875)
UST INC (UST, 26.875)
U S WEST INC (USW, 65.125)
UNITED TECHNOLOGIES CORP (UTX, 56.375)
VF CORP (VFC, 30)
VIACOM INC -CL B (VIA.B, 52.75)
VULCAN MATERIALS CO (VMC, 42.4375)
SEAGRAM CO LTD (VO, 44.3125)
WESTVACO CORP (W, 31.875)
WALGREEN CO (WAG, 28.75)
MCI WORLDCOM INC (WCOM, 88.5)
WENDY'S INTERNATIONAL INC (WEN, 23.75)
WHIRLPOOL CORP (WHR, 65.4375)
WINN-DIXIE STORES INC (WIN, 28.1875)
WARNER-LAMBERT CO (WLA, 88.6875)
WILLAMETTE INDUSTRIES (WLL, 45.6875)
WELLPOINT HLTH NETWRK -CL A (WLP, 66.875)
WASTE MANAGEMENT INC (WMI, 16.1875)
WAL-MART STORES (WMT, 58.875)
WATSON PHARMACEUTICALS INC (WPI, 37.3125)
WORTHINGTON INDUSTRIES (WTHG, 15.6875)
WRIGLEY (WM) JR CO (WWY, 84.1875)
WEYERHAEUSER CO (WY, 62.4375)
USX-U S STEEL GROUP (X, 24.625)
EXXON CORP (XON, 80.25)
XEROX CORP (XRX, 24.875)
TRICON GLOBAL RESTAURANTS (YUM, 42.3125)

## Appendix A

Operating return on assets is skewed by numerous other accounting distortions. The most relevant are listed below.

- Restructurings occur when a company makes a fundamental change in its business strategy, operations, or structure, resulting in provisions for expected losses.[29] This provisional charge has three effects. First, it reduces depreciation and/or amortization expense, helping operating margins. Second, it boosts future reported earnings by recognizing future expenses in the current period. Finally, it shrinks the asset base, enhancing returns. Restructuring charges have become more and more prevalent. Warren Buffett recently said, "I believe that the behavior of managements has been...worse when it comes to restructurings and merger accounting...many CEOs think this kind of manipulation is not only okay, but actually their duty." [30]
- As the source of value has shifted, employees have become more and more valuable. Increasingly, the way to attract and motivate employees is through employee stock options (giving them "a piece of the action") [31]. Although cash compensation is expensed, most employee stock options are not. Recognizing employee stock options as an expense serves to reduce operating profits and depress computed returns.

Current accounting convention views research, development, software, and information technology spending as costs—which are expensed on the income statement—rather than as investments in future growth—which are capitalized on the balance sheet. This convention has caused a material understatement both of the reported asset base and earnings. The impact is significant. To put it in perspective, consider that U.S. companies spent $212 billion on information technology in 1996 alone.[32]

# Appendix B

## Calculation of the S&P 500 Cash Conversion Cycle

Unless otherwise indicated, cash conversion cycles were calculated using the last twelve months sales, last twelve months cost of goods sold, and average accounts receivable, inventories, and payables over the prior four quarters.

Companies in the financial, transportation, and utilities sectors were removed from the calculation because of the absence of a defined product cycle. In addition, the companies listed below were excluded for one or more of the following reasons: (1) accounts payable is not reported as a separate line; item, (2) quarterly data is missing; or (3) financing is a core business.

**Figure 15**
**Companies Excluded in Calculation of the S&P 500 Cash Conversion Cycle**
S&P 500 sector definitions

| Sector | Ticker | Company Name |
|---|---|---|
| ***Basic Materials*** | TIN | TEMPLE-INLAND INC |
| ***Capital Goods*** | GE | GENERAL ELECTRIC CO |
| | MDR | MCDERMOTT INTL INC |
| ***Communication Services*** | NXTL | NEXTEL COMMUNICATIONS |
| | PCS | SPRINT PCS GROUP |
| | T | AT&T CORP |
| ***Consumer Cyclicals*** | CD | CENDANT CORP |
| | DNB | DUN & BRADSTREET CORP |
| | HLT | HILTON HOTELS CORP |
| | RX | IMS HEALTH INC |
| ***Consumer Staples*** | KO | COCA-COLA CO |
| | PEP | PEPSICO INC |
| | PG | PROCTER & GAMBLE CO |
| | UMG | MEDIAONE GROUP INC |
| | UN | UNILEVER N V -NY SHARES |
| | VO | SEAGRAM CO LTD |
| ***Energy*** | RD | ROYAL DUTCH PET -NY REG |
| ***Financial*** | | All |
| ***Health Care*** | AET | AETNA INC |
| | HUM | HUMANA INC |
| | PNU | PHARMACIA & UPJOHN INC |
| | UNH | UNITED HEALTHCARE CORP |
| | WLP | WELLPOINT HLTH NETWRK -CL A |
| ***Technology*** | CA | COMPUTER ASSOCIATES INTL INC |
| | EGG | PERKINELMER INC |
| | FDC | FIRST DATA CORP. |
| ***Transportation*** | | All |
| ***Utilities*** | | All |

Because the aggregated calculations are sales weighted, large companies may have undue influence on the entire sector's cash conversion cycle. Figure 16 shows the five largest companies, by sales, included in the calculations.

**Figure 16**
**Largest Companies by Sales and Sector**
S&P 500 sector definitions; in days; percentage change

**Revenue**

*Largest by Sector*

| | *Ticker* | *Name* | *Jun-99* |
|---|---|---|---|
| ***Basic Materials*** | DD | DU PONT E I DE NEMOURS & CO COM | $25,430.0 |
| | IP | INTERNATIONAL PAPER CO COM | 21,994.0 |
| | DOW | DOW CHEM CO COM | 17,791.0 |
| | AA | ALCOA INC COM | 16,325.1 |
| | ADM | ARCHER DANIELS MIDLAND CO COM | 15,137.8 |
| ***Capital Goods*** | BA | BOEING CO COM | $59,344.0 |
| | LMT | LOCKHEED MARTIN CORP COM | 25,920.0 |
| | UTX | UNITED TECHNOLOGIES CORP COM | 24,422.0 |
| | CAT | CATERPILLAR INC DEL COM | 20,547.0 |
| | WMI | WASTE MGMT INC DEL COM | 17,457.2 |
| ***Communication Services*** | BEL | BELL ATLANTIC CORP COM | $32,249.0 |
| | WCOM | MCI WORLDCOM INC COM | 30,720.0 |
| | SBC | SBC COMMUNICATIONS INC COM | 29,604.0 |
| | GTE | GTE CORP COM | 25,478.0 |
| | BLS | BELLSOUTH CORP COM | 24,154.0 |
| ***Consumer Cyclicals*** | F | FORD MOTOR CO DEL COM | $150,710.0 |
| | WMT | WAL MART STORES INC COM | 142,532.0 |
| | GM | GENERAL MTRS CORP COM | 125,952.4 |
| | S | SEARS ROEBUCK & CO COM | 40,804.0 |
| | HD | HOME DEPOT INC COM | 34,339.0 |
| ***Consumer Staples*** | MO | PHILIP MORRIS COS COM | $59,572.0 |
| | KR | KROGER CO COM | 30,603.5 |
| | MCK | MCKESSON HBOC INC COM | 29,923.1 |
| | SWY | SAFEWAY INC COM NEW | 25,961.8 |
| | CAH | CARDINAL HEALTH INC COM | 25,033.6 |
| ***Energy*** | XON | EXXON CORP COM | $97,238.0 |
| | MOB | MOBIL CORP COM | 45,753.0 |
| | TX | TEXACO INC COM | 30,289.0 |
| | CHV | CHEVRON CORPORATION COM | 29,597.0 |
| | HAL | HALLIBURTON CO COM | 20,044.2 |
| ***Health Care*** | MRK | MERCK & CO INC COM | $29,923.8 |
| | JNJ | JOHNSON & JOHNSON COM | 25,583.0 |
| | BMY | BRISTOL MYERS SQUIBB CO COM | 19,182.0 |
| | COL | COLUMBIA/HCA HEALTHCARE CORP COM | 17,815.0 |
| | PFE | PFIZER INC COM | 14,902.0 |
| ***Technology*** | IBM | INTERNATIONAL BUSINESS MACHS COM | $87,448.0 |
| | HWP | HEWLETT PACKARD CO COM | 48,816.0 |
| | CPQ | COMPAQ COMPUTER CORP COM | 38,489.0 |
| | LU | LUCENT TECHNOLOGIES INC COM | 35,766.0 |
| | MOT | MOTOROLA INC COM | 30,234.0 |

[1] Interview with Walter Wriston, quoted in Thomas A. Stewart, "Brainpower," *Fortune*, June 3, 1991.

[2] See *Intellectual Capital* by Thomas A. Stewart, Doubleday, 1997.

[3] http://www.bog.frb.fed.us/BOARDDOCS/SPEECHES/19961016.htm.

[4] See *The Weightless World* by Diane Coyle, Capstone Publishing, 1997.

[5] This example is taken from *Intellectual Capital* by Thomas A. Stewart, Doubleday, 1997.

[6] See *New Rules for the New Economy* by Kevin Kelly, Penguin Books, 1998.

[7] See *Myths of Rich and Poor* by W. Michael Cox and Richard Alm.

[8] http://www.intel.com/intel/museum/25anniv/hof/moore.htm.

[9] http://www.seas.upenn.edu/~gaj1/wireless.html.

[10] See *Unleashing the Killer App* by Larry Downes and Chunka Mui, Harvard Business School Press, 1998.

[11] This is a commonly used measure of the productivity of assets.

[12] See Financial Statement Analysis by Leopold Bernstein and John Wild, McGraw-Hill, 1998.

[13] Warren Buffett, Berkshire Hathaway Annual Report 1998.

[14] See Appendix A.

[15] *Purchase accounting* assumes that one company uses its economic resources to acquire another, and thus net assets acquired are recorded at their fair value purchase price. In a purchase of net assets, this is exactly what happens: the net assets purchased from the selling entity are recorded on the acquirer's books at fair value. Any premium over and above fair value is goodwill. While part of the gap between book value and price is allocated to the target's identifiable net assets to bring them up to fair value, the largest portion (up to 90% in some acquisitions) is assigned to goodwill.

*Pooling accounting* merges two firms using the existing recorded book values of their net assets. There is no adjustment to fair value because the underlying assumption is that there has not been an exchange of economic resources, but rather a combining of equity interests.

[16] See *"Let's Make a Deal"* by Michael Mauboussin and Bob Hiler, Credit Suisse First Boston, April 27, 1998.

[17] Assumes net working capital and net PPE remained at the same percentage of sales as in 1990 in each subsequent year. This figure is the nominal sum of the incremental difference between implied and actual net working capital and net PPE.

[18] See *"What Is the Right Supply Chain for Your Product?"* by Marshall Fisher, *Harvard Business Review*, March-April 1997.

[19] See *"A Cash Conversion Cycle Approach to Liquidity Analysis"* by Verylyn D. Richards and Eugen J. Laughlin*, Financial Management*, Spring 1980, 32-38.

[20] DSO = Days in the year (360) / (Sales / Average accounts receivable).

[21] DII = Days in the year (360) / (Cost of goods sold / Average inventory).

[22] DPO = Days in the year (360) / (Cost of goods sold / Average accounts payables).

[23] Product financing costs amounted to more than 4% of GDP in 1998. See *"Combining Logistics with Financing for Enhanced Profitability"* by Richard Palmieri and Jon Africk, Credit Suisse First Boston at http://palmieri.ascet.com.

[24] See *Essentials of Managerial Finance, 5th ed.* by J. Fred Weston and Eugene F. Brigham, The Dryden Press, 1979.

[25] Jay Fitzsimmons, Wal-mart senior vice-president, quoted in *The Wall Street Journal*, November 10, 1999.

[26] See Appendix B for methodology.

[27] See *Intellectual Capital* by Thomas A. Stewart, Doubleday, 1997.

[28] See *"Thomas Meredith"* by Stephen Barr, *CFO Magazine*, September 1998.

[29] There are two main types of restructuring charges:

1. Costs associated with terminated employees or assets no longer being used—termination benefits, facility closure costs, operating leases, lease termination costs, excess lease costs, losses on planned disposals of assets, and certain contractual obligations.
2. Costs associated with retained employees or assets—employee relocation, temporarily idled facilities, equipment relocation, training and retraining, business re-engineering, information systems enhancements, inventory write-downs, and asset impairments.

Source: Financial Accounting Standards Board, Emerging Issues Task Force No. 94-3, February 21, 1994.

[30] Warren Buffett, Berkshire Hathaway Annual Report 1998.

[31] See *"A Piece of the Action"* by Michael Mauboussin and Bob Hiler, Credit Suisse First Boston, November 2, 1998.

[32] See *New Rules for the New Economy* by Kevin Kelly, Penguin Books, 1998.

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