

Capital intensity and stock returns

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Most investment professionals organise the equity world in distinct categories such as Growth, Value, Large Cap, Small Cap, U.S. and non-U.S. It is common for portfolio managers and research directors to structure their investment research in similar terms. Plan sponsors, consultants and asset allocation specialists also build their models along these lines. At Morgan Stanley Investment Management (MSIM), the Global Franchise investment team has taken a different approach. We have long believed that the capital intensity of a business and the nature of its intangible assets are a more subtle and more profitable framework for marking distinctions among companies.

Companies that depend primarily on physical assets like real estate, factories and machinery for their competitive advantage are unlikely to earn reliably superior returns on their invested capital over the long term. Physical assets invite replication by competitors which often leads to excess capacity, price competition and erosion of returns on capital. In contrast, companies whose decisive assets are intangible, such as brands, patents, licenses, copyrights and distribution networks, can earn consistently superior returns on relatively smaller amounts of invested capital. Our research has shown that dominant, intangible assets can be difficult to create and more difficult for competitors to duplicate than physical assets. In addition, a dominant intangible asset can provide a company with an enduring franchise that can support consistently high returns on capital and compound shareholder wealth over time.

This paper sets out to examine the relationship between capital intensity and stock returns both across and within industries. We propose that:

- Greater capital intensity impairs returns on capital and depresses long-term stock returns
- Businesses that rely on intangible assets, thereby reducing capital intensity, should be able to sustain higher returns on capital and increase shareholder value

WHAT IS CAPITAL INTENSITY?

Capital intensity describes the amount of plant, property, equipment, inventory and other tangible or physical assets required to generate a unit of sales revenue. We quantify this characteristic by using the ratio of a company's annual capital expenditure divided by revenues.

INDUSTRY COMPARISONS

Chart 1 below shows the broad range of the average capital intensity in a representative sample of industrial sectors during the period 1998–2002. At one extreme, the food manufacturing industry is among the least capital intensive industries. Its capital expenditures average roughly 3 per cent of revenues. In the middle of the capital intensity range is the pharmaceutical industry, with an average capital expenditure equal to approximately 9 per cent of annual revenues. Telecommunications, at the other extreme, is one of the most capital-intensive industries with an average capital expenditure equal to over 20 per cent of revenues.

Food products were first industrialized over a hundred years ago as companies sought to provide growing urban populations with food variety independent of harvest or seasonal variations. Despite the improvements in food processing techniques, processing factories are relatively simple and do not require substantial capital spending. Yet volumes, and hence revenues, can be substantial. As a result, the capital intensity ratio benefits from both a small numerator and a large denominator. Moreover, if the product has a successful brand associated with it, then the manufacturer can charge a premium compared to commodity versions of the same product. Compare the price of Nescafé with store-brand coffee or Yoplait with tub yogurt—the brand premium translates into incremental revenue and inflates the denominator of our ratio, further reducing the capital intensity ratio.

Compared to food, prescription drugs are complex products, made from carefully refined raw materials in highly sophisticated manufacturing facilities. The costs of property, plant and equipment for a new drug production facility can run into the hundreds of millions of dollars. At the same time, pharmaceutical companies typically market their new products under patent protection. These patents regulate competition within the industry and increase pricing power. Here again, the ability to charge a premium for products increases revenues and reduces capital intensity.

Technical obsolescence can be the death knell for a telecom company in a competitive market place. As a result, it is not unusual for a phone company to spend more than 20 per cent of its annual revenues to renew plants, property and equipment. Fixed-line phone companies are under continuous pressure to replace analogue with digital switches, upgrade copper to fiber optic cable, and replace older technology with the latest systems. Cellular phone companies face similar pressures as they migrate from analogue to digital to third generation mobile networks. The relentless progress and obsolescence of technology manifests itself in hefty capital spending by phone companies.

In some respects, phone companies suffer from the worst of both worlds: not only do they have to foot the bill for big capital spending projects, but their products also face continuous pricing pressure. Deregulation has created increasingly competitive markets in long distance, local, data, internet and mobile services. Despite growth in volume, hefty falls in unit prices have squeezed revenue and the capital expenditure to revenue ratio gets pressured on both sides.

Later in this paper we will show how this diversity in capital intensity is linked to differences in sustained profitability and the long-term creation of shareholder wealth.

CAPITAL INTENSITY VARIES WITHIN INDUSTRIES

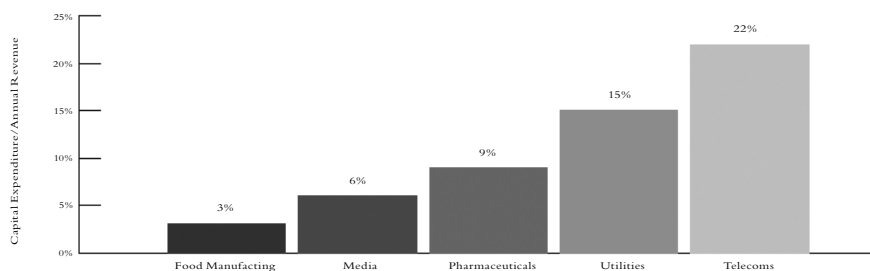
Not only does capital intensity vary across different industries, it can also vary dramatically within an industry. Chart 2 shows examples of the variance in capital intensity within the pharmaceutical, auto and media industries.

In the pharmaceutical industry, Novo Nordisk and Merck have very different levels of capital intensity. Novo Nordisk is a Danish pharmaceutical company whose products are used primarily to treat diabetes and hemophilia. Novo's diabetes products compete directly with commodity-like insulins, while most of its other products are made up of very complex, small molecules that require exceptionally sophisticated manufacturing processes. This business mix results in a higher than average ratio of capital expenditure to revenues of 11 per cent.

Merck, on the other hand, spends only about 5 per cent of annual revenues on capital expenditures. Its diverse portfolio of patented compounds is made up of relatively simple "large molecules" that treat scale diseases like high cholesterol, arthritis and hypertension. Merck uses intangible assets such as patents and extensive clinical research and development studies to establish the superior medical outcomes of its compounds and differentiate them from generic drugs. In contrast to Novo, Merck's relatively simple molecule products are less demanding to manufacture and benefit from a more benign pricing environment. This lowers capital intensity by reducing capital expenditure and increasing revenue.

DaimlerChrysler and Porsche form another high-contrast pair in the same industry. Both are obviously car makers, but they have very different business models. Historically, DaimlerChrysler has followed a complete vertical integration

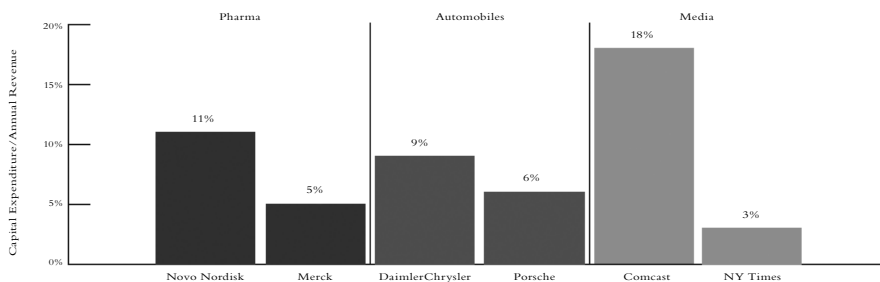
CHART 1. CAPITAL EXPENDITURE/ANNUAL REVENUE



Source: FactSet, Worldscope, Morgan Stanley Investment Management

Note: Data as of December, 2002

CHART 2. CAPITAL INTENSITY VARIES WITHIN INDUSTRIES



Source: Company Reports, Morgan Stanley Investment Management.

Note: Data as of December, 2002

Provided for informational purposes only and should not be deemed as a recommendation to buy the securities mentioned or securities in the industries shown above

model. Daimler believes that it must control every stage of the business—from initial design, prototype development and component manufacturing all the way through to final assembly. Daimler's capital intensity suffers from the added burden of competing in many commodity car segments. These include categories like compact cars, family sedans and minivans where price competition is fierce.

On the other hand, Porsche limits itself to premium sports cars and SUVs, where the Porsche brand, design and development of the cars are powerful intangible assets that provide pricing power. The incremental revenue from the brand's pricing power increases the denominator of the capital expenditure to revenue ratio and further reduces Porsche's capital intensity. In addition, Porsche aggressively uses third-party component suppliers and subcontractors to manufacture the components and assemble its cars. With this "light manufacturing" model, Porsche is able to make cars with substantially fewer assets tied up in capital-intensive manufacturing facilities.

In our final example, Comcast Communications and The New York Times are both commonly thought of as media companies but have very different capital intensity profiles. Comcast's vast proprietary cable infrastructure suffers from many of the same obsolescence and renewal pressures that telephone networks face. In contrast, The New York Times has built a nationwide distribution platform by renting other newspapers' printing presses and delivery systems. Its primary asset is a powerful editorial franchise that allows it to charge premium ad rates to reach a premium audience.

CAPITAL INTENSITY CAN ALSO VARY OVER TIME

Capital intensity can also vary for the same company at different periods in its life cycle, and this variation can have a profound impact on its profitability. The 3G mobile phone license fees in Europe are an example of how a license fee—usually a relatively nominal expense for most businesses—can grow to such enormous magnitude that it dwarfs other variables and becomes a capital expenditure burden with dire consequences for the returns on capital. Vodafone provides a classic example of this phenomenon.

In 1999, Vodafone's UK operations were on the brink of harvesting extraordinary returns from years of heavy capital

spending on second generation digital mobile phone networks. Most of the expensive infrastructure had already been installed, and revenue was growing quickly as mobile phone penetration and usage rates continued to rocket. That year, Vodafone's estimated return on capital employed (ROCE) exceeded 90 per cent¹.

In the following estimated year, the UK and several other European governments auctioned radio spectrum licenses for new, third generation mobile networks. In the bidding frenzy that followed, Vodafone spent billions of pounds to help ensure procurement of licenses. In Vodafone's case, the 3G license fees represented an enormous increase in the company's invested capital—equivalent to several years' capital expenditures—without a proportionate increase in revenues and profits. As a result, its estimated return on capital employed fell to only 13 per cent in 2002. Moreover, the increase in capital intensity appears to have permanently impaired the profitability of its assets. Even now, despite years of further growth, Vodafone's ROCE and stock price show no signs of returning to 1999 levels.

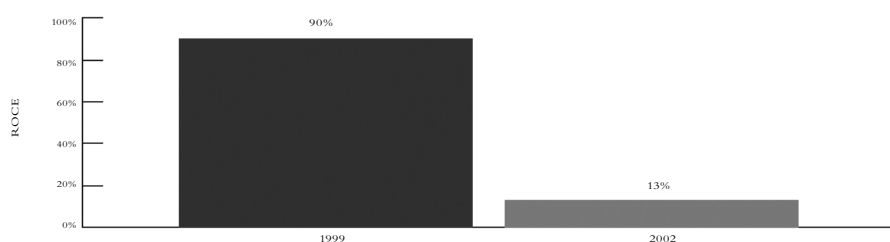
CAPITAL INTENSITY AND PROFITABILITY

We have just seen an example of how capital intensity can influence a company's profitability and its stock price. For a broader view, Chart 4 shows the major sub-sectors of the MSCI World Index as measured by their capital intensity relative to profitability (ROCE).

Strictly speaking, we cannot describe a statistical correlation between the ROCE and capital intensity because both variables are denominated by a related factor—the amount of capital in a business. Even so, the data suggest that those sectors with lower capital intensity are rewarded with higher profitability. In the northwest quadrant of the graph are those sectors that tend to demonstrate higher returns on capital and lower capital intensity—pharmaceuticals, household and personal goods and food manufacturing. Conversely, the southeast quadrant holds the more capital-intensive and generally lower-return industries like telecommunications, real estate and utilities.

The relative positions of these sectors on the chart reflect broad differences in their underlying business models. Businesses that are able to exploit intangible assets like brands, patents and licenses to further their competitive advantage appear to

CHART 3. VODAFONE UK ROCE



Source: FactSet, Worldscope, Morgan Stanley Investment Management

Note: Provided for informational purposes only and should not be deemed as a recommendation to buy the securities mentioned or securities in the industries shown above

1. ROCE is the operating profit from Vodafone's UK operations divided by the relevant net plant, property, equipment and working capital.

sustain higher levels of profitability. Businesses that operate with greater capital intensity are likely to deliver lower returns on capital. Over the long term, this lower profitability may translate into lower stock returns.

EMPIRICAL ANALYSIS

To study the relationship between capital intensity and total returns, we analyzed data from over 2,200 publicly listed companies in Europe and North America. Beginning with data in 1984, we divided the universe of companies into five subsets, or quintiles, according to their capital intensity. We assigned the least capital-intensive companies to the first quintile and the most capital-intensive companies to the fifth quintile, and measured the average return for the stocks in each quintile over the following year. We re-ran the analysis every year through the end of 2002, and the annualized results for the most recent 3-, 5-, 10-, and entire 18-year period are presented below in Chart 5. Based on our analysis, there appears to be a compelling argument for preferring investments in less capital-intensive companies regardless of investment horizons.

The evidence confirmed our own anecdotal experience as professional investors. For all time periods, the two lowest capital expenditure/sales quintiles significantly outperformed the two most capital-intensive quintiles. There appears to be a long-term constraint on a capital-intensive company's ability to generate consistently superior growth in shareholder value. As previously discussed, we believe that this is because capital-intensive companies typically rely on tangible assets for their competitive advantage which can easily be replicated by competitors. This ease of replication encourages plentiful capacity, tough competition, weak pricing and lower returns on capital. In contrast, companies that are dominated by intangible

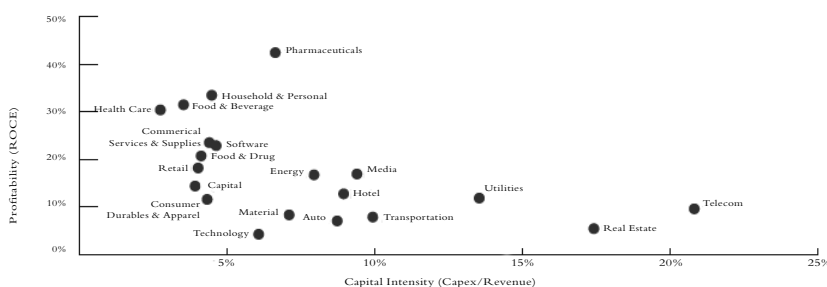
assets can benefit from a more benign pricing environment, higher returns on capital and superior organic compounding of wealth. Investors should benefit from an investment approach focused on low capital intensity companies driven by vibrant intangible assets.

The evidence from this study is corroborated by a similar analysis we conducted in 1998. That study did not include data from much of the TMT bubble of the late 1990s or the subsequent bust. Unlike the current study, returns in the previous study were positive for the 1- and 3-year periods as well as the longer periods. Importantly, the relative relationship between the quintiles in the previous study was broadly the same as the relationship in the current analysis, and we came to similar conclusions. This suggests an element of durability in the relationship we have identified between capital intensity and stock returns.

The association between capital intensity and stock returns is also evident *within* industries. Again, we took the universe of companies and grouped them into quintiles according to capital intensity—however, this time we did it within each industry.

The chart 6 shows the difference in the returns between the least capital-intensive quintile and most capital-intensive quintile within each industry over the past 18 years. In all but two industries, investors would have benefited from investing in less capital-intensive companies. The negative bars for the utility and telecommunications industries suggest a pattern that is the opposite of the rest of the world. In these two industries, the least capital-intensive companies earned lower returns than the most capital-intensive companies. The anomalous results in telecommunications and utilities appear to have been skewed by outsize returns from just a few companies (Enron, Worldcom) in a very small industry sample size. It is also likely that higher capital intensity acts as an

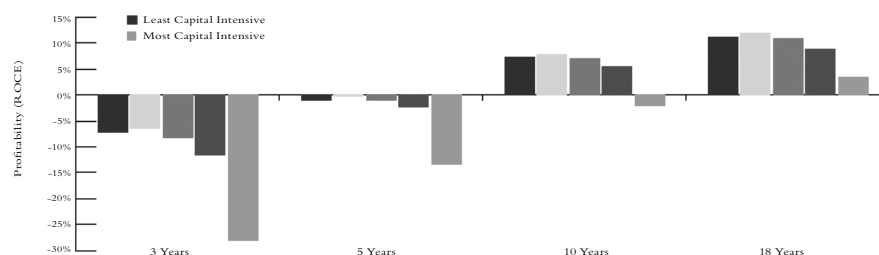
CHART 4. PROFITABILITY AND CAPITAL INTENSITY ARE LINKED



Note: Year ending December 2002

Source: FactSet, MSCI, Worldscope, Morgan Stanley Investment Management. Past performance is no guarantee of future results

CHART 5. BUSINESSES WITH LOWER CAPITAL INTENSITY HAVE GENERATED BETTER RETURNS



Note: Date as of December 2002

Source: FactSet, MSCI, Worldscope, Morgan Stanley Investment Management. Past performance is no guarantee of future results

effective barrier to entry in natural monopoly industries like telecommunications and utilities. Even with these exceptions, the statistical relationship between capital intensity and stock returns appears compelling.

CONCLUSIONS

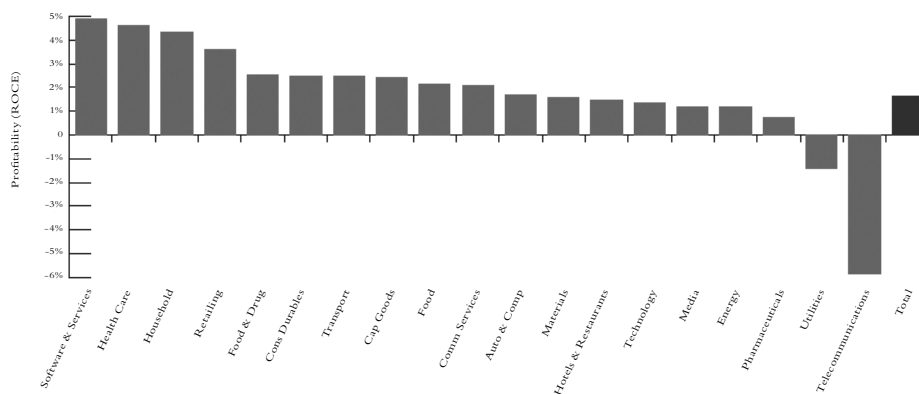
Our research shows that stock markets tend to reward companies that make relatively modest use of tangible assets and penalize those that are more capital-intensive. Unfortunately, very few professional investors have organized their research to identify the relationship between capital intensity, intangible assets and stock returns in a systematic way. Even Warren Buffett, once a paragon of investing in companies dominated by intangibles, has drifted to acquiring capital-intensive businesses like power generation and gas pipelines.

For equity analysts and investors, the conclusions from our work are clear: analyzing the balance between intangible and physical assets should be a key element in assessing any business franchise. The degree of capital intensity in a business plays an

important role in its long-term ability to create shareholder wealth. Companies that rely on easily replicated physical assets for their competitive advantage appear to be unable to sustain superior rates of return on capital over time. Companies that use minimal physical assets and rely on intangible assets like brands, patents, licenses and distribution systems appear to be able to sustain superior rates of return on capital and create shareholder wealth.

For retirement plan sponsors, trustees and other fiduciaries concerned with the long-term returns from equity investing, the implications are equally clear: the investment commitment to capital-intensive companies implicit in passive or benchmark-sensitive portfolios seems likely to impair long-term returns. There may be value in selecting active managers who systematically incorporate capital intensity, comprehensive franchise analysis and valuation in their security selection decisions.

CHART 6. RETURN SPREAD BETWEEN THE LEAST AND MOST CAPITAL-INTENSIVE INDUSTRIES



Note: Data from 1984–December 2002

Source: FactSet, Worldscope, Morgan Stanley Investment Management

