
The Scratch Report: Strategies For Beating The S&P 500 Benchmark

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Identifying R&D Value in Drug Companies

Company	Amgen	Bristol-Meyers	Schering AG
Ticker	NYSE: AMGN	NYSE: BMY	NYSE: SHR
Price as of 4/14/03:	\$59.08	\$22.55	\$42.85
52 wk range:	\$30.57 - \$61.48	\$19.49 - \$40.49	\$34.16 - \$63.60
Shares outstanding (mm):	1,154	1,944	197
Market Cap (mm):	\$68,178	\$43,837	\$8,441
Dividend Yield:	0.0%	4.9%	2.3%
Recommendation:	SELL	BUY	BUY

Source: Palladian Research, 2003

Investment Thesis

If investors accept the premise that research and development will ultimately drive the long-term growth of drug companies, then one should be a buyer of those companies with robust R&D efforts. It will be shown that investors should buy those drug firms where a smaller market cap and resultant share price offers substantially higher R&D. This report recommends the purchase of **Bristol-Meyers Squibb** and **Schering AG**, as these two companies offer the most R&D value relative to existing share prices. Alternatively, the sale of **Amgen** is recommended as investors would be receiving disproportionately less R&D at the Company's current valuation.

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While pharmaceutical and biotechnology firms are generally classified as separate industries, the respective research efforts can be considered comparable. Certain chemical and biological differences do exist; however, the overriding goal is to develop new drugs that aid in human health. In contrast to conventional wisdom, this report evaluates pharmaceutical and biotechnology firms on a parallel basis to better determine investment recommendations.

R&D has become increasingly important to the success or failure of drug manufacturers. Generic drug makers have steadily increased market share within the industry. It is estimated that drug makers lose between 70% - 80% of a particular drug's sales within two months of a generic entrant. In addition, drug exclusivity, or the time companies retain patent protection on innovative drugs has been slowly declining as well. With these catalysts forcing drug companies to produce new products more efficiently, R&D will be the key to future growth within the drug industry.

This report performed an analysis on R&D spending and market capitalization. This analysis derived a percentage that revealed the amount of R&D an investor could buy relative to current share prices. This is based on the theory that several large-cap drug stocks yield little R&D value when viewed on a market cap basis.

It was determined that large cap drug stocks such as **Amgen** will face significant difficulties in meeting optimistic earnings growth estimates based on current R&D spending. Amgen is a leading drug manufacturer with a market capitalization of \$67 billion. However, the Company spends 50% less on R&D and achieved 70% less in revenues than Bristol Meyers in 2002. Additionally, Amgen is dependant upon two drugs for over 70% of total revenue and trades at a 71% premium to the large cap drug industry.

Conversely, **Bristol Meyers** yields a significantly higher R&D/Market Cap ratio. The Company has experienced several near term difficulties that have led investors to question its long term growth ability. However, the Company possesses a diverse drug pipeline and does not depend on any one drug in particular for a large percentage of revenues. Also, Bristol's R&D expenditures were slightly below that of Merck at \$2.2 billion, yet trades at a 28% discount to the industry average. It is our opinion that recent dilemmas are already reflected in the Company's share price and its significant revenue base also positions Bristol as an acquisition target in an industry that could experience further consolidation.

Similarly, **Schering AG** spends a disproportionately large amount on R&D relative to its market capitalization. In 2002, Schering and Amgen's R&D expenditures and resultant revenues were comparable, yet Schering exhibits an 11.2% R&D/Market Cap ratio vs. Amgen (1.7%). Schering is a German drug firm that dominates its smaller, niche markets. Its continued focus on these markets such as hormonal contraceptives has provided consistent sales and earnings growth while others within the industry have been negatively impacted by generic competition.

Investment Recommendations

- We recommend the purchase of Bristol Meyers (NYSE: BMY \$22.55) as the Company should be able to overcome short term difficulties through aggressive R&D spending and its diverse revenue base. Additionally, Bristol is a likely takeover candidate in the event that drug expiries inhibit long term growth potential.
- We recommend the purchase of Schering AG (NYSE: SHR \$42.85) due to its reliable record of consistent earnings growth, dominance within small markets and above average R&D spending relative to share price.
- We recommend the sale of Amgen (NYSE: AMGN \$59.08) based on the Company's disproportionately small R&D/Market cap ratio, premium valuation and heavy reliance upon few drugs for Company revenue.

While biotechnology and pharmaceutical firms are classified as two separate industries, the primary growth driver behind both businesses is the development of new drugs through R&D efforts. Admittedly, there are certain scientific differences and technological requirements that distinguish biotech from traditional pharmaceutical labs. For example, Amgen markets human therapeutics based specifically on advances in cellular and molecular biology. Conversely, Bristol-Meyers develops and markets pharmaceutical products in the broader human health field. However, project coordination, drug development, manufacturing and patent protection procedures are so similar that marked differences are difficult to identify¹. Essentially, the research efforts for pharmaceutical and biotech companies are parallel.

Regardless of drug development techniques, these efforts all fall under the umbrella of R&D. For a pharmaceutical or biotech company to maintain its competitive edge and resultant profitability, R&D staff must provide effective product development to keep a steady flow of new drugs in the company's pipeline. Therefore, this report will compare and value companies operating in both industries under the assumption that R&D is the common thread between the two. Consequently, companies will be classified as drug manufacturers for simplicity.

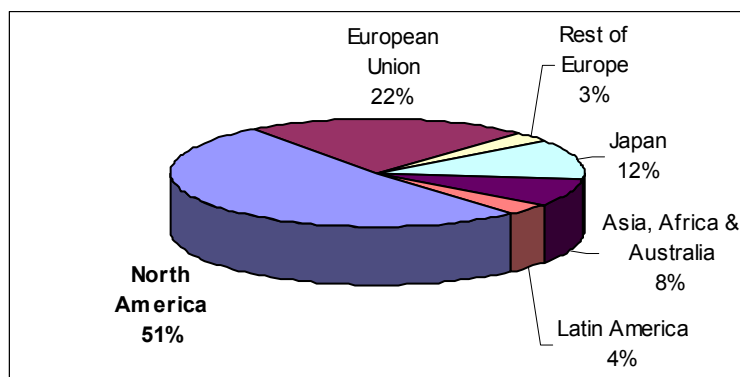
This report will provide an overview of the pharmaceutical and biotech industry that will highlight certain emerging trends followed by a detailed analysis of R&D efforts within the industry. Subsequent to the broader industry analysis, our investment recommendations will be presented.

¹ Source: PhRMA, 2003

The Drug Manufacturing Industry

It is estimated that the pharmaceutical industry reached sales from prescription drugs of \$401 billion in 2002, or an increase of 8% from \$369 billion in 2001². North America and the US in particular, accounted for 51%, or \$204 billion of global sales as shown in Table 1.

Table 1: Global Pharmaceutical Sales by Region



Source: PhRMA and Palladian Research, 2003

In addition to recent growth rates, there are certain factors that will characterize the bio-pharma industry in 2003 including:

- US population growth
- Industry consolidation
- Industry's departure as a "safe" investment
- Current valuations

US Population Statistics

Drug manufacturing firms will likely benefit from an aging US population in coming years. According to the US Census Statistical Abstract, during 1990-2000, the number of people age 65 and over has grown 12% from 31.2 million to 35 million as exhibited in Table 2.

² Source: IMS Health, 2003

Table 2: US Census Population Statistics, 1990-2000

Characteristic	1990	2000	% change
45 - 54 years	25,223	37,678	49.4%
55 - 59 years	10,532	13,469	27.9%
60 - 64 years	10,616	10,805	1.8%
65 - 74 years	18,107	18,391	1.6%
75 - 84 years	10,055	12,361	22.9%
85 years and over	3,080	4,240	37.7%
65 years and over	31,242	34,992	12.0%

Source: US Statistical Abstract and Palladian Research, 2003

Additionally, the US Census predicts that the number of people 65 and over will grow to 53 million by 2020, which represents an increase of 51% from 2000 statistics. It is important to note that on an annualized basis, residents 65 and over only grew at 1.3% from 1990-2000. This is a function of demographics whereby the older population can only grow proportionate to the younger population. While the US population is living longer, drug makers are only receiving a 1% annual increase in the number of aging Americans over 65. However, these statistics do solidify the assertion that drug manufacturers will benefit from a population that will continue to age and the demand for R&D will continue to increase.

Industry Consolidation

The drug manufacturing industry was characterized by both small and large-scale acquisitions throughout the 1990s. The largest, Pfizer's purchase of Warner-Lambert in 2000, was valued at approximately \$90 billion. More recently, Bristol Meyers purchased Dupont's pharmaceutical business for \$8 billion and Pfizer's acquisition of Pharmacia for \$60 billion is pending³.

Although acquisitions were frequent during this time period, it is likely that M&A activity could continue beyond 2003. Aside from achieving economies of scale from such acquisitions, drug manufacturers are repeatedly faced with patent expirations and generic competition (this will be discussed in greater detail later in the report). Once a company's drug has lost exclusivity rights, generic manufacturers flood the market with comparable products at discounted prices. Mergers afford drug companies the ability to purchase additional drugs to compensate for the expiration. Similarly, the decline in sales from patent expiration can be spread over a wider revenue base thereby decreasing the impact of such a loss. Examples of this include Glaxo's purchase of Wellcome (Zantac expiry) and Astra's merger with Zeneca (Losec and Zestril expiries).

³ For a detailed listing of recent industry acquisitions, see Exhibit 1

In addition to patent concerns, consolidation could also be driven by increasing demand for R&D productivity. As will be discussed later, the costs of R&D expenses are growing disproportionately to actual pharmaceutical drug sales. A company with a weak pipeline of drugs over the next several years can purchase a stronger product base to offset this with fresh growth prospects. As R&D will support future growth, companies with large R&D efforts at depressed price levels such as Bristol-Meyers and Schering-Plough may become likely acquisition candidates.

While consolidation has been widespread, the industry remains fragmented. The top 10 firms account for only 40% of the entire market. Of this, Pfizer alone will capture 11% of the market after the Pharmacia transaction is complete. Given the increased competition and advantages gained from acquisitions, it is likely that large-scale acquisitions will continue.

Changing Investment Characteristics

Drug companies have long been considered a “safe” investment due to US demographic trends and the non-cyclical nature of these stocks. However, the growing presence of generic drug competition has forced companies to maintain a large number of potential drugs in the pipeline, which requires a productive R&D staff. If new drugs are not continuously brought to market, revenues will decline accordingly. This dynamic has caused several drug companies to lower earnings guidance, most notably for 2003. For example, faced with its Claritin expiry, Schering-Plough chose to offer an over-the-counter (OTC) version of the drug, Clarinex. This strategy caused Claritin’s sales to decline 48%, from \$2.7 billion in 2001 to \$1.4 billion in 2002. Consequently, the company lowered earnings estimates from \$1.10 - \$1.15 to \$0.75 - \$0.85 in 2003.

Aside from patent concerns, the industry also experienced questionable business tactics by some of its formidable components. Particularly, Bristol-Meyers Squibb underwent a series of financial restatements after it was discovered the company improperly booked approximately \$2 billion in net revenues over the last few years. Controversies such as this coupled with increased generic competition, have exposed the industry as one which is not immune to extraneous events.

Given these developments, it should be noted that investors must be increasingly disciplined when purchasing drug stocks. It is our opinion that buying R&D at a reasonable price is the most logical approach, as R&D productivity will be under tremendous pressure in coming years.

Drug Industry Valuation Analysis

The Dow Jones drug index fell approximately 24% in 2002 due to a lack of blockbuster drugs and a resultant earnings decline. As shown in Table 3, earnings for the group are expected to increase only 5% in 2003, which will limit significant expansion in multiples for the majority of drug stocks.

Table 3: Drug Industry Valuation Chart

Ticker	Company	Price	Calendar EPS			P/E		P/E/G	
			2002A	2003E	2004E	2003	2004	2003	2004
AMGN	Amgen	\$57.88	\$1.39	\$1.76 26.6%	\$2.16 22.7%	32.9x	26.8x	1.6x	1.3x
PHA	Pharmacia	\$44.30	\$1.55	\$1.78 14.8%	\$2.06 15.7%	24.9x	21.5x	1.7x	1.4x
SGP	Schering Plough	\$16.82	\$1.42	\$0.76 -46.5%	\$0.91 19.7%	22.1x	18.5x	2.5x	2.1x
AZN	AstraZeneca	\$34.50	\$1.84	\$1.57 -14.7%	\$1.79 14.0%	22.0x	19.3x	2.7x	2.4x
LLY	Eli Lilly	\$58.36	\$2.55	\$2.54 -0.4%	\$3.01 18.5%	23.0x	19.4x	1.6x	1.4x
PFE	Pfizer	\$31.51	\$1.59	\$1.80 13.2%	\$2.07 15.0%	17.5x	15.2x	1.1x	1.0x
NVS	Novartis	\$38.50	\$1.88	\$2.14 13.8%	\$2.37 10.7%	18.0x	16.2x	1.8x	1.6x
BAY	Bayer	\$16.55	\$1.12	\$0.84 -25.0%	\$1.43 70.2%	19.7x	11.6x	3.3x	1.9x
SHR	Shering AG	\$42.83	\$2.32	\$2.59 11.6%	\$2.99 15.4%	16.5x	14.3x	1.0x	0.9x
MRK	Merck	\$55.42	\$3.14	\$3.40 8.3%	\$3.72 9.4%	16.3x	14.9x	1.8x	1.7x
WYE	Wyeth	\$34.54	\$2.22	\$2.45 10.4%	\$2.76 12.7%	14.1x	12.5x	1.2x	1.0x
GSK	GlaxoSmithKline	\$38.09	\$2.35	\$2.58 9.8%	\$2.65 2.7%	14.8x	14.4x	1.5x	1.4x
AVE	Aventis	\$44.67	\$2.76	\$3.33 20.7%	\$3.81 14.4%	13.4x	11.7x	0.6x	0.5x
BMJ	Bristol Meyers Squibb	\$22.20	\$1.25	\$1.60 28.0%	\$1.72 7.5%	13.9x	12.9x	1.5x	1.4x
Average				5.0%	17.8%	19.2x	16.4x	1.7x	1.4x

Source: Company Information and Palladian Research, 2003

The group is currently trading at a P/E of 19.2x vs. 2003 earnings projections and 16.4x vs. 2004 earnings. This is well below the historical averages:

- 10-year average of 24.5x
- 5-year average of 30.1x
- 3-year average of 27.3x

Due to its “safe-haven” investment status, Amgen is by far the most expensive drug company and is trading at a 71% premium to its peers vs. 2003 estimates. Additionally, Pharmacia trades at 30% premium, which can mostly be attributed to Pfizer’s pending acquisition of the company. In contrast, Schering AG and Bristol-Meyers trade at a substantial discount to the group, at 14% and 28%, respectively. This is largely due to accounting and drug pipeline concerns that will be addressed later in the report.

Based on our analysis, it does not appear that the drug sector is significantly overvalued when compared to historical norms. However, given the recent problems within the industry and challenges pertaining to future R&D expenditures, multiple expansion of those companies with premium valuations will be difficult. Under this assumption, Amgen appears to be the most

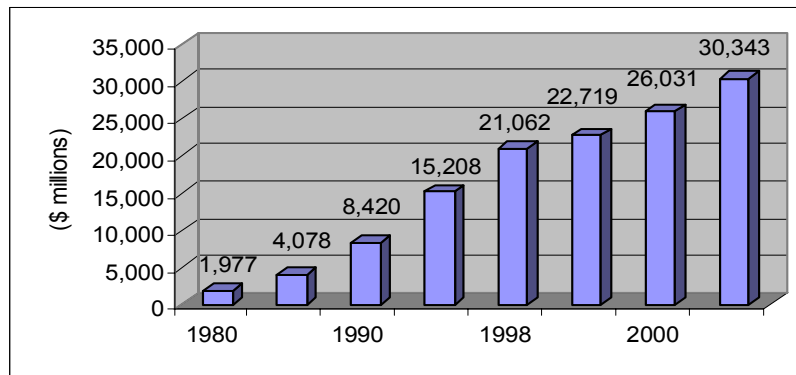
overvalued drug company with the least potential for share appreciation. Conversely, companies with proven R&D labs and a discounted valuation such as Schering AG and Bristol-Meyers could potentially offer investors significantly greater returns.

The Importance of Research and Development

In 2003, the rate of growth for drug companies will be dependant upon the productivity of each respective R&D department. Therefore, it is essential to provide an accurate depiction of the current R&D environment.

From 1980-2001, R&D expenditures for PhRMA (Pharmaceutical Research and Manufacturers of America) member companies have grown from \$2 billion to \$30.3 billion, or at a CAGR of 14.6% as exhibited in Table 4.

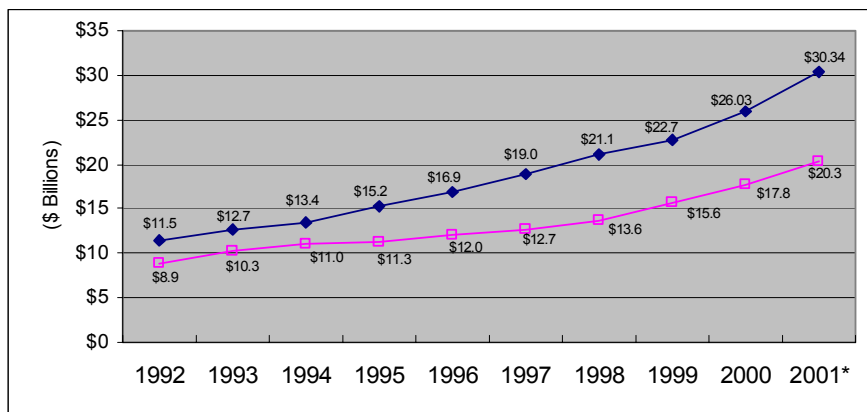
Table 4: PhRMA Member Companies R&D Spending, 1980-2001



Source: PhRMA and Palladian Research, 2003

Interestingly, the pharmaceutical companies' R&D spending of \$30.4 billion in 2001 was significantly higher than the level of spending by the entire National Institute of Health (NIH) during the same year. This divergence demonstrates the heightened demand for R&D spending that is likely to continue in 2003. Table 5 below depicts the disparity between industry and NIH R&D spending.

Table 5: PhRMA Member R&D Spending Vs. NIH Budget, 1992-2001



Source: PhRMA and Palladian Research, 2003

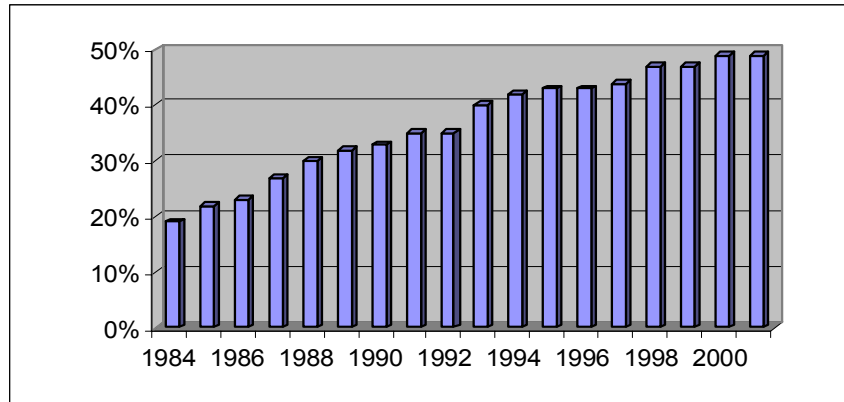
The continuous need for drug innovation and increased generic competition make it likely that drug companies' R&D spending should, at the least, exhibit historical 15% growth in 2003. Additionally, this report identifies three primary reasons that will underscore the importance of R&D effectiveness:

1. Generic competition/Competing drugs
2. New molecular entities (NME) approvals are decreasing
3. Rise in the cost of drug manufacturing

Generic Competition

In 1984, the Drug Price Competition and Patent Term Restoration Act (Hatch Waxman) was passed, which established the generic drug makers' position within the drug manufacturing industry. The Act allowed generic makers to access the original manufacturer's drug safety, efficacy and toxicology data when a drug is submitted for FDA approval. Since that time, generics have increased share within the market to approximately 50% in 2001 as exhibited in Table 6.

Table 6: Generic Market Share, 1984-2001



Source: IMS Health and Palladian Research, 2003

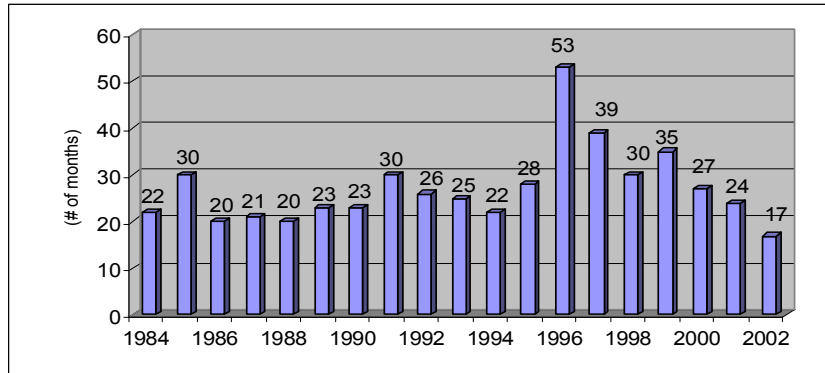
While the number of years a company has exclusivity on a particular drug varies, it is certain that generics will continue to pressure market share and revenues from the drug manufacturers. It is estimated that most large products will lose between 70% and 80% of revenues within two months of expiry. This intensifies the pressure on drug companies to maintain a steady flow of new drugs in the pipeline to counter the presence of generics.

In addition to generic competition, competing drug makers are bringing similar drugs to the market more quickly. For example, when Tagamet was released in 1977, it took 6 years for the competing drug, Zantac, to be released in 1983. However, Prozac's release in 1988 was countered by the introduction of Zoloft in 1992, or a time lapse of 4 years. More recently, the time interval was lowered to 4 months between the release of Celebrex and competitor Vioxx in 1999.

Declining New Molecular Entities (NME)

Over the last couple of years, there has been a decrease in the number of new drug approvals. As exhibited by Table 7, the number of NME's in 2002 declined to its lowest level in nearly 15 years. A NME is a medication containing an active substance that has never before been approved for marketing in any form in the US.

Table 7: Number of NME's, 1984-2002



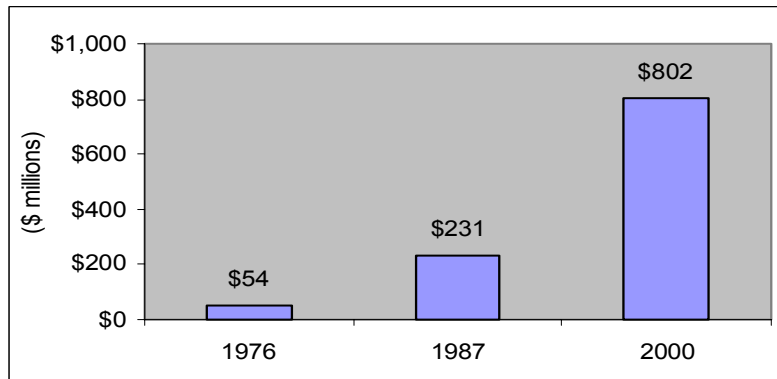
Source: PhRMA and Palladian Research, 2003

While drug companies blame the FDA for longer approval times, several drug manufacturers have suffered from a lack of new drugs in the pipeline. The industry filed 98 NDA's (New Drug Application) in 2001, which was 15% fewer than 2000 and a decrease of nearly 30% from 1999. Given the pressure on drug companies to submit numerous NDA's annually, increased reliance upon R&D should be seen in 2003 and beyond. Therefore, it will be the companies with superior R&D efforts that will perform well under these demanding conditions.

Rising Drug Costs

The downside to rising R&D outlays is the increased cost of drug development. It is estimated that the cost of developing a drug has risen from \$54 million in 1976 to \$802 million in 2000 as shown in Table 8 below. The \$802 million includes approximately \$300-350 million in failure costs.

Table 8: Cost of Developing a Drug, 1976-2000



Source: PhRMA and Palladian Research, 2003

According to consulting firm, Accenture, there are four primary drivers to the increased cost of pharmaceutical R&D:

1. More complex diseases
2. High drug attrition rates
3. More demanding development requirements
4. Increasing scale and globalization

In addition to the rising cost element, the time involved in bringing a drug from discovery phase to market has increased from 11 years in 1980 to 15 years in 2002. Quite possibly, the same reasons cited for cost increases have also led to difficulties in bringing new drugs to market quicker. Specifically, increasingly complex human diseases and more stringent FDA requirements would certainly lead to high attrition rates among new drug candidates.

In sum, factors including generic competition, declining NME growth rates and rising cost of R&D will likely require drug manufacturing firms to significantly increase R&D spending in 2003. More importantly, the reliance upon R&D for meaningful growth in coming years will benefit those companies with strong R&D departments. Therefore, a brief discussion entailing current R&D spending follows.

The Current R&D Spending Environment

As demonstrated earlier, the drug discovery process is capital-intensive, but is critical for the generation of sales growth. Below in Table 9 is a summary of the leading drug manufacturers' R&D spending growth rates:

Table 9: Large Drug Firms' R&D Spending, 1999-2002

	1999	2000	2001	2002	CAGR 1999-2002
(\$US in millions)					
Aventis*	\$1,578	\$3,648	\$3,440	\$3,586	31.1%
		131%	-6%	4%	
Biogen	\$221	\$303	\$315	\$368	18.2%
	25%	37%	4%	17%	
Shering AG	\$725	\$860	\$916	\$1,004	11.3%
	15%	19%	7%	10%	
Amgen	\$823	\$845	\$865	\$1,117	10.6%
	24%	3%	2%	29%	
Bristol Meyers Squibb	\$1,705	\$1,878	\$2,183	\$2,218	9.1%
	13.5%	10%	16%	2%	
Merck	\$2,068	\$2,344	\$2,456	\$2,677	8.9%
	14%	13%	5%	9%	
Pfizer	\$4,036	\$4,374	\$4,776	\$5,176	8.6%
	22%	8%	9%	8%	
AstraZeneca	\$2,472	\$2,620	\$2,687	\$3,069	7.4%
	0%	6%	3%	14%	
Eli Lilly	\$1,784	\$2,019	\$2,235	\$2,149	6.3%
	3%	13%	11%	-4%	
Schering Plough	\$1,191	\$1,333	\$1,312	\$1,425	6.1%
	18%	12%	-2%	9%	
GlaxoSmithKline	\$3,702	\$3,839	\$3,817	\$4,098	3.4%
		4%	-1%	7%	

*1998 financial statements did not consolidate Hoechst contributions

Source: Company Information and Palladian Research, 2003

As illustrated, Aventis has exhibited the highest R&D growth rate at a CAGR of 32% while GlaxoSmithKline ranked lowest with a CAGR of 3.4%. The low growth rate displayed by Glaxo highlights an important consequence of the mega-mergers that have occurred recently: *The larger the pharmaceutical firm becomes, the more difficult it will be to increase R&D at a meaningful rate.* For large cap stocks such as Merck and Pfizer to grow R&D through consolidation efforts, this requires the acquisition targets to have substantially large R&D operations. This could affect Pfizer in the next couple of years as the company is close to completing its \$60 billion acquisition of Pharmacia, making it the largest pharmaceutical company in the world.

However, the goal of any R&D effort is to produce the next blockbuster drug. Currently, a blockbuster drug is one which exceeds \$1 billion in annual sales. The 3 largest drugs in terms of 2002 sales are listed below⁴:

- **Lipitor** (Pfizer): \$7.9 billion
- **Zocor** (Merck): \$5.6 billion
- **Losec/Prilosec** (AstraZeneca): \$4.6 billion

⁴ For a complete table of top-selling drugs, see Exhibit 2

Which firms will produce the next blockbuster is difficult to ascertain. What can be said is that those firms with substantial annual R&D expenditures should have a relatively stronger chance of such a discovery. However, the price at which an investor pays for R&D should be of the highest priority.

Investment Recommendations

It is reasonable to believe that R&D drives the growth of a drug company. If one accepts this premise, then it follows that companies with a superior R&D department should exhibit a superior growth rate. However, this report takes this assumption one step further. It will be recommended that investors buy those companies where a smaller market cap and resultant share price will buy disproportionately higher R&D. Similarly, one should sell those companies where a higher market cap will buy disproportionately less R&D.

Valuing a drug company's R&D effectiveness has spawned the use of several measures within the investment community. However, our analysis used the following valuation metric:

$$\text{R\&D/Market Capitalization Ratio: } \frac{\text{Total R\&D Expenditures}}{\text{Total Market Capitalization}}$$

This derives a percentage that reveals the amount of R&D an investor could buy relative to the company's market capitalization⁵.

Based on this analysis, it was determined that several large cap drug stocks such as Pfizer, Merck, GlaxoSmithKline and Amgen produce very little R&D relative to their respective total market cap, or the price at which an investor would purchase shares, as shown in Table 10 below:

Table 10: Drug Industry R&D/Market Cap Ratios

Pharmaceutical	R&D/Mkt Cap	Biotechnology	R&D/Mkt Cap
Bayer	20.96%	Biogen	7.10%
Shering AG	11.22%	Sanofi-Synthelabo	6.28%
Aventis	9.95%	Chiron Corp	4.60%
Schering Plough	5.77%	Genetech, Inc	3.40%
AstraZeneca	5.16%	Barr Laboratories	3.04%
Bristol Meyers Squibb	5.14%	Allergan, Inc	2.51%
Wyeth	4.11%	MedImmune	1.78%
Pharmacia	4.05%	Mylan Laboratories	1.73%
Eli Lilly	3.39%	Forest Labs	1.68%
GlaxoSmithKline	3.12%	Amgen	1.67%
Novartis	2.75%	Gilead Sciences	1.57%
Pfizer	2.68%	Teva	1.53%
Abbott Lab.	2.54%	Cardinal Health	0.26%
Alcon	2.40%		
J&J	2.37%		
Merck	2.13%		

Source: Company Information and Palladian Research, 2003

⁵ See Exhibit 3 for complete analysis

This report recommends the sale of Amgen, as the company offers little R&D value relative to its market capitalization, is priced 70% above its peers and lacks product diversity. *It should be noted that although Pfizer, Glaxo and Merck are not recommended in this report, these companies will face substantial difficulties in growing future revenues as company size and existing R&D efforts will require the repetitive production of blockbuster drugs to increase current revenues. It is rare that any company can deliver near perfect execution.*

Conversely, the purchase of Bristol-Meyers and Schering AG is recommended based not only on our R&D/market cap analysis, but also future growth potential and/or acquisition possibilities. These companies represent investments with limited downside risk and could experience a significant increase in share price in 2003. Particularly, Bristol and Schering AG spend substantially more in R&D and produce equally higher revenues than Amgen. However, due to short term difficulties, these companies have fallen out of favor with investors and are trading well below Amgen's premium valuation.

Therefore, if logic follows, investors should either buy Bristol and Schering as these companies are just as productive in R&D activities as Amgen, yet offer a discounted valuation. Or, alternatively, these companies are not productive in their respective R&D efforts and will be acquired by a larger competitor due to a high revenue base in an industry that is still consolidating.

SELL: Amgen (NYSE: AMGN \$59.08)

Amgen, with a market capitalization of \$68 billion, is a global biotechnology company that discovers, develops, manufactures and markets human therapeutics based on advances in cellular and molecular biology. The Company's R&D efforts are focused on human therapeutics delivered in the form of proteins, monoclonal antibodies and small molecules in the areas of nephrology, oncology, inflammation, neurology and metabolic disorders.

The Company has 6 primary drugs currently on the market that are listed below:

- Epogen: \$2.3 billion or 45% of revenues
- Neupogen: \$1.4 billion or 28% of revenues
- Neulasta: \$464 million or 9% of revenues
- Aranesp: \$416 million or 8% of revenues
- Enbrel: \$362 million or 7% of revenues
- Kineret: \$70 million or 1% of revenues

While Amgen has several drugs in the pipeline, the Company's near-term growth is expected to come largely through the expansion of existing drugs⁶. For example, sales of Neupogen are projected to accelerate from \$464 million in 2002 to \$1.1 billion in 2003, or 136%. Similarly, Aranesp is expected to grow sales from \$416 million in 2002 to \$1 billion in 2003, or an increase of 149% Y/Y. Following this strategy, Aranesp is a long-acting form of the Company's blockbuster, Epogen, and is being marketed for different medicinal purposes.

⁶ See Exhibit 4 for Amgen's complete product portfolio

In 2002, Amgen acquired bio-tech competitor Immunex and, subsequently, inherited the potential blockbuster inflammatory drug, Enbrel. Sales of Enbrel are expected to grow from \$770 million in 2002 to \$1.3 billion in 2003, or 69%.

Although consensus suggests that Amgen will exhibit 20%+ growth into 2005, we have identified four negative catalysts that, in aggregate, warrant a sell recommendation. These include:

- Little R&D relative to market capitalization
- Limited product diversity
- Premium valuation
- Questionable growth estimates

R&D/Market Cap

As shown in Exhibit 3, Amgen has one of the lower R&D/Market Cap ratios of 1.7% relative to several other drug manufacturing firms. Keeping in mind the theory behind this valuation was to identify companies that offered high R&D and low share prices, biotech competitors such as Biogen (7%) and Sanofi-Synthelabo (6.3%) seem to offer more attractive investments based on this metric. Further, based on a R&D/per share basis, Amgen has \$0.97 of R&D per share, which is considerably lower than entrenched pharmaceutical firms such as Schering AG (\$4.81) and Bristol Meyers (\$1.14) (See Exhibit 3). Interestingly, Amgen also generates 70% less revenues than Bristol Meyers (\$5.5b vs. \$18.1b). While R&D will be crucial for Amgen's future growth, at current levels, investors would be overpaying for the Company's potential innovation.

Product Pipeline

The inherent risk residing in Amgen's product portfolio is a lack of depth. Essentially, Amgen is a two drug company, with Epogen and Neupogen accounting for 73% of 2002 total revenues. Amgen is not immune to generic competition and the reliance upon too few drugs could present substantial growth difficulties in the next few years. Additionally, unforeseen legal ramifications could be problematic if a particular drug is proved to be harmful.

Sales estimates are quite optimistic for the Company's current drug portfolio and the resultant 37% increase in total revenues in 2003. However, the fact that Amgen acquired Immunex in 2002 for inflammatory drug, Enbrel, may be a precursor for Amgen's future pipeline difficulties and lack of organic growth. While growth through consolidation is not viewed as a negative for the Company, purchasing a firm for a strong pipeline could assign additional risk to Amgen due to the high failure rate for trial drugs.

Valuation Concerns

As alluded to earlier, Amgen's premium valuation offers little potential for share price appreciation over the next 12 months. The Company trades at 32.9x vs. 2003 earnings estimates of \$1.76 and 26.8x vs. 2004 projections of \$2.16. This is a 71% premium to the industry average in 2003 of 19.2x and a 63% premium to the 2004 average 16.4x. Investors have found Amgen to be a "safe" investment in the drug industry as the Company is expected to aggressively grow earnings. However, at these levels, this expected growth is priced into current valuations and Amgen should not experience meaningful multiple expansion in 2003.

Excessive Growth Estimates

A. Revenue Analysis

Amgen is projected to grow revenues from \$5.5 billion in 2002 to \$7.6 billion in 2003, or 37%. This requires an incremental increase in revenues of \$2.1 billion. If an increase in sales of such magnitude is widely expected by the investment community, it would be prudent to analyze where this growth must come from. Amgen's leading drug, Epogen, has been on the market since 1989. Similarly, Neupogen was launched in 1991. It is common for a drug to experience a significant ramp in sales up upon introduction and then gradually level off. Therefore, it is safe to assume that these drugs have reached maturity and sales will likely exhibit very modest future growth. For example, it is improbable that physicians will prescribe substantially more Epogen to patients in 2003 so that Amgen can meet its estimates. Even if this was attempted, it is reasonable to assume that the number of illnesses that require Epogen as treatment could not increase exponentially in 2003. Therefore, the required \$2.1 billion increase in revenues should not come from Epogen or Neupogen in 2003.

If sales growth will not be derived from the Company's leading drugs, it should follow that other existing drugs will provide this growth. Enbrel, Aranesp and Neulasta have been on the market since 1998, 2001 and 2002, respectively. Since these drugs have been on the market for a sufficient amount of time, it is likely that a ramp up in sales will not occur in 2003. For product sales to grow and meet 20%+ estimates for the Company, new uses must be found for these drugs. The Company is testing Enbrel for arthritic purposes and Aranesp for several cancer ailments. However, FDA approval decisions are extremely unpredictable. If luck were on the Company's side, the FDA could approve these drugs around September 2003 so that sales could grow in a timely manner to provide the expected \$2.1 billion in revenue growth this year. This report takes the contrary view that the FDA will not base approval decisions to accommodate a company's sales goals.

On an individual product basis, it would take an extremely large incremental increase in each drug's sales to provide an additional \$2.1 billion in 2003. For example, Aranesp would be required to grow its sales 405%, Neulasta 352%, Enbrel 480% and Kineret twenty-nine fold. To say the least, these are aggressive estimates considering this scenario relies on timely FDA approvals in 2003. This is not to assume that any one drug has to account for total company growth; however, the inherent risk involved in the drug approval process does provide sufficient evidence that these estimates may be difficult to attain.

B. Productivity of R&D

Aside from individual product growth, Amgen's R&D productivity will have to exhibit industry-leading effectiveness as well. For Amgen to grow over 20% per annum, the Company will need to continuously produce blockbuster drugs. As shown in Exhibit 2, Amgen will need to develop the equivalent of Johnson and Johnson's anti-psychotic, Risperdal, with \$2.1 billion in 2002 sales. This may be attainable in the near term, however, as the Company's revenue base increases accordingly, a \$2 billion drug will not support current growth estimates. Likely, a Lipitor or Zocor (\$5b+) will need to be produced annually. This will be a difficult task.

Further, the top-selling drugs generally aid ailments in the blood-pressure and anti-psychotic markets. Amgen's pipeline of drugs primarily consists of cancer-related and arthritic products. If Amgen produces the next blockbuster arthritis drug, the Company may not achieve sales comparable to leading blood-pressure products. Similar ailments such as asthma and diabetes have only produced drugs with sales of \$2.4 billion and \$2 billion, respectively (See Exhibit 2). Arthritis, asthma and diabetes affect a large percentage of the population; however, they do not produce significantly large drug sales, relative to the variety of products currently on the market.

It would seem that if Amgen is to grow to the size of Pfizer or Merck, or to even meet long-term growth expectations, drugs in the anti-psychotic or blood pressure/cholesterol market would be required. Although cancer drugs could prove highly profitable if achieved, the likelihood of this is questionable given the track record of previous hopeful cancer cures. What is certain is that for Amgen to grow at such rates, annual blockbusters will be required by the Company.

In sum, it will be very difficult for Amgen to increase its existing product sales to the level that the consensus expects, due to FDA unpredictability and product maturity. Additionally, Amgen's R&D must be able to produce blockbusters year after year to sustain projected growth. The probability of one of these catalysts occurring is small. The probability of both happening in tandem, which will be required of the Company to support growth estimates, is even more questionable.

In addition to overall sales growth, earnings growth is equally aggressive with a consensus 5-year growth rate of 21%. Interestingly, while revenues are expected to increase twofold by 2005, R&D is estimated to increase only 41% during the same period. It will be difficult for Amgen to sustain these earnings estimates when the Company spends far less on R&D expenditures than comparable companies. If Amgen spends approximately \$1.1 billion on R&D and Bristol-Meyers spends \$2.2 billion, researchers at Amgen will have to be twice as productive in their efforts. This report takes the position that it is illogical to assume that Amgen's researchers are twice as intelligent, or productive to those at Bristol.

In our opinion, rarely can a company meet such aggressive expectations. Amgen will be particularly vulnerable due to industry risks associated with drug discoveries. Accordingly, Amgen is placed in a difficult conundrum. If the Company misses expectations of \$1.76 in 2003 and \$2.16 in 2004, investors should expect a substantial decline in share price. This scenario is likely in lieu of catalysts highlighted above. However, if Amgen meets expectations, the Company's stock is already priced at such a premium that shares are unlikely to appreciate. So, whether or not Amgen can meet these expectations remains to be seen. Either way, investors would be prudent to sell the Company's shares.

BUY: Bristol-Meyers Squibb (NYSE: BMY: \$22.55)

Bristol-Meyers is a global healthcare company engaged in the production of pharmaceutical drugs, nutritional products, medical imaging and other OTC products. In 2002, the Company's revenue breakdown is as follows:

- **Pharmaceuticals:** \$14.7 billion or 86% of revenues
- **Nutritionals:** \$1.8 billion or 10% of revenues
- **ConvaTec:** \$744 million or 4% of revenues

In an attempt to redirect the Company's focus on pharmaceuticals, Bristol divested its Clairol and Zimmer business units in 2000. In 2001, the Company acquired the DuPont Pharmaceuticals business from E.I. du Pont de Nemours for \$7.8 billion in cash. DuPont is primarily a domestic R&D firm, which strengthens Bristol's R&D capabilities.

Bristol's stock price has declined approximately 46% over the last year due primarily to accounting irregularities to its wholesalers. In addition, concerns over patent expiries to some of Bristol's key drugs have kept considerable pressure on the Company's shares. Also, Bristol arguably made an ill-advised investment into the bio-tech firm, ImClone, which has received numerous headlines. Each of these issues is discussed below.

Accounting Issues- It was discovered that Bristol had improperly booked approximately \$2 billion in net sales from the period 1999-2001. The Company experienced a significant buildup of wholesaler inventories in 2000 and 2001, primarily Cardinal and McKesson. Sales incentives were offered to these wholesalers towards the end of the quarter to incentivize wholesalers to purchase products so that Bristol could meet sales estimates, or "channel stuffing." Bristol had booked these revenues upon delivery to the wholesalers. However, the Company determined these product revenues should have been accounted for under the consignment method whereby revenues are recognized once end user sales are transacted as opposed to when the product is shipped. Consequently, Bristol has restated its financials for 1999, 2000 and 2001.

Patent Expiries- Much concern has been raised regarding Bristol's patent exposure in 2003 and 2004. These drugs include:

- Monopril: (Expiration: 2003)
- Serzone: (Expiration: 2003)
- Glucovance: (Expiration: 2004)
- Glucophage: (Expiration: 2004)
- Cardiolite: (Expiration: 2004)
- Paraplatin: (Expiration: 2004)

ImClone- In September 2001, Bristol entered into an agreement with ImClone to co-develop and co-promote the cancer drug, Erbitux. Under the agreement, Bristol was required to pay ImClone \$1 billion upon the achievement of 3 separate milestones. In November 2001, Bristol also purchased 14.4 million shares (19.9% of outstanding shares) of ImClone at \$70 per share, for a

total of \$1 billion. Due to a series of concerns related to ImClone including the FDA's refusal of an Erbitux application and CEO criminal allegations, Bristol was forced to record a \$379 million charge to 3Q02 earnings as the price of ImClone's stock declined substantially.

These events have caused investors to significantly discount Bristol to other large cap drug companies. *It is our opinion that the recent decline in the Company's price provides an opportune time to buy Bristol-Meyers based on the following:*

- High R&D/Market Capitalization ratio
- Diverse product pipeline
- Low valuation due to near-term difficulties
- Potential acquisition target

High R&D/Market Cap Ratio

As shown in Exhibit 3, Bristol's R&D/Market Capitalization of 5.1% is significantly higher than Amgen (1.7%) and other large cap drug companies such as Pfizer (2.7%) and Merck (2.1%). From this valuation, Bristol offers substantially cheaper R&D exposure than the majority of the drug manufacturers. Additionally, its \$1.15/share of R&D is 19% higher than that of Amgen (\$0.97). Bristol's R&D expenditures are nearly double that of Amgen (\$2.2b vs. \$1.1b). So even if Bristol is half as effective in its R&D efforts as Amgen, productivity could be similar based on relative expenditures.

Product Pipeline

Bristol benefits from an extensive pipeline of existing drugs, which provides a diverse revenue base⁷. For example, Provachol and Plavix are the Company's top-selling drugs, attributing 12.5% and 10.4%, respectively to 2002 sales. Beyond these two products, no other drug accounts for more than 5% of total revenues. Additionally, sales from its Nutritional and ConvaTec units provided 14% of non-pharmaceutical sales in 2002. This is in sharp contrast to Amgen's concentrated portfolio on two drugs.

Investors have been concerned with Bristol's pipeline, which has further depressed the Company's share price. However, if one subscribes to the theory that large investments in R&D will provide substantial new product development, then Bristol has an equal chance of discovering new drugs as Merck, as R&D expenditures are similar for both companies (\$2.2b vs. \$2.4b). Therefore, near-term patent expiries should be offset by productive R&D efforts.

The Company's drugs exposed to generics as highlighted earlier could provide a loss of \$800-\$900 million in revenues by 2004. However, Bristol's new anti-psychotic drug, Abilify, is

⁷ See Exhibit 5 for Bristol's complete product portfolio

projected to be a blockbuster with sales exceeding \$1 billion. While the Company is required to share 35% of product profitability with partnering firm, Otsuka Pharmaceuticals, other pipeline drugs such as Astaznavir and Erbitux could more than offset the potential loss to generics. Particularly, if cancer drug Erbitux overcomes past difficulties, Bristol could profit quite substantially from such an approval.

The Company still maintains a healthy pipeline despite near term dilemmas. Therefore, the negative reaction to Bristol's generic exposure in coming years might well be overdone. Inherent to the industry, drug companies will always face patent and exclusivity exposure. Additionally, R&D spending has consistently grown from \$1.7 billion to \$2.2 billion, or a CAGR of 9.1% from 1999-2002. The continued focus on productive R&D should provide a steady flow of new drugs despite the ever-present generic competition.

Depressed Valuation

Due to catalysts highlighted above, Bristol trades at a significant discount to its peers. At a P/E of 13.9x vs. 2003 earnings estimates of \$1.60, the Company carries the lowest valuation of the companies in our analysis. Particularly, Bristol trades at a 58% discount to Amgen (32.9x) and a 28% discount to the peer average of 19.2x. Given the large disparity that exists between current valuations, Bristol appears relatively inexpensive at these levels. Further, the current P/E of 13.3x is well below its 10-year historical average of 22.2x. Although the decline in Bristol's share price was due to valid concerns pertaining to the Company's financial strength, these problems are reflected in the current share price and Bristol could experience a significant multiple expansion in 2003 or 2004.

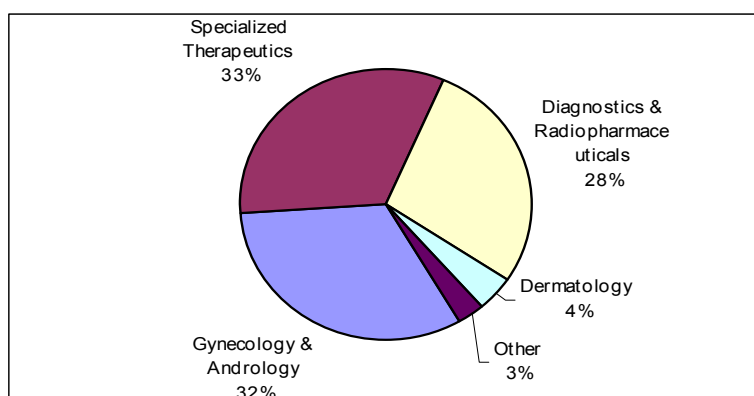
Acquisition Target

As the Company trades at depressed levels, the problems recently incurred could position Bristol as a takeover candidate. Restating the investment thesis, if Bristol does not have a productive R&D effort, then the Company would be attractive to a larger firm due to its large revenue base and discounted valuation. Revenues totaled \$18.1 billion in 2002 and Bristol still maintains several branded products. In addition, the Company derives diversified revenues from nutritional products, certain medical imaging components and several OTC products. For a large pharmaceutical firm in need of R&D expansion, Bristol seems to be the most likely acquisition candidate in the industry.

BUY: Schering AG: (NYSE: SHR \$42.85)

Schering AG, with a market capitalization of \$9 billion, is a German pharmaceutical firm that specializes in Gynecology, Specialized Therapeutics, Diagnostics and Dermatology products. In 2002, the Company's revenue breakdown is as follows:

Table 11: Schering AG Revenue Breakdown, 2002



Source: Company Information and Palladian Research, 2003

2002 was a pivotal year for the Company as it repositioned itself as a pure play pharmaceutical firm. Schering acquired marketing and production rights to Leukine from Immunex for \$448 million, which further strengthened the Company's leukemia franchise. Additionally, Schering divested its 24% stake in Aventis Crop Science to Bayer, for \$1.6 billion.

Schering AG presents a compelling investment opportunity for the following reasons:

- High R&D/Market Capitalization ratio
- Consistent growth through niche market dominance
- Diverse product line

High R&D/Market Cap Ratio

As shown in Exhibit 3, Schering has one of the highest R&D/Market cap ratios of 11.2%. This compares quite favorably to Amgen's 1.7%. Additionally, Schering has the highest R&D/share of \$4.81, which is substantially higher than that of Amgen (\$0.97), Pfizer (\$0.84) and Glaxo (\$1.19). Based on this valuation, investors would purchase substantially more R&D per share relative to other large cap manufacturers.

On a P/E basis, Schering trades at 16.5x vs. 2003 estimates of \$2.59 and 14.3x vs. 2004 estimates of \$2.99. This is a 50% discount to Amgen and 14% discount to the peer average. Also, the Company's P/E/G of 1.0x is well below the group's average of 1.7x and Amgen (1.6x). Given the Company's successful growth strategy, long term earnings growth estimates of 16% seem attainable. Schering's low valuation coupled with a high percentage of R&D per share provides investors with more value per R&D dollar than Amgen and other large cap drug manufacturers.

Consistent Growth

Despite difficulties that have plagued the broader pharmaceutical industry, Schering AG has consistently grown both revenues and earnings through this environment. Revenues have grown from \$3.5 billion to \$5.4 billion, or at a CAGR of 11.2% from 1998-2002. Similarly, earnings increased from \$1.29 to \$2.32, or at a CAGR of 21.4% during the same period.

This reliable growth is the result of the Company's strategy to become the leader in certain specialized niche markets. Unlike companies such as Pfizer or Merck, Schering is not a sizeable competitor in the highly-contested cardiovascular or anti-psychotic markets⁸. Rather, Schering has become the dominant manufacturer of gynecology and andrology products such as the Company's drug, Yasmin, an oral contraceptive. As a result, Schering has captured 25% of the world's hormonal contraceptive market⁹. This strategy offers proportionate insulation from generic competition. Generics are more likely to market higher volume drugs such as anti-psychotics. This is not to say that Schering is immune to generic competition; however, generics are less likely to target Schering's products.

Diverse Product Line

In addition to Schering's concentration on niche markets, the Company also benefits from a broad product offering¹⁰. The Company's largest drug, Betaseron/Betaferon, attributed \$729 million, or 13.6% to 2002 revenues of \$5.4 billion. In contrast to Amgen which derives over 70% of revenues from two drugs, Schering has several drugs distributed throughout its portfolio so as to protect the Company from competition on any one drug in particular. As generic market share is expected to continue its erosion of the prescription market, Schering should remain well positioned to withstand this movement.

Due to Schering's dominance in smaller markets such as Fertility Control and Specialty Therapeutics, the Company is not likely to produce multiple blockbuster drugs in future years. For example, its highest selling drug Betaseron reached sales of \$729 million in 2002, below the \$1 billion standard for "blockbusters." However, it is predicted that the oral contraceptive, Yasmin, could reach this mark by 2005. Additionally, the Company is heavily engaged in a male contraceptive product and multiple cancer drugs that could provide substantial future revenues. Schering's industry-leading R&D spending ratios should maintain the Company's healthy drug pipeline.

⁸ Schering does devote R&D to cardiovascular markets; however, the company does not focus primarily on this market.

⁹ Source: Midas, 2003

¹⁰ See exhibit 6 for Schering's complete product portfolio

Schering is markedly smaller than the likes of Pfizer and Glaxo, which have to continuously produce blockbusters year after year to maintain consistent growth. Schering can still grow revenues 10% - 15% per annum by keeping its existing niche market dominance strategy. While a blockbuster would be certainly be welcomed, it is not a necessary requirement for the Company to exhibit a higher rate of growth than its larger cap peers.

It should be noted that Schering has an exceptionally clean balance sheet. The Company had net debt of -\$174 and a debt/capitalization ratio of 14.4%. Its favorable liquidity position recently led S&P to rate the Company's debt as investment grade A and Moody's to initiate ratings at A2.

In sum, Schering should continue to grow both earnings and revenue in the expected range of 10% - 15%. While Amgen's growth estimates of 20% - 25% may provide the illusion that Amgen will achieve greater returns, Schering's discounted valuation and niche market dominance should position the Company to outperform Amgen and maintain its historically consistent growth.

An investment in Schering is not without its risks. The Company is susceptible to a weakening European economy, Germany in particular, which exposes a potentially negative currency impact. However, due to a multiple that is well below its peers, the downside to Schering is far less than that of Amgen, which is priced for mere perfection. Further, Schering is a long-term investment that should withstand temporary currency impacts.

Investment Summary

For drug firms, innovation and resultant revenue growth can only be achieved through an effective R&D capacity. R&D will become increasingly important in 2003 as generic competition and new drug discovery times increase. Therefore, investors should purchase those companies with growing R&D capabilities. However, the price at which an investor pays for R&D capacity should be of primary concern. Hence, this report performed an analysis that revealed several large-cap drug companies offered very little R&D relative to share price, or market capitalization. For example, Amgen spends 50% less than Bristol Meyers on R&D and provided 70% less revenues, yet trades at a premium of 137% to Bristol and 71% to the industry on a P/E basis. Further, the Company relies on two drugs for over 70% of total sales. Accordingly, the sale of Amgen is recommended.

Bristol Meyers has experienced a number of near-term difficulties that has led to a severely depressed share price. However, the Company yields a R&D/Market Cap ratio of 5.2% and has R&D expenditures similar to that of Merck. If one accepts the premise that robust R&D spending will result in an increase in the rate of revenue growth, then Bristol should exhibit above average sales growth. Additionally, the Company's discounted valuation should provide for share appreciation greater than its large cap peers. Similarly, Schering AG yields a R&D/Market Cap ratio of 11.4% and its R&D expenditures equal that of Amgen. However, Schering's valuation is discounted 50% to Amgen and the Company's diverse drug pipeline provides insulation from increased generic competition. Accordingly, the purchase of Bristol Meyers and Schering AG is recommended.

Companies Mentioned in This Report (Prices as of 4/14/03)

Bristol-Meyers (NYSE: BMY \$22.55)
Amgen (NYSE: AMGN \$59.08)
Schering AG (NYSE: SHR \$42.85)
Pfizer (NYSE: PFE \$32.12)
GlaxoSmithKline (NYSE: GSK \$39.10)
Merck (NYSE: MRK \$56.67)
AstraZeneca (NYSE: AZN \$35.39)
Aventis (NYSE: AVE \$46.05)
Schering Plough (NYSE: SGP \$16.82)
Sanofi-Synthelabo NYSE: SNY \$29.05)
Biogen (NYSE: BGEN \$34.71)

Exhibit 1: Recent Drug Industry Acquisitions

Year	Buyer	Target	Target Value (\$ billions)
2003	Pfizer	Pharmacia	60*
2002	Amgen	Immunex	17.6
2001	Bristol Meyers	DuPont Pharma	7.8
2000	Johnson & Johnson	Alza	10.8
2000	Shire	Biochem Pharma	4.0
2000	Abbott	Knoll (BASF Pharma)	6.9
2000	Glaxo Wellcome	SmithKline Beecham	76.0
2000	Pfizer	Warner-Lambert	89.2
1999	Pharmacia Upjohn	Monsanto	26.9
1998	Rhone Poulenc Rorer	Hoechst AG	21.2
1998	Sanofi	Synthelabo	11.1
1998	Zeneca	Astra	34.6
1997	Hoffmann La Roche	Boehringer Mannheim	11.0
1996	Sandoz	Ciba-Geigy	60.0
1995	Glaxo	Burroughs Wellcome	20.0
1995	Hoechst Roussel	Marion Merrell Dow	7.1
1995	Pharmacia	Upjohn	13.0
1995	Rhone Poulenc Rorer	Fisons	2.7
1995	American Home	American Cyanamid	9.2
1994	Hoffmann La Roche	Syntex	5.3
1994	Sanofi	Sterling	1.9
1990	Beecham	SmithKline Beckman	6.5

*pending

Source: Palladian Research, 2003

Exhibit 2: Top Selling Drugs

25 Leading Drugs by Revenues in 2002

Product	Product Category	Company	Sales (\$MM)
Lipitor	Hyperlipidemic	Pfizer	\$7,942
Zocor	Hyperlipidemic	Merck & Co	\$5,580
Losec/Prilosec	Proton pump inhibitor	AstaZeneca	\$4,623
Procrit/Eporex	Erythropoietin	Johnson & Johnson	\$4,269
Norvasc	Hypertension	Pfizer	\$3,846
Zyprexa	Atypical anti-psychotic	Eli Lilly	\$3,689
Seroxat/Paxil	Anti-depressant	GlaxoSmithKline	\$3,085
Prevacid	Proton pump inhibitor	TAP Holdings	\$3,157
Celebrex	COX-2 inhibitor	Pharmacia	\$3,050
Zoloft	Anti-depressant	Pfizer	\$2,742
Epogen/Aranesp	Erythropoietin	Amgen	\$2,676
Advair	Asthma	GlaxoSmithKline	\$2,449
VIOXX	COX-2 inhibitor	Merck & Co	\$2,530
Plavix	Clot-buster	Sanofi/Bristol Meyers	\$2,440
Neurotonin	Epilepsy/pain	Pfizer	\$2,269
Pravachol	Hyperlipidemic	Bristol Meyers Squibb	\$2,266
Fosamax	Osteoporosis	Merck & Co	\$2,250
Cozaar/Hyzaar	Hypertension	Merck & Co	\$2,190
Risperdal	Anti-psychotic	Johnson & Johnson	\$2,146
Effexor XR	Anti-depressant	Wyeth	\$2,072
Insulin	Insulin	Novo Nordisk	\$2,035
Nexium	Proton pump inhibitor	AstaZeneca	\$1,978
Claritin	Anti-histamine	Schering Plough	\$1,933
Allegra	Anti-histamine	Aventis	\$1,914
Premarin	Hormone replacement therapy	Wyeth	\$1,880

Source: Palladian Research, 2003

Exhibit 3: Drug Industry R&D/Market Capitalization Analysis

2002 (US \$ in millions)

Ticker	Company	R&D	Shares Outstanding	R&D/Share	Price (4/1/03)	Revenues	Market Capitalization	R&D/Mkt Cap
Major Drugs:								
PFE	Pfizer	\$5,176	6,126	\$0.84	\$31.51	\$32,373	\$193,040	2.68%
JNJ	J&J	\$4,146	3,054	\$1.36	\$57.38	\$36,298	\$175,244	2.37%
GSK	GlaxoSmithKline	\$4,317	3,631	\$1.19	\$38.09	\$31,963	\$138,305	3.12%
MRK	Merck	\$2,677	2,264	\$1.18	\$55.42	\$51,790	\$125,476	2.13%
NVS	Novartis	\$2,619	2,475	\$1.06	\$38.50	\$21,002	\$95,286	2.75%
LLY	Eli Lilly	\$2,149	1,085	\$1.98	\$58.36	\$11,078	\$63,326	3.39%
ABT	Abbott Lab.	\$1,562	1,573	\$0.99	\$39.12	\$17,685	\$61,547	2.84%
AZN	AstraZeneca	\$3,069	1,725	\$1.78	\$34.50	\$17,841	\$59,513	5.16%
PHA	Pharmacia	\$2,359	1,316	\$1.79	\$44.30	\$13,993	\$58,299	4.05%
WYE	Wyeth	\$1,870	1,317	\$1.42	\$34.54	\$14,129	\$45,489	4.11%
BMJ	Bristol Meyers Squibb	\$2,218	1,944	\$1.14	\$22.20	\$18,119	\$43,157	5.14%
AVE	Aventis	\$3,556	800	\$4.45	\$44.67	\$21,859	\$35,736	9.95%
SGP	Schering Plough	\$1,425	1,469	\$0.97	\$16.82	\$10,180	\$24,709	5.77%
ACL	Alcon	\$324	303	\$1.07	\$44.50	\$3,009	\$13,484	2.40%
BAY	Bayer	\$2,532	730	\$3.47	\$16.55	\$31,401	\$12,082	20.96%
SHR	Shering AG	\$947	197	\$4.81	\$42.83	\$5,023	\$8,438	11.22%
Biotechnology:								
AMGN	Amgen	\$1,117	1,154	\$0.97	\$57.88	\$5,523	\$66,765	1.67%
CAH	Cardinal Health	\$65	450	\$0.14	\$56.44	\$44,394	\$25,398	0.26%
SNY	Sanofi-Synthelabo	\$1,291	728	\$1.77	\$28.26	\$7,895	\$20,573	6.28%
DNA	Genetech, Inc	\$624	524	\$1.19	\$35.00	\$2,719	\$18,340	3.40%
TEVA	Teva	\$193	281	\$0.69	\$44.92	\$2,519	\$12,623	1.53%
AGN	Allergan, Inc	\$233	134	\$1.74	\$69.27	\$1,385	\$9,282	2.51%
FRX	Forest Labs	\$158	185	\$0.85	\$50.98	\$1,567	\$9,431	1.68%
GILD	Gilead Sciences	\$135	206	\$0.66	\$41.80	\$467	\$8,611	1.57%
MEDI	Medimmune	\$144	250	\$0.58	\$32.41	\$848	\$8,103	1.78%
CHIR	Chiron Corp	\$326	187	\$1.74	\$37.86	\$1,276	\$7,080	4.60%
BGEN	Biogen	\$368	152	\$2.42	\$34.12	\$1,148	\$5,186	7.10%
MYL	Mylan Laboratories	\$59	127	\$0.46	\$26.87	\$1,104	\$3,412	1.73%
BRL	Barr Laboratories	\$76	45	\$1.69	\$55.60	\$1,189	\$2,502	3.04%

Source: Company Information and Palladian Research, 2003

Exhibit 4: Amgen Product Portfolio

AMGEN INC.					
Drugs in Pipeline	Status	Category	Launch	Sales (\$MM)	% of Total Sales
Epogen	Current	Anemia	1989	\$2,260	45.28%
Aranesp	Current	Anemia	2001	\$416	8.34%
Neupogen	Current	Leukemia	1991	\$1,379	27.63%
Neulasta	Current	Cancer	April 2002 (US), 2003 (Europe)	\$464	9.30%
Enbrel	Current	Inflammatory	1998	\$362	7.25%
Kineret	Current	Arthritis	2001	\$70	1.40%
Other	Current		-	\$6	0.12%
Cinacalcet	Phase III	Hyper-parathyroidism			
AMG-412	Phase III	Lymphoma			
Keratinocyte growth factor (KGF recombinant)	Phase III	Cancer			
ABX-EGF	Phase II	Cancer			
Averend	Phase II	Cancer			
GDNF (Glial derived growth factor)	Phase II	Parkinson's			
Leptin, first-generation	Phase II	Lipodystrophy			
Leptin, second-generation	Phase II	Obesity			
NIL-A (neuroimmunophilin ligands)	Phase II	Parkinson's			
Osteoprotegerin	Phase I/II	Cancer			
Soluble tumor necrosis factor alpha receptor type 1	Phase II	Arthritis			
TRAIL/APO2L	Phase I	Cancer			
4-1BB agonist	Early preclinical	Anti-cancer			
B219 leptin receptor based therapeutics	Preclinical	Obesity			
Betasecretase (BACE)	Research	Alzheimer's			
Combinatorial chemistry	Research	Neurology			
Cytokine mimetic (Oral Epogen)	Research	Anemia			
H6375 gene	Research	Obesity			
IL-15	Preclinical	Cancer			
IL-IR type II	Early preclinical	Myeloma			
Leptin, third generation	Preclinical	Obesity			
Monoclonal antibody targets	-				
Mega-mouse gene	Program suspended	Cachexia			
Monoclonal antibodies	Early preclinical	Cancer			
ORK/Tek	Late preclinical	Anti-angiogenesis			
Secretory leukocyte protease inhibitor	Research	Inflammation			
TP-1 protein inhibitors	Research	Cancer			

Source: Company Information and Palladian Research, 2003

Exhibit 5: Bristol Meyers Product Portfolio

Prescription Drugs	Status	Sales (\$MM)	% of Total Sales
<u>Cardiovascular Diseases:</u>			
Pravachol	Current	\$2,266	12.5%
Capoten/Captopril	Current	\$209	1.2%
Monopril	Current	\$426	2.4%
Plavix	Current	\$1,890	10.4%
Avapro	Current	\$586	3.2%
Coumadin	Current	\$300	1.7%
Other	Current	\$154	0.8%
<u>Anti-cancer:</u>			
Taxol/analogs	Current	\$857	4.7%
Paraplatin	Current	\$727	4.0%
Oncology Therapeutics Network	Current	\$1,900	10.5%
Other	Current	\$279	1.5%
<u>Anti-infectives:</u>			
Sustiva	Current	\$455	2.5%
Zerit	Current	\$443	2.4%
Cefzil	Current	\$287	1.6%
Tequin	Current	\$184	1.0%
VIDEX	Current	\$262	1.4%
Maxipime	Current	\$163	0.9%
Other	Current	\$602	3.3%
<u>CNS:</u>			
BuSpar	Current	\$53	0.3%
Serzone	Current	\$221	1.2%
Other	Current	\$156	0.9%
<u>Other Pharmaceuticals:</u>			
Abilify	Current	\$26 (e)	
Glucophage	Current	\$220	1.2%
Glucophage XR	Current	\$297	1.6%
Glucovance	Current	\$246	1.4%
Glucophage Family	Current	\$763	4.2%
Other	Current	\$686	3.8%
<u>Analgesics:</u>	Current	\$377	2.1%
<u>Total Pharmaceuticals Sales</u>			<u>82.8%</u>
<u>Pipeline</u>			
Vanlev	-		
Factor Xa	-		
Erbitux	-		
Epothilone	-		
FTI	-		
Atazanavir/BMS-23632	-		
Desquinolone	-		
Entecavir	-		
NNRTI programs	-		
LEA29y	-		
Alliance Revenue on Abilify	-		
CTL4-A	-		

Source: Company Information and Palladian Research, 2003

Exhibit 6: Schering AG Product Portfolio

(US\$ in millions) Drugs	Status	Launch	Sales	% of Total Sales
Mirena	Current	1990	107	2.0%
Diane-35	Current	1980	229	4.3%
Microgynon/Levlen	Current	1973	149	2.8%
Mediane	Current	1995	132	2.4%
Femovan	Current	1987	113	2.1%
Triquilar	Current	1979	98	1.8%
Miranova/Levlite	Current	1973	52	1.0%
Yasmin 30mg	Current	2000	48	0.9%
Valette	Current	1996	35	0.7%
Climara	Current	1995	117	2.2%
Climen	Current	1991	70	1.3%
Nuvelle	Current	1992	27	0.5%
Climodien	Current	2001	7	0.1%
Avaden	Current	2001	3	0.1%
Other	-	-	428	8.0%
Fertility Control & Hormone Therapy:				
Betaseron/Betaferon	Current	1993	729	13.6%
Fludara (intravenous)	Current	1991	140	2.6%
Androcur/patent expiry	Current	1970	108	2.0%
Leukine	Current	1991	-	-
Betapace/patent expiry	Current	1991	102	1.9%
Noctamid	Current	-	48	0.9%
Ventavis/Iloprost	Current	1992	44	0.8%
Campath	Current	2001	32	0.6%
Bonefos	Current	1990	42	0.8%
Quadramet	Current	1998	14	0.3%
Refludan	Current	1997	3	0.1%
Other	-	-	351	6.5%
Specialty Therapeutics:				
Iopamiron	Current	1984	381	6.7%
Magnevist	Current	1988	342	6.0%
Ultravist	Current	1988	256	4.5%
Levovist	Current	1999	11	0.2%
Imavist	Current	2001	5	0.1%
Gadovist	Current	1999	13	0.2%
Resovist	Current	2001	-	-
Eovist	Current	2003	-	-
MS 325/EPIX	Current	2003	-	-
Supravist/SHU555c	Current	2004	-	-
AcuTest	Current	1998	16	0.3%
NeoTect	Current	1999	27	0.5%
CISNOET	Current	2002	-	-
Leucotect	Current	2004	-	-
Other	-	-	489	8.6%

Source: Company Information and Palladian Research, 2003

Exhibit 6 Cont.

Pipeline	Status	Launch (e)
Fertility Control & Hormone Therapy:		
FC Patch	Phase III	2004
Yasmin 20	Phase III, submitted 03	2004
Climodien lower dose	Phase III	-
Climarelle	Phase III	2004
Estradiol Sulamat	n.a.	2006
Endometrion	Phase III	-
Endometrion	Submitted for approval	-
HPV vaccine	Phase II	2005
Mesoprogesterin	Phase II	-
Vaginal ring with Oxybutynin	Phase II	2004
Testosterone Undecanoat (TU)	Phase III	-
MENT	Phase I	-
Contraceptives for men	Phase II	-
E2	Phase III	2005
Climara Pro	Submitted for approval	2003
Angeliq	Submitted for approval	2002
Therapeutics:		
Fludara i.v.	Submitted for approval	-
Zevalin	Submitted for EU approval, approved in US	2002
Ventavis	Phase III	2003
MS 209	Phase III (Japan), Phase II	2004
Generx (Ad5FGF-4)	Phase III	2005
Factor Xa inhibitor	Phase I	2005
Mesopram PDE IV inhibitor	Phase II	>2005
VEGR-TK1	Phase I/II	2005/6
VEGR-TK inhibitor	Phase II	-
ADI-PEG	Phase I	2006
CCR 1 antagonist	Phase I	-
Pirfenidone	Phase II	-
NS-7	Phase II	-
MS-275	Phase II	2006
Fasudil	Phase II	2004
Ventavis (Ilomedin)	Submitted for approval	2003
Genervx (AGT)	Phase I/II	-
Genvascor (AGT)	Pre-clinical	-
Antiestrogen	Phase I/II	2006
Antiprogesterin	Phase I	-
Diagnostics & Radiopharmaceuticals:		
Eovist	Submitted for approval	2003
CISNOET	Phase III	2003
MS 325/EPIX	Phase III	2004
Supravist (SHU 555 C)	Phase II	2004
NeoTide	Phase I	-
Leucotect	Phase II	2004
Dermatology:		
ABT-218	Pre-clinical	-
Calcitriol-Analgon	Pre-clinical	-

Source: Company Information and Palladian Research, 2003

Exhibit 7: Bristol Meyers Financials

Bristol-Meyers Squibb

Annual Income Statement/Balance Sheet, 1999-2003E

(\$ in millions)

	2000	2001	2002	2003E
Total Sales	17,538	17,987	18,119	19,569
COGS	4,730	5,453	6,388	6,899
Gross Profit	12,808	12,534	11,731	12,669
SG&A	5,378	5,193	5,218	5,635
Research & Development	1,878	2,183	2,218	2,253
Operating Income	5,247	2,218	2,647	4,295
Provision for income taxes	1,260	(35)	607	1,288
Minority Interest net of taxes	97	102	178	187
Earnings from continuing operations	3,890	2,151	1,862	3,076
Net Income	4,531	4,942	1,895	3,076
Basic EPS	\$2.31	\$2.55	\$1.25	\$1.60
Diluted EPS	\$2.27	\$2.51	\$1.25	\$1.60

Margin Analysis

Gross Margin	73.0%	69.7%	64.7%	64.7%
R&D % of Sales	10.7%	12.1%	12.2%	11.5%
Operating Margin	29.9%	12.3%	14.6%	21.9%
Net Margin	25.8%	27.5%	10.5%	15.7%

Balance Sheet Items

Cash and Cash Equivalents	3,182	5,500	3,277	3,277
Property and Equipment, net	4,509	4,887	5,412	5,953
Total assets	17,756	27,812	24,749	25,244
Current liabilities	7,102	11,109	8,120	7,789
Long term debt	1,336	6,237	6,204	6,204
Total liabilities	9,868	18,737	15,755	16,070
Shareholders' Equity	7,888	9,075	8,994	9,174
Total liabilities and Shareholders' Equity	17,756	27,812	24,749	25,244

Source: Company Information and Palladian Research, 2003

Exhibit 8: Schering AG Financials¹¹

Schering AG

Annual Income Statement/Balance Sheet, 1999-2003E

(\$US in millions)

	2000	2001	2002	2003E
Net Sales	4,808	5,181	5,375	6,047
Cost of Sales	1,165	1,300	1,297	1,459
Gross Profit	3,643	3,881	4,078	4,588
Research and Development	868	924	1,013	1,114
Operating Profit	685	715	793	892
Profit from ordinary activities	679	747	1,225	1,378
Depreciation and amortization	322	306	182	182
EBITDA	1,001	1,053	1,407	1,560
Net Income	360	447	928	585
EPS	\$1.82	\$2.26	\$2.32	2.59
% Growth		24.2%	2.7%	11.6%
Margin Analysis				
Gross Margin	75.8%	74.9%	75.9%	75.9%
R&D % of Sales	18.1%	17.8%	18.8%	18.4%
Operating Margin	14.2%	13.8%	14.8%	14.8%
Net Margin	7.5%	8.6%	17.3%	9.7%
Balance Sheet Items				
Assets:				
Fixed assets	2,402	2,761	2,350	2,562
Intangible assets	536	700	905	986
Property, plant and equipment	1,285	1,348	1,316	1,434
Receivables and other assets	1,637	1,612	1,678	1,829
Marketable securities, cash and cash equivalents	698	316	703	766
Total assets	5,571	5,631	5,769	6,288
Liabilities:				
Interest bearing liabilities	250	249	214	233
Total Liabilities	3,113	2,896	2,630	2,867
Shareholders' Equity	2,458	2,735	3,139	3,422
Total Shareholders' Equity and liabilities	5,571	5,631	5,769	6,288

Source: Company Information and Palladian Research, 2003

¹¹ Based on exchange rate of: 1 euro = \$US 1.07