US Equity Strategy Focus Point

Equity Strategy

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Is American innovation dead?

Bank of America Merrill Lynch

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Innovation cycle alive and well in the US

Over the last several decades, prognosticators have argued that the US innovation cycle is dead. Whether it was the threat of Japan in the 1980s or China in the 2000s, we have perceived an ongoing fear that the US is losing its edge as the world's innovator. Falling innovative capability scores, complacency, a weakening talent pool, and signs of dwindling funding for research and development (R&D) are cited as concerns. While some fears are warranted, a compelling amount of evidence suggests the contrary – that the innovation cycle in the US is alive and well, and could continue to serve as an engine for future US growth.

Deconstructing the data: patents, ranks, funding trends

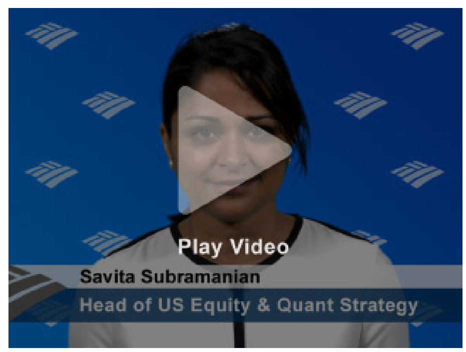
Skeptics use various statistics, including patent data, global ranking schema and R&D funding trends, to paint a dire picture for the US. But the details matter. For example, granted patents may be more relevant than applications. And on global ranks, the leadership roster changes dramatically if the economic impact of regions is controlled for. For most measures, the US comes out on top. The lion's share of venture capital resides in the US, suggesting a strong culture of innovation. And contrary to popular belief, funding for R&D within the US has grown – not declined – since the 1950s. In fact, corporate America appears to prioritize R&D funding above other uses of cash; for example, R&D expense is half as volatile, and three times more likely to be maintained as capital expenditure.

Empirical evidence that innovation yields alpha

Examples of US innovation can be found in nearly every facet of our lives. From social media to robotic surgeries, innovation is driving increased efficiency and changing the way that we interact with each other and with technology. We have collaborated with our BofA Merrill Lynch fundamental equity analysts to highlight the companies that are leading innovation in their respective industries. Importantly for investors, our analysis suggests that innovation (proxied by R&D) generates shareholder value. Companies that maintain non-zero R&D budgets have historically outperformed by 2-3ppt per year on average. And within Tech, the poster child for innovation, excess returns approached 10ppt per year. The amount spent on R&D matters, as companies that spent between zero and 30% of sales on R&D were rewarded most consistently, whereas companies that spent more than 60% of sales were generally penalized. Also, R&D spenders outperform in the long term, but also generally generated excess returns in the short-term, possibly a signaling aspect.

Risks to continued dominance

Ailing education and slowing immigration trends are widely cited as risks to continued US dominance. Other risks include fiscal austerity, a limit on public funding for organizations associated with innovation, which could make the corporate sector an even more important source of funds. But maybe the most insidious risk to innovation is the short-term focus of company management. In a CFO survey in the mid 2000s, 80% polled indicated that they would decrease spending on discretionary items, including R&D, in order to avoid missing short-term earnings targets.



Click the image above to watch the video.

Refer to important disclosures on page 28 to 31. Link to Definitions on page 27.

US innovation – alive and well

Over the last several decades, prognosticators have argued that the US innovation cycle is dead, and that the US could cede its position as global leader to other more innovative nations. Whether it was the threat of Japan in the 1980s or China in the 2000s, we have perceived an ongoing fear that the US is losing ground due to a lack of investment in education, research & development (R&D), and talent attraction and retention. Some of these fears may be warranted, and there are risks to the US' continued efforts to innovate. However, we have found a compelling amount of evidence to suggest the contrary – that the innovation cycle in the US is alive and well, and could continue to serve as an engine for future growth.

For the equity investor, this could play a role in long-term alpha generation. Innovation appears to create alpha, suggesting the equity market could benefit from US corporations' continued focus. We present empirical evidence that companies that spend on R&D, a proxy for pipeline or innovation, have generally created both short-term and long-term shareholder value. We also team with our BofA Merrill Lynch US fundamental equity research analysts to identify the next wave of likely innovators via themes and stocks within specific sectors.

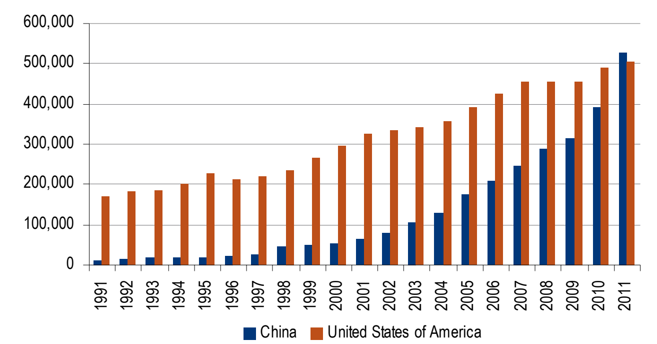
Deconstructing the data

Patent trends – what really matters

One measure of innovation is patent trends. In 2010, China surpassed the US in the number of patent applications filed, and as of 2011 had that number by double over five years and by six times over 10 years (Chart 1). But despite this rapid growth, the US has maintained its lead in the number of actual patents granted, suggesting that the quality of the Chinese patent applications may not be as high. This may be a result of tax and other policy measures aimed at incentivizing patent generation (Chart 2).

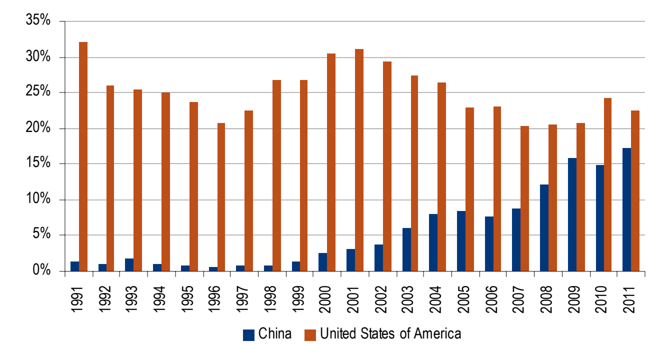
Further, there is some controversy as to whether patent applications are a positive or negative indicator of innovation. A recent study from the St Louis Federal Reserve argues that a higher number of patents or stronger patent laws could actually hinder innovation, as they present barriers to innovate from a legal perspective[1].

Chart 1: Patent applications for China have recently eclipsed US patents



Source:WIPO statistics database. Last updated: November 2012

Chart 2: But the US retains the lead in patents actually granted
Percentage of world patents granted, 1991-2011



Source:WIPO statistics database. Last updated: November 2012

1 http://research.stlouisfed.org/wp/2012/2012-035.pdf

Global ranks don't tell the whole story

The Global Innovation Index from INSEAD and the World Intellectual Property Organization (WIPO) suggests that the US has been dropping in the ranks. According to their methodology, the US ranked 10th in the world in 2012, down from seventh in 2011 and first in 2009.

The drop in the US' ranking illustrates that there is potential for the US to improve on its innovative capabilities. But if we apply a simple size adjustment to the ranks using a GDP weighting schema, the US remains the global powerhouse (Table 1). The US economy is more than three times bigger than the combined economies of all nine higher-ranked countries in the current line-up. And China, the biggest perceived threat to the US, ranked 34th, down from 29th in 2011, with an economy still less than half the size of that of the US.

Some argue that size-adjusting the ranks ignores that if, for example, five smaller nations gain dominance in five different arenas, this critical mass could rival larger regions with a lesser presence in each of those five arenas. While this may be valid, we believe the truth lies somewhere in the middle, and that the global scores should acknowledge the size of the underlying economies to assess the true competitive landscape.

Table 1: GDP-adjusted innovation scores

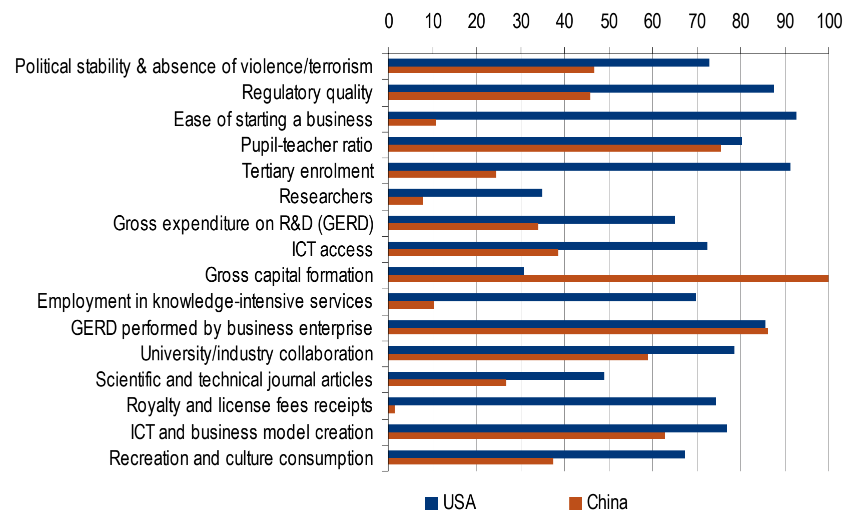
Country	2012 Global Innovation Score	2012 GDP (bn PPP)	GDP Adjusted Score
USA	57.69	15,653	1,109
China	45.41	12,383	691
Japan	51.67	4,617	293
Germany	56.25	3,194	221
India	35.68	4,711	206
UK	61.25	2,316	174
France	51.75	2,253	143
Russia	37.88	2,512	117
Korea	53.86	1,622	107
Brazil	36.58	2,366	106
Canada	56.94	1,446	101
Italy	44.48	1,834	100
Spain	47.25	1,407	82
Mexico	32.86	1,758	71
Australia	51.91	961	61
Netherlands	60.55	710	53
Turkey	34.14	1,125	47
Indonesia	28.07	1,212	42
Poland	40.36	802	40
Saudi Arabia	39.3	741	36
Iran	27.35	997	34
Argentina	34.43	747	32
Sweden	64.77	396	31
Switzerland	68.24	362	30
Thailand	36.94	646	29

Source:BofAML US Equity & Quant Strategy, INSEAD/WIPO, IMF

US still outranks China in most innovation categories

We focus on China as one of the most widely cited threats to the US' global position. Not only does the US rank significantly higher than China in the Global Innovation Index rankings, but it ranks higher in 62 of the 84 sub-components of the index, ranging from political stability to royalty and license fee receipts (Chart 3). The categories in which the US lags significantly behind China include gross capital formation, quality management certifications and creative goods exports. But in other key categories, such as the ease of starting a business or royalty and license receipts, the US lead is very significant.

Chart 3: US vs China on select Global Innovation Index sub-components

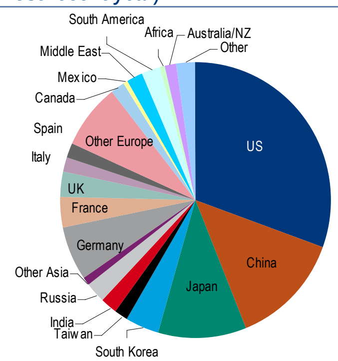


Source:INSEAD, WIPO

US R&D greater than China, Japan & Europe

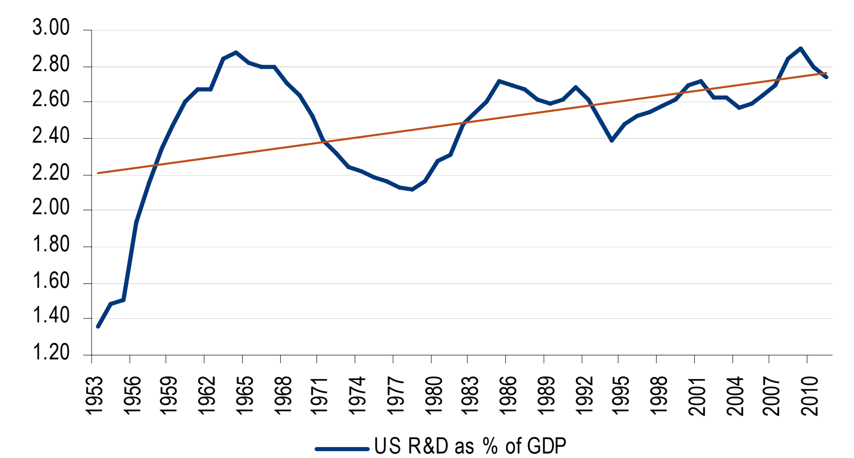
The US spends more on R&D than China, Japan, South Korea and Taiwan combined; and more than the entire European continent (Chart 4). Also, R&D as a percentage of GDP has generally been on the rise for the last 50 years within the US (Chart 5), where some argue R&D budgeting has shown signs of complacency.

Chart 4: Share of global R&D expenditures (2010 or most recent year)



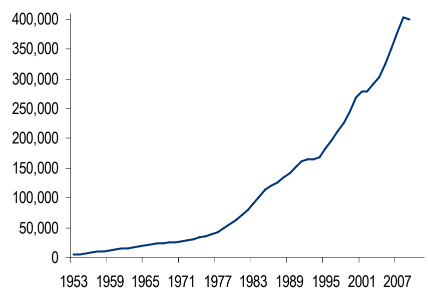
Source:US National Science Foundation

Chart 5: Ratio of U.S. R&D to gross domestic product, 1953–2011



Source:US National Science Foundation

Chart 6: US research & development ($mn)



Source:National Science Foundation

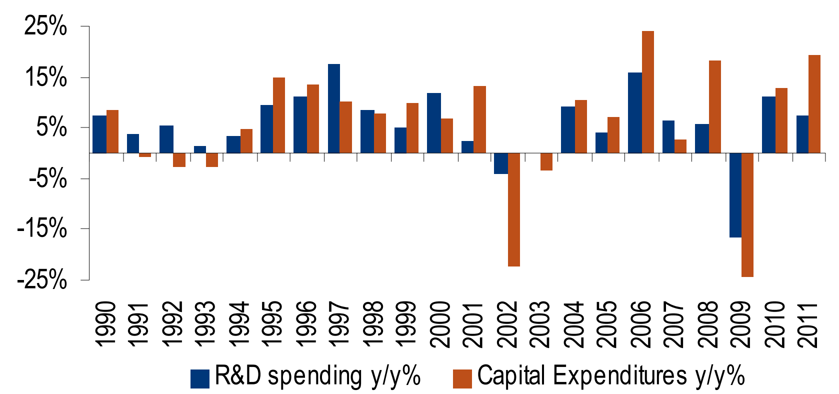
US R&D spend is stable and growing

The US corporate sector clearly recognizes the importance of innovation, which is evident when examining the disclosures of S&P 500 companies. Since 1989, R&D spending has more than tripled, and has grown nearly 30ppt faster than capex over the same period (roughly 40bp/year).

And R&D spending growth has been incredibly consistent over time. The average US corporation has been less likely to sacrifice the R&D budget versus many other expenditures. For example, in the most recent two decades, annual S&P 500 capital expenditure has declined six times, but R&D expenditure has only declined twice. And the volatility of R&D expenses over this period (σ = 0.07) is almost half of that of capex volatility (σ = 0.12).

Note: Research & development spending is not disclosed by all companies. For this analysis, we analyzed the aggregate R&D spending of companies for only those companies that disclose it.

Chart 7: Annual growth in research & development vs. capital expenditures

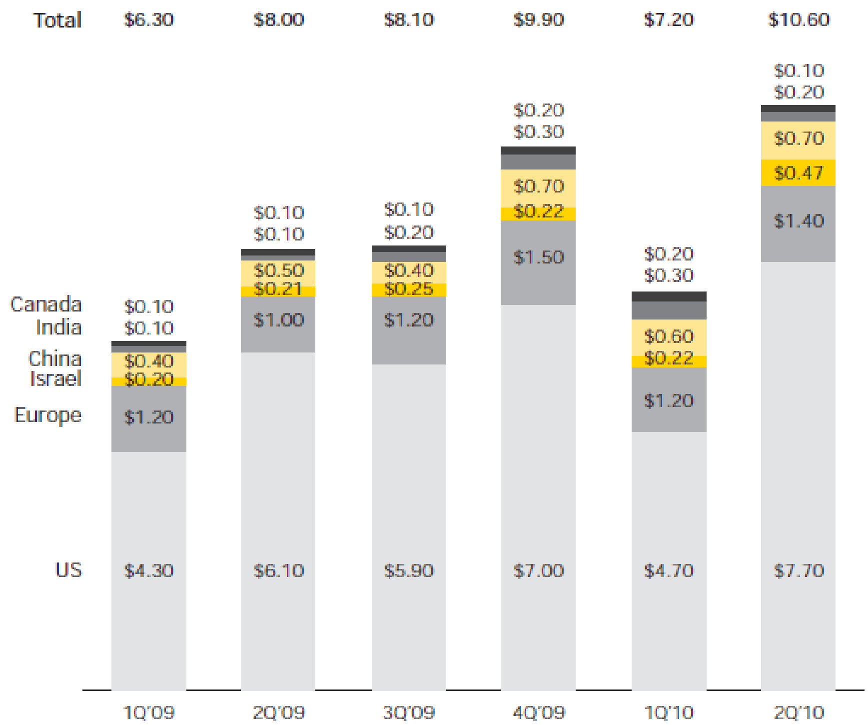


Source:BofAML US Equity & Quant Strategy, S&P, Compustat,

US represents 75% of global venture capital

As another example of the US' continued prioritization of innovation, Chart 8 illustrates that the US venture capital industry, an industry associated with investing in entrepreneurial and innovative endeavors, makes up nearly three-quarters of the entire global market. Admittedly, the investments may take place both domestically and abroad, but we believe the physical location of the bulk of venture capital indicates the culture of the US remains sharply focused on innovation.

Chart 8: Global quarterly venture capital total investment by geography (US$bn)



Source:Ernst & Young, Dow Jones VentureSource

Risks to US innovation

The decline in the US Global Innovation Index ranking from first to tenth over the last three years highlights certain risks to the sustainability of the US' competitive position over time. Education and immigration trends are widely cited as risks to continued dominance, but there are other risks that may be less documented.

Education

The US is ranked 74th in graduates in science and engineering, 42nd in tertiary inbound mobility and 119th in gross tertiary outbound enrollment, which is a weakness revealed only this year. The slippage in ranks indicates the US has lost ground in at-home talent, and may need to focus on this weakness.

Immigration

The US still dominates global university rankings, representing half of the top 10 schools in the QS World University Rankings, and seven of the top 10 in the Times Higher Education World Reputation Rankings (Table 2). The US higher education system is arguably second to none, and continues to attract some of the brightest minds from all over the world, but some question the country's ability to retain this talent. With some signs of slowing trends in H1-B visa applications, the quality of the US talent pool may be at risk.

Table 2: Top global university rankings

Institution	Country	Times Rank	QS Rank
Harvard University	USA	1	3
Massachusetts Institute of Technology	USA	2	1
University of Cambridge	UK	3	2
University of Oxford	UK	4	5
University of California, Berkeley	USA	5	22
Stanford University	USA	6	15
Princeton University	USA	7	9
University of California, Los Angeles	USA	8	31
University of Tokyo	Japan	9	30
Yale University	USA	10	7
California Institute of Technology	USA	11	10
University of Michigan	USA	12	17
Columbia University	USA	13	11
University of Chicago	USA	14	8
Imperial College London	UK	14	6
University of Toronto	Canada	16	19
Cornell University	USA	17	14
University of Pennsylvania	USA	18	12
Johns Hopkins University	USA	19	16
University College London	UK	20	4

Source:Quacquarelli Symonds, Times Higher Education

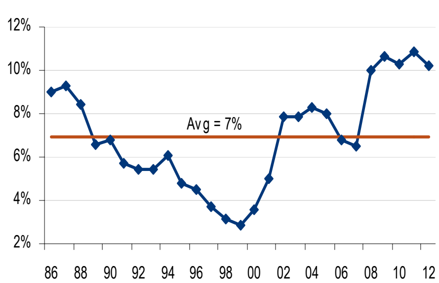
Fiscal austerity

Automatic spending cuts resulting from sequestration will impact funding for organizations such as the National Institutes of Health, National Science Foundation, Food and Drug Administration and Centers for Disease Control and Prevention. Many Health Care companies in the S&P 500, such as medical device companies, receive a significant proportion of revenue from these organizations and other government sources. So, innovation could be hampered by the US embarking on a path of fiscal austerity.

Corporate conservatism in a slow GDP growth environment

Public funding cuts could make the private sector even more important. But corporations have been reluctant to spend – cash to market cap is at the highest levels in at least the last 25 years (Chart 9). The anemic US economy forecast by BofAML economists could keep corporations conservative. Although it has remained more stable than other uses of cash, R&D spending could suffer if corporations remain in the "bunkers". This risk could turn into a reward, as cash levels suggest there is much "dry powder", such that when confidence is restored, potential to ramp up R&D spend is significant. Some other indicators we follow show green shoots in the corporate spending cycle.

Chart 9: S&P 500 Non-Financials Cash/Market Cap, 1986-2012



Note: excludes Financials and Managed Health Care.
Source:Compustat, BofA Merrill Lynch US Equity & US Quant Strategy

Short-term focus of Corporate America

Possibly the most insidious risk to the US as a leader in innovation is what we view as the investment community's obsession with shorter and shorter-term goals. We have highlighted the inefficiencies created by shrinking time horizons for the average investors. The corporate sector is equally susceptible to this "short-termism", possibly in response to increasingly impatient shareholders. In a 2004 survey of more than 400 CFOs at US corporations[2], 80% indicated they would decrease spending on "discretionary" items, including R&D, in order to avoid missing short-term earnings targets. Fifty percent of survey respondents said they would delay new projects even if it meant sacrificing value creation. With this focus on the short-term, the danger of neglecting the longer-term pipeline is evident.

[2] https://faculty.fuqua.duke.edu/~charvey/Teaching/BA456_2006/The_economic_implications.pdf

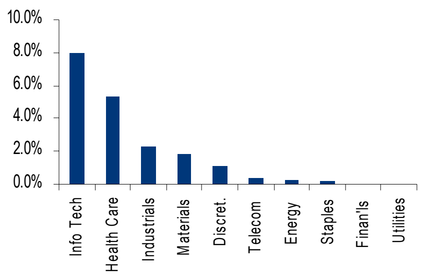
Innovation and stocks

US corporations have continued to export US-generated innovations overseas, and have replicated these business models in other regions. Furthermore, they have flexed their size and capital structure to acquire innovators overseas. As a result, benefits of the US innovation cycle extend beyond US borders. This theme bolsters our optimistic outlook on US equities, especially those with global exposure. From a more micro perspective, we analyzed the relative performance of US corporations that indicate an innovative bent, and found evidence that they generally outperform the market.

Does innovation = alpha?

The qualitative signs of innovation are manifold and include corporate culture, recruiting practices, management track record and a host of other subjective characteristics. But in order to quantify innovation, we elected to examine companies that disclosed a non-zero R&D expense. As noted, R&D expense is not disclosed by all companies, so our analysis may understate or ignore companies with innovative characteristics that our data do not pick up.

Chart 10: R&D as % of sales be sector for S&P 500 stocks



As of March 8, 2013
Source:Compustat, BofA Merrill Lynch US Equity & US Quant Strategy

Innovation drives shareholder return

Our analysis of stock price reactions by segmenting companies with reported R&D expense suggests that investing in the pipeline generally enhances shareholder value. We examined the relative returns of companies with an R&D expense line item versus companies without it, and found some interesting results. In general, our analysis showed that companies that spend on R&D have stronger relative returns than their less pipeline oriented counterparts. The average excess return is about 1-4ppt of annualized excess return versus the market depending on the time period, and as much as 10ppt of excess return for more R&D focused sectors. The sectors of the US that focus most on R&D are Technology and Health Care (Chart 10). And within these sectors, there is evidence of reasonably persistent excess returns from companies with R&D expense versus those without it (Table 3).

Table 3: Annualized excess return of S&P 500 co's with reported R&D expense vs. those with no reported R&D expense (1990-2012, ppt)

	3 mth	12 mth	36 mth
S&P 500	3.7	1.8	1.0
Discretionary	1.6	-4.3	-3.6
Staples	4.8	3.6	1.9
Energy	-2.2	1.9	1.7
Health Care	2.6	3.7	3.4
Industrials	3.6	2.9	2.0
Technology	7.9	9.6	4.9
Materials	1.0	1.9	0.9

Source:Compustat, BofA Merrill Lynch US Equity & US Quant Strategy

Short-term signaling boost, but alpha persists

Before conducting the analysis we assumed companies with greater R&D budget would require patience from average investors to outperform. But the disclosure may work equally well as a signaling mechanism that the company is concerned with its pipeline, as we saw evidence of a greater annualized boost to returns in next three months for most sectors, and for the market overall (Table 4).

Positive excess returns did persist over as long as a three year forward window following the expense disclosure, suggesting the reaction is not just a short-term "pop", but quite likely a sustained reward to companies that are growing their pipeline. The general trend of diminished results over a longer time period may be because some projects are positive net present value, and others are not. However, time is required to differentiate between success and failure.

Table 4: Avg. excess returns of S&P 500 stocks by % R&D to sales (1990-2012, ppt, annualized)

R&D level	3m	12m	36m
No R&D	-1.0	-0.6	-0.4
0% - 30%	2.7	0.8	0.8
30% - 60%	3.4	2.3	-7.7
> 60%	-3.2	-1.4	-8.8

Source:Compustat, BofA Merrill Lynch US Equity & US Quant Strategy

But don't spend too much on R&D

Unlike other fundamental signals that seem to generate more alpha the higher the value, we found evidence that companies can spend too much on R&D. At some level, the more a company spends, the less the company appears to be rewarded. For the overall S&P 500, companies that historically spent more than zero but less than 30% of sales each quarter on R&D appeared to be rewarded most consistently. (Within the 0-30% range, there was no apparent information content to be derived from analyzing smaller cuts within that range.) From 30% to

60%, the results were somewhat mixed and varied greatly by sector, but we found that spending more than 60% of sales in R&D generally destroyed shareholder value. For more details on our analysis, please see the Methodology section on page 26.

The fundamental guide to innovation

Our US fundamental equity research team helped identify the next wave of likely innovators with themes and specific stocks within their sectors. While this list is far from comprehensive, we believe these ideas represent a broad cross section of sectors and themes for investors looking for ways to invest in the US innovation theme. We encourage investors to read the most recent research report on the individual stocks discussed herein before making investment decisions.

Consumer

Apparel & Footwear

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Nike remains the global innovation leader in the athletic space after driving industry growth over the last few years through impressive new technologies, including the Lunar and Free running platforms.

In 2013, we expect Nike to expand production of its new Fly-knit technology (initial launch July 2012), made from a proprietary knitting process that uses yarns and fabric variations that are engineered to be a form-fitting and virtually seamless upper. Fly-knit creates an extremely lightweight upper and can eventually be used on a range of Nike's existing footwear platforms. Longer-term, we believe Nike will also benefit from the more efficient automated sourcing of Fly-Knit that is less labor intensive with reduced waste from traditional cut and sew sourcing and could potentially transfer production away from Asia to the US.

In addition, Nike+ technology, which is digitally enabled footwear that connects with mobile applications to measure data (eg, jump height, speed), continues to evolve. Nike first unveiled the technology for running products in 2006, and the NIKE+ community has grown to 10 million digitally connected athletes. The new Nike+ technology utilizes a new Nike+ Pressure Sensor built into each shoe that collects information about the user's movement and then wirelessly transmits data to their phone.

Cable & Satellite/Entertainment

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American innovation is alive and well across the major Media and Entertainment companies, in our view. The Hollywood content machine remains a critical supplier of the global television marketplace, which is projected to grow at a 6-7% CAGR between now and 2015E. With leading domestic penetration rates supporting a scaled industry that can profitably make large and differentiated programming investments for playout around the world, we view major studio owners / global network programmers as well positioned to deliver, and monetize, innovative products worldwide.

In our view, companies such as NWS and CBS offer the best exposure to such trends, providing investors with access to leading television production studios (9% and 23% of EBITDA, respectively) and strong cable networks (NWS' global cable networks supply more than 60% of EBITDA). We also view DIS as well positioned to offer innovative products, aided by the company's unique portfolio of intellectual property (eg, Disney, Pixar, Marvel and Lucasfilm) and worldwide monetization platforms (Cable Networks are 57% of EBITDA, Theme Parks are 20% and Consumer Products are 9%).

Technology

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The US is at the forefront of the innovation engine centered on mobility, which is a driving force behind big changes under way, not only in technology, but also in the way people around the globe consume and pay for products and services. It is also changing the way corporations are thinking about their products and the way they interact with their customers.

The rapid adoption of smartphones and tablets globally, 90% of which operate on software created by US companies, has changed the landscape of the $220bn+ PC industry and $280bn+ handset market, including the $300bn+ semiconductor market. In just three short years since the introduction of the first iPad in July 2010, tablets have become a $50bn market with a forecast growth rate of 35% from 2011-2014.

And it is not stopping there. The apps economy, with Apple and Google's app stores being the most dominant, was a $10bn market as of 2011, and app revenues are projected to grow to $46bn by 2016. The rise of the app store has led to the creation of a new global business model that targets consumers directly on their portable devices. As a result, cloud-based services and software housed on the Internet are rapidly disrupting the multi-billion dollar brick and mortar global software and services industry, and driving new sets of services and industries around mobile advertising, mobile payments and others.

Further, the consumption of content is quickly shifting from TV and desktops to mobile devices, a trend that is likely to have major long-term implications on advertising dollars, movie and TV content. The rapid rise of YouTube and the subsequent shift in content and advertising dollars is a great example of the type of disruptive innovation being generated in the US. In our view, these innovations represent only the tip of the iceberg of what will come out of the pipeline from a robust technological innovation engine in the US.

Enterprise Software

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Cloud computing

Cloud computing, the use of hardware and software delivered as a service over a network, is one of the most significant trends impacting the technology industry over the last 10 years, and it will continue to drive the sector over the next decade or two. Today, cloud computing is a small 4-5% sliver of the IT industry, but could end up being a much bigger addressable market.

US software companies, such as Salesforce.com, Workday, Oracle, Microsoft, Raxspace, Amazon Web Services, RedHat, NetSuite, ServiceNow, Concur and Intuit, have all been the key drivers and forces behind innovation in this all too important realm. Moreover, cloud computing companies have been a disproportionately larger contributor to employment growth in the US, albeit from a small base. Cloud computing vastly changes the economics, scale and delivery of innovative and productivity-enhancing services to the worldwide professional workforce. Its impact on productivity growth has been significant and will remain significant, in our view.

Cloud computing in the technology industry is akin to the significant shift that was brought forth in the making and delivery of power in the utilities industry. American companies went from making their own power to plugging into a utility grid, which was operated by a service provider that had scale and innovation. Similarly, cloud computing is poised to dictate the economics and consumption of computing services.

It is more than fair to say that American companies have been the stewards and the driving force of cloud computing that has captured the fascination and attention of the technology world. See Cloud Wars Part IV: on Cloud Nine for more on this theme.

Big Data

Big Data, an endeavor spawned by the surge in data sets larger than scope of typical software tools' capture and analysis capabilities, is another significant technology trend that will continue to profoundly impact the technology landscape in the next decade or two. Just as the advent of relational databases in the 1970s in the US catalyzed the transformation and creation of a $20bn+ data management industry, Big Data technology is shaping up to create unprecedented growth opportunities.

And just as Oracle, an American company, pioneered the creation of this $20bn+ relational database market, which in turn spurred a $20bn+ enterprise applications market, we expect US-innovated Big Data technology will play a significant role in creating a new $100bn+ total addressable market (see Big Data II - new themes, new opportunities). Technology companies such as Splunk, IBM, Palantir, TIBCO, VMware, Salesforce.com and Cloudera will play a large role in shaping the Big Data technology wave ahead.

Enterprise Hardware and Storage

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Apple is well known for its innovative work in smartphones, tablets, PCs and mp3 players, and there are rumors of potential future innovations such as iWatches and/or iTVs.

In 2011, IBM was awarded 6,180 US patents, more than any other company (70%+ for software and services). In particular, we think the company's work with Watson, IBM's advanced computing system, and data analytics is very interesting.

Fusion-io is a leader in PCIe SSDs (solid state drives), one of the fastest growing segments in enterprise hardware. The company has strong IP on the hardware and software, and we believe this market is poised for strong growth in 2013-2014. PCIe SSDs are a new way to approach storage in the datacenter, and pretty heavily used by Facebook and Apple. We expect increasing adoption, particularly among webscale vendors with Hadoop architectures, and with enterprise customers as well

Telecom, Data Networking & Wireless Equipment

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Key innovations spearheaded by US companies in wireless are around deployment of underlying technology for Long Term Evolution (LTE) wireless technology. The US fell behind in terms of deploying 3G for several years, but it has been at the forefront of deploying 4G technology, with over two-thirds of worldwide LTE installed user base in the US. Also, North American carriers are pushing LTE coverage more broadly than in other regions. In fact, spectrum allocation for 4G has yet to take place in many countries, including India and China, suggesting the US is ahead in terms of the bandwidth race.

Within our coverage, Qualcomm continues to lead the industry in delivering innovative wireless solutions and supporting semiconductor technology.

Other innovations are happening inside data centers. New technologies such as software defined networking (SDN), which emerged from Stanford University, from companies such as Nicira (acquired by VMware) have the potential to be very disruptive in enterprise data center. Cisco, Juniper and VMware are leading the charge in terms of driving the market acceptance of this technology.

Semiconductors

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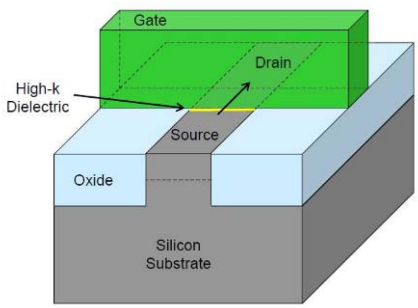
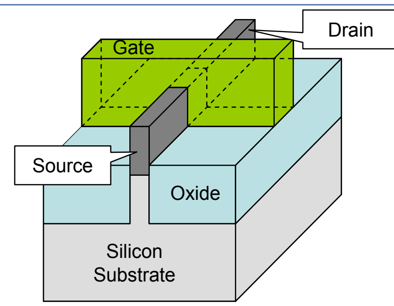
Semiconductor producers have a higher ratio of R&D to sales (16-18%) than any other industry, driven by the need to keep up with the demand for smaller, faster and lower cost devices. Intel has been a pioneer in many semiconductor design and manufacturing techniques, including the 3D transistor. This disrupted the 2D planar approach that has been the backbone of the industry for 20+ years, resulting in better performance and lower power consumption (Chart 11 and Chart 12).

Chart 11: Traditional planar (2D) transistor structure



Source:Intel, BofA Merrill Lynch Global Research

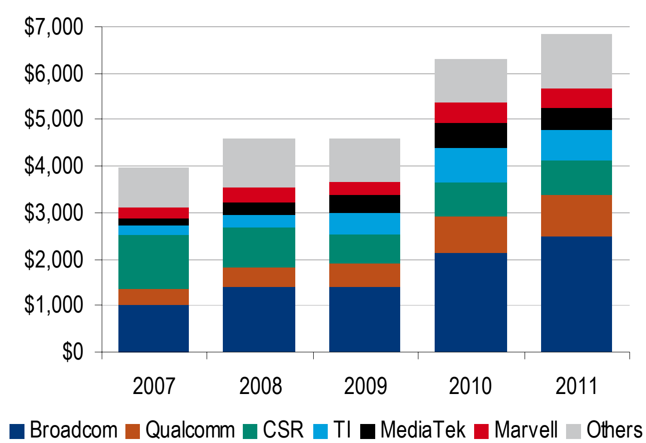
Chart 12: Intel's 22nm 3D (or Tri-Gate or FinFET) transistor structure



Source:Intel, BofA Merrill Lynch Global Research

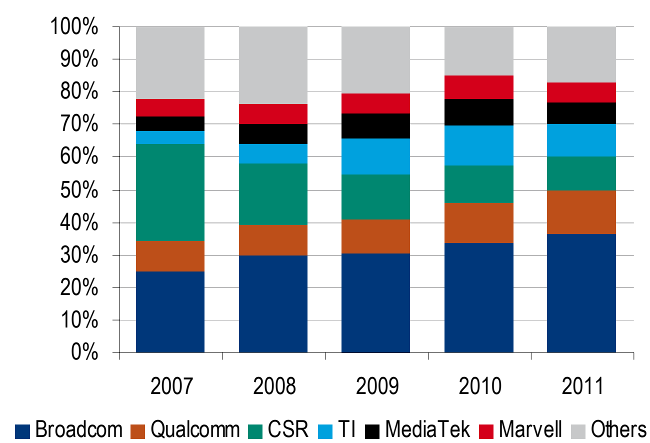
The growth of the wireless connectivity semiconductor market has significantly outpaced the overall semiconductor market, led by the adoption of combo chips, which integrate WiFi, Bluetooth, GPS, FM radio and other connectivity functions into a single chip. Broadcom is the leader in the connectivity market, with its combo chips used in over 80% of all smartphones and tablets globally, followed by Qualcomm, another California-based company. That these industry leaders continue to strengthen their positions in this rapidly evolving market is evidence that US innovation is alive and well in this space (Chart 13 and Chart 14).

Chart 13: Connectivity overall sales by vendor



Source:Gartner, BofA Merrill Lynch Global Research Estimates

Chart 14: Connectivity overall sales mix by vendor



Source:Gartner, BofA Merrill Lynch Global Research Estimates

Semiconductor Capital Equipment

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Silicon Valley based Ultratech (UTEK) and Massachusetts based IPG Photonics

(IPGP) are the leaders in their respective areas with innovative technology and products that are replacing the incumbent technology.

IPGP is a leading fiber laser manufacturer that sells high performance fiber lasers for cutting, welding, and marking in materials processing and other advanced applications. The company's technology is at the forefront of a secular trend in which fiber lasers are displacing traditional laser solutions due to its high efficiency and high beam quality. IPGP continues to be the strong beneficiary of increased industry adoption, as fiber lasers are still in the early stages of penetration into the overall laser market and the company has a strong multi-year technological lead compared to its competition.

Ultratech is a semiconductor equipment supplier that benefits from the strong customer adoption of its innovative laser spike annealing (LSA) tool, as well as longer-term opportunities in the advanced packaging market. As the complexity of chip manufacturing continues to increase and critical dimensions shrink further, issues such as device leakage become more pronounced and drive the strong demand for Ultratech's LSA technology. The company's advanced packaging tools similarly benefit from key industry inflection points like the adoption of through-silicon via (TSV).

Furthermore, Ultratech's continues to innovate and has introduced a new overlay metrology product (Superfast 3G), which has the ability to address overlay issues with reticle, lithography tool and the wafer surface. Any penetration in the overlay metrology market would be incremental, in our view.

Internet

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Mobile, mobile, mobile

The transition to mobile Internet usage is shaping the sector, with mobile likely to grow to 20% of total Internet time in 2013. For mobile we favor eCommerce marketplaces (EBAY, AMZN) to media sites, as many media companies are seeing pressure on PC advertising revenues. Within media, we like Facebook best for mobile driven acceleration potential. These companies continue to make their mobile platforms more user friendly, driving engagement and eCommerce transactions.

Tablet ecosystem competition

HW and software ecosystem competition is intensifying with lower price points and new form factors driving tablet adoption, and pressuring margins for Amazon and Google. We expect Google's Android OS to gain share on tablets relative to Apple and others in 2013. Amazon and Google's aggressive investment in tablet and app ecosystems has raised the innovation bar across the industry, benefitting consumers.

Google disintermediation and the starting point battle

With the Federal Trade Commission probe over, Google will move toward entity level search that positions its results closer to transactions, and we would expect new competitive products (especially in travel, EXPE, PCLN, TRIP could see risk) in 2013.

Heavy competition for digital content continues

Content libraries should continue growing in 2013, along with higher costs. Netflix, Amazon, Google and Apple are all in the market for content.

Innovation in digital media has enabled leaders like Netflix in video and Pandora in radio to differentiate themselves from existing/traditional players and emerging Internet-based competition. Both companies have focused on the user experience by creating intelligent algorithms for content discovery, as well as innovative uses of bandwidth to minimize interruption of the streaming content.

In the future, however, we believe pay services like Netflix, as opposed to advertising supported companies like Pandora, will have to do more than just provide the best user interface to hold onto to the average consumer; they will have to innovate in a more traditional media sense by creating compelling content. Netflix has started to move down this path, like its more traditional media competitor HBO before them, with original serial shows like "House of Cards".

Mobile payments big, but adoption will be later, not sooner

Multiple platforms are in the early stages of consumer adoption, but adoption will take years not months. eBay's PayPal is well positioned, in our view, but the market is very early. Also, PayPal is in the midst of extending its platform to offline retail, which significantly expands its market opportunity, and has built a partner ecosystem to drive ubiquitous offline merchant acceptance. PayPal offline launches with Discover in 2Q, and we expect the launch to focus investor attention on PayPal's offline ambitions.

Supply Chain

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The revolution of Touch enabled by Cover Glass

Touch capability has enabled a revolution in smartphones and tablets. Most new smartphones and tablets coming to market today include this feature, and next generation notebooks are expected to have this capability as well.

To make touch devices reliable and functional, Corning (GLW) developed its Gorilla Glass^{TM} brand of cover glass, which is now in its third generation. Gorilla Glass^{TM} supports Native Damage Resistance,^{TM} which enables improved scratch resistance, reduced scratch visibility and improved retained strength. Corning had roughly $1bn in Gorilla Glass sales in 2012 and we expect sales to continue to grow over the next few years. Corning's cover glass is used in over 1 billion devices worldwide, in over 900 product models and by over 33 major brands.

Reducing glass capex spend by use of thin glass

The use of thin glass allows more sheets of glass to be produced from the same glass tank; in effect, increasing the capacity limit of a tank. Thin glass has been another step in the evolution of LCD glass, where over 50% of Corning's world wide shipment is of the thin glass variety.

Not only does thin allow more sheets of glass to be produced, those sheets can be used in a variety of applications, often for manufacturing lighter weight end products. Corning's Lotus^{TM} glass has been designed, not only to be thin, but also to retain its shape and quality during high-temperature processing. It also performs well in low temperature poly-silicon (LTPS) and oxide film transistor (TFT) backplane manufacturing.

Going curved, and future roll-to-roll glass

While thin is certainly "in" when it comes to LCD glass, the industry continues to move toward curved and flexible designs. Corning's Willow^{TM} Glass enables thin, light, cost effective displays, where the glass has the flexibility to be "wrapped" around a device. Also, the glass can be processed at high temperatures (up to

500 degrees C). In the future, Willow glass is expected to support high-temperature, continuous roll-to-roll processes, similar to the production of newsprint. It also supports thinner backplanes and color filters for Organic Light Emitting Diodes (OLED) and Liquid Crystal Display (LCD).

Industrials & Materials

Multi-Industry

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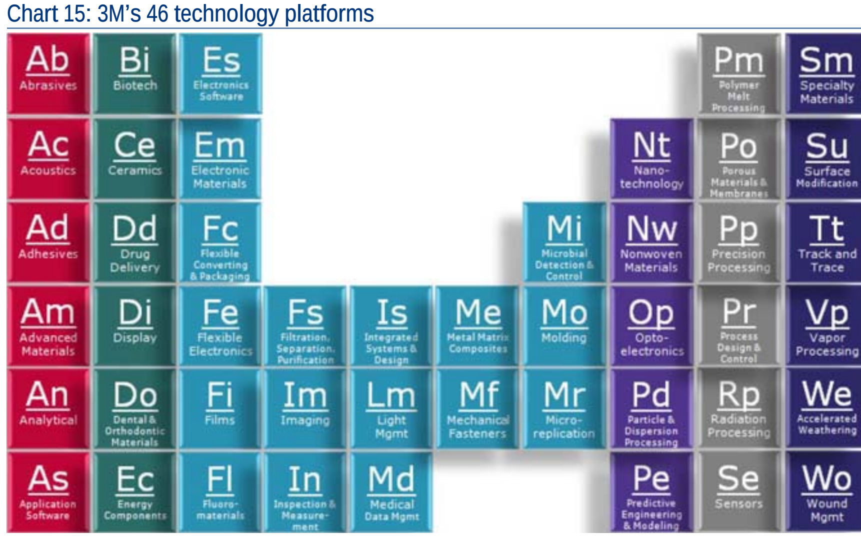
Technology is at the heart of 3M. The company defines its business model around the portfolio of 46 technologies. Most 3M products contain at least three of the company's technologies. Although 3M is often associated with adhesives and abrasives, we identify nine core technology platforms that are found throughout the company's products: abrasives, adhesives, advance materials, ceramics, electronics & software, films, microreplication, nanotechnology, and non-wovens.

3M is dedicated to creating new and innovative products that combine its various technologies. For instance, the technology that led to the creation of Scotch tape over 90 years ago has been used to create everything from Post-It Notes to brightness-enhancing computer films and drug delivery sub-dermal patches. Similarly, 3M has leveraged its core competence in ceramics to create unique abrasive products, as well as ceramic brackets for orthodontics and fibers for power transmission lines.

Other recent innovations include devices that can test food contamination in 15 minutes by combining isothermal DNA amplification and bioluminescence detection into one compact device. Other systems typically take up to 3.5 hours.

Chart 15: 3M's 46 technology platforms



Source:Company reports, image used with company's permission

Recently, the company's new CEO, Inge Thulin, has stressed that 3M must reinvest in the US, which remains its largest market. The company plans to complete construction on a new $150mn, 700-person product development laboratory at its headquarters in Minnesota by 2015. Additionally, the company expects to increase its R&D as a % of sales from 5.5% currently to 6.0% by 2017, which underscores the company's commitment to new product development.

3M is also famous for its strong engineering culture. The company instituted a policy in 1948, known as 15% Time, in which employees are allowed to spend time exploring new projects and ideas. Post-it notes and Cubitron II abrasives are famous examples of products created from 15% Time. Collaboration and experimentation are encouraged, while management approval is not required. This policy exemplifies the company's cultural focus on innovation and demonstrates its ability to leverage technology platforms for new and creative applications. The ability to sustain a strong engineering culture is one of the most important long-term competitive differentiators for 3M, in our view.

GE is another company within the Industrials sector that pursues innovation domestically. GE has ramped up its investment in R&D over the past several years, with the US being a key focus. R&D as a % of sales has increased from 3.1% in 2001 to 4.8% in 2012, and has increased in absolute terms from $2.0bn in 2001 to $4.5bn in 2012. And similar to 3M, GE is reinvesting in the US. Since 2009, GE has added 13,000 jobs and 16 new manufacturing facilities to its industrial businesses in the US.

GE has developed new and innovative products across its range of end markets in the US in the recent years. For instance, a new Durathon battery for telecom and utility end markets is half the size of conventional lead acid batteries, but lasts 10 times as long. The company spent $100mn opening a new facility in upstate New York to develop these batteries. Five years of work and over 30 patents went into creating this new product.

Another example of innovation at GE is its GEnx plane engine, the fastest selling engine in the company's history. Design work began on the engine in 2003 at its R&D center in Cincinnati and is now fitted on Boeing's new 787 Dreamliner. The GEnx engine is 15% more fuel efficient and generates 15% fewer carbon emissions than current engines, while reducing noise by 30%. GE has also developed new ceramic matrix composites (CMCs) at its R&D center in New York, made from silicon carbide and coated fibers. These composites are used in jet engines and gas turbines, specifically CFM's new LEAP jet engine. Given their complex structure, the composites weigh only one-third as much as nickel alloys, but remain durable, working in temperatures up to 2,400F.

On the locomotive side, GE's Evolution Series engine has reduced emissions by more than 70% versus previous engines and adheres to Tier 4 standards. GE designed the locomotives at its center in Erie, Pennsylvania and manufactures them there and in Texas. There are over 5,000 Evolution Series locomotives currently in operation globally. GE is also achieving greater efficiency levels in its gas turbine business. The new FlexEfficiency 60 turbines, which launched in 2012, has a 61% natural gas to electricity yield, while offering incomparable flexibility, which allows utility operators to scale power generation according based on demand and supply source.

Machinery

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Agriculture equipment manufacturers Deere, AGCO and CNH Global address 95% of the US tractor and combine market. In our view, Deere, AGCO, and CNH's consistent investment in technology and innovation has allowed the AG equipment industry to raise prices 3-5% annually, and that includes 2009.

Deere is the largest manufacturer/distributor of AG equipment worldwide and is the No. 1 player in the US market. Deere continues to lead the AG equipment space in terms of best-in-class equipment and technology. For example, Deere invested capital over the last two years to upgrade and expand its facility in Waterloo, Iowa to increase the manufacturing capabilities in the high horse-power segment. The North America farm industry continues to see a mix shift to higher horse power tractors and combines (4WD vs 2WD) as larger, more professional farmers upgrade their fleet.

Additionally, Deere, AGCO, and CNH are investing in technology, software, and hardware products that would be part of a total solution offering to increase farmer productivity. For example, myjohndeere.com allows farmers to view real-time information about their farm operations, field locations and machine performance data. Farmers can share data with dealers or crop advisors from their computer. Deere's FarmSight technology integrates equipment through AG management solutions and allows a farmer to operate machines in the field via wireless technology.

Caterpillar continues to be known for its No. 1 market position in the construction and mining equipment space, but we believe CAT's progress in the oil and gas market gets overlooked. CAT is the No. 1 supplier of engines to fracking rigs and a top supplier of transmission for fracking rigs. CAT continues to invest in this space and is improving its presence in fracking rig pumps as well. The company is planning on leveraging its existing technology, engineering skills, and distribution network in an effort to gain market share in the coming years and evolve into a one-stop shop for fracking rigs and large O&G customers. Also, the largest portion of CAT's Power Systems business (one-third of CAT's overall Group sales) is engines and turbines sold into the gas compression market.

Aerospace & Defense / Metals and Mining

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The US remains the most innovative in the world when it comes to new product development in aerospace & defense and metallurgy.

Boeing pushed the limits of aerospace engineering with the development of the 787 Dreamliner. Some estimates put the total investment of the program at more than $32bn. The 787 is the first aircraft in production made primarily of carbon fiber materials. It is the first all electric airplane, which eliminates the use of "bleed air" from engines and minimizes the need for heavy hydraulic systems. The program is sold out through 2018.

United Technologies spent more than $1bn in fundamental R&D to develop the Pratt & Whitney Geared Turbofan (GTF) engine. The engine reduces fuel burn by up to 15%, cuts noise levels by 50-75% and cuts carbon emissions by 3,000 tonnes per aircraft per year. This GTF will power the Mitsubishi Regional Jet, Bombardier CSeries, Airbus A320NEO and the upgrade of the ERJ-190/195.

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As companies like Boeing and United Technologies demand lighter and stronger materials for airframe and engines, US specialty metal companies like Allegheny Technologies developed high temperature-resistant alloys like the ATI 718Plus and ATI Rene. These specialty metals increase the efficiency of jet engines by allowing them to burn hotter. Hotter burning engines allow for less fuel consumption. We note that two of the three exclusive titanium suppliers to Boeing, Allegheny Technologies and Titanium Metals (recently acquired by Precision Castparts) are US based.

Health Care

Biotechnology

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Using our database of FDA drug approvals, more than 60% of 175 NDA's, BLA's and other new drugs approved in the US in the last three years were developed by US companies, with the balance from companies headquartered outside the

US. We categorize the sponsors of these drugs as either biotech, specialty pharmaceutical or large pharmaceutical companies, with each accounting for roughly one-third of the new drug approvals. Given that many drugs discovered by small biotech companies are licensed or acquired by larger pharmaceutical companies, we suspect that biotech companies could account for over half of new drug discoveries. While late-stage drug clinical development can be cost prohibitive for small biotech companies, big pharma companies increasingly rely on the biotech sector as the source of early-phase drug development.

Medical Technology & Devices

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US-based Medtronic (MDT) is in the process of bringing to market (still a few years away) a new treatment for severe hypertension that for the first time could reduce blood pressure in millions of patients that previously had no options. This could have a dramatic effect on cardiovascular disease.

US-based Edwards Lifesciences (EW) has revolutionized heart valve surgery. Over time its procedure could eliminate the need for open surgery to treat valve disease, dramatically reducing hospital stay and costs.

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In 2000, Intuitive Surgical (ISRG) introduced the first robotic surgery system, which allows surgeons sitting at a console in the operating room to manipulate a set of nearby robotic arms that perform the actual surgery. Compared to other methods of surgery, this robotic system, called the da vinci robot, allows surgeons to have better control, better range of motion and better vision when performing minimally invasive surgeries.

Over the last 10 years, the da vinci robot has come to be used in a large portion of urology and gynecology procedures in the US. And with recent, new technology to the robot, we view ISRG as poised to take meaningful share of the much larger general surgery market. Recently introduced technology include robotic stapling technology and “single site” surgical instruments, which can be used to perform surgeries through a patient’s belly button in order to make the surgery less invasive. In addition, we anticipate that sometime in the next 12 months ISRG will likely launch a next generation robotic system that is more amenable to general surgery procedures than the current version.

We estimate these product launches, the company’s resulting expansion into general surgery and international growth should allow ISRG to drive a 15-20% revenue and EPS CAGR over the next three years.

Life Sciences & Diagnostic Tools

Next Generation DNA sequencing

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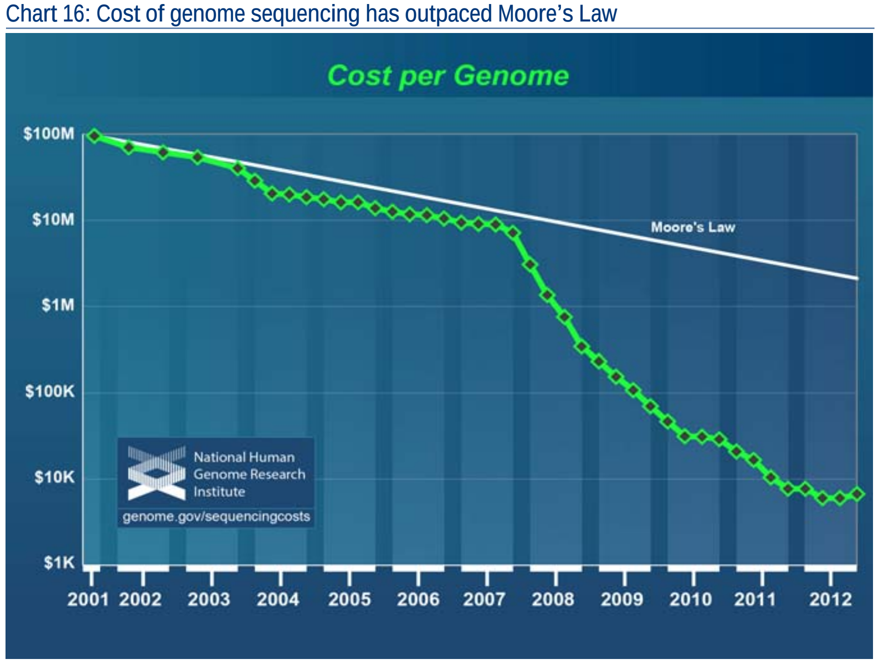
After the first human genome was sequenced in 2001, the US government, via the National Human Genome Research Institute (NHGRI), began to fund grants for academic and commercial labs to develop high throughput next generation DNA sequencing (NGS) technologies in order to break the $100,000 and $1,000 genome barriers.

It took 10 years and cost roughly $3bn to sequence the first full human genome, but to make the human genome truly accessible for commercial and clinical use, new technologies were needed to dramatically lower the time and cost of large scale genomic analysis. Specifically, having one human genome is like having one fax machine, in that the power of the technology comes from network effects. In the case of the human genome, in order to fully understand the genetic diversity of individuals (eg, why is one person more susceptible to cancer than another), not just one genome but millions of genomes need to be sequenced.

American companies 454, Life Technologies (LIFE) and Illumina (ILMN) have been the leaders in the NGS race. New Haven, CT's 454, a spin-out of Curagen that was eventually acquired by Roche, was the first company to launch a commercially viable, though technology limited, NGS platform in 2005. LIFE acquired its NGS business when it merged with Applied Biosystems in 2008 and then acquired Ion Torrent in 2010. Applied Biosystems NGS platform, SOLiD, came to the company in 2006 when it acquired Beverly, MA based Agencourt Personal Genomics. Ion Torrent was founded by the same team that developed the original 454 NGS platform.

ILMN entered the NGS arena when it acquired Solexa in 2006. Although Solexa's core technology came out of the UK's University of Cambridge, ILMN has advanced and refined the original technology well beyond anyone's expectations at the time of the deal, and has since come to dominate the NGS market. ILMN's current technology can sequence a human genome with high accuracy in about a day for roughly $3,500 in reagents. Costs continue to fall, with the $1,000 genome easily within reach. Although SOLiD failed to keep pace with ILMN's HiSeq platform, LIFE believes that its Ion Torrent technology will also break the $1,000 genome in the near future.

Chart 16: Cost of genome sequencing has outpaced Moore's Law



Source:National Human Genome Research Institute

The first NGS technologies were launched in 2005, and it has become a US$1.0-1.5bn market on its way to multi-billion US$ levels. NGS technology has not only brought DNA sequencing to the masses (of researchers), but it is also dramatically changing the face of healthcare. For example, several companies have recently launched non-invasive prenatal diagnostic tests based on ILMN's NGS technology that will ultimately replace the need for amniocentesis for the detection of Down Syndrome (Trisomy 21). It is changing the face of applied markets as well, with AgBio an example.

In addition, because the amount of DNA sequence information being generated is staggering, it is an important driver of biological Big Data. As a result, it has attracted the attention of IT giants such as Google, a primary investor in consumer genomics company 23andMe.

The analysis of large scale genomic data has spawned an entire bioinformatics industry, much of which is centered in the US.

US Major Pharmaceuticals

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The US may be turning a corner after several years of poor R&D productivity. Since our launch on the US Major Pharma companies in March 2011 when sentiment around US Major Pharma's ability to innovate was poor, there have been multiple positive pipeline readouts and approvals of novel potential blockbusters.

In 2012, the FDA approved 39 new drugs, the highest number in more than 10 years. Significant areas of innovation include immunotherapies for cancer such as Bristol-Meyers Squibb's (BMY) Yervoy (approved in 2011 for metastatic melanoma) and nivolumab (novel immunotherapy in late-stage testing for multiple tumor types), as well as other novel therapies for various tumor types (palbociclib, PFE's CDK 4/6 inhibitor for breast cancer).

AbbVie's (ABBV) late-stage HCV regimen also deserves a mention, which has demonstrated SVR rates (equivalent of a cure) of roughly 100% for patients with Hepatitis C, a significant improvement over currently-marketed therapies. BMY/Pfizer's Eliquis (novel oral anticoagulant for stroke prevention) and PFE's Xeljanz (novel oral treatment for rheumatoid arthritis) are key examples of two recently-approved novel potential blockbusters. Comparing across the US Major Pharma pipelines using a standardized approach, Eli Lilly (LLY) looks the most favorable in terms of number of Phase II/III assets and potential NPV per share (see our "Basics" R&D pipeline analysis).

Pharmaceutical Services

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As the largest pharmacy benefit management (PBM) company in the US, Express Scripts' mission is to reduce the drug cost trends for its payor customers and improve the efficacy of drug benefits for its millions of members. Innovation is central to its focus on delivering high quality care while driving waste from the health care system. Its pioneering work in understanding consumer behavior relative to health care benefits has yielded practical, well-accepted programs that reduce waste, while preserving individual choice and reducing non adherence to medication therapy.

Payors in the US have readily adopted cost trend management programs developed by Express Scripts and other PBMs, including branded drug formularies, tiered copayments, step therapy programs, and home delivery. Double-digit increases in the traditional pharmacy spend have not been seen since 2005. However, significant waste from patient nonadherence remains, and there are opportunities to ensure more competitive pharmacy costs in what we view as an increasingly saturated retail pharmacy industry. Also, there is a growing need to manage the cost of specialty medication, which is the fastest growing segment of drug spend due to limited competition and few generic alternatives by therapeutic category.

Express Scripts' research suggests there is over $400bn in pharmacy-related waste incurred by health care payors each year. Because Express Scripts shares in the financial savings of its customers, the opportunity for from reducing this waste is material. Three innovative programs that it has launched should help it capture some of the savings:

- **ScreenRx.** Express Scripts launched ScreenRx in 2012 under the premise that just as medical screenings make it possible to detect health issues before they are well-advanced, so too can detecting nonadherence before it starts to provide an opportunity to improve health outcomes and reduce waste. Using proprietary predictive models, the company has up to 98% accuracy in predicting nonadherence of its individual members up to one year in advance. Because nonadherence stems from multiple causes, ScreenRx uses a personalized approach in the form of tailored interventions and clinical services to overcome patient specific obstacles. Used with other types of solutions designed to meet the needs of plan sponsors, optimal care and lower costs can be achieved.

- **Express Advantage Network.** In 2013, Express Scripts released its Express Advantage Network that combines tiered retail networks with member engagement and cost sharing to achieve cost savings for payors with minimal member disgruntlement. In practice, members still have access to open pharmacy networks, albeit at higher copayments, which acknowledges that with more than 60,000 dispensing pharmacies in the US, not every one is needed to ensure sufficient access.

- **Express Scripts Specialty Benefit Services.** Specialty medications are the fastest growing segment of the drug spend, with the cost trend expected to rise over 20% annually over the next few years, versus a relatively flat cost trend for traditional medications. Express Scripts' expanding suite of offerings enables it to manage drug utilization under both the pharmacy and medical benefits in all sites of care, and during any phase of treatment.

Longer-term, Express Scripts' focus on personalized medicine may result in greater quality of care and savings for plan sponsors and members. The effectiveness of some drug therapies varies based on genetic mutations of disease, and some of these variations can be detected through sophisticated genetic testing. Express Scripts only recommends a small number of the available pharmacogenomic tests, given limited bodies of evidence to support the effort more broadly, but it does have programs in place where it sees clear value for its customers. In addition, public policy changes may result in new or enhanced programs from Express Scripts to better manage cost trends for growing government membership base.

Oil Services

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American innovation is driving the global shale revolution, or the move toward producing crude oil and natural gas from shale rock. Just a decade ago conventional wisdom suggested oil and gas accumulations in shales were not economically viable. However, technological advances in directional drilling and multistage hydraulic fracturing have turned these accumulations into valuable economic resources. Directional drilling, or more specifically, horizontal drilling, exposes more of the wellbore to producing zones. Multistage hydraulic fracturing creates paths in the rock to allow more oil and gas to enter the wellbore and flow to the surface.

Shale drilling, or more broadly, unconventional drilling, has grown rapidly in the

US. The unconventional rig count (ie, rigs targeting unconventional resources) grew from an average of 459 in 2008 to 922 in 2012, with its share of the total rig count growing from 24% to 50% over the same time. There are significant opportunities to export shale technologies. In 2011 the Energy Information Administration (EIA) released a preliminary assessment of the world's shale gas resources. Technically recoverable shale natural gas reserves were estimated at 6,622 tcf worldwide, including 862 tcf in the US. Other countries with significant shale reserves include China (1,275 tcf), Argentina (774 tcf), Mexico (681 tcf), South Africa (485 tcf), Australia (396 tcf) and Canada (388 tcf). Oil shales offer additional opportunities.

We view the Big Three integrated oil service companies Schlumberger (SLB), Halliburton (HAL) and Baker Hughes (BHI) as primary drivers of the US innovation given their exposure to directional drilling and hydraulic fracturing. Average R&D per year for the Big Three integrated service companies stands at $1,774mn, or 2.6% of revenues since 2008. SLB's R&D ran between $862mn and $1,168mn since 2008 ($1,168mn, or 2.8% of revenues in 2012). HAL's R&D ran from $325mn and an estimated $460mn since 2008 (estimated $460mn, or 1.6% of revenues in 2012). BHI's R&D ran from $397mn to $497mn since 2008 ($497mn or 2.3% of revenues in 2012). R&D has been consistent over the years and only decreased 3% in 2009 during the financial crisis (revenues decreased 18%), highlighting the commitment to R&D.

Financials

Money Center Banks, Brokers, and Asset Managers

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The US financial service sector, particularly within the capital markets, has been a constant area of innovation. Over the years there have been new products developed, including the mutual fund, exchange traded funds, the muni market, the high yield market, commodity products and structured products, just to name a few. More recently, there has been stronger growth in alternative and absolute return strategies, which we expect to continue to evolve and grow.

On the efficiency side, since the 1970s there has been a constant focus on reducing costs and friction in the market, which has driven more participation. Many of the efficiencies have occurred on the broker or trading side, including deregulation of broker commissions, increased competition, the electronification of exchanges, regulatory changes to increase competition (decimalization, reg nms, penny pilot, etc), and most recently, the upcoming and potential changes across the fixed income markets, including clearing and the potential electronic trading in the future of some products.

While the pace of innovation could be reduced in the near term from heightened regulation, we expect it to continue over time, with the goal of providing financial solutions to evolving issues and lowering costs for end users.

Networks & Credit Card Companies

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Expediting the electronification of payments

Card networks and credit card companies continue to lead innovation around the electronification of payments from paper-based methods (cash and checks). Visa (V) and MasterCard (MA) are delivering offerings to push forward and expedite electronification, with key products including mobile payment solutions, government payment solutions and budgeting offerings that help consumers, businesses and institutions around the world transact digitally.

Credit card companies like American Express (AXP) are also helping grow digital payments, creating innovative offerings and tools for cardmembers and merchants that harness the power of social media. These offerings increase the value proposition for its cardholders, help them to capture more wallet-share and attract new customers.

Visa & MasterCard: mobile is ground-zero

For the networks, mobile wallets and mobile payments remain the ground zero for innovation. Both Visa and MasterCard have created new wallet products that are facilitating the inevitable transition to mobile payments, working with financial institutions, telecommunications companies, governments, merchants and consumers. The networks' mobile product offerings facilitate the development of ecommerce, point-of-sale payments and other contactless payments.

In developed markets, the networks have created e-wallets and applications with single-click purchase capabilities, integrated alerts and loyalty functionality. At the point-of-sale, innovative technologies such as MasterCard's PayPass and Visa's payWave allow consumers and merchants to make and accept mobile payments. In areas such as transit, the networks have enabled contactless payments for taxi cabs, subways and parking payments.

In developing markets, where mobile phone penetration far exceeds bank card availability, Visa and MasterCard's new products are pushing forward the democratization of financial services to the billions of unbanked and underbanked around the world. Working with banks and telcos, Visa and MasterCard are leading the charge in developing mobile money platforms for banks to offer basic financial services to consumers. In countries such as India, Brazil and South Africa, the networks are working with governments and telcos to deliver innovative payment solutions such as biometric payment cards for the administration of social benefits. These products expand financial inclusion around the world, while increasing the efficiency of government spending by reducing leakage and fraud.

The networks have also developed new peer-to-peer payment products, further advancing electronification and growing financial inclusion. These offerings allow consumers to send and receive funds quickly and securely to any of their branded credit, debit or prepaid accounts around the world.

The networks are developing innovative products outside of mobile as well. Products such as MasterCard's InControl enables consumers, businesses, and governments to manage spending and budgets, allowing for spending controls and spending blocks by ticket size, merchant type, geography and even the time of day. Another promising network product in development is TV programming based shopping, which allows viewers to identify and instantly purchase products while watching their favorite shows.

American Express: tapping into the power of social media

Credit card company American Express is innovating in the digital payments arena, developing offerings and tools to capitalize on the power of social media to generate new revenues and increase its customer base. The company has partnerships with key social media companies Facebook, Twitter and Foursquare to sync up cardholders' accounts to their social media accounts.

For Facebook, American Express has created a product service called Link-Like-Love, where enrolled cardholders receive digital discounts and coupons that are tied to their likes, interests, and social connections of the cardmembers and their Facebook friends. When activated on purchase, the discounts automatically sync to and credit their monthly statements. American Express has also launched a first of its kind marketing tool called Go Social to empower its small business merchants. Go Social allows merchants to create and distribute coupon-less offers into digital channels like Facebook, and manage their campaigns through electronic dashboards.

With Twitter, American Express has developed a tweet-to-buy capability, where Twitter users can link their card account to their twitter account and make purchases simply by tweeting. With Foursquare, American Express offers similar deals, discounts, and rewards to enrolled cardmembers when they “check-in” and make purchases at selected locations.

Real Estate Investment Trusts

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Financial innovation to fix the housing crisis

Billions of dollars have been raised to buy foreclosed homes and short-sales and rent them out to many of the same people who lost their homes but otherwise have great credit. Players include Blackstone, Colonial and newly formed public REIT, Silver Bay.

Office innovation

There are redevelopment projects across the country, where office developers are demolishing old, tired buildings and developing modern office buildings that are green (LEED certified) and cater to today's office needs. Such needs include America's desire to have work, live and play environments. New York City is working on a huge 10-year initiative.

Warehouse innovation

We continue to see US-based, Prologis, which is the world's largest global warehouse company, develop modern warehouses throughout the world that serve today's logistic needs.

Retail innovation

SPG, which is the world's largest retail real estate company, continues to increase its global footprint via 1) exporting its premium outlet expertise by developing premium outlets throughout Asia and Mexico; and 2) exporting its retail expertise, which is understanding the most effective ways to operate and manage a regional mall. This is evidenced by its investment in Kleppiere, a pan-European retail real estate company. SPG has helped Kleppiere improve its operating efficiencies, occupancy and rents through re-tenanting efforts and balance sheet. Additionally, retailers are evolving and cleverly figuring out how to leverage the Internet with brick and mortars. US retailers seem to be on the cutting edge on this front.

Methodology

For backtesting purposes, we defined our investment universe as the S&P 500 Index. In terms of a comparable benchmark, we created a benchmark of equal-weighted returns for the companies for which data was available at both a sector and a stock level.

We derive all historical price and index constituent data used in the study from Compustat through FactSet; all measures used are quarterly or a summation of the last 12 months. We assumed no R&D expenditure for companies that do not have available R&D data. The study spans March 1990 to December 2012.

To avoid a "look-ahead" bias, we lagged fundamental data by one quarter to ensure that the information used to construct the portfolios would have been available at each point in time.

When comparing the performance of companies with R&D vs. those with no R&D, we calculated indexed performance based on equal-weighted rebalancing at 3-mth, 12-mth and 36-mth intervals. In our exhibit, we show the alpha as the excess CAGR of companies with R&D expenditure vs. CAGR of those with no R&D expenditure.

To calculate the performance of companies with respect to their level of R&D as % of revenue, we calculated the arithmetic average of the relative performance of all companies within the corresponding R&D band across all time periods.

Link to Definitions

Consumer & Retail
Click here for definitions of commonly used terms.

Energy
Click here for definitions of commonly used terms.

Financials
Click here for definitions of commonly used terms.

Healthcare
Click here for definitions of commonly used terms.

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Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	20	47.62%	Buy	17	89.47%
Neutral	7	16.67%	Neutral	5	71.43%
Sell	15	35.71%	Sell	12	85.71%

Investment Rating Distribution: Electrical Equipment Group (as of 01 Jan 2013)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	15	51.72%	Buy	10	71.43%
Neutral	6	20.69%	Neutral	2	50.00%
Sell	8	27.59%	Sell	3	37.50%

Investment Rating Distribution: Energy Group (as of 01 Jan 2013)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	145	45.89%	Buy	111	81.62%
Neutral	105	33.23%	Neutral	75	84.27%
Sell	66	20.89%	Sell	37	64.91%

Investment Rating Distribution: Financial Services Group (as of 01 Jan 2013)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	172	47.78%	Buy	123	73.65%
Neutral	112	31.11%	Neutral	62	57.41%
Sell	76	21.11%	Sell	30	40.00%

Investment Rating Distribution: Health Care Group (as of 01 Jan 2013)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	155	55.36%	Buy	105	70.47%
Neutral	66	23.57%	Neutral	42	68.85%
Sell	59	21.07%	Sell	35	63.64%

Investment Rating Distribution: Industrials/Multi-Industry Group (as of 01 Jan 2013)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	56	66.67%	Buy	32	69.57%
Neutral	12	14.29%	Neutral	10	90.91%
Sell	16	19.05%	Sell	8	53.33%

Investment Rating Distribution: Machinery/Diversified Manufacturing Group (as of 01 Jan 2013)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	33	47.14%	Buy	22	70.97%
Neutral	22	31.43%	Neutral	12	66.67%
Sell	15	21.43%	Sell	8	53.33%

Investment Rating Distribution: Media & Entertainment Group (as of 01 Jan 2013)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	47	50.54%	Buy	27	62.79%
Neutral	23	24.73%	Neutral	12	57.14%
Sell	23	24.73%	Sell	13	65.00%

Investment Rating Distribution: Technology Group (as of 01 Jan 2013)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	136	59.13%	Buy	83	66.94%
Neutral	52	22.61%	Neutral	39	82.98%
Sell	42	18.26%	Sell	27	65.85%

Investment Rating Distribution: Telecommunications Group (as of 01 Jan 2013)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	79	42.02%	Buy	52	76.47%
Neutral	54	28.72%	Neutral	33	76.74%
Sell	55	29.26%	Sell	28	63.64%

Investment Rating Distribution: Textiles/Apparel Group (as of 01 Jan 2013)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	16	59.26%	Buy	13	86.67%
Neutral	5	18.52%	Neutral	5	100.00%

Sell	6	22.22%	Sell	5	83.33%

Investment Rating Distribution: Global Group (as of 01 Jan 2013)

Coverage Universe	Count	Percent	Inv. Banking Relationships*	Count	Percent
Buy	1961	49.47%	Buy	1299	71.85%
Neutral	1013	25.55%	Neutral	640	70.18%
Sell	990	24.97%	Sell	543	59.15%

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Investment rating	Total return expectation (within 12-month period of date of initial rating)	Ratings dispersion guidelines for coverage cluster*
Buy	≥ 10%	≤ 70%
Neutral	≥ 0%	≤ 30%
Underperform	N/A	≥ 20%

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