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The Industry Cost of Equity

- Estimating the equity market risk premium (EMRP) is a forecasting exercise.
- Using historical data, forward looking measures, and economic reasoning we estimate the EMRP to be in the 4.5% to 6.5% range.
- Our point estimates for US and European EMRPs are economically and statistically indistinguishable. Therefore the cost of equity in these markets should use equal EMRPs.
- Industry betas are more robustly measured than company-specific betas. We thus suggest using industry betas in valuation and benchmarking applications.
- Our estimates of beta using daily data are very consistent. Thus betas estimated using daily data do not need to be adjusted.

Contents

We thank Eric Lindenberg, Michael Lawley and John Chirico for helpful discussions, Brian Lee for his excellent research work, and Kim Grigas for her help in publishing this report.

Executive Summary

The cost of equity is used in many valuation applications, such as IPOs and Mergers and Acquisitions. It is also useful as an investment performance benchmark for firms considering new investments — it is the appropriate project hurdle rate when a project is equity financed.

When estimating the cost of equity using the Capital Asset Pricing Model (CAPM), two measures are debatable: the equity market risk premium (EMRP), and the exposure to market risk (beta).

We investigate various approaches to estimate the equity market risk premium and conclude that it should be regarded as a synthesis of historical and forward-looking measures. It should also be viewed as a range rather than a fixed number.

Based on our analysis, we now advocate the use of an EMRP in the range of 4.5% to 6.5% for both the United States and European markets. This range is lower than the 5% to 7.5% range we advocated in the past.

We also investigate firm-specific betas versus industry betas and conclude that industry median betas are a better (more robust) measure of a firm's exposure to market risk. Whenever possible, an industry beta, rather than a firm-specific beta, should be used to evaluate a firm's cost of equity.

Our quantitative results also suggest that — within most industries — beta coefficients are not correlated with leverage.

We measure beta coefficients over different time horizons and find them to be very stable. Therefore, when the beta coefficient estimate is reliable, there is no reason to adjust the coefficient.

Introduction

Applying the Capital Asset Pricing Model (CAPM) to estimate the cost of equity capital requires knowledge of three measures: The risk-free rate, the equity market risk premium (EMRP), and the equity beta. The first and second measures apply to all stocks, while the third, beta, is firm specific.

Equity beta is a risk index that quantifies the nondiversifiable risk associated with an equity investment. It is the multiplier (or loading) applied to the equity market risk premium. Theoretically, market risk is the only risk that entails a cost, because other firm-specific risks can be diversified away.

Of the three inputs into the CAPM equation — the risk-free rate is the easiest to measure. Because equity is a long-term investment our best measure will be the yield on the longest US Treasury bond (currently a 30-year bond).

Estimating the other two inputs is more tricky. The size of the EMRP is one of the most controversial issues in finance theory and the investment industry alike. Because EMRP should be considered as a forward-looking measure of market returns, it is rare to find market practitioners agreeing on the "right" EMRP to use.

As for beta coefficients, several different measures are referred to collectively as "beta." These include levered versus unlevered betas, raw versus adjusted betas, and beta coefficients measured over various historical horizons. The existence of these various reported measures has created some confusion: which are the appropriate measures to use analyzing the cost of equity capital?

This confusion is even more pronounced when analyzing the cost of equity capital for stocks that are not yet publicly traded — where a company's beta cannot be regressed from historical prices — as is the case with equity IPOs (initial public offerings).

We aim at shedding light on those issues, by combining a theoretical discussion with a statistical examination of the full sample of S&P 500 stocks. In particular, we address the following questions:

- What is the "right" equity market risk premium?
- Are betas stable within industry sectors?
- Does the amount of leverage affect beta within an industry sector?
- Does our estimate of beta depend on the measurement horizon?
- Should betas be adjusted?

Our report addresses these questions using an empirical study of historical returns of S&P 500 Index companies.

What Is the "Right" Equity Market Risk Premium?

The equity market risk premium (EMRP) measures the degree of excess return — above the risk-free rate — that investors require in order to hold the equity market portfolio, which is a portfolio of stocks representing aggregate holdings of all investors.

The EMRP that should be incorporated into the cost-of-equity equation is a measure of future expected returns. The problem is that future returns are unknown and there are several competing ways to estimate the EMRP. Some of these estimates look back at the past and form a statistical view as to the what the expected future return should be. Others look at current market expectations as measures of the EMRP.

What Are the Different Ways to Estimate the EMRP?

Since the EMRP is a forecast of equity returns, we apply several competing points of view to get a better understanding of this expected value.

- The Historical/Statistical View
- The Market Expectations Survey View
- The Economic View
- Population Dynamics Considerations

The Historical/Statistical View

From a statistical point of view, equity market returns are modeled as a random process that is normally distributed[1] with a mean and variance that are time-invariant. According to this view, Ibbotson Associates[2] estimates the historical EMRP and calculates the expectation of excess equity returns. This value — measured in the US market over the available horizon of more than 70 years (1926–1997) — is 7.5% per year. The number quoted for the UK market for a horizon of the past 40 years (1958–1997) is 7.2% per year.

An international sample of countries and their historical risk premiums is given in Figure 1. For each country, the EMRP for the period of 1970–1997 is given (if available). For the longer time periods given in the table, only the total geometrically averaged real market returns are available for European countries. We calculate the long-term EMRP from these returns assuming a 15% average annual standard deviation and a 2% average real interest rate.[3]

From Figure 1 we can infer that historical European EMRPs ranged between 4% and 7.3% during a period of over 70 years. In the more recent period of 1970–1997, European EMRP ranged between 3.8% and 8.6% (with the exception of Italy).

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[1] If prices x_t are log-normally distributed, then $log(x_t)$ are normally distributed. The market returns $R_t = log(x_{t+1}/x_t)$ will also be normally distributed.

[2] Ibbotson Associates. "Stocks, Bonds, and Inflation." 1997 Yearbook.

[3] To convert the geometric averages to arithmetic averages we use the formula:

(Arithmetic avg. return) = (Geometric avg. return) + ½ (return standard deviation)²

Furthermore, on a purely statistical basis, we cannot distinguish between the EMRPs of the different countries.

Figure 1. Historical Equity Market Risk Premiums for Selected Countries

Country	EMRP 1970–1997 (Arithmetic Avg.)	Long-Term Time Span	Long-Term Real Market Return (Geometric Avg.)	Long-Term Calculated EMRP (Arithmetic Avg.)
Austria	3.76			
Belgium	7.36			
Denmark	—	1923-95	4.88	4.00
France	6.13			
Germany	4.84	1924-95	4.83	3.95
Italy	1.89			
Netherlands	8.63			
Sweden	—	1926-95	7.13	6.25
Switzerland	7.99	1926-95	5.57	4.70
UK	8.29	1921-95	8.16	7.28
US	5.85	1921-95	8.22	7.34

Source: Ibbotson Associates, Jorion and Goetzman[4], and Salomon Smith Barney.

There are other shortcomings to the statistical approach. Academics argue that the historical EMRP is too high, that people are not so risk averse as to require such a high excess return (see, for example, Mehra and Prescott[5]). More recent academic work contends that historical EMRP is so high because of limited participation — not all people participate in the equity market (see Vissig-Jorgansen[6]). If we were to accept this view, and if we expect increased participation in the market in the future, then the expected EMRP should be lower than the historical average of 7.5%.

[4] Jorion, Philip and W. Goetzmann, "Global Stock Markets in the Twentieth Century," *Journal of Finance*, forthcoming.

[5] Mehra, Rajnish and Edward S. Prescott (1985), "The Equity Premium Puzzle," *Journal of Monetary Economics* 15: pp. 145–161.

[6] Vissing-Jorgansen, Annette. Review of Economic Studies. MIT thesis, 1998.

The Market Expectations Survey View

Another way of evaluating this risk premium is to look at the current market estimates used by corporations and finance firms in setting the cost of capital. An opportunity to peek into these estimates is given by a 1995 "best practices" study[7] among investment banks' mergers and acquisitions (M&A) groups and 27 leading North American corporations. This study reports that most corporations use an EMRP of about 5%, while M&A groups of investment banks clustered around 7%. Both groups, however, base their estimates on historical data rather than on forward-looking estimates.

PricewaterhouseCoopers recently polled 12 big pension fund managers in the United Kingdom as to their expected EMRP in the next 15 years.[8] Of these fund managers, seven reported EMRPs of 2%–3%, three reported a range of plus to minus 1% and two reported levels between 6%–8%.

However, we believe that, as their US investor base expands, European corporations will slowly shift their cost of equity benchmarks closer to US estimates. Global shareholders who focus on shareholder value have had a noticeable impact on European companies' tendency to use more realistic estimates of the cost of equity. Still, many European companies underestimate their cost of equity to be at levels as low as 2% or 3%[9].

The Economic View

The economic view tries to match the earnings yield to the expected real investment return on equity. The dividend discount formula relates the P/E multiple to the cost of equity k_e and the real earnings growth rate g.

$$P/E = 1 / (k_e - g) = 1 / (R + EMRP - g)$$

$$\text{or: } EMRP = E/P - (R - g)$$

Historical P/E multiples of about 14 imply a 7.2% E/P ratio. Combining this with average annual real-growth rates for the S&P 500 companies — of about 4% — results in a real annual yield of about 11.2% for the US equity market. This yield is roughly equivalent to the observed inflation-adjusted annual investment return on the stock market. Using the current forward real interest rate of 3.8% and an assumption of a 4% real-growth rate for S&P 500 company earnings results in a current EMRP estimate of 7.4% for the US market. (However, this real interest rate is very high with respect to the 2% historical average for the United States).

[7] Harvard Business Review, 1995

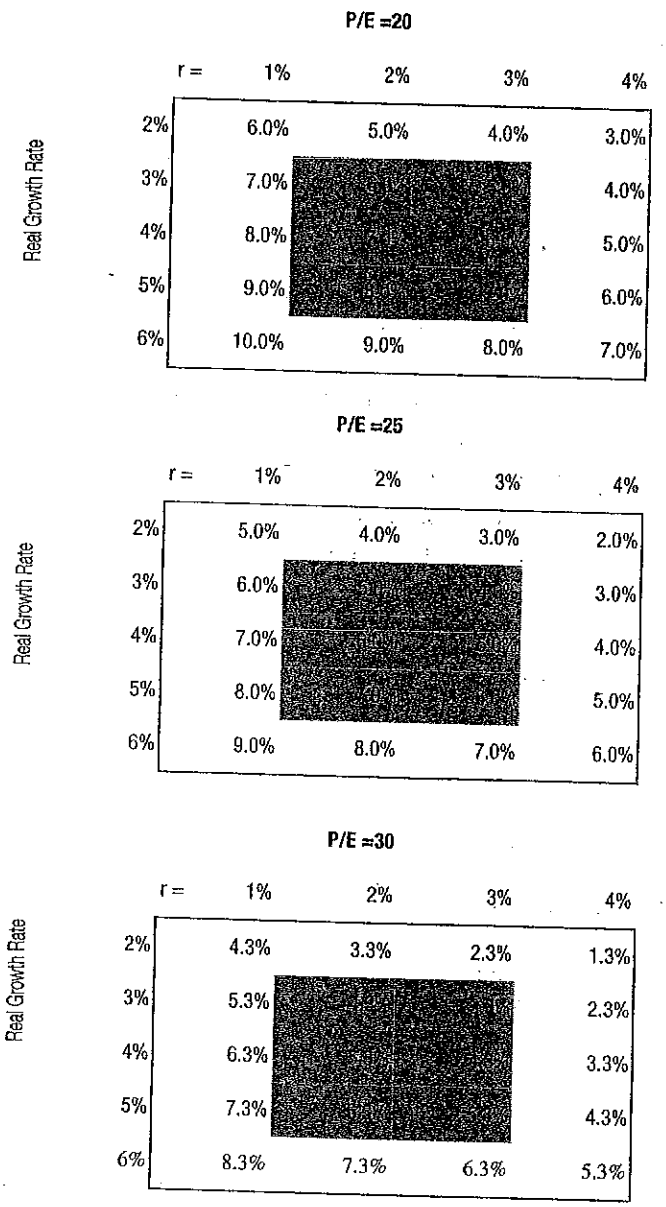
[8] Riley, Barry, "Turning the Equity Market Risk Premium Upside Down," *Financial Times*, September, 16, 1998.

[9] "European Companies, Wishing up to Shareholder Value," *Euromoney*, March 15, 1998, p. 109.

But with current P/E multiples[10] ranging between 25 and 30, and current annual real-growth estimates at 4%[11] — the implied inflation-adjusted yield on the US market is only 7.3% to 8%. Using a current real interest rate of 3.8%[12] implies an EMRP between 3.8% and 4.5%.

Figure 2 demonstrates the sensitivity of the calculated forward-looking EMRP to our assumptions regarding real-growth rates and real interest rates. The inner box illuminates the more reasonable range of growth and real interest rate assumptions.

Figure 2. EMRP as a Function of P/E, Real Interest Rates (r), and Real Growth Rates



[10] Average P/E of all S&P 500 companies, market value weighted as of January 1999.

[11] Average of I/B/E/S growth estimates for S&P 500 companies as reported in Bloomberg as of January 1999.

[12] The yield on the Treasury inflation bonds as of January 1999.

Figure 3 shows the implied EMRPs for European and the US markets using January 1999 P/E multiples. We assume a long-term real interest rate of 2% and an annual real earnings growth rate of 4%.

Figure 3. P/E Multiples and Implied EMRPs

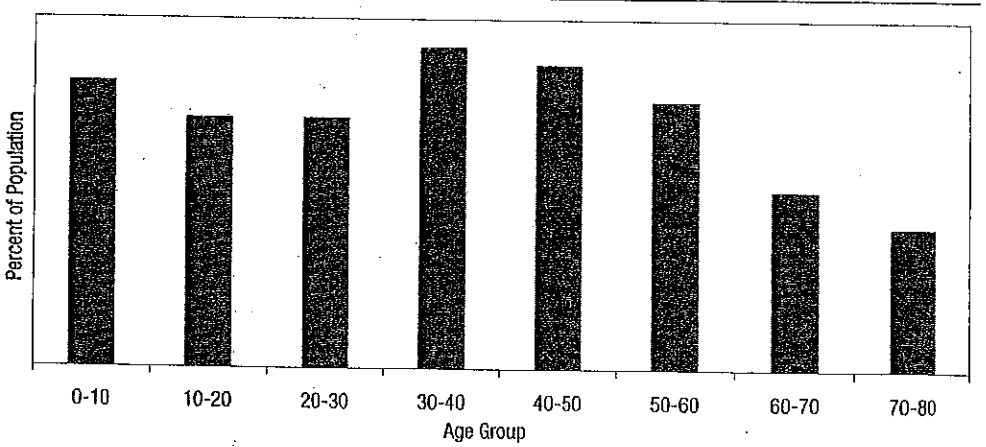
Country	Index	Current P/E	Implied EMRP
Belgium	BEL20	23.9x	6.2%
France	CAC	25.6	5.9
Germany	DAX	29.3	5.4
Italy	MIB30	30.4	5.3
Spain	IBEX	20.1	7.0
Sweden	OMX	21.0	6.8
United Kingdom	FTSE 100	22.6	6.4
United States	SP 500	28.5	5.5
Median		24.8x	6.0%

Source: Salomon Smith Barney.

Population Dynamics

Why is current EMRP lower than past estimates? Is it the result of temporally overvalued equity markets, or is there a fundamental reason? The reasons — according to a recent analysis by McKinsey and Co.[13] — are (1) increased demand for financial assets caused by the aging of the baby boom generation; and (2) a decreased supply of government securities as public sectors in developed countries reign-in their spending. The combined effect of these changes is that the equity market now commands a lower premium.

Figure 4. The Generation Wave (Values Given for Demonstration Only)



Source: Salomon Smith Barney.

[13] Quoted from Bryan, Lowell L. "Managers Journal: Stocks Overvalued ? Not in the New Economy," *The Wall Street Journal*, November 3, 1997.

The EMRP Is a Range

We believe that EMRP used in practice should be viewed as a range — rather than any one number. The arguments we outline here support a range that is currently between 4.5% and 6.5%. Ideally, the cost of equity should be estimated using EMRP values within this range. Furthermore, we do not see a compelling reason for applying an EMRP for European markets that is different from that applied to the US market.

Are Betas Stable Within Industry Sectors?

Our next step is to evaluate the beta coefficients within industry segments. Our methodology involves estimating betas by regressing the daily returns of S&P 500 companies against market returns, with the market returns represented by the S&P500 index return.

For companies that have such history available, we use daily returns going back as far as eight years (1991–1998). Using such a long series of daily data allows us to achieve tight confidence intervals for the estimated beta coefficients.

Figure 7 in Appendix A contain detailed results about S&P 500 company betas within broad industry segments,[14] with each industry segmented shown on a separate graph. For each company in the graphs, we provide beta estimates using the 1991–1998 sample period.[15] We also provide the 95% lower and upper confidence intervals for the beta estimates. We plot the industry median on each industry graph. This allows us to compare betas for the companies in each industry against the median beta for that industry sector.

We can see from the industry graphs that for most industries the median falls within the confidence interval of an individual company's beta estimate (or very close to it). There are, however, some outliers (e.g., Microsoft in the Packaged Software sector).

The industry sectors that do not obey this rule are Commercial Banking, Insurance and Department Stores.

Figure 5 contains a more detailed description of beta coefficients by industry. In addition to the industry median coefficient, we provide the range of outliers and discuss specific issues within that industry.

[14] We have used the major (two-digit) SIC industry sector classification, with some required modifications.

[15] For companies that do not have sufficient history, we use all available history from 1998 backward.

Figure 5. Beta Coefficients by Industry

Industry Segments (Beta-Sorted)	Levered[a] Median Beta	Low Limit	High Limit	Unlevered Median Beta	Low Limit	High Limit	Comments
Electric and Gas Utilities	0.538 0.029	0.342	0.787	0.470 0.021	0.344	0.674	WMB, which has telecom operations, has a higher beta. CGP has considerable Oil Exploration activities.
Crude Petroleum and Natural Gas	0.619 0.047	0.532	0.805	0.568 0.038	0.506	0.737	
Petroleum Refining	0.663 0.033	0.494	0.802	0.610 0.029	0.475	0.787	UCL is partly a Petrochemical company and has a higher beta.
Newspapers & Printing	0.758 0.036	0.691	0.859	0.719 0.033	0.625	0.844	DJ has greater exposure to the financial sector and thus a higher beta.
Chemicals	0.804 0.036	0.599	1.005	0.749 0.032	0.573	0.941	MTC is closer to being a pharmaceutical company and has a higher beta. KMG has significant Oil Exploration activities and has a lower beta.
Communication Services	0.808 0.037	0.665	1.071	0.761 0.032	0.625	0.991	FON, T, and WCOM are international carriers and have higher betas then RBOCs.
Food	0.807 0.033	0.690	0.931	0.765 0.030	0.663	0.931	OAT's lagging stock performance in a rising market contributes to its lower beta.
Aircraft and Motor Vehicle Parts	0.828 0.039	0.724	0.860	0.724 0.033	0.539	0.967	BA is in the more cyclical commercial aircraft business and has a higher beta. GD, which has longer-term defense contracts, has a lower beta.
Metals	0.846 0.048	0.612	1.142	0.781 0.040	0.556	0.962	
Paper	0.849 0.039	0.780	0.891	0.703 0.030	0.667	0.849	
Insurance	0.855 0.040	0.435	1.178	0.794 0.035	0.433	1.136	Health insurers such as CNC and UNH have higher betas. Property and Casualty insurers such as CINF, PGR, SPC, and SAFC have lower betas.
Department Stores	0.961 0.049	0.775	1.213	0.801 0.041	0.684	1.153	Discount department stores such as WMT, DH, S, and KM have higher betas.
Commercial Banks	1.047 0.039	0.504	1.376	0.744 0.026	0.502	1.139	Money Center banks have higher betas than regional banks.
Auto Manufacturers	1.049 0.053	0.986	1.157	0.816 0.033	0.603	0.920	
Pharmaceuticals	1.073 0.038	0.773	1.141	1.053 0.036	0.749	1.134	AGN is concentrated in the contact lens business and has a lower beta.
Semiconductors	1.402 0.075	1.344	1.642	1.348 0.070	1.253	1.567	MU has a strong exposure to the volatile RAM business and a higher beta.
Packaged Software	1.407 0.075	1.315	1.565	1.407 0.075	1.315	1.560	
Computer Hardware	1.413 0.074	1.000	1.604	1.398 0.071	0.910	1.595	IBM has a strong service component. And has a lower beta. AAPL suffered a long distress period and has a lower beta.

[a] Industry average standard deviations are given below beta estimates.

Source: Salomon Smith Barney.

Figure 6 contains beta values for industry segments, measured using daily data over a horizon of up to eight years. The Figure also contains equity risk premiums, calculated using market risk premiums of 4.5%, 6%, and 7.5%.

Figure 6. Industry by Industry Betas and Equity Risk Premiums

Industry (SIC 2-Digit)	Median Beta	4.50 (%)	6.00 (%)	7.50 (%)
Elec and Gas Utils	0.54	2.40	3.20	4.00
Crude Petr and Nat Gas	0.62	2.80	3.70	4.60
Petroleum Refining	0.66	3.00	4.00	5.00
Newspapers & Printing	0.76	3.40	4.50	5.70
Chemicals	0.80	3.60	4.80	6.00
Communication Services	0.81	3.60	4.80	6.10
Food	0.81	3.60	4.80	6.10
Aircraft and Motor Vehicle Parts	0.83	3.70	5.00	6.20
Metals	0.85	3.80	5.10	6.30
Paper	0.85	3.80	5.10	6.40
Insurance	0.86	3.80	5.10	6.40
Department Stores	0.96	4.30	5.80	7.20
Commercial Banks	1.05	4.70	6.30	7.90
Auto Manufacturers	1.05	4.70	6.30	7.90
Pharmaceuticals	1.07	4.80	6.40	8.00
Semiconductors	1.40	6.30	8.40	10.50
Packaged Software	1.41	6.30	8.40	10.60
Computer Hardware	1.41	6.40	8.50	10.60

Source: Salomon Smith Barney.

Does the Amount of Leverage Affect Beta Within an Industry Sector?

Figure 9 in Appendix C shows our S&P 500 company-by-company betas plotted against their most recent debt-to total- capitalization ratios (measured by their current market value).

Even though the degree of leverage changes considerably within industry sectors — it does not seem to be correlated with our measurements of levered betas.

This suggests that the *levered* cost of equity tends to be stable within industry. A possible explanation is that companies optimize their capital structure given the equity beta, which is determined by the industry. While not ruling out the current practice of calculating a company beta (delevering peer betas, averaging asset over all peers and relevering), we think that averaging *levered* peer betas of companies within an industry should yield a valid result.

Figure 10 displays our panel of S&P 500 companies by industry, this time using unlevered beta coefficients.

Does Our Estimate of Beta Depend on the Measurement Horizon?

In Figure 10, we compare beta coefficients for our panel of S&P 500 companies, taken over histories of one year, two years, and five years, going from the end of 1997 backwards.

Figure 10 suggests that betas measured over varying horizons are very close to each other, with five-year betas explaining more than 90% of the variation of two-year betas, and two-year betas explaining over 90% of the variation of one-year betas. Even when five- and one-year betas are regressed against each other, five-year betas still explain almost 80% of the variation in five-year betas.

Should Betas Be Adjusted?

Beta coefficients measured over shorter time horizons and with less frequent data are often adjusted using the Value-Line method. The reason for this adjustment is an assumption that betas measured over shorter horizons tend to deviate more from the market beta of one. The adjustment pulls the estimate toward the market beta.

Our results, however, provide evidence that betas measured over shorter time horizons are still very close to those measured over longer horizons. Our beta-on-beta regressions yield slope coefficients that are very close to one. This suggests that as long as daily data are used, it is not necessary to adjust the resulting beta estimate toward one, even when measuring betas over shorter time horizons.

We think that the major reason that our results do not have to be adjusted is because we use daily regressions — which give us very tight confidence intervals.

Conclusions

- We have examined the equity market risk premium that should be used in evaluating the cost of capital. As a forward-looking measure, it should be viewed as a range rather than any fixed number. The range is currently between 4.5% and 6.5% per year.
- Firm beta coefficients vary according to the industry and firm-specific exposure to market risk. We presented evidence that company-by-company beta coefficients for S&P 500 companies are stable within broad industry segments. We view this as support for our hypothesis that beta coefficients are driven by industry — rather than by firm-specific factors.
- The immediate implication of this result is that, in most cases, the *median* industry beta coefficient — rather than a company's own beta coefficient — can and should be used to determine a company's cost of equity.
- We also find that — for most industries — a correlation between beta coefficients and leverage is absent. This result is most striking for industries in which leverage varies considerably between industry peers.
- We view this result as evidence that — when choosing capital structure — companies tend to take their levered cost of equity as fixed by their industry segment. Capital structure is optimized to match the inherent industry cost of equity.
- Finally, our empirical evidence also suggests that a company's beta remains stable when measured over varying time horizons. We view this as evidence in favor of using *raw* rather than *adjusted* betas when evaluating the cost of equity capital.

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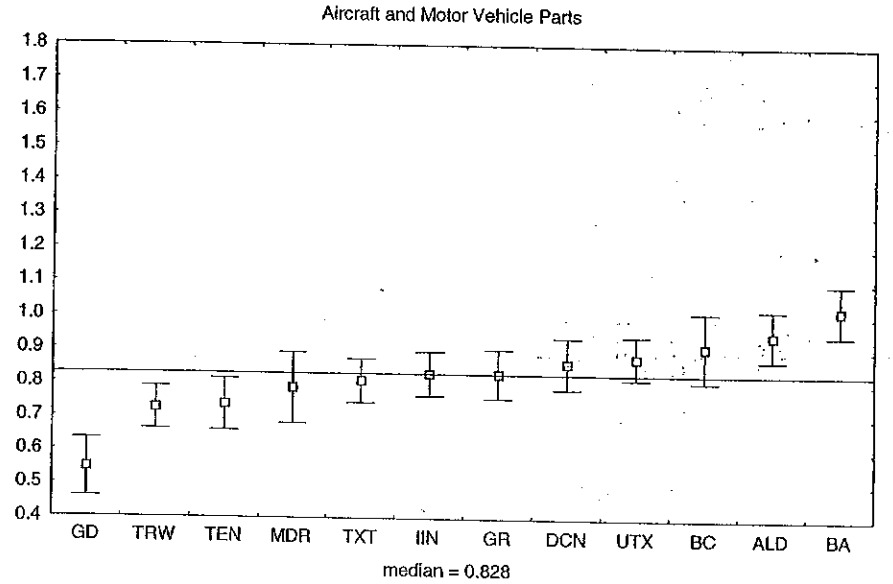
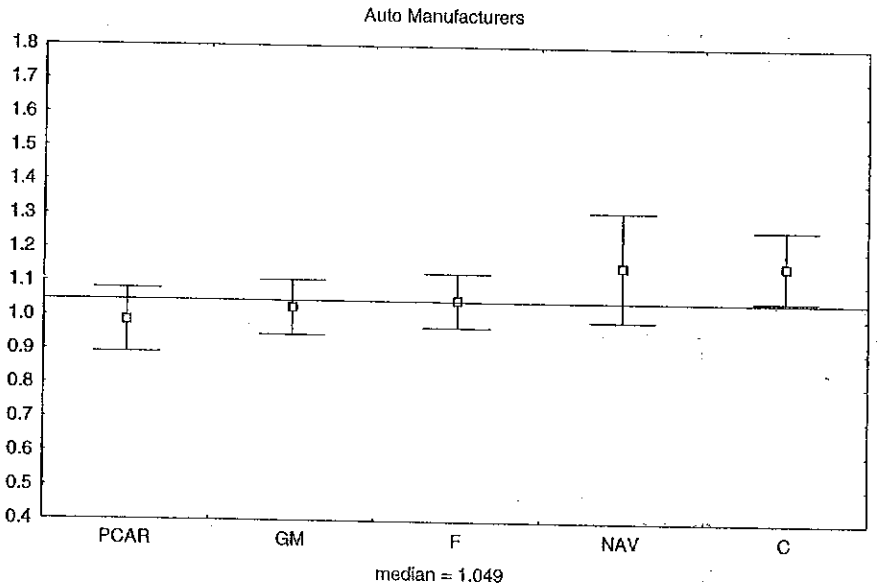
Appendix A

Company-specific equity betas are almost always indistinguishable from industry-median equity betas.

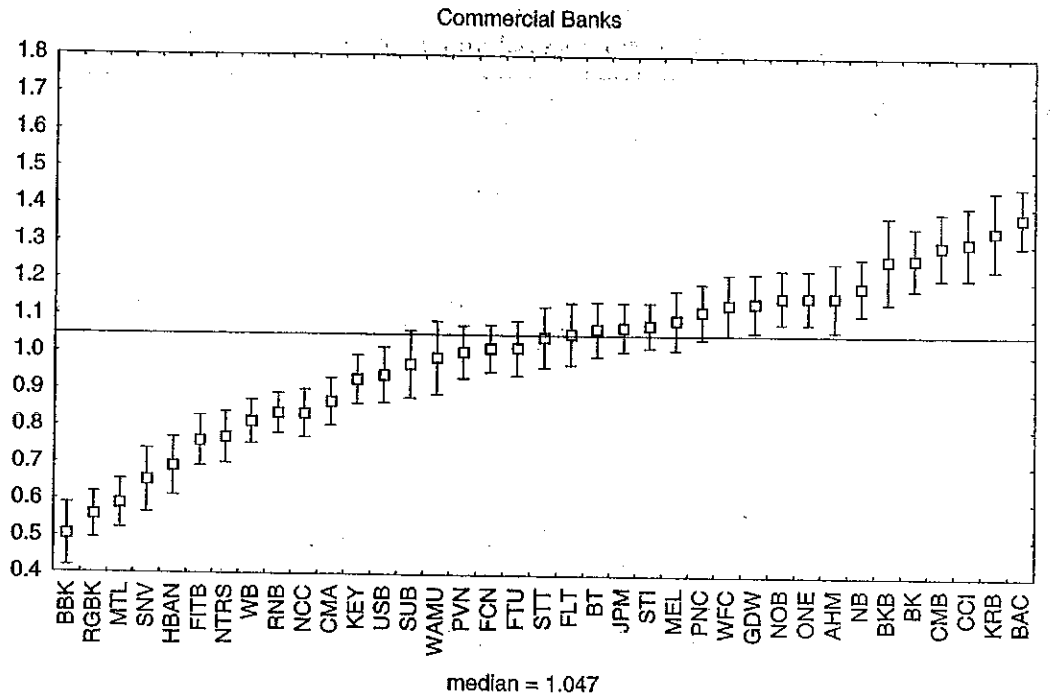
Figure 7. Industry/Beta for Companies (All Sectors)

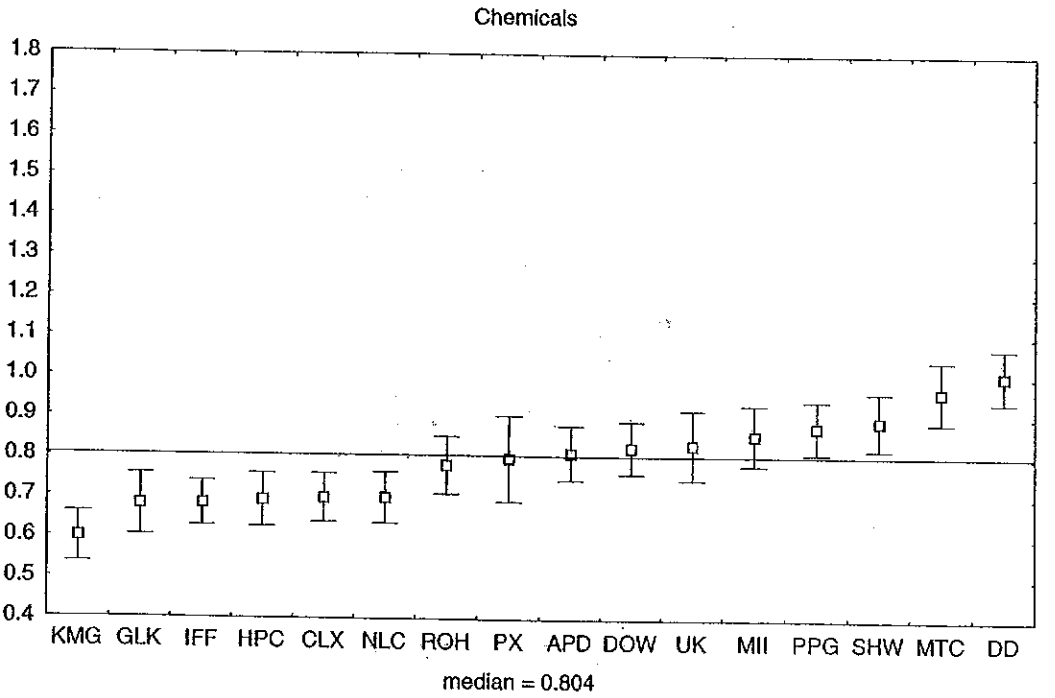




Source: Salomon Smith Barney.

Figure 7. Industry/Beta for Companies (All Sectors) (Continued)





Source: Salomon Smith Barney.

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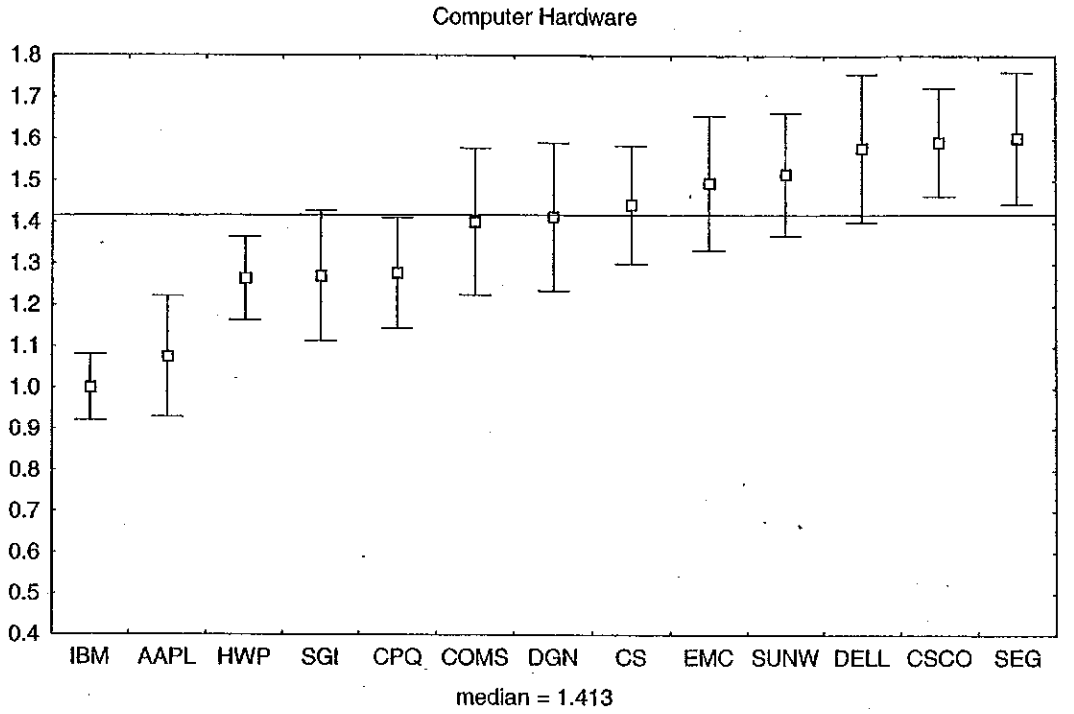

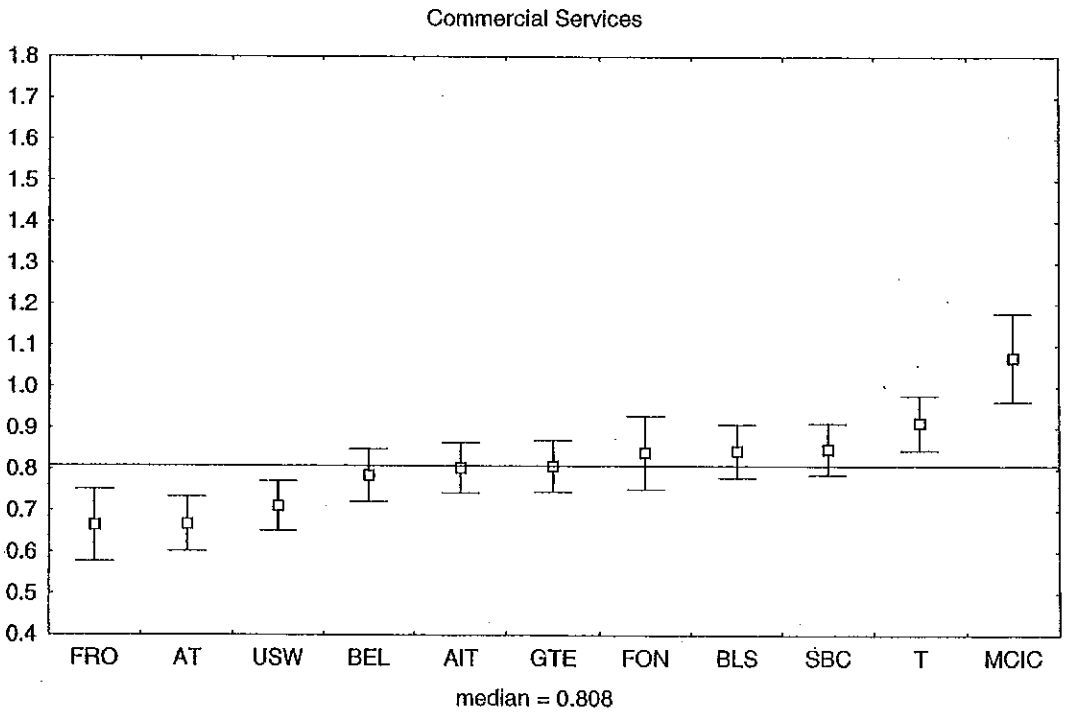

Source: Salomon Smith Barney.

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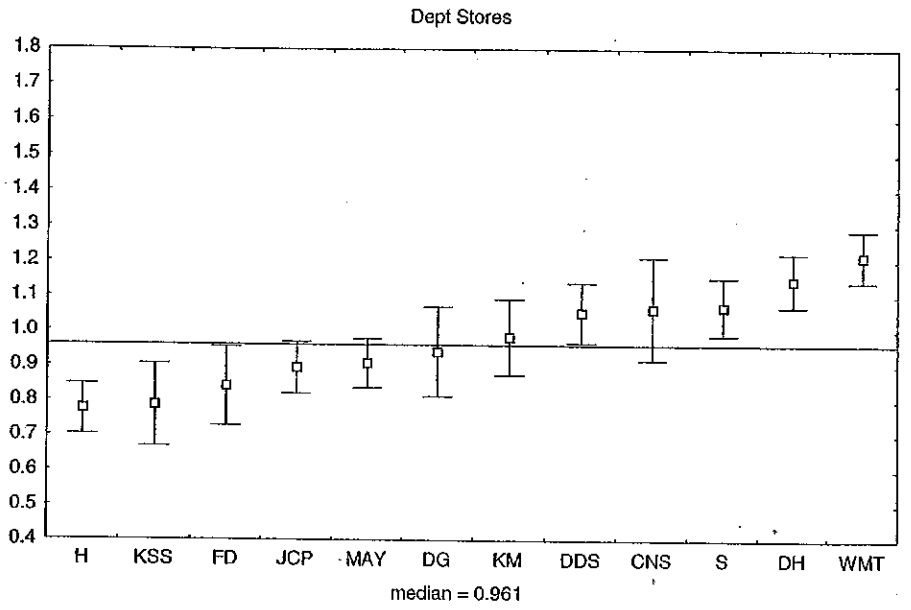
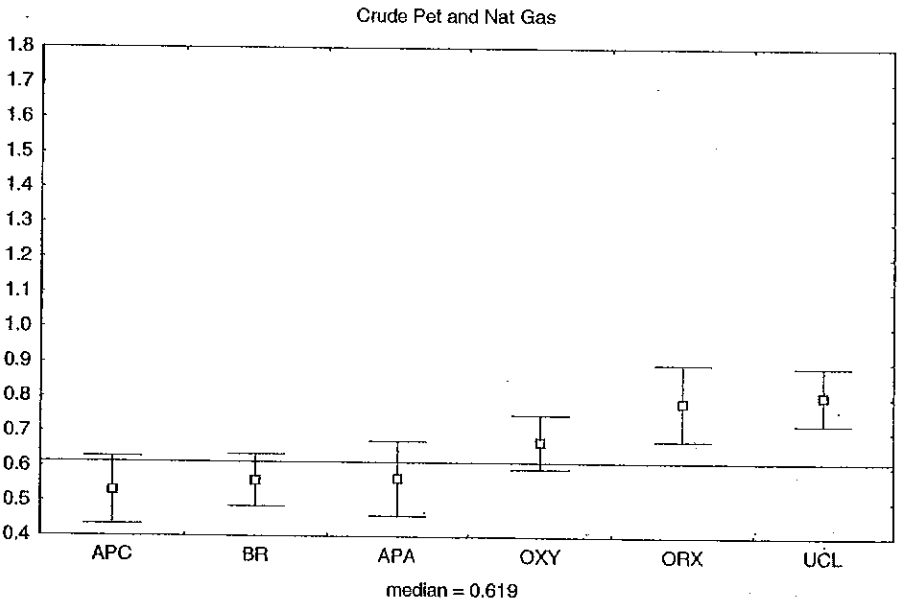
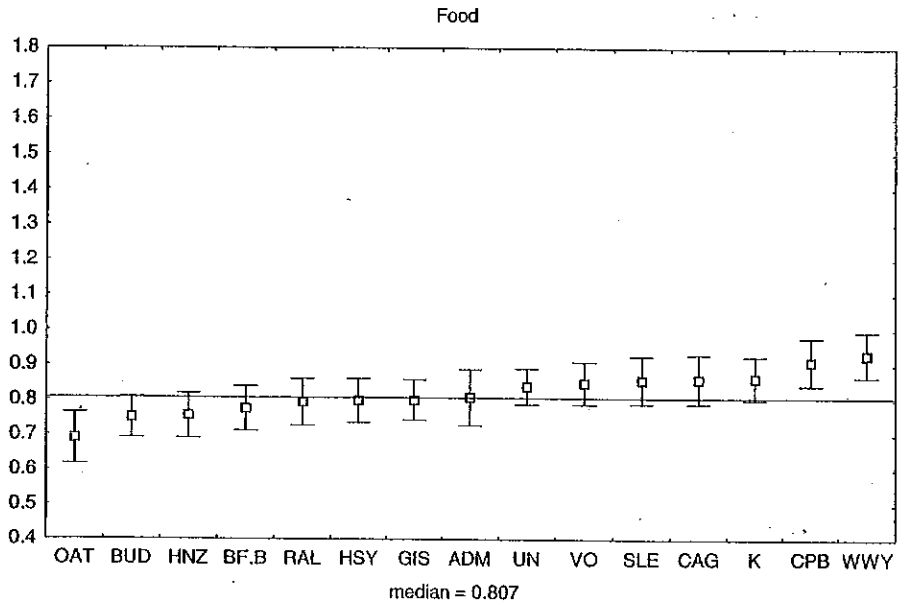
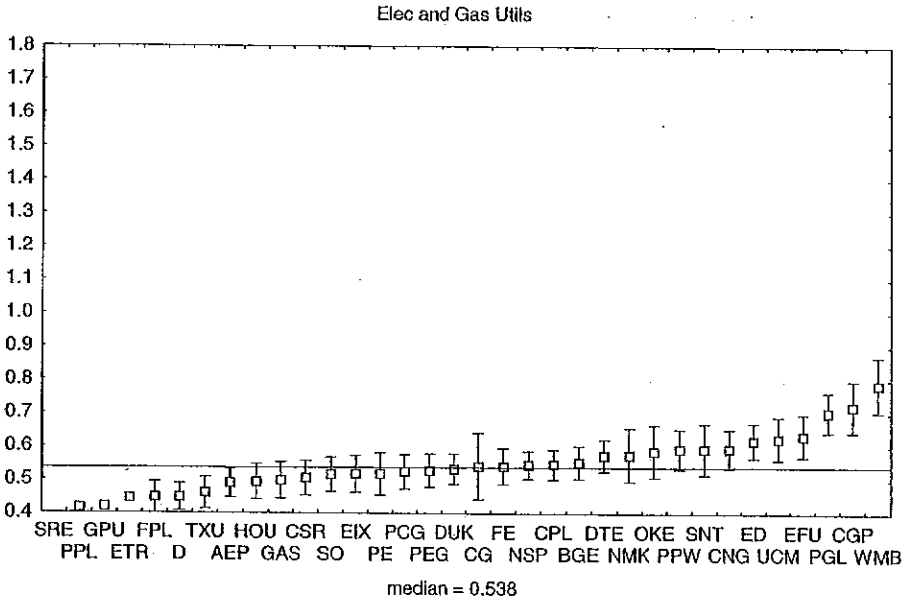




Source: Salomon Smith Barney.

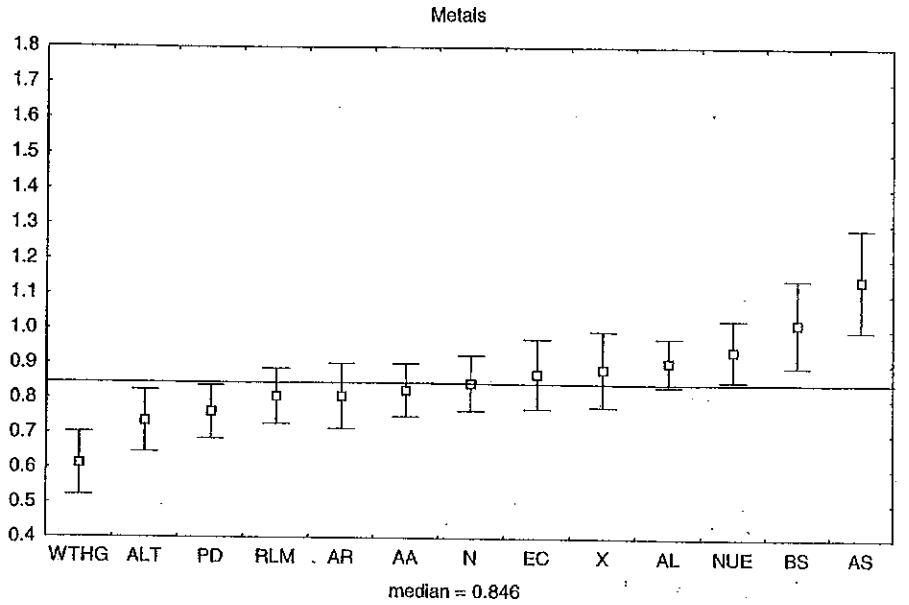
Figure 7. Industry/Beta for Companies (All Sectors) (Continued)

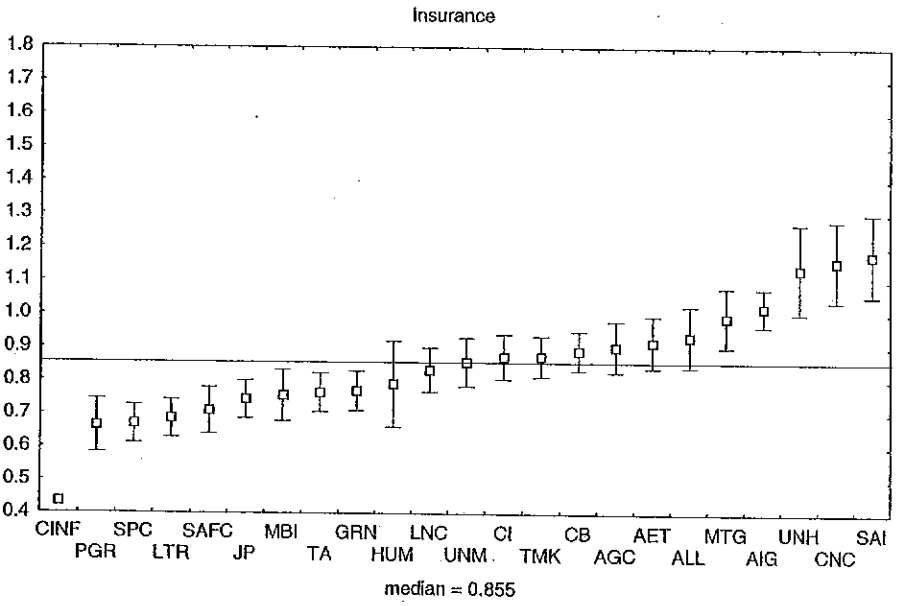




Source: Salomon Smith Barney.

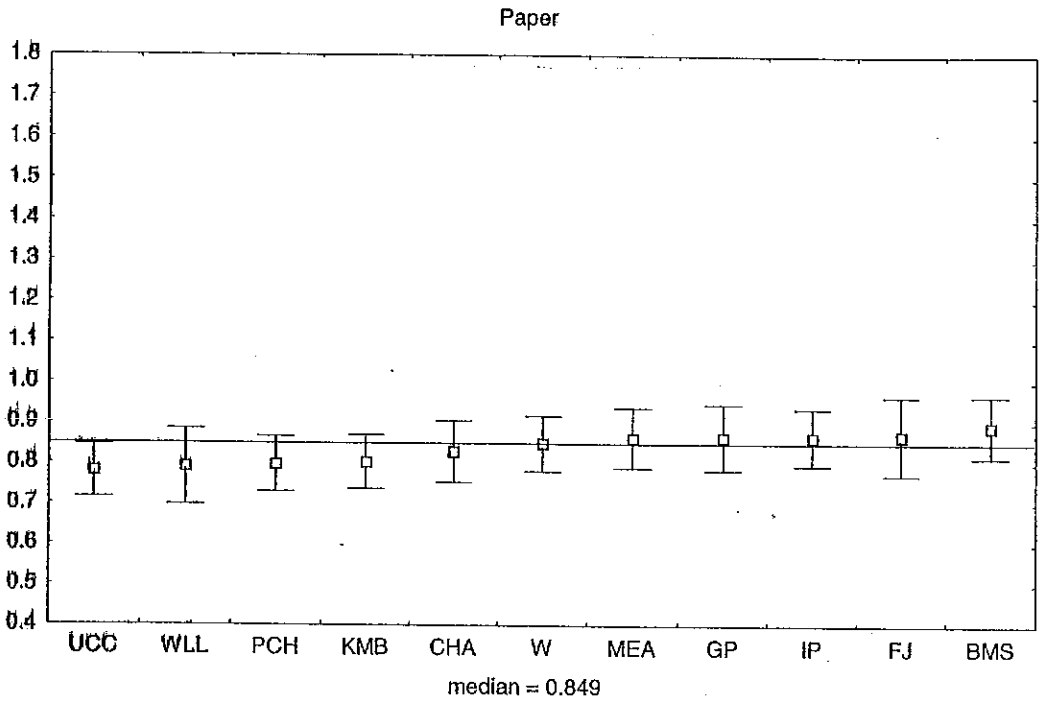
Figure 7. Industry/Beta for Companies (All Sectors) (Continued)

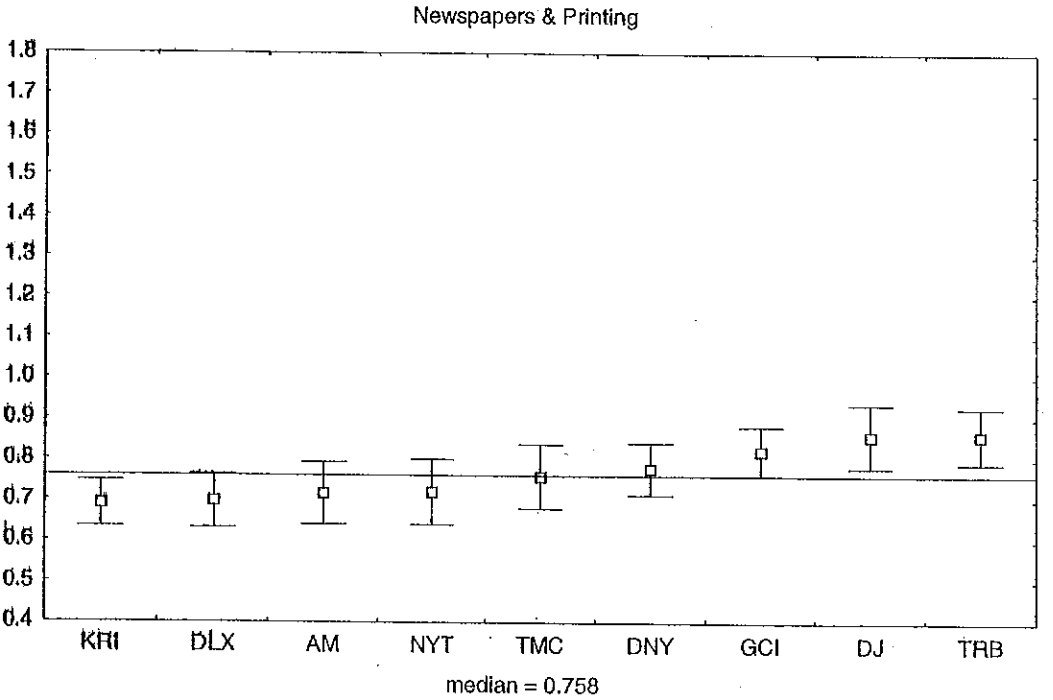




Source: Salomon Smith Barney.

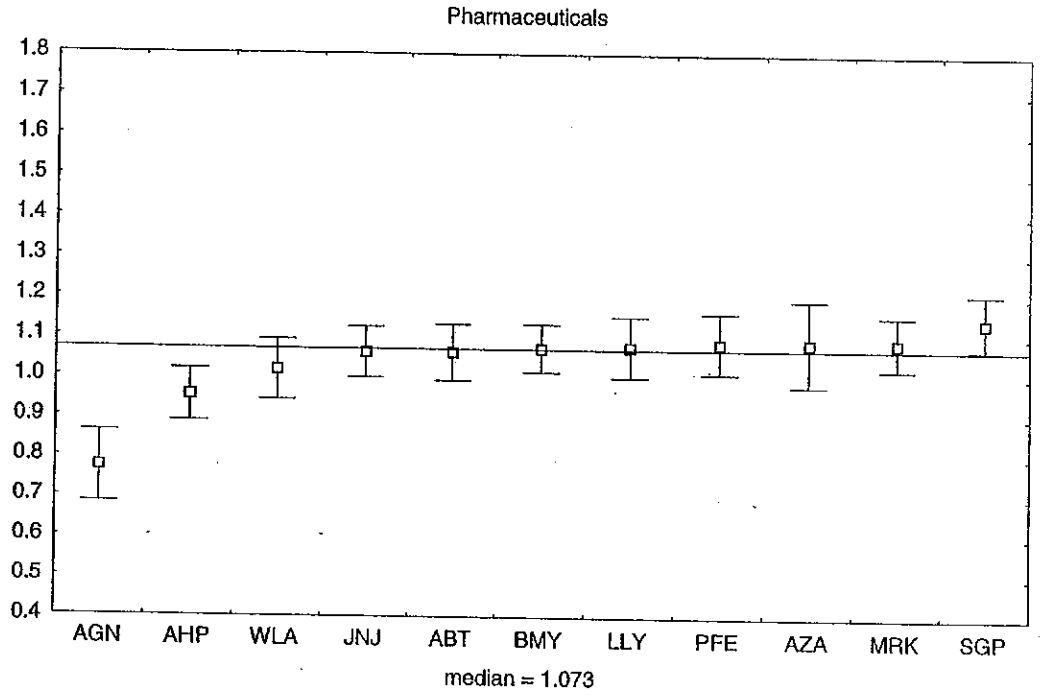
Figure 7. Industry/Beta for Companies (All Sectors) (Continued)

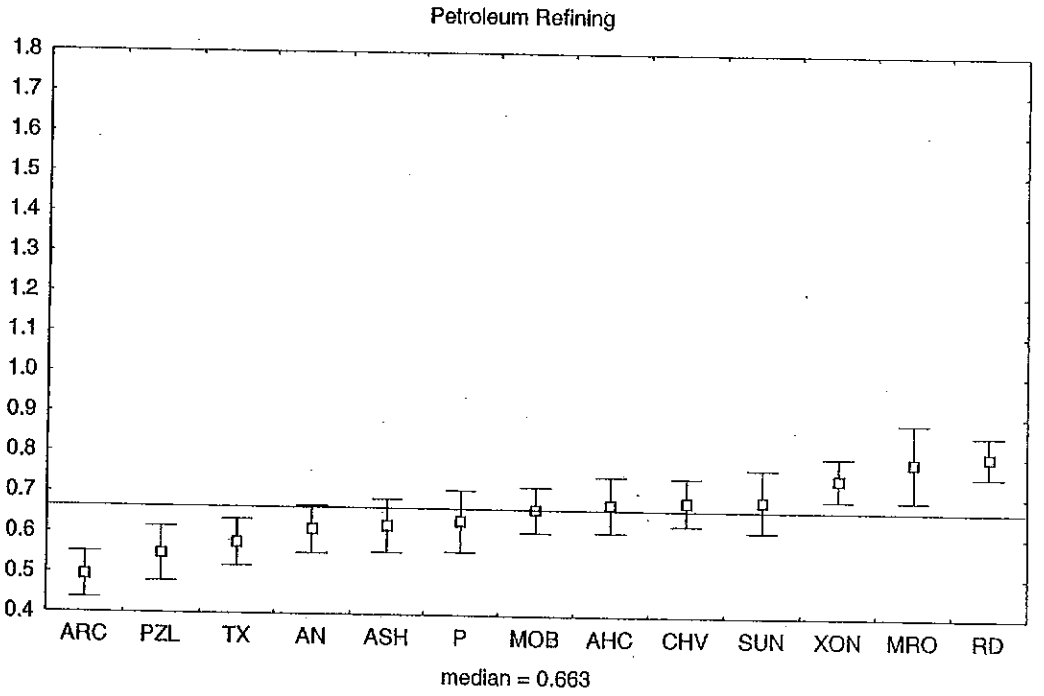




Source: Salomon Smith Barney.

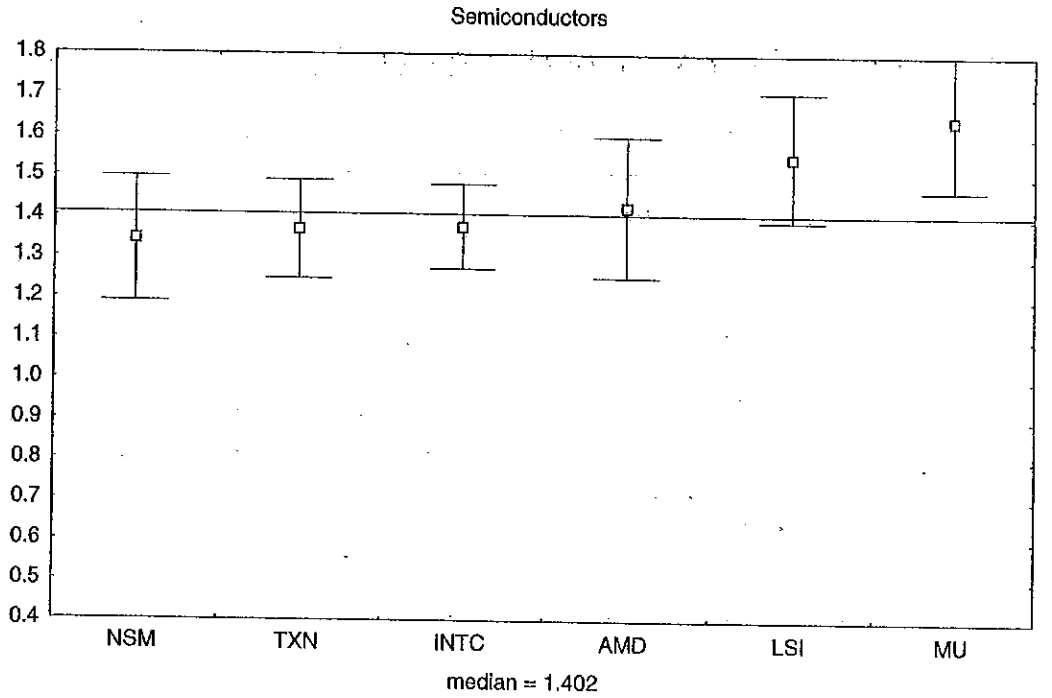
Figure 7. Industry/Beta for Companies (All Sectors) (Continued)

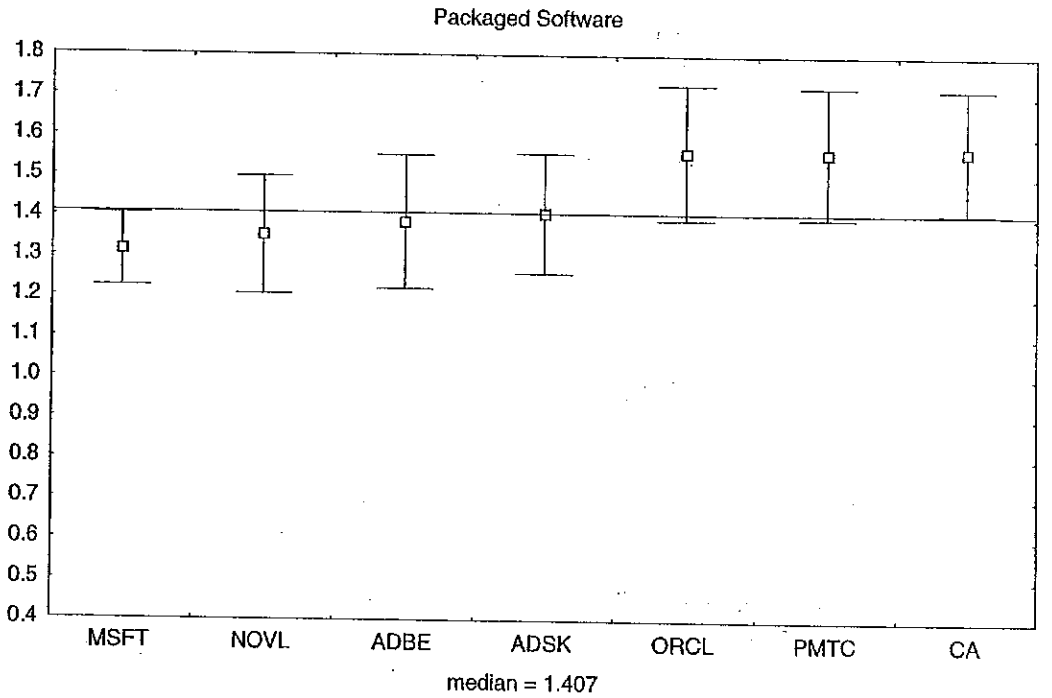




Source: Salomon Smith Barney.

Figure 7. Industry/Beta for Companies (All Sectors) (Continued)



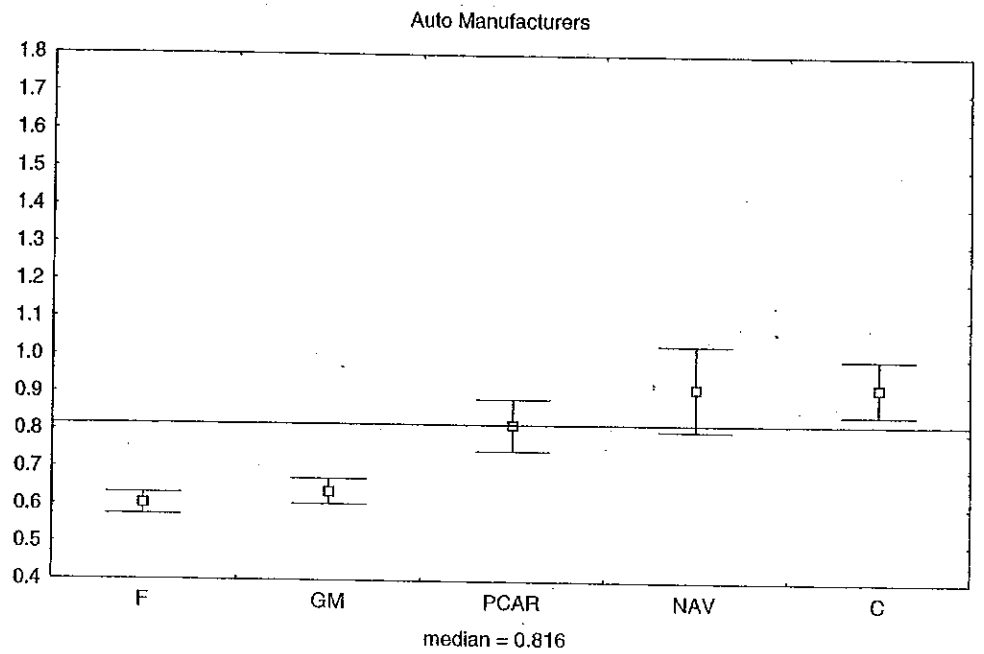


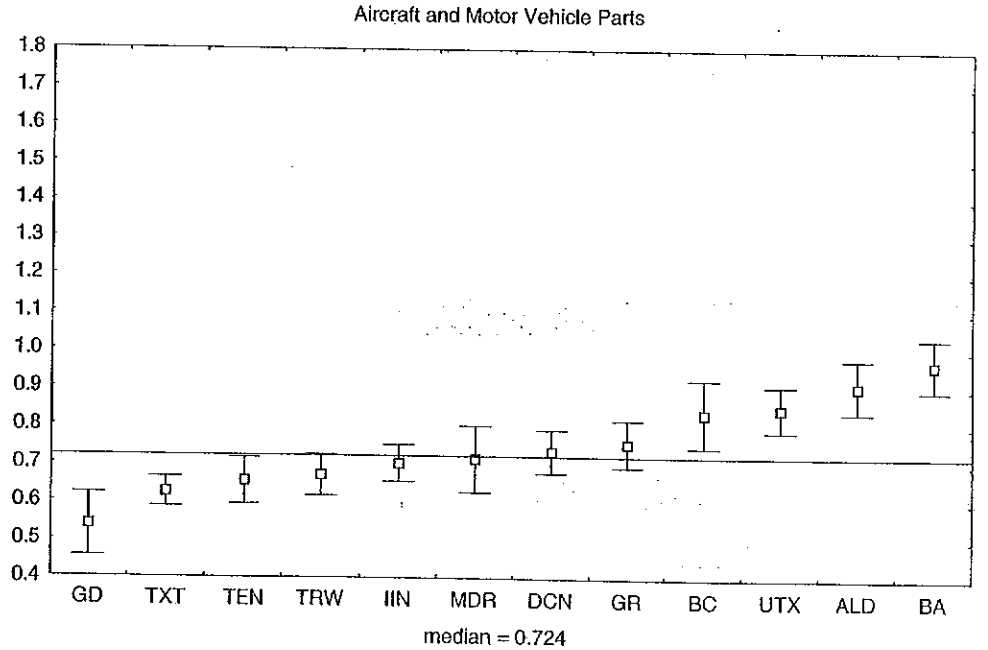
Source: Salomon Smith Barney.

Appendix B

Although company-specific asset betas are more dispersed than levered betas, they still fall very close to industry medians.

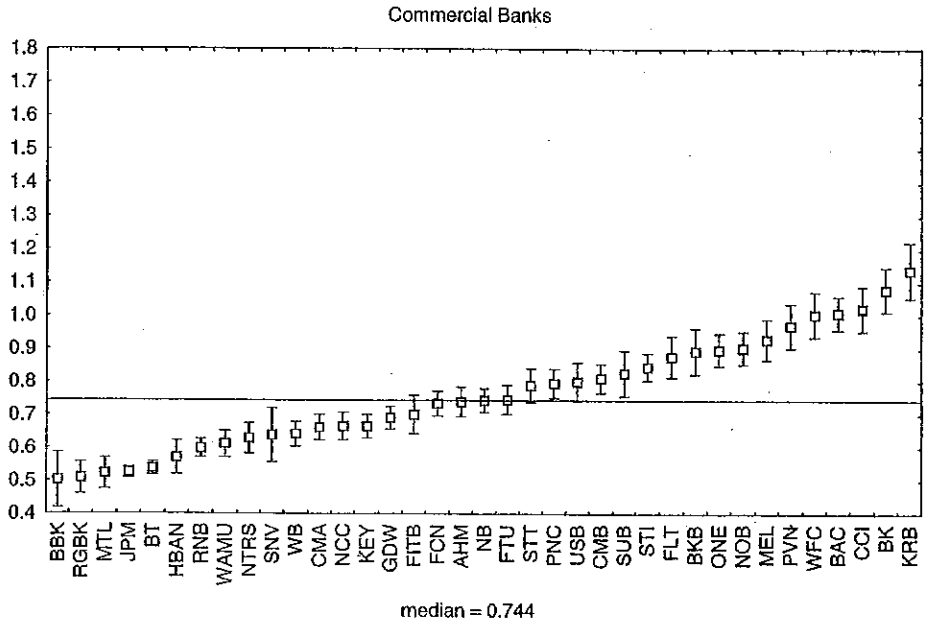
Figure 8. Unlevered Asset Betas

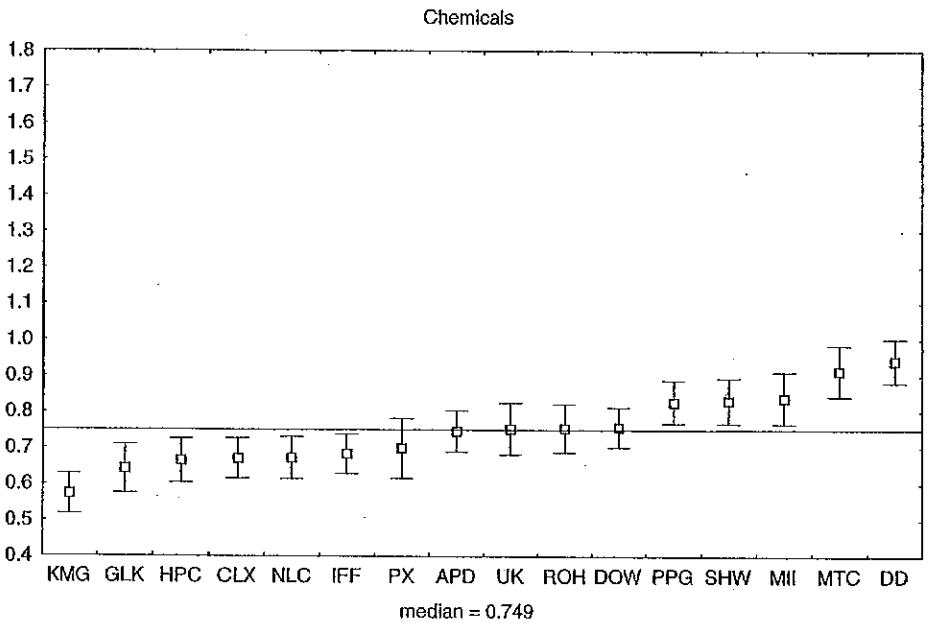




Source: Salomon Smith Barney.

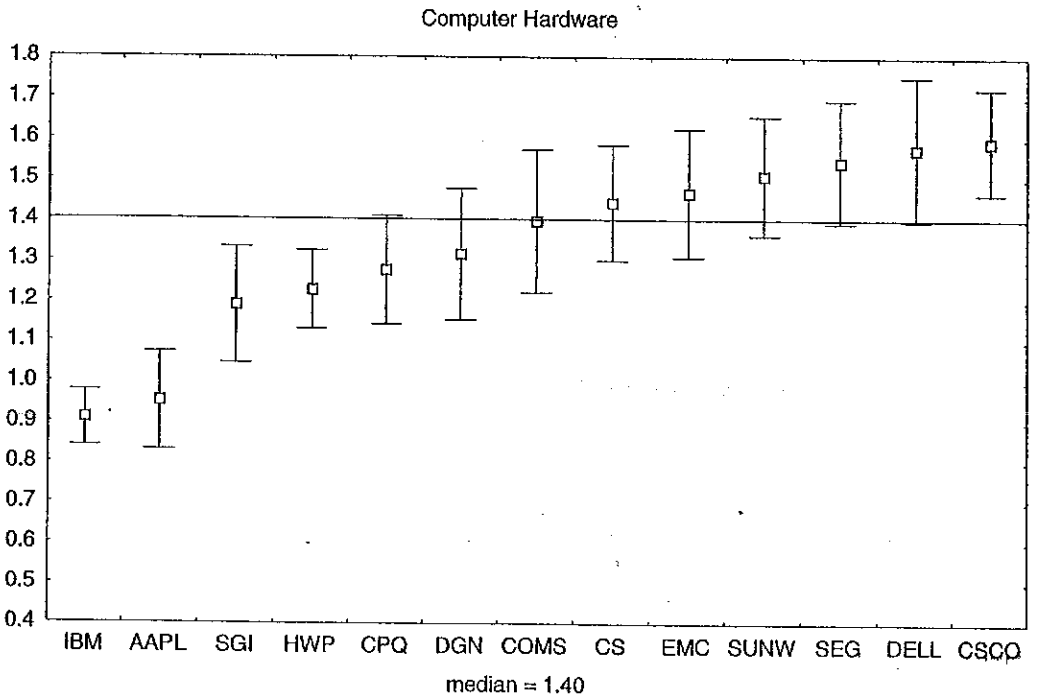
Figure 8. Unlevered Asset Betas (Continued)

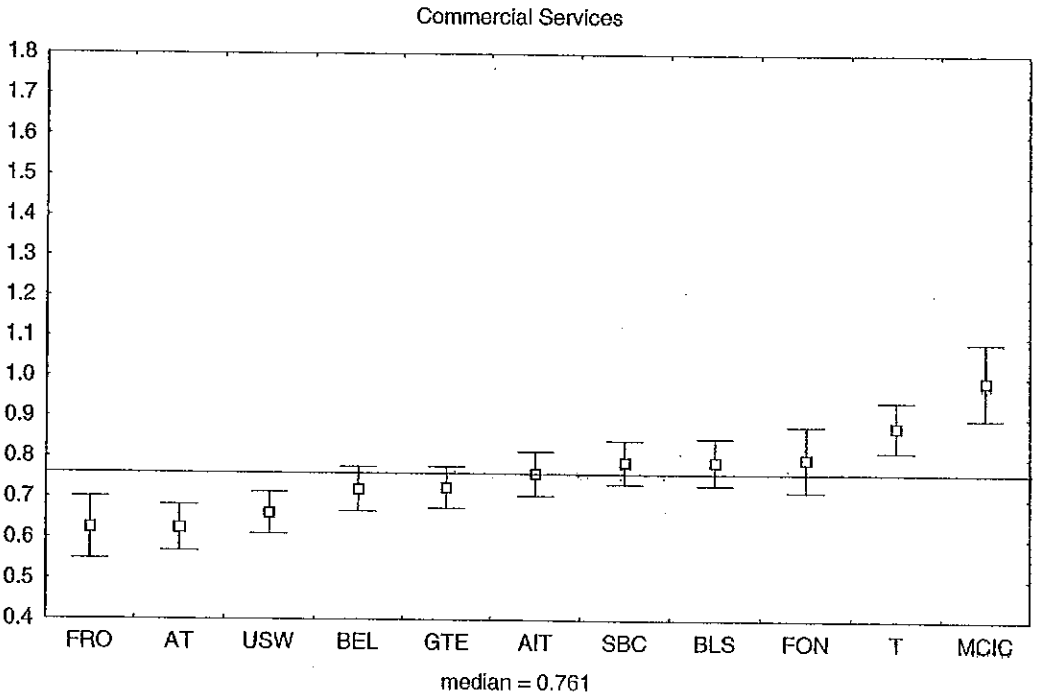




Source: Salomon Smith Barney.

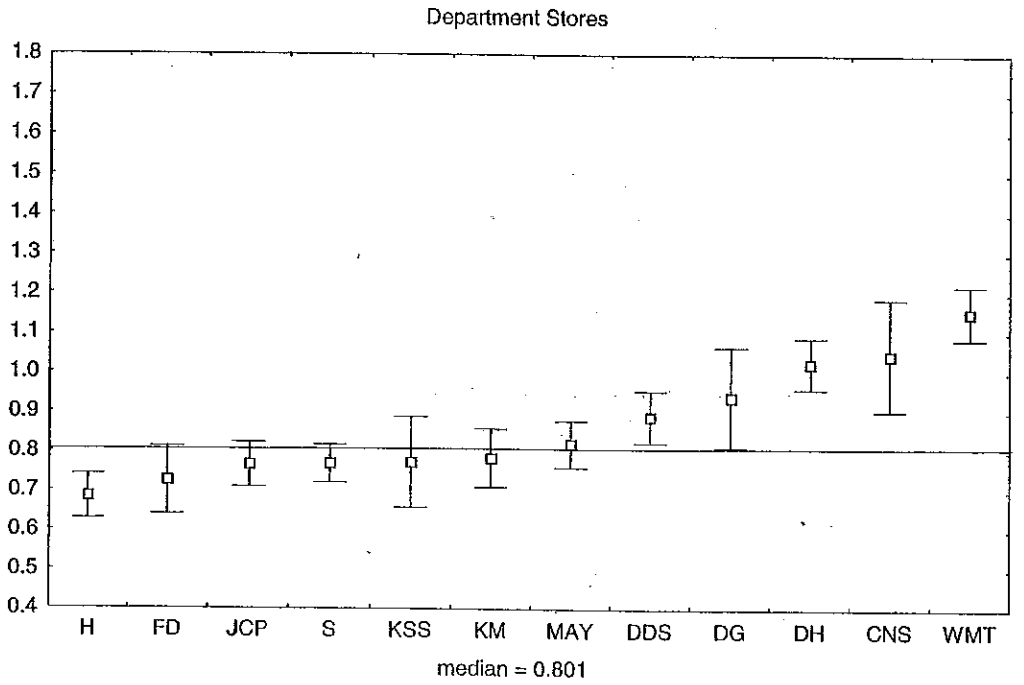
Figure 8. Unlevered Asset Betas (Continued)

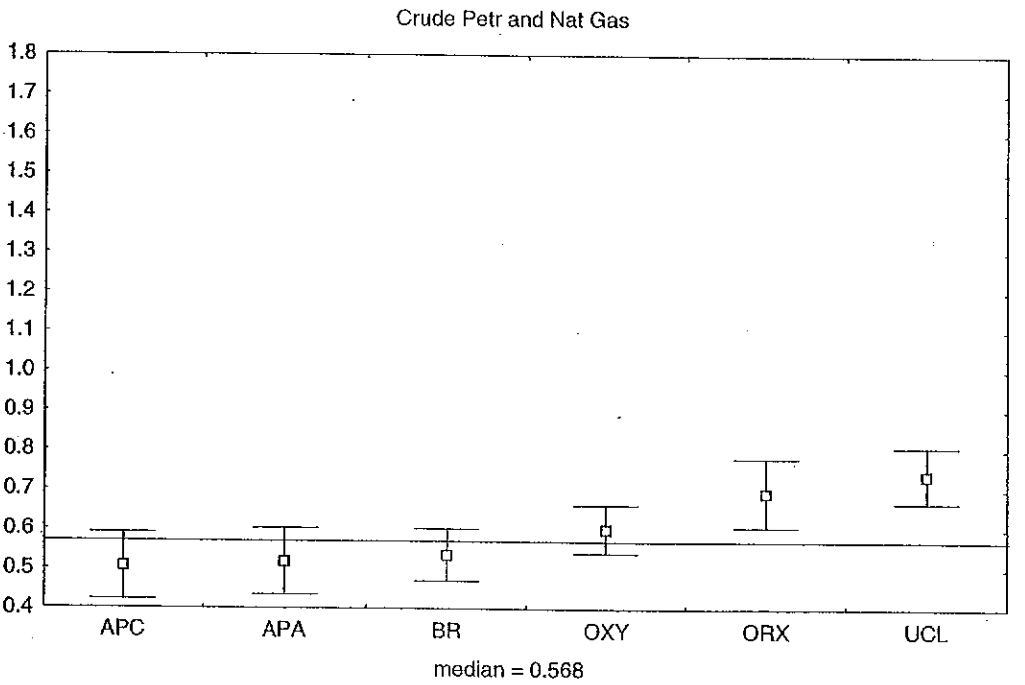




Source: Salomon Smith Barney.

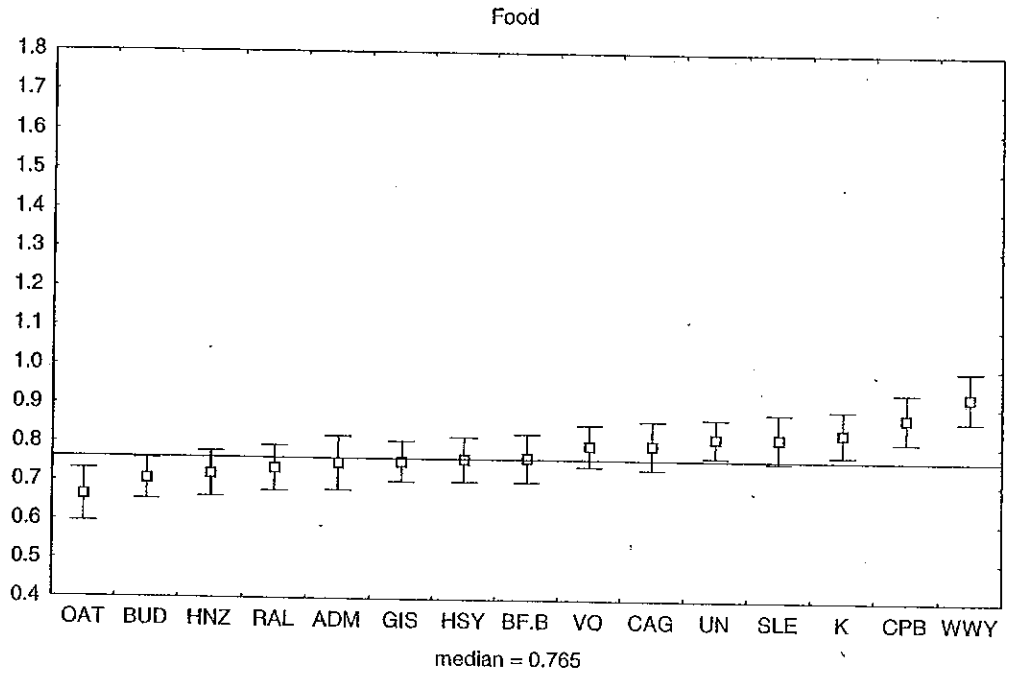
Figure 8. Unlevered Asset Betas (Continued)

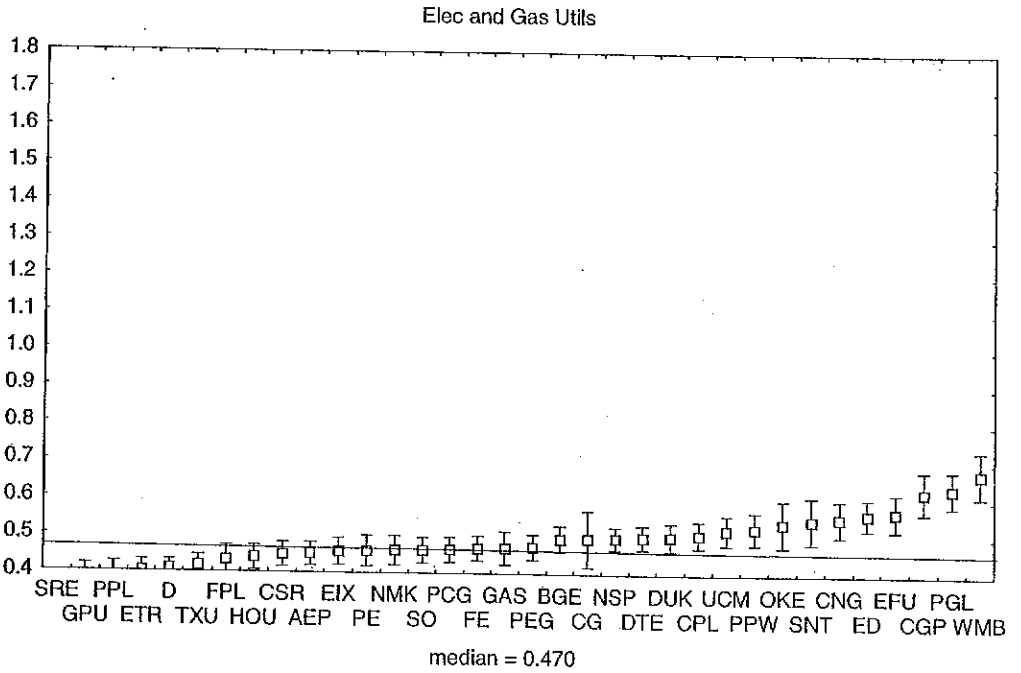




Source: Salomon Smith Barney.

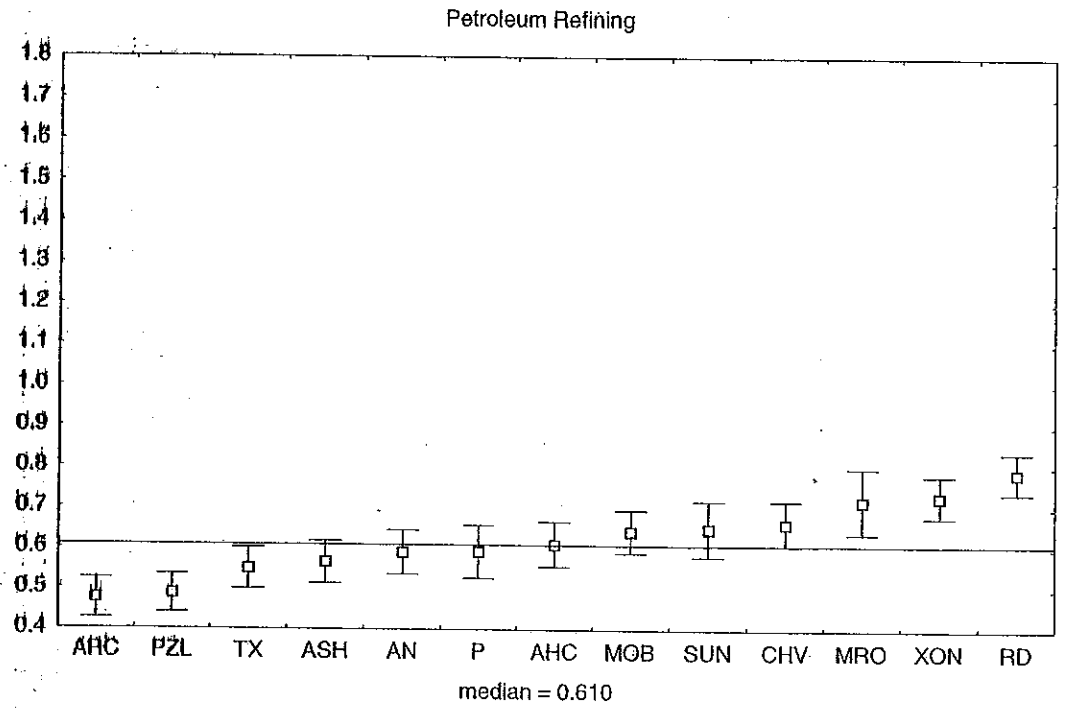
Figure 8. Unlevered Asset Betas (Continued)

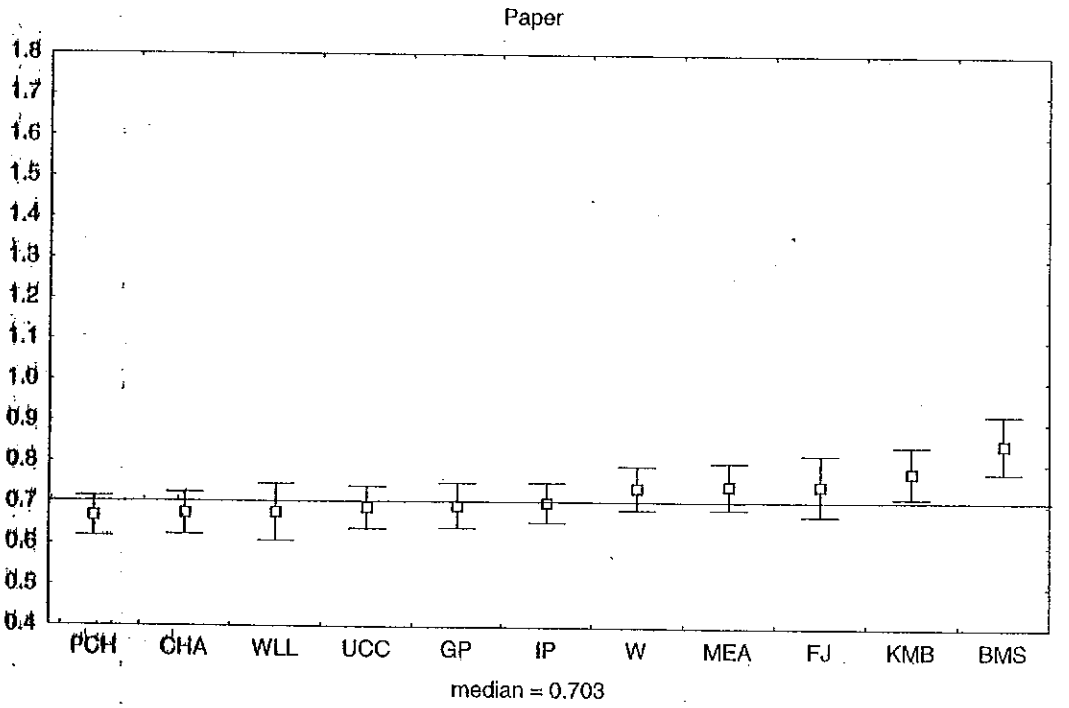




Source: Salomon Smith Barney.

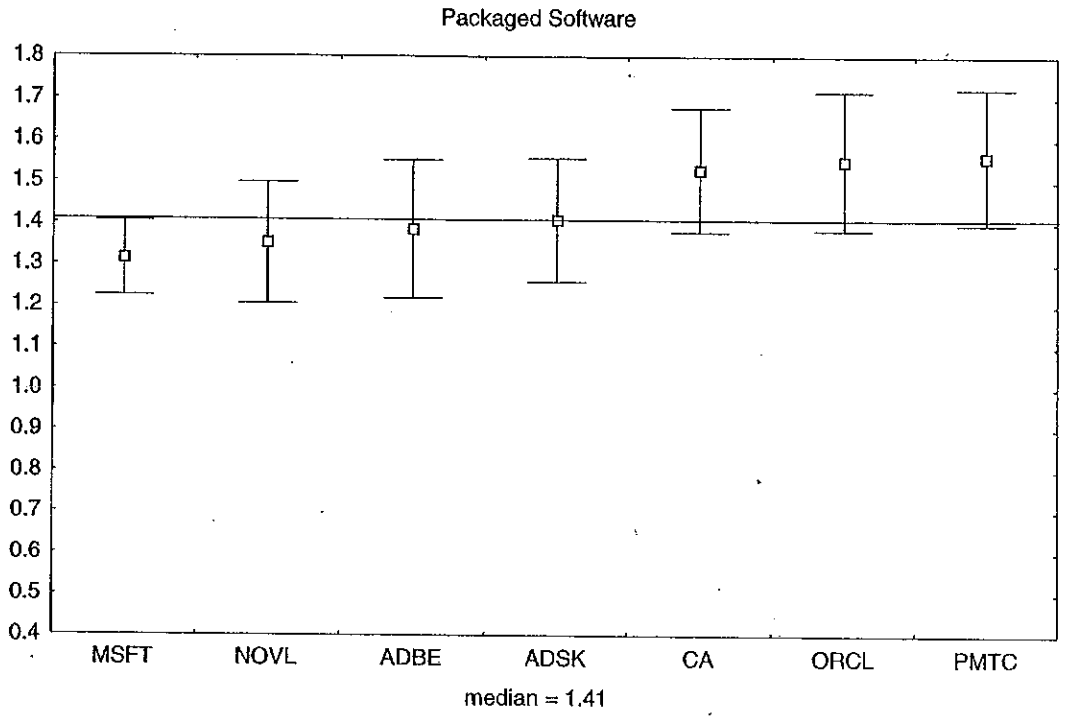
Figure 8. Unlevered Asset Betas (Continued)

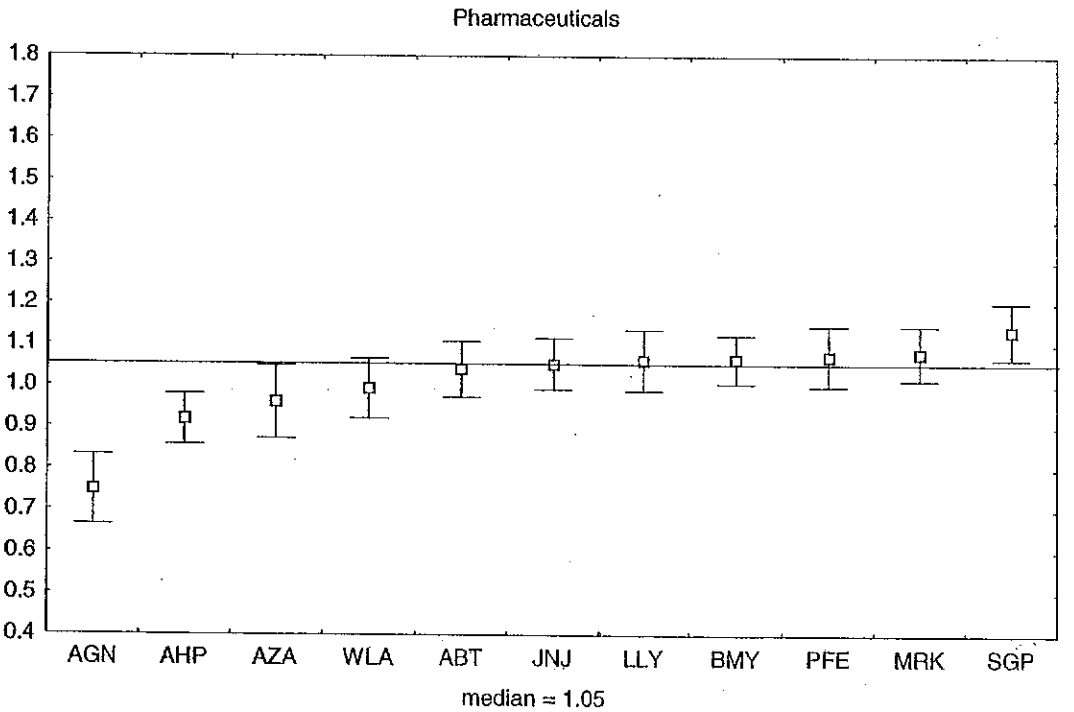




Source: Salomon Smith Barney.

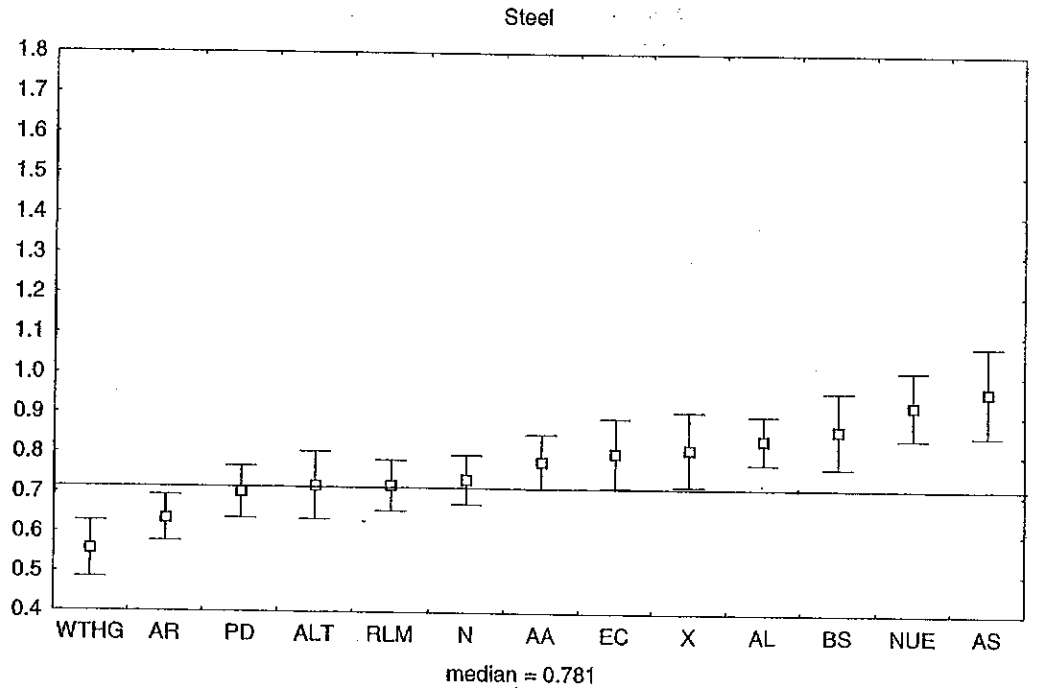
Figure 8. Unlevered Asset Betas (Continued)

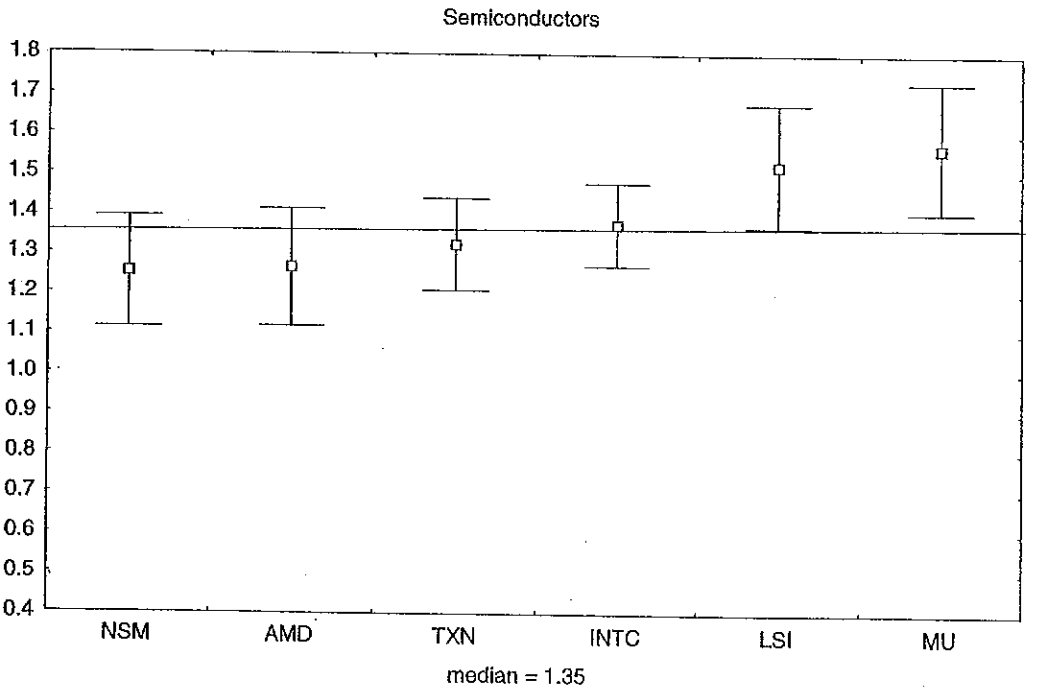




Source: Salomon Smith Barney

Figure 8. Unlevered Asset Betas (Continued)



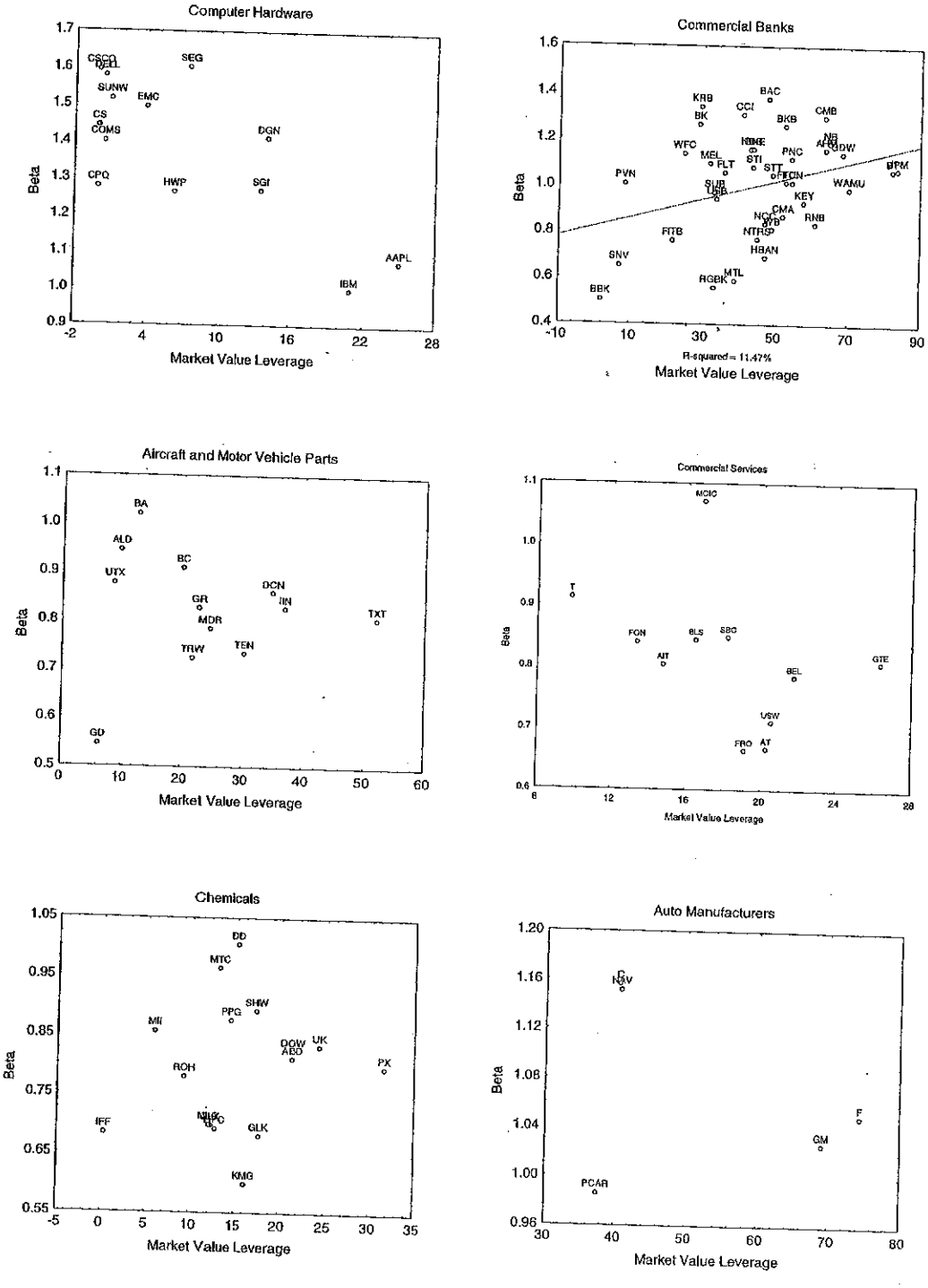


Source: Salomon Smith Barney.

Appendix C

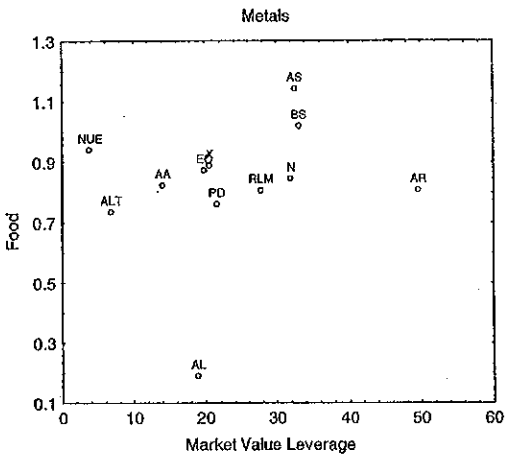
Within industries, higher leverage does not necessarily imply higher betas.

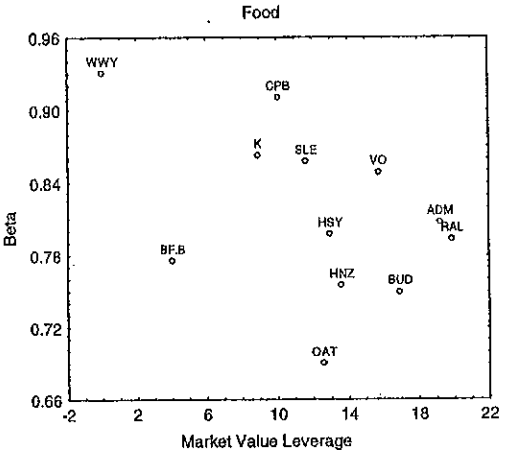
Figure 9. Beta Versus Leverage, by Industry

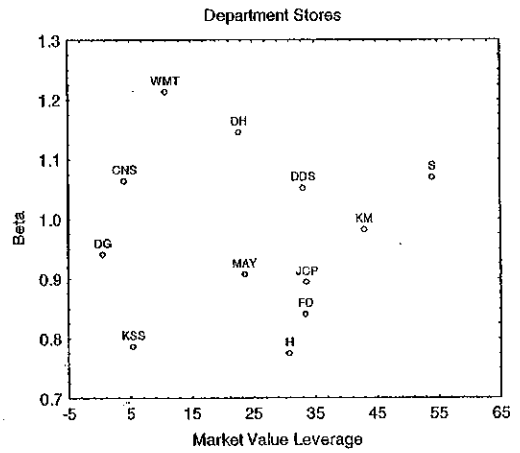


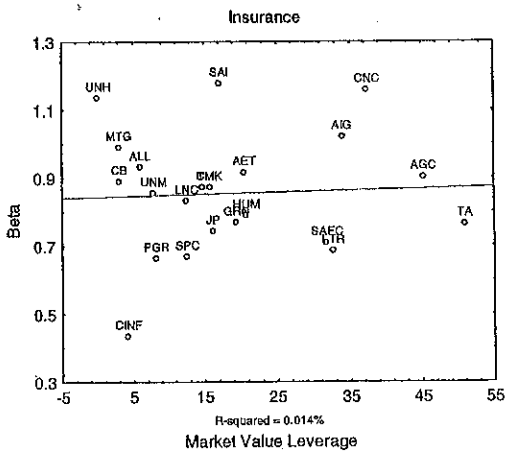
Source: Salomon Smith Barney.

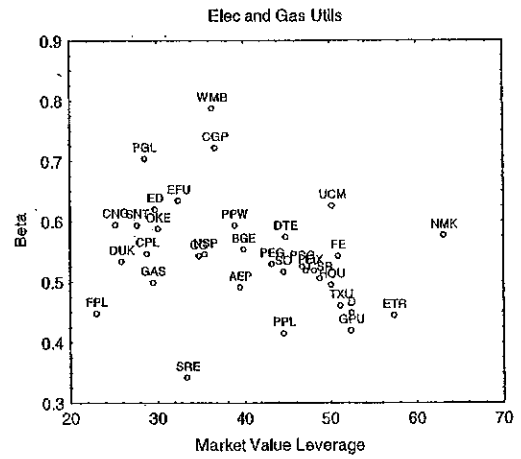
Figure 9. Beta Versus Leverage, by Industry (Continued)











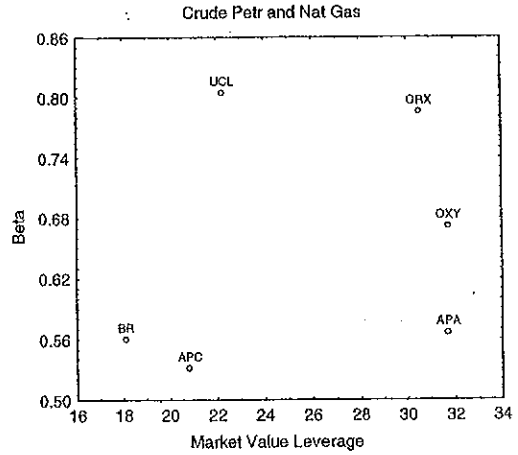
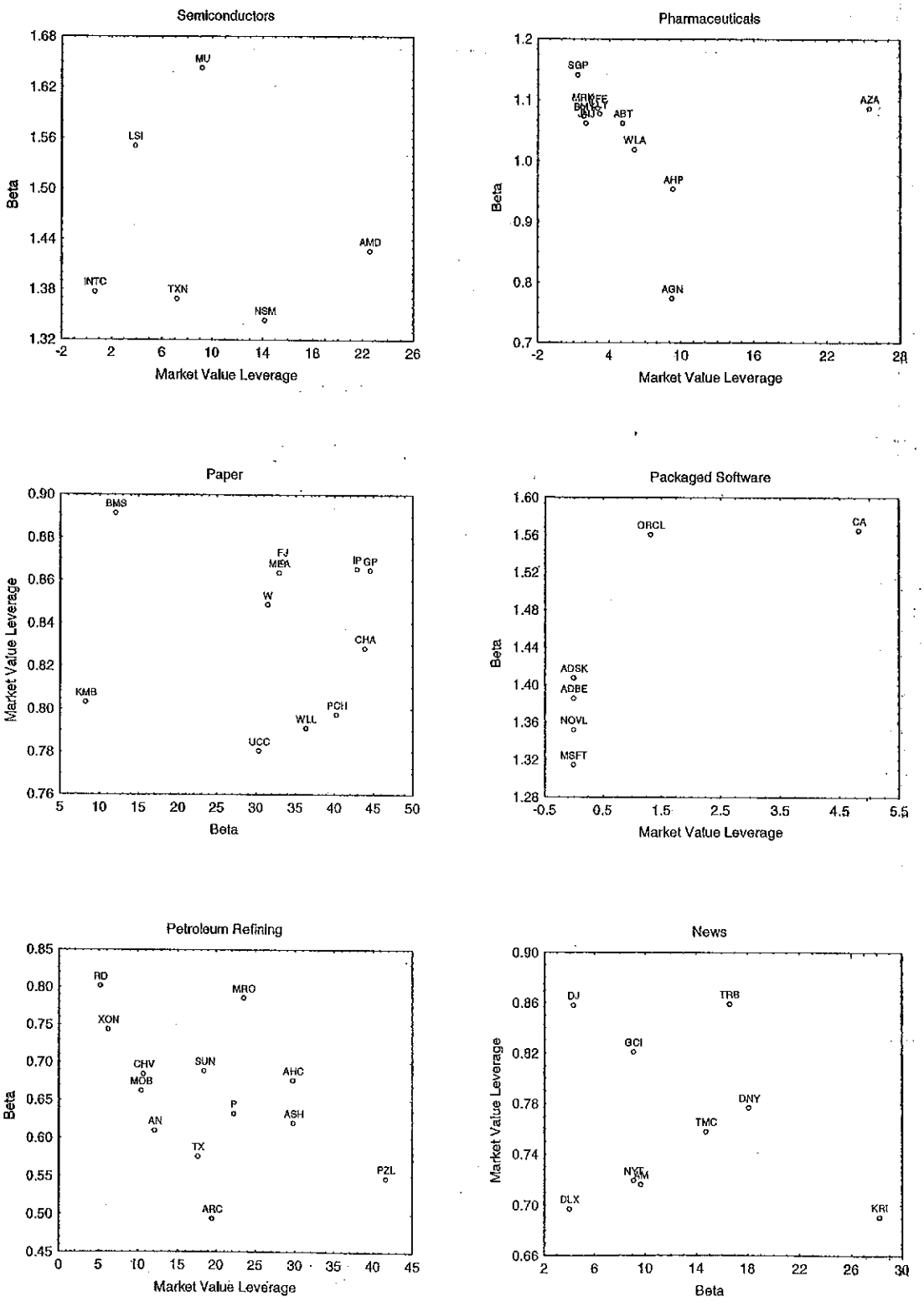


Figure 9. Beta Versus Leverage, by Industry (Continued)

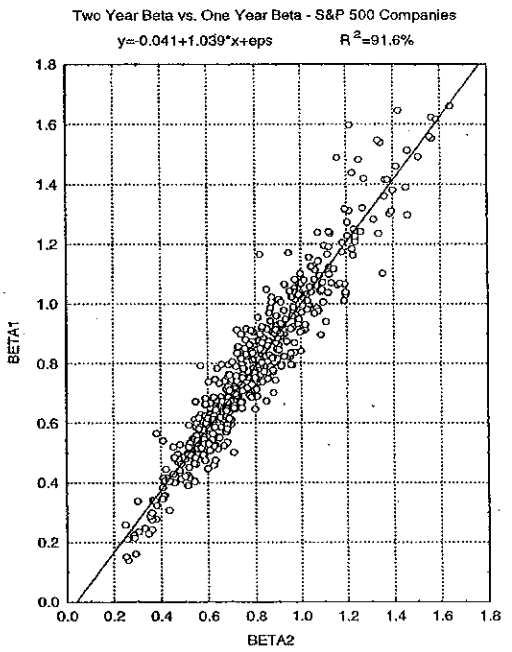


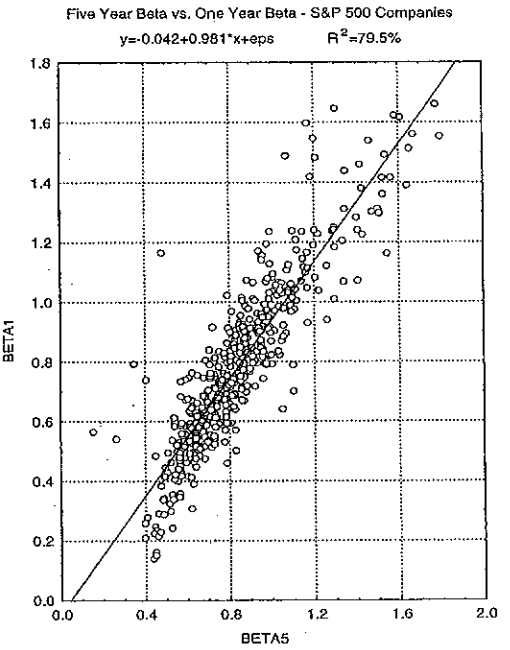
Source: Salomon Smith Barney.

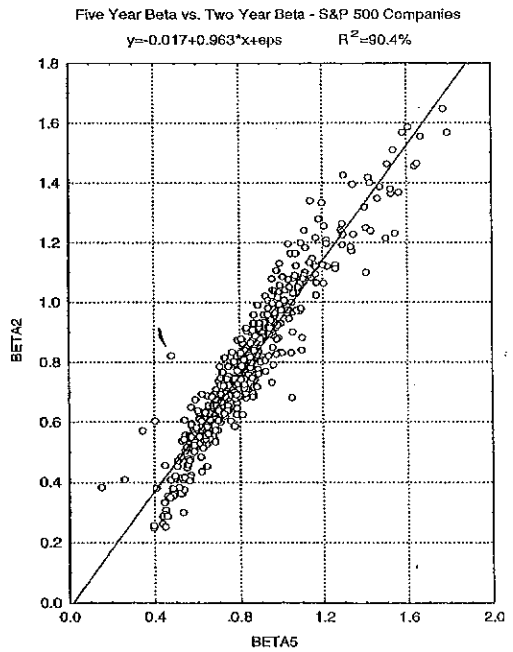
Appendix D

Beta measurements using daily data yield consistent results when measured over varying time horizons.

Figure 10. Beta Coefficients Measured Over Varying Time Horizons







Source: Salomon Smith Barney.

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