Our current studies

New analytic work by Froot has extended his previous studies on industries in general to consider for insurers in particular the added effect of customer risk aversion. He finds an explicit expression for the marginal financial value of additional capital for an insurer with a given risk profile. Changing the risk profile will also affect the value of the firm, so these findings provide a coherent integrated framework for addressing the value consequences of insurer underwriting, financing, investment and reinsurance decisions. In essence he shows that the insurance market effect – added pricing and growth from financial strength – combines with the capital market effect – differential internal and external financing costs – to further increase the value of risk management in particular and financial strength in general. However these effects are difficult to estimate separately, so the empirical studies emphasize estimation of their combined impact.

Volatility Study

Earnings volatility presents a risk of capital depletion, so it would be expected to have a negative impact on insurer value. One study we did was to explore the effects of earnings volatility on stock market valuation. However this is tricky for a number of reasons. First of all, there are numerous factors that go into a stock price, including earnings trends, growth prospects, etc., all of which make it difficult to establish a benchmark value. So we looked instead on the effect of earnings volatility during a period on the change in market value for the period.

This is to some extent a marginal effect: if a company has had stable earnings, and that fact indeed does improve its value, then continuing to show stable earnings would just be a confirmation of what the market already had priced in. The confirmation is worth something, but presumably only a fraction of the value of stability already built in to the market price. On the other hand, if during the period observed a company is much more or much less stable than the market had anticipated, the change in value would be closer to the full impact of the degree of stability it demonstrates. Our results found that the market value did respond as anticipated to the volatility in the period. The volatility was then a proxy for the change in volatility, as these could be expected to be correlated. However the degree of change would then be an average effect across firms, some of which were confirming market anticipations and some of which were surprises. Thus the impact found would represent less than the full value of stability on market prices.

Current theory of change in market value of equities includes several factors that the market responds to, such as correlation of the price with the overall market. The model of Fama and French is representative of current thinking on what the key factors are. So any impact of earnings volatility should be measured with respect to

the changes that would already be anticipated from that model. In addition, growth in earnings would be anticipated to have a positive effect on market price. Thus the impact of volatility on market price can be reliably measured only after these known effects are all accounted for. This leads to a multiple regression approach, where all the known factors are included, as is the effect of volatility. The regression setup we use measures excess return (return less the risk free rate) as a function of the Fama-French factors, earnings-to-capital (ROE), and the standard deviation of ROE. The best exact form for this regression – logs vs. levels, etc. – is still under investigation.

In one trial, separate log/log regressions were run on different mixes of types of insurance companies and firm sizes. There was a fairly consistent effect of stability on return indicated. Roughly speaking, a reduction of 10% in the standard deviation of quarterly earnings translated into an increase in market value in the range of 1/5 to 1/3 of a percent, with the smaller companies having the greater impact. As discussed above, this change is presumed to be an average impact of the extra information provided by the stability demonstrated in the period, and so is probably less than the total long-term impact of stability on the market price.

This is less than the results of Sommer, who found a 1/3 % increase in pricing from a 1% decrease in standard deviation. Presumedly the pricing increase would increase earnings and therefore value, but would be more leveraged. If earnings are 15% of premium, then a 1/3 % increase in premium would produce (1/3 %)/.15 = 2.2 % increase in earnings, which could be assumed to translate into a similar value increase. The problem in our regression is that the earnings are already in the formulation as an explanatory variable. This is correlated with lower standard deviation in the data, but the regression is picking up a separate effect of stability on value over and above its effect on earnings.

In any case, as an example consider a firm with a market cap of $10B which takes steps to reduce its standard deviation of quarterly earnings from 2.0% to 1.8%, or 10%. By our results that would translate into an increase in market value around 0.25%, or $25M, and probably a fair amount more over time if the stability is maintained. If the stability is produced by reinsurance, the increase in market value would be compared to the margin ceded, that is to the long-term expected excess of cost over recovery. This gives one estimate of the value of reinsurance, but probably understates the true value, both because of the averaging over previously stable and newly stable firms and not taking into account the effect of stability on higher earnings.

It could be argued that the relationship with earnings and stability is spurious, in that the companies with an earnings hit in the time period studied would automatically show a higher standard deviation. However, the major loss drivers, such as catastrophes, loss level surprises, and rate adequacy tend to hit the whole industry simultaneously. The firms that do not spend money on risk management might be

expected to have higher average earnings and a higher standard deviation, but the opposite is found.

Capital Adequacy

A standard measure of the capital strength of an insurer in comparison with its obligations is AM Best's BCAR score – Best's Capital Adequacy Ratio. BCAR generalizes the simple premium-to-surplus and reserve-to-surplus ratios into a combined score of capital relative to total obligations, and it includes an adjustment for loss reserve adequacy.

If policyholders indeed demand premium concessions for less secure coverage, then you would expect to see the companies with higher BCAR scores showing better results. Exhibit 1 illustrates this relationship for companies in the A rated range.

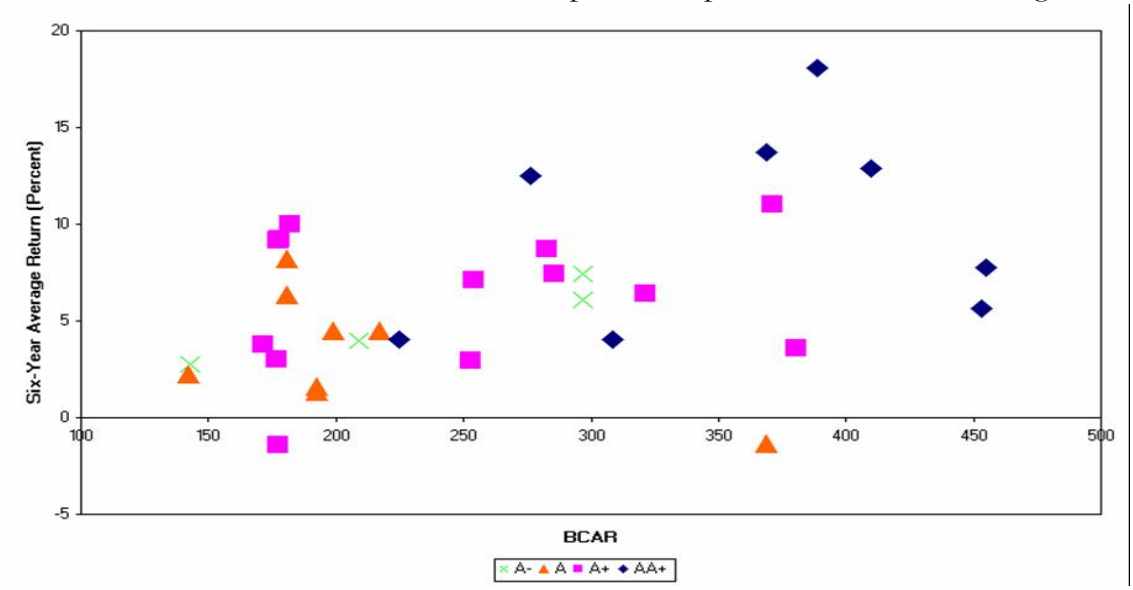

Exhibit 1 – Return as a Function of BCAR

The graph also indicates the Best ratings of the companies, which is established in view of both BCAR and earnings history, as well as Best's evaluation of company management, etc. The BCAR score itself appears to be significantly correlated with earnings even without considering the ratings achieved. Higher BCAR ratings seem to be associated with higher returns, but also with more of a spread across companies. One possibility for this spread could relate to differences between commercial and personal lines' buyers responses to financial strength, which the financial theory would expect, as discussed above.

Exhibits 2 and 3 illustrate the predicted relationship between capital adequacy and return given the results so far noted.

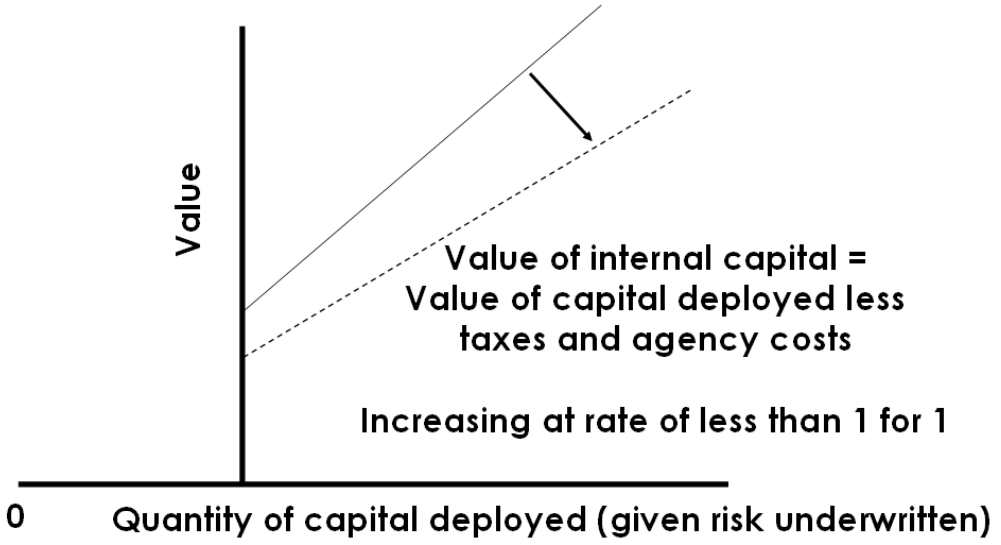

Exhibit 2 – Initial Model of Value vs. Capital

For a fixed degree of risk obligations, the original idealized financial theory would have firm value increasing 1 for 1 with capital. But recognition of the frictional carrying costs of capital, such as taxes on investment income and the reluctance of investors to let managers control a lot of money, would predict that value increases less than 1 for 1.

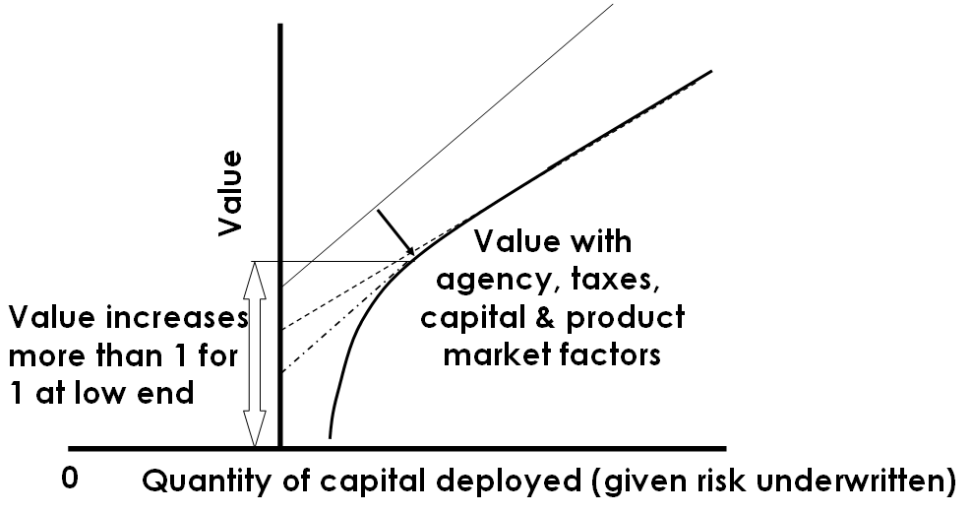

Exhibit 3 – Refined Model of Value vs. Capital

Adding in capital market effects – the value of retained earnings – and insurance market effects – the risk aversion of policyholders – gives a different picture for lower levels of capital strength. In that region adding capital increases value at a rate of more than 1 for 1, as growth and profitability potential are both enhanced. At the upper end, however, the picture remains the same as before, in that once a very strong capital position is attained, there is not much additional value in more, and the frictional costs dominate.

Effect of capital adequacy on value

The mathematical form of the curve at the low end of Exhibit 3 would be useful for valuing capital adequacy, including the value of reinsurance. To study this we looked at the loss of capital suffered by insurers in the September 11, 2001 attacks, as initially estimated, in comparison to their loss in market cap during that month. Exhibit 3 would anticipate that the firms with lower capital adequacy would experience a much sharper drop in value than would the stronger firms. Taking BCAR as the measure of capital adequacy, the following preliminary version of this model was found to fit reasonably well to the data:

$$\text{Change in market value / Change in surplus} = \beta + \gamma \text{BCAR} + \text{random term}$$

Here β was found to be 9.25 for personal lines companies and 4.64 for commercial lines writers, with a value of -2.02% for γ. For a base BCAR score of 100 (capital = required capital), this would lead to a market loss of 7.2 times the capital loss for a personal lines writer, and 2.6 times for commercial lines. Paying anything up to these multiples of expected losses would thus be cost effective for reinsurance.

For a commercial writer, a BCAR of about 180 would bring the loss to the level of 1 for 1, while this wouldn't happen until somewhat over a BCAR of 400 in personal lines. These could then be considered optimum levels of capital. The model of Exhibit 3 would predict that the market loss would even be less than the capital loss for insurers above these levels, but the model as stated would not be expected to hold for too much higher BCAR levels, as the market loss would eventually become too low. Our model imposes a line with a slope of 95% above these levels.

The difference between personal and commercial lines is what would be anticipated from postulated financial theory. While the corporate insurance buyer is risk averse, it is less so and for different reasons than the individual policyholder. Beta is still important for commercial enterprises, even though some degree of aversion to specific risk is now seen to be rational.

Companies with a given BCAR score can have quite a wide range of market values. This can reflect, among other things, perceptions of growth prospects and reserve adequacy. To illustrate the data for this study in comparison to the model, it is useful to look at the ratio of market value to the level of surplus required to produce a BCAR score of 100. Exhibit 4 shows this for personal lines and commercial lines companies before and after the 9/11 event. The BCAR scores and market values before the event are labeled P for personal lines and C for commercial lines companies, and the implied post-event values are the other end of each line segment.

The predicted movements in these points for a company at any starting point in this space are given by the curves shown in Exhibits 5 and 6, for personal and commercial

lines writers. The actual lines from Exhibit 4 are superimposed on the curves on Exhibits 7 and 8. As with any regression model there is not perfect agreement between model and data, as reflected in the random term. but as can be seen in the exhibits, the greatest disagreement is for companies that had very minor losses in the event.

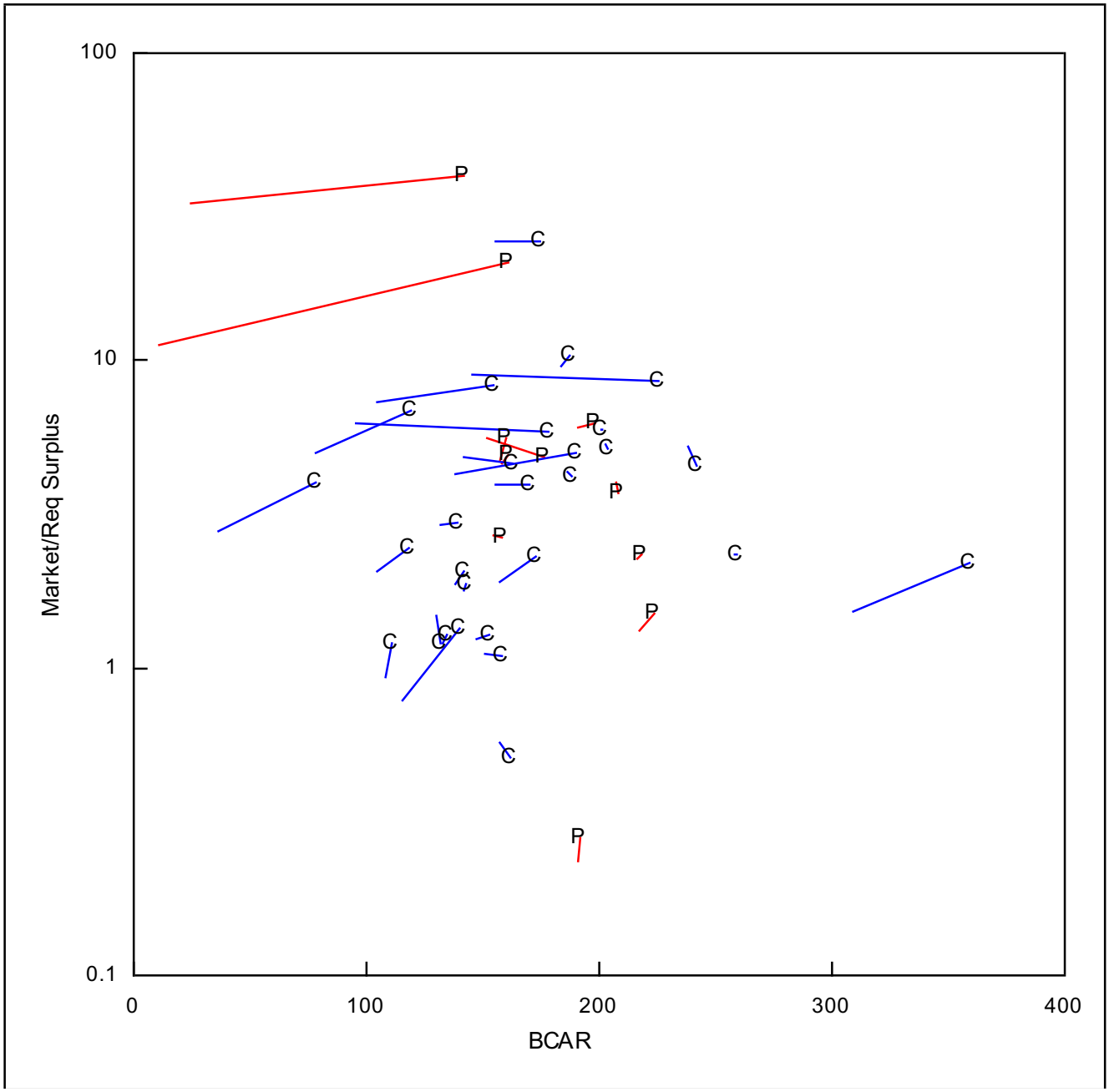

Exhibit 4 – BCAR and Market Values Before and After

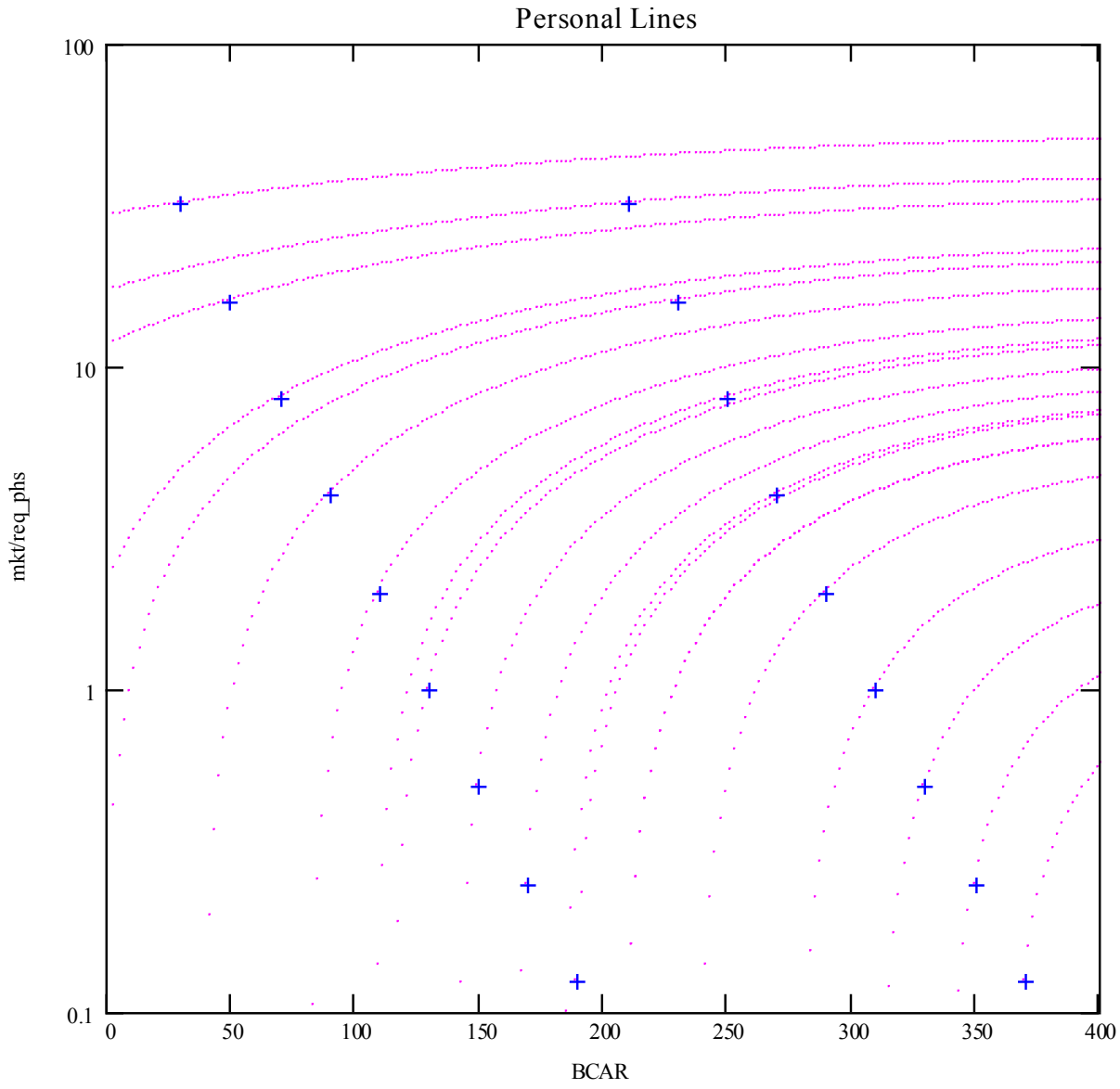

Exhibit 5 – Model Changes in BCAR and Market Value – Personal Lines

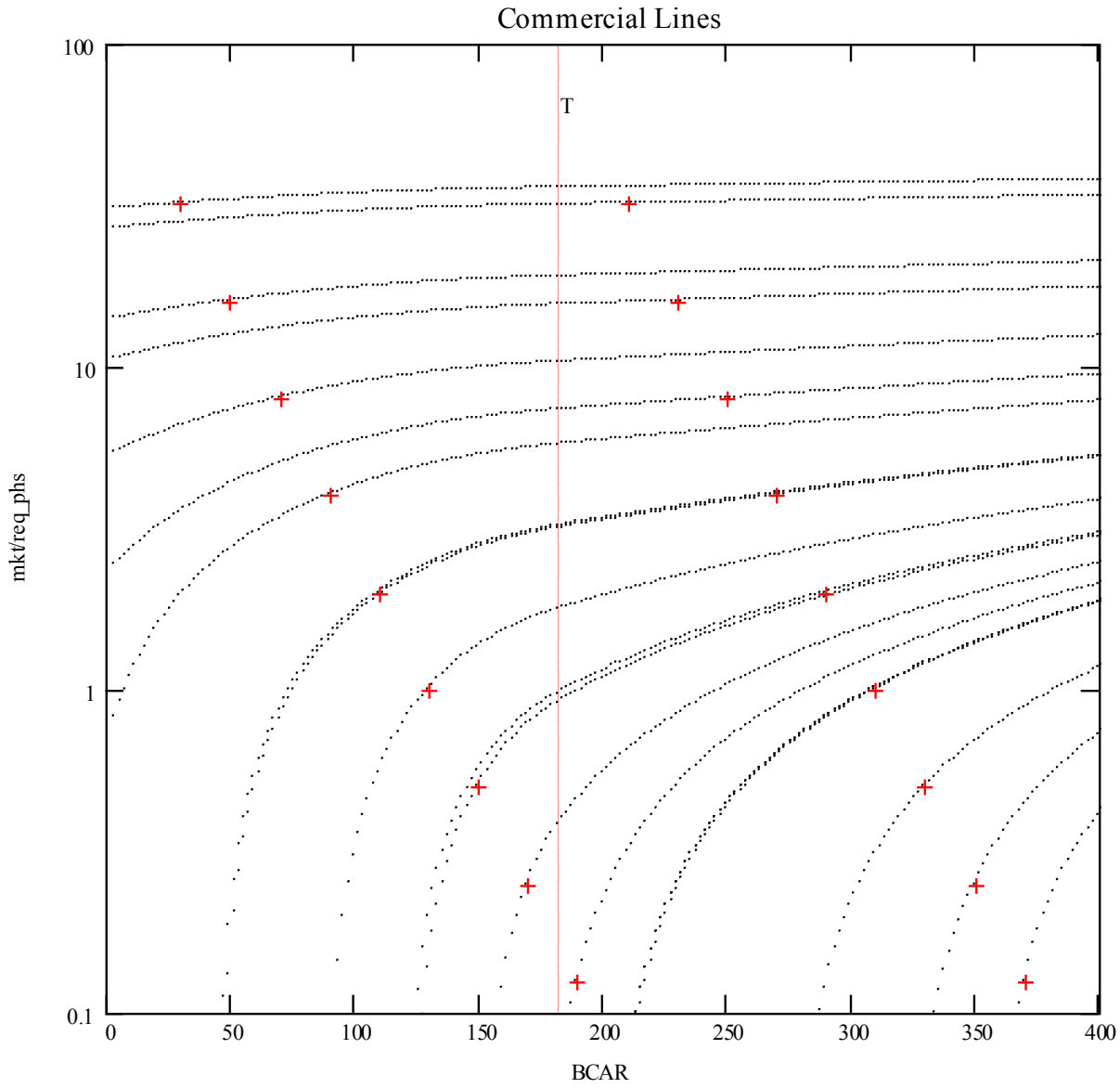

Exhibit 6 – Model Changes in BCAR and Market Value – Commercial Lines

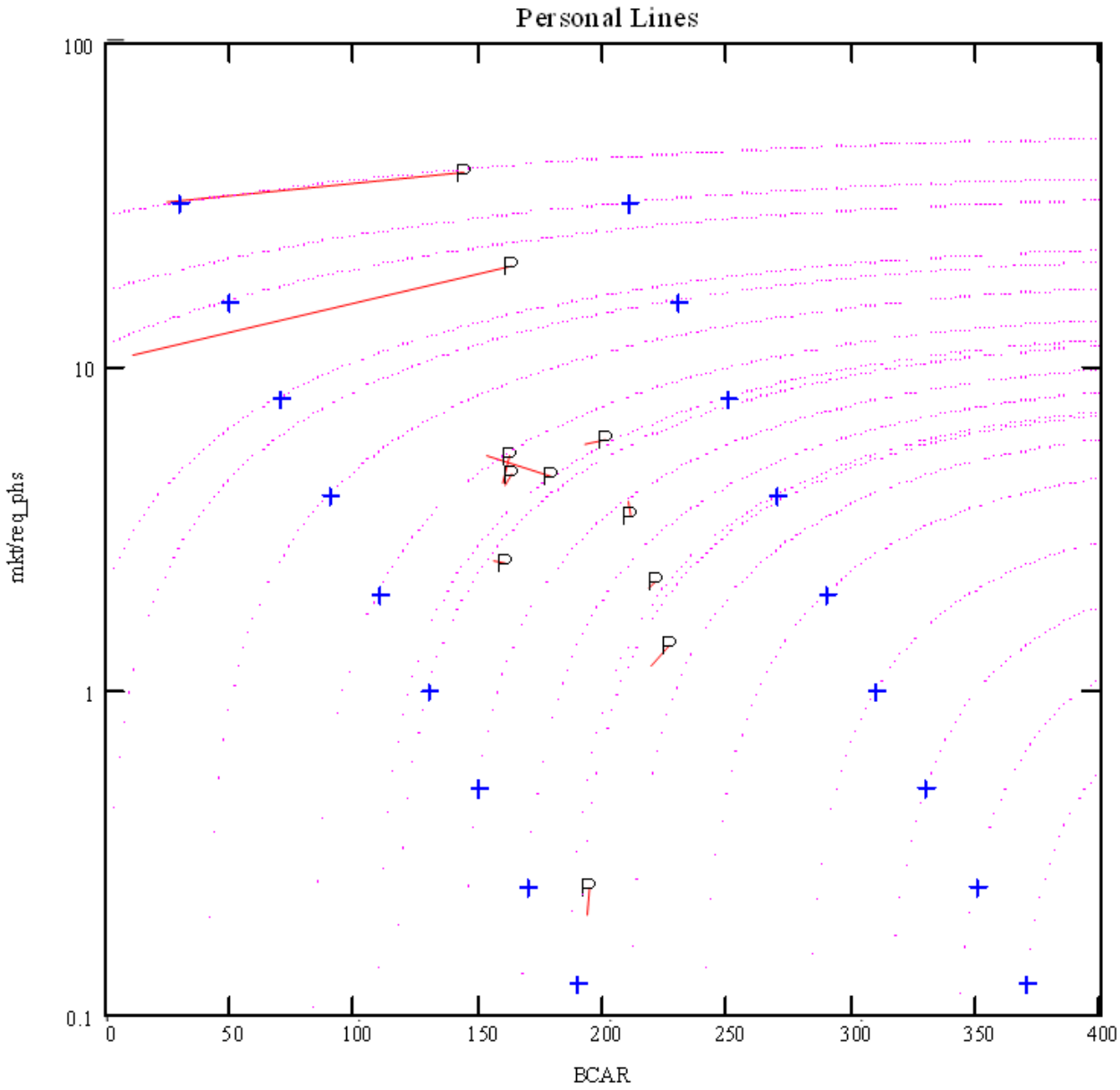

Exhibit 7 – Model vs. Actual Changes in BCAR and Market Value – Personal Lines

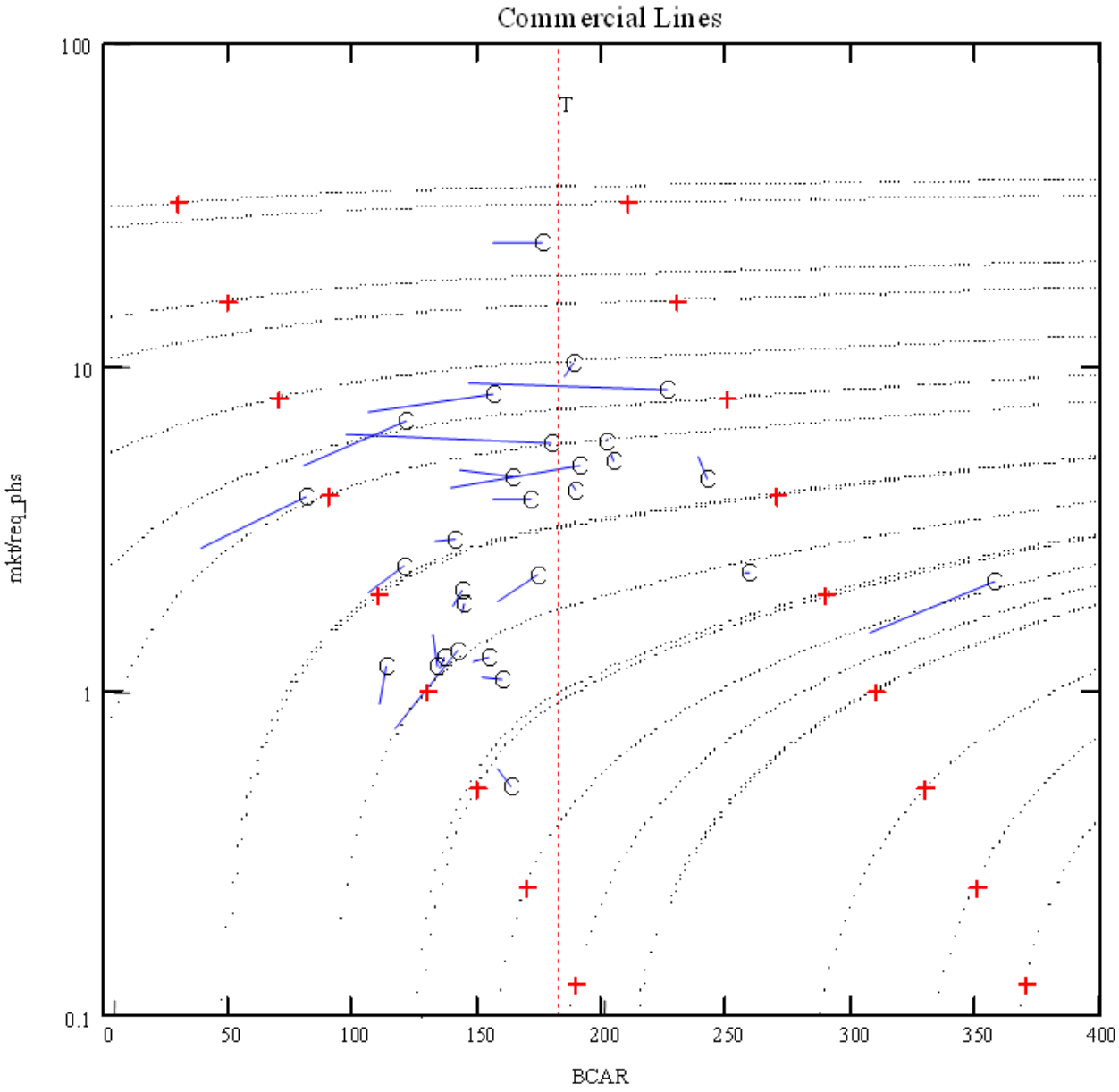

Exhibit 8 – Model vs. Actual Changes in BCAR and Market Value – Commercial Lines