A SELECTED EXCERPT FROM VOLUME 4, NUMBER 1, DECEMBER 2001

THE JOURNAL OF
Investment Consulting

TO CATCH A THIEF ...

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After constructing an efficient portfolio within the bounds of a client's risk tolerance and financial goals, the investment management consultant has the daunting task of bringing the plan to life through selection of real-life managers, each representing a respective slice of the allocation pie. Ideally, one would choose a manager who tends to garner greater return while taking on less risk than his benchmark. With the idea that investment return is one's payment *from* the capital markets and investment risk is one's payment *to* the capital markets, what the investor really wants is a thief, one who "takes something she doesn't pay for," or at least takes more than what she pays for.

The investment management consulting industry has become a throng of private detectives on the hunt for the next thief. Along the way, they have picked up many quantitative tricks of the trade: past performance, risk, Sharpe ratio, Jenson alpha, beta, Treynor ratio, selection ratio, returns-based style analysis, to name a few.[1]

Now making its way into the consultant's quantitative toolbox is a measure dubbed the capture ratio. This ratio is purported to "catch a thief" by identifying managers[2] who tend to "capture" more of their benchmarks' upside and less of their benchmarks' downside.

However, despite the ratio's growing application, other than its intuitive appeal, there is a dearth of evidence supporting its efficacy. For the practitioner, using an untested tool is professionally dangerous. Meanwhile, for investors it could also prove quite costly. On the other hand, if this ratio is validated, it will be an important addition to the consultant's toolbox. Hence, the chief aim of this paper is to discover the extent of the capture ratio's usefulness.

Capture Ratio 101

The *capture ratio* essentially reports a money manager's success (or failure) in capturing the upside of his respective benchmark, as well as his success (or failure) in *not* capturing the downside of such benchmark. Hence, there are two capture ratios for each manager: *the upside and downside capture ratio.* These ratios are fairly straightforward and are calculated as follows:

Upside Capture Ratio:

$$\frac{\text{Annualized Return of Fund during + Index Return Quarters}}{\text{Annualized Return of + Index Return Quarters}}$$

Downside Capture Ratio:

$$\frac{\text{Annualized Return of Fund during - Index Return Quarters}}{\text{Annualized Return of - Index Return Quarters}}$$

The manager's returns are divided into two categories: all returns during the quarters her respective index had a positive return and all

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quarterly returns during her respective index's negative return quarters. Next, all of her index's negative quarterly returns are linked and annualized, as well as all the index's positive returns; that is, the index's annualized down and up return each respectively becomes the denominator in each calculation. For the numerator, the manager's return series during all her index's positive quarters are annualized, as well as all her returns for her index's negative quarters. To further illustrate this calculation, we next derive a hypothetical large cap value balanced manager's capture ratio:

Investment	Seven-Year Annualized Return
Large Value Balanced Index	8.7%
Index Return for Positive Quarters	20.8%
Index Return for Negative Quarters	-15.1%
Manager X (Large Value Balanced)	9.0%
Manager X for + Index Qtrs.	16.8%
Manager X for - Index Qtrs	-7.3%

Upside Capture = 16.8% / 20.8% = 80.7%
Downside Capture = -7.3% / -15.1% = 48.4%

The capture ratio thus indicates whether or not she is a thief. That is, has she garnered more gain than she has paid for, which in this example she has: she only "paid" 48.4 percent of the losses while "receiving" 80.7 percent of the gains. Thus, the capture ratio is analogous to beta; it measures how much she tends to go up and down relative to her index. However, the capture ratio is simpler to calculate than beta and it does not assume a linear relationship between the manager and the respective index, as does beta. Moreover, the capture ratio does not assume a manager maintains a constant beta. Specifically, an equity fund may manage beta analogously to how a bond fund manages duration: during expected up markets, the manager increases his weighting of high beta stocks (and/or decreases his low beta holdings), whereas during expected down markets the manager decreases his high beta holdings (and/or increases his low beta holdings). Hence, the manager's beta could be a very unstable datum. A more appropriate comparison is contrasting *the upside and downside beta* with the capture ratio. These are quite similar measurements: they segregate a manager's market sensitivity into down and up markets. Again, the chief difference with the capture ratio is that it does not assume a linear relationship between the manager and the benchmark. Also, the capture ratio is simpler to calculate than beta and perhaps more easily grasped by an individual investor.

One last consideration of relating upside and downside beta with the capture ratio is market (systematic) risk versus nonmarket (nonsystematic) risk. The upside and downside betas *only* identify a manager's ability to capture the systematic or market return. These betas are calculated as follows:

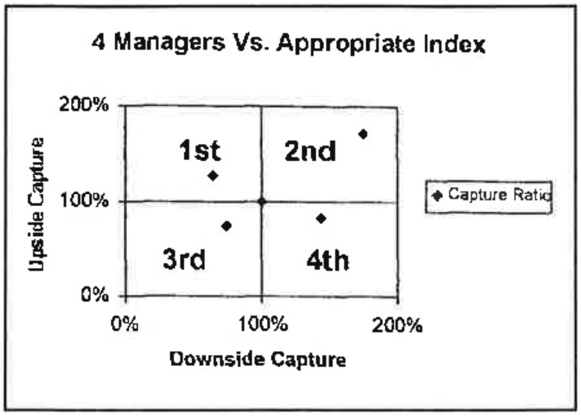
$$R_u = \alpha_u + \beta_u R_{mn}$$
$$R_d = \alpha_d + \beta_d R_{md}$$

Where
R_u = manager's excess return in up markets,
α_u = manager's alpha in up markets,
β_u = manager's beta in up markets and
R_{mn} = market excess return in up markets.

Hence, when using upside (downside) beta, a manager creates alpha when she has a greater return in an up (down) market based solely on the amount of up market or systematic risk she is taking (i.e., up [down] market beta). Consequently, the manager may have a greater total return during up markets and yet not have any upside alpha as a result of having a higher up market beta. Conversely, the manager may have a total return less than her market during up markets while still creating upside alpha if she has a lower up market beta. Meanwhile, the manager's *total* risk (i.e., both systematic and nonsystematic) may be more or less than her market.

The capture ratio, on the other hand, simply identifies a manager's ability to absolutely outperform his benchmark in up and down markets. If he captures more of his benchmark's total upside return, this is not considered more risky, but simply outperformance. If he captures less than his benchmark's total downside return, this also contributes to outperformance.

Although the capture ratio has value as a stand-alone measure, it is most commonly used to select managers from within an asset class. This is often done by dividing a group of similar asset



class managers into capture-ratio quadrants and then mapping them as shown in the above graphic.

The x-axis is the downside capture ratio, whereas the y-axis is the upside capture ratio. Hence, the middle dot on the crosshairs, representing 100 percent upside and downside capture, is the benchmark or index against which this group of four managers is measured. A manager in the second quadrant is one who goes up more than his benchmark and goes down more than his benchmark. A manager in the third quadrant tends to go up and down less than her benchmark. The fourth-quadrant manager has the worst of both worlds: he goes up less than his benchmark's upswings and goes down more than his benchmark's downswings. Finally, we have the manager in the first quadrant, who exhibits more return on benchmark upswings and less loss on benchmark downswings. Consequently, one would expect first-quadrant managers to exhibit overall positive alpha, or excess return, whereas fourth-quadrant managers would exhibit overall negative alpha. Thus, one would hypothesize the first quadrant as the most favorable and the fourth as the least favorable quadrant for a manager to be in. Indeed, anecdotal evidence shows that most consultants presently recommend first-quadrant managers over the other quadrants. Interestingly, our results show this may not be the best advice.

And so we have the underpinnings of the capture ratio and the reason for its intuitive appeal: a fairly straightforward way to capture thieves and discover fools. Now it is time to test empirically if this is really so.

Off to the Laboratory

There are essentially two levels of testing for the capture ratio, which yield four possible conclusions on the value of the capture ratio. First, we must find if the capture ratio even correlates to superior performance. However, even if the capture ratio does not correlate with superior performance, it is still of value if it persists (i.e., the second test) because the ratio can be used to help determine the *future style* of one's manager. Here, style is meant to be a manager's tendency to go up and down more or less than his respective benchmark (*i.e., not his asset class style*). For example, if one hires a manager in the second quadrant, one should expect the account to go down and up more than the manager's benchmark. Hence, knowing this information ex-ante would aid greatly in selecting an appropriate manager for a particular client's risk tolerance. However, if the capture ratio does not correlate to superior performance and does not persist, *it is really of little use*. Perhaps the only use of the ratio would be to explain why a particular manager gave you *past* indigestion or *past* elation.

If, however, the capture ratio does correlate significantly with superior performance, we again need to administer a second test to determine the ratio's persistence. If the ratio does not persist, it still has value, for it can explain *how past alpha was created*. On the other hand, if the ratio does persist, we have acquired a very valuable investment management tool: *the capture ratio would be useful for explaining past alpha and predicting future management style and future alpha.*

Therefore, we test three hypotheses:

1. The ex-post capture ratio highly correlates with ex-post performance.
2. The capture ratio significantly persists (i.e., past capture ratios hold for the future).
3. The past capture ratio predicts future performance.

For testing the first hypothesis, we study Growth & Income funds over the fifteen-year period from 10/1985 through the end of 9/2000; exhibit 1 reports the capture ratio of all these funds for this fifteen-year period. We chose Growth &

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Income funds due to their being one of the largest mutual fund classes as well as a fairly homogenous group of funds that tend to have a reliable investment style classification (see Mayes et al.). Sources of data include both CDA/Weisenberger and Morningstar. These databases are crosschecked for accuracy as well as used to eliminate overlapping funds (e.g., multiple share class funds). Funds are divided into multiple seven-, five-, and three-year periods, and then for each period the funds' capture ratios are calculated against both the Growth & Income CDA average and the Frank Russell 1000 Value index using quarterly return series. We use the Frank Russell 1000 Value index and CDA Average due to their high correlation to the Growth & Income fund class; it is important to use a benchmark that fairly reflects the manager's investment style in order to discern the manager's ability to capture benchmark returns from simply benchmark dissimilarities. Using multiple periods, a relatively long time frame, a homogenous fund class, and two different indexes from which to calculate the capture ratios helps control for lurking variables. A lurking variable is what statisticians call an unknown factor that may skew one's test results. Once each fund's capture ratio is calculated for a given period, each fund is placed in its appropriate capture-ratio quadrant. This is completed for each subperiod for a total of ten subperiods. Lastly, each quadrant is compared to the average of all funds to determine if any quadrant tends to have better ex-post performance on a risk-adjusted basis.

To test the second hypothesis we again divide the funds into capture-ratio quadrants for each of their respective periods. However, we next follow each fund for a subsequent period to determine *how many remain in their original capture-ratio quadrant for the subsequent period*. We use a chi-squared test to determine if funds from one period maintain the same capture ratio for the next period on a statistically significant basis. If there is no significant persistence, we accept the null hypothesis that the capture ratio does not persist. However, if there is significant persistence of funds' capture ratios from one period to the next, then we reject the null hypothesis in favor of the alternative hypothesis: indeed, past capture ratios do hold for the future.

For testing the final hypothesis, we follow the same steps of testing as for the first hypothesis with one important exception: instead of comparing capture-ratio quadrants to performance over the same period, we evaluate performance over a subsequent period. For example, we compare the period 1/1980 through 12/1982 to the successive period 1/1983 through 12/1985. We determine if each past group of capture-ratio quadrant funds demonstrates performance *in the future* that is any different from a mix of 50 percent above and 50 percent below the median fund performance of all Growth & Income funds. Thus, if there is no statistically significant difference, as measured by the chi-squared statistic, in the future performance of funds among the different past capture-ratio quadrants, we accept the null hypothesis that the capture ratio does not predict future performance. On the other hand, if there is a significant relationship between past capture ratios and future performance, we reject the null hypothesis in favor of the alternative hypothesis that the capture ratio does predict future performance.

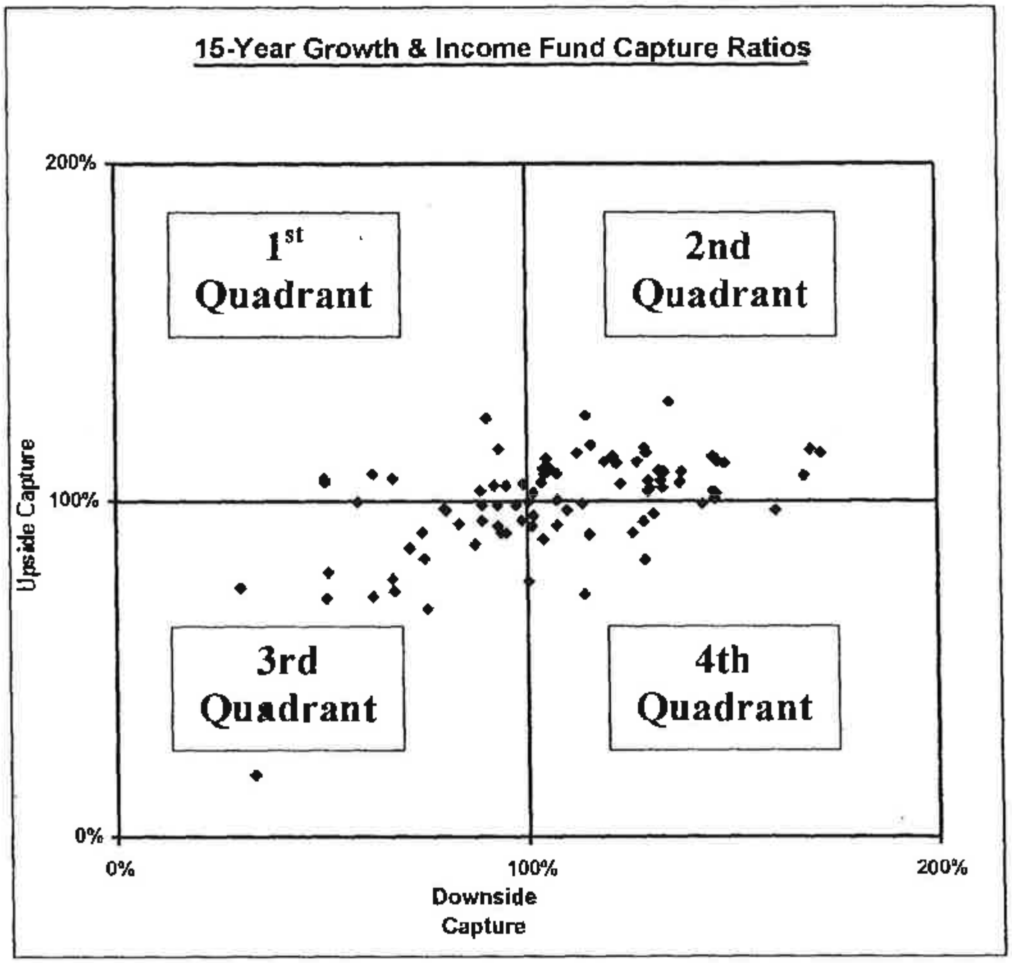
And the Winner Is…

CONTEST 1: *Past Performance*

Exhibits 1 through 4 were created using the CDA Growth & Income average as the index from which to calculate the capture ratio. We also completed all three tests using the Frank Russell 1000 Value as the capture ratio index; the results were nearly identical. However, using the CDA Growth & Income average afforded more even distributions among the capture-ratio quadrants; hence we were able to test all time periods for statistical significance. Had we used the Frank Russell 1000 Value index for statistical testing, there would have been several quadrants in several periods with inadequate test sample sizes. The row labeled "average" represents the equally weighted average of all Growth & Income funds in existence for the reported subperiod.

With few exceptions, the performance is ranked in the order of respective quadrants for all subperiods. Exhibits 2 and 3 summarize the risk and return characteristics of the three-, five- and seven-year subperiods of capture ratios.

Exhibit 1



Specifically, the first quadrant tends to rank first as measured by total return and Sharpe ratio,[3] and the ranking continues sequentially with the fourth quadrant turning in the worst numbers across the board. We also completed the analysis using the selection ratio[4] and found the results wholly consistent with the sequential Sharpe ratio rankings. One may ask why the second quadrant tends to consistently produce superior returns compared to the third quadrant. Intuitively, the latter is the favored portfolio. Indeed, negative returns have more dollar impact than equivalent positive returns. For example, a 100 percent gain is erased by a 50 percent loss, and a 33 percent gain is eliminated with a 25 percent loss. Nevertheless, the reason the second quadrant mostly turns out better results than the third quadrant is the simple fact that there are generally more positive than negative quarters in these return series; for the entire fifteen-year period of this study, there are eleven negative quarters and forty-nine positive quarters for both indexes. These negative quarters produced a total of a 50 percent loss for both indexes, where as the positive quarters overwhelmed these losses with a total gain of more than 1200 percent and 1600 percent for the CDA and Frank Russell indexes, respectively. The need to have a favorable upside capture over a downside capture ratio is thus evident at least over this fifteen-year time period.

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Exhibit 2

SEVEN-YEAR PERIODS

Seven-Year 1 (10/86 to 9/93)

Quadrant	Number of Funds	Upside Capture	Downside Capture	Annualized Return	Annualized Risk	Sharpe Ratio
1	12	108.95%	85.72%	14.42%	13.70%	0.61
2	45	116.39%	116.82%	12.95%	15.97%	0.44
3	24	77.10%	77.08%	11.14%	11.48%	0.46
4	15	85.27%	111.57%	9.83%	14.63%	0.26
	Average	**96.93%**	**97.80%**	**12.09%**	**13.94%**	**0.44**

Seven-Year Period 2 (10/93 to 9/00)

Quadrant	Number of Funds	Upside Capture	Downside Capture	Annualized Return	Annualized Risk	Sharpe Ratio
1	27	122.53%	79.03%	18.58%	13.91%	0.98
2	27	121.89%	117.15%	16.53%	14.87%	0.78
3	26	75.38%	73.45%	12.96%	11.20%	0.74
4	16	85.94%	120.64%	12.26%	13.47%	0.54
	Average	**101.44%**	**97.57%**	**15.08%**	**13.36%**	**0.76**

FIVE-YEAR PERIODS

Five-Year Period 1 (10/85 to 9/90)

Quadrant	Number of Funds	Upside Capture	Downside Capture	Annualized Return	Annualized Risk	Sharpe Ratio
1	12	114.48%	91.93%	14.71%	16.95%	0.45
2	40	119.96%	115.23%	12.58%	19.63%	0.28
3	36	79.03%	80.06%	10.73%	14.42%	0.25
4	9	88.33%	109.15%	9.08%	18.23%	0.11
	Average	**100.45%**	**99.09%**	**11.77%**	**17.31%**	**0.27**

Five-Year Period 2 (10/90 to 9/95)

Quadrant	Number of Funds	Upside Capture	Downside Capture	Annualized Return	Annualized Risk	Sharpe Ratio
1	39	118.03%	26.25%	18.96%	10.03%	1.46
2	37	111.79%	165.43%	16.57%	10.22%	1.19
3	29	87.21%	21.18%	15.17%	7.96%	1.35
4	35	84.42%	165.57%	13.06%	9.05%	0.95
	Average	**100.36%**	**94.61%**	**15.94%**	**9.32%**	**1.24**

Five-Year Period 3 (10/95 to 9/00)

Quadrant	Number of Funds	Upside Capture	Downside Capture	Annualized Return	Annualized Risk	Sharpe Ratio
1	39	126.30%	83.25%	20.74%	15.53%	1.00
2	39	124.70%	118.43%	18.43%	16.53%	0.80
3	29	74.09%	66.03%	13.88%	12.11%	0.74
4	33	83.42%	125.49%	12.08%	15.61%	0.46
	Average	**102.13%**	**98.30%**	**16.28%**	**14.94%**	**0.75**

Exhibit 3

Three-Year Periods

Three-Year Period 1 (10/85 to 9/88)

Quadrant	Number of Funds	Upside Capture	Downside Capture	Annualized Return	Annualized Risk	Sharpe Ratio
1	12	113.00%	87.00%	19.56%	18.62%	0.72
2	39	117.89%	119.03%	16.62%	22.38%	0.47
3	29	79.31%	75.72%	13.90%	15.92%	0.49
4	8	88.81%	112.66%	11.91%	20.40%	0.28
	Average	**99.75%**	**98.60%**	**15.50%**	**19.33%**	**0.49**

Three-Year Period 2 (10/88 to 9/91)

Quadrant	Number of Funds	Upside Capture	Downside Capture	Annualized Return	Annualized Risk	Sharpe Ratio
1	19	119.75%	86.15%	17.27%	13.92%	0.68
2	57	117.81%	118.08%	14.93%	15.92%	0.47
3	27	81.86%	72.47%	12.18%	11.13%	0.43
4	19	82.24%	122.09%	9.14%	14.68%	0.11
	Average	**100.41%**	**99.70%**	**13.38%**	**13.91%**	**0.42**

Three-Year Period 3 (10/91 to 9/94)

Quadrant	Number of Funds	Upside Capture	Downside Capture	Annualized Return	Annualized Risk	Sharpe Ratio
1	39	119.92%	-38.43%	13.61%	7.34%	1.40
2	33	114.60%	196.02%	10.15%	8.25%	0.81
3	31	83.73%	-5.28%	9.58%	6.00%	1.05
4	52	82.48%	206.01%	6.82%	7.48%	0.46
	Average	**100.18%**	**89.58%**	**10.04%**	**7.27%**	**0.93**

Three-Year Period 4 (10/94 to 9/97)

Quadrant	Number of Funds	Upside Capture	Downside Capture	Annualized Return	Annualized Risk	Sharpe Ratio
1	85	114.57%	22.16%	27.93%	8.97%	2.54
2	82	113.07%	163.65%	26.65%	9.49%	2.26
3	43	86.83%	17.96%	22.26%	7.81%	2.22
4	41	81.55%	171.46%	20.05%	8.61%	1.73
	Average	**99.01%**	**93.81%**	**24.22%**	**8.72%**	**2.19**

Three-Year Period 5 (10/97 to 9/00)

Quadrant	Number of Funds	Upside Capture	Downside Capture	Annualized Return	Annualized Risk	Sharpe Ratio
1	68	138.96%	81.02%	17.68%	18.59%	0.67
2	61	124.14%	120.11%	11.97%	19.73%	0.35
3	48	72.11%	71.92%	8.42%	14.41%	0.24
4	74	73.43%	120.86%	4.34%	17.85%	-0.04
	Average	**102.16%**	**98.48%**	**10.60%**	**17.65%**	**0.30**

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Another important observation is that volatility was created primarily (80 percent of the time) from the positive return series, which is the kind of risk that some might not consider the same risk as negative return volatility. The implication is the Sharpe ratio may not be the best risk-adjusted measure, for a manager with a lower return could have less Sharpe ratio risk (i.e., standard deviation) than a manager with a higher average return, even while the lower-returning manager has significantly more losing quarters. This is due simply to the fact that the lower-returning manager has less to deviate from his average before losing money than the higher-returning manager. Thus, consistently losing money could be recorded as less "risky" than occasionally losing money when averaging a high return. Further exploration of this observation is beyond the scope of this paper.

Thus, unlike the Sharpe ratio, the capture ratio is helpful in explaining the *origins* of past return *and* past risk, as well as a manager's past style (i.e., does he tend to capture more or less of his respective benchmark's returns in both up and down periods?). Unfortunately, however, the past is seldom a crisp picture of the future. And thus the next question is one of persistence.

CONTEST 2: *Persistence*

Exhibit 4 provides the results of our persistence test. For example, we tested the first seven-year period's persistence over the next seven-year period. The plus sign in the seven-year table indicates with statistical significance, as shown by the chi-squared test, that quadrant-three funds in the first seven-year period tended to remain in the third quadrant for the future seven-year period. "None" simply indicates we cannot claim with statistical significance a quadrant's tendency to be any different *in the future* from a basket of funds randomly selected from *all* the previous quadrants. A negative sign in a table indicates the quadrant of funds in question moved in the future to quadrants *other than their original quadrant* to the point of statistical significance.

The most persistent capture-ratio quadrant on a statistically significant[5] basis was the third quadrant. Intuitively, this makes sense; quadrant three represents the manager who tends to exhibit less volatility through capturing less of both the upside

Exhibit 4

SEVEN-YEAR PERIODS

Seven-Year Period 1 to Period 2

Quadrant	Persistence	P-Value
1	None	0.3791
2	None	0.2117
3	+	0.0162
4	None	0.5683

FIVE-YEAR PERIODS

Five-Year Period 1 to Period 2

Quadrant	Persistence	P-Value
1	None	0.9558
2	None	0.2919
3	+	0.0429
4	None	0.3884

Five-Year Period 2 to Period 3

Quadrant	Persistence	P-Value
1	None	0.1158
2	+	0.0127
3	None	0.2742
4	None	0.1186

THREE-YEAR PERIODS

Three-Year Period 1 to Period 2

Quadrant	Persistence	P-Value
1	None	0.13531
2	+	0.0042
3	+	0.00185
4	None	0.70931

Three-Year Period 2 to Period 3

Quadrant	Persistence	P-Value
1	None	0.52848
2	None	0.83389
3	None	0.89317
4	None	0.40825

Three-Year Period 3 to Period 4

Quadrant	Persistence	P-Value
1	–	0.01696
2	None	0.69375
3	None	0.61794
4	None	0.11687

Three-Year Period 4 to Period 5

Quadrant	Persistence	P-Value
1	+	0.0053
2	–	0.0001
3	+	0.000001
4	None	0.4951

and downside of her respective benchmark. Hence, in the future, these managers tend to continue their lower relative volatility management "style." The third-quadrant funds persisted on a *statistically significant* basis in two out of three of the longer subperiods (i.e., five- or seven-year periods), whereas the second quadrant persisted on a *statistically significant* basis in one out of three longer subperiods.

One other interesting observation is what generally happens to the first-, second-, and fourth-quadrant funds, since they do not persist to the same degree as third-quadrant funds. Funds in the second and fourth quadrants tend to fare better in their respective subsequent periods (i.e., they tend to be in the same quadrant or a better one), whereas first-quadrant funds tend to do worse in their subsequent periods (of course, there is no place to go from the top but down). Specifically, upon further investigation we found that second-quadrant funds tend to fall in the first or second quadrant *in the future*. Although this general trend cannot be proven statistically, it helps explain why second-quadrant funds tend to be superior performers *in the future:* they tend to still capture upside volatility in the *future* periods.

It is thus advised to utilize past capture ratios cautiously when using it to predict managers' future investment styles. For selecting *future* quadrant-three- and quadrant-two-style managers via *past* quadrant-three and quadrant-two managers, the capture ratio seems to be a reasonable tool, albeit not as robust for second-quadrant managers. However, the fact that a manager falls into the first or fourth quadrant provides little information, save for the tendency to perform contrarily in the future. It is this question of *future performance* that we now turn to for our final test.

CONTEST 3: *Past as Prologue*

Exhibit 5 reports the *future* performance of a given capture-ratio quadrant. A positive sign indicates the given quadrant had more funds *above* the median than below the median respective performance measure for the *subsequent period*. For example, we tracked the same Growth & Income funds that made up the second quadrant for the first seven-year period into the next seven-year period. We found that of this group of funds, more of them performed above than below the median of the entire fund sample for all three performance measures for the subsequent period. A negative sign denotes the quadrant had more of its funds in the future below the median of all funds than above it. Lastly, an equal sign indicates that within one fund, the quadrant had in the future period the same number of funds below as above the median performance ratio.[6] The p-value for all four quadrants' future performance distribution is reported in each respective performance measurement column. A p-value of 0.05 or less indicates the superior or inferior *future* performance of all previous quadrants of funds as statistically significant.

For five- and seven-year periods, we find quadrant-two funds tend in the future to be superior performers, most times on a statistically significant basis. The other quadrants produce mixed results. For three-year periods, the second-quadrant funds tend to be superior performers every other period and inferior performers for the alternate periods. We hypothesize this is due to style cycles. If only using a three-year period, one is likely to pick a "high" style that in the next three-year period reverts to the mean through becoming a future "low"-returning style. Since we used Growth & Income funds, most of them tend to be midcap and largecap value funds. However, some have a growth bias. Moreover, even among value managers there are different styles (e.g., yield-driven value, relative value, etc.) that come in and out of favor. This hypothesis is further supported by the fact that fourth-quadrant funds tend to be above-average performers and first-quadrant funds tend to be below-average performers for the future three-year periods, though this mean-reverting pattern does not hold for longer future periods (i.e., the five- and seven-year periods).

Caveats

Now that the results are in, it is apparent that more research on this topic is needed. The aforementioned capture-ratio patterns may or may not hold for other asset classes; we are thus next extending our research to include all the major mutual fund classes for the same fifteen-year period. Also, although we attempted to control for biases through using a homogenous fund class,

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Exhibit 5

SEVEN-YEAR PERIODS

	Period 1 to 2		
Quadrant	Annualized Return	Selection Ratio	Sharpe Ratio
1	−	−	−
2	+	+	+
3	−	−	−
4	=	+	=
P-Value	0.02530	0.00853	0.15182

FIVE-YEAR PERIODS

	Period 1 to 2			Period 2 to 3		
Quadrant	Annualized Return	Selection Ratio	Sharpe Ratio	Annualized Return	Selection Ratio	Sharpe Ratio
1	=	=	+	−	−	−
2	+	+	−	+	+	+
3	=	−	+	−	−	−
4	=	=	−	+	+	=
P-Value	0.97578	0.86534	0.11215	0.011041	0.005046	0.004562

THREE-YEAR PERIODS

	Period 1 to 2			Period 2 to 3		
Quadrant	Annualized Return	Selection Ratio	Sharpe Ratio	Annualized Return	Selection Ratio	Sharpe Ratio
1	−	−	−	−	−	=
2	+	+	=	−	−	−
3	−	−	+	=	=	=
4	+	+	=	+	+	+
P-Value	0.01589	0.00379	0.52782	0.31711	0.31711	0.12314

	Period 3 to 4			Period 4 to 5		
Quadrant	Annualized Return	Selection Ratio	Sharpe Ratio	Annualized Return	Selection Ratio	Sharpe Ratio
1	−	−	−	+	+	+
2	+	+	=	−	−	−
3	+	+	=	=	=	+
4	=	+	+	−	−	−
P-Value	0.14032	0.21605	0.51627	7.858E-06	3.84E-06	1.3E-05

Continued from page 9

two different benchmarks, and multiple periods of varying lengths, our results could be skewed from style biases. Moreover, the results could prove period specific for this fifteen-year period (a relatively strong U.S. stock market period as shown by mostly positive Sharpe ratios among all periods). Lastly, research also needs to be completed on separately managed accounts. We are thus continuing our research to address these areas.

Prognostications and Implications

Nonetheless, based on the present research we offer several guidelines and recommendations for the use of the capture ratio:

1) Unless an appropriate equity index creates a fairly even distribution of quadrant rankings, one should use peer group averages to calculate the capture ratio. Many times the peer group affords a more even distribution since most of the funds that make up the peer group have returns highly correlated to the peer-group average, more highly correlated than to a capitalization-weighted index such as the Frank Russell 1000 Value index.
2) For selecting *future* longer-term superior performers, second-quadrant managers tend to offer the best prospects. Meanwhile, past first-quadrant managers do *not* offer any more significant prospects than past third- and fourth-quadrant managers. Therefore, we would *not* recommend simply shunning past third- and fourth-quadrant managers in favor of past first-quadrant managers; this appears to be contrary to the present practice of some consultants.
3) Quadrant-two and quadrant-three managers tend to maintain similar styles in the future.
4) Unless one desires to actively trade managers one should use longer periods, such as five to seven years, to construct the capture ratio.

Conclusion

We empirically examined the value of the capture ratio. At a minimum, the capture ratio is useful in explaining the origins of past return and risk. It also, however, seems the ratio may be helpful in selecting future superior performing managers. Interestingly, it is not necessarily the historically most evident thieves (i.e., quadrant-one managers), as we originally thought, that we should be looking for if seeking future superior performance. Rather, it is the manager who pays more in terms of downside risk and likewise garners more payment in the form of increased upside *in the future* (i.e., quadrant two). Lastly, we found the ratio helpful in selecting certain managers who will in the future tend to maintain a similar risk/return management style (i.e., by selecting second- or third-quadrant managers).

As a result of this research, we also presented some specific guidelines for using the capture ratio. To this end, the capture ratio, as any ratio, should not be used as a one-stop black box approach to manager selection. Regardless of any past statistical significance, the past is not always prologue to the future. Moreover, even the best of quantitative tools cannot replace the value of *qualitative* evaluation of a particular money manager. Nevertheless, the capture ratio is likely to prove a valuable addition to the investment management consultant's quantitative toolbox.

References

Bauman, W. Scott, and Robert E. Miller. "Can Managed Portfolio Performance Be Predicted?" *Journal of Portfolio Management*, Summer 1994, pp. 31-40.

Blake, R. Christopher, Edwin J. Elton, and Martin J. Gruber. "The Persistence of Risk-Adjusted Mutual Fund Performance." *The Journal of Business*, April 1996, Volume 69, Number 2, pp. 133-157.

Detzel, F. Larry, and Margaret L. Gagne. "Stargazing: Enlightening in Selecting Mutual Funds?" *The Journal of Investment Consulting*, Volume 1, Number 2, June 1999, pp. 22-31.

Goetzmann, William N. and Roger G. Ibbotson. "Do Winners Repeat?" *The Journal of Portfolio Management*, Winter 1994.

Grinold, Richard C., and Ronald N. Kahn. "The Historical Record for Active Management." *The Journal of Investment Consulting*, Volume 2, Number 1, November 1999.

Gupta, Francis, Robertus Prajogi, and Eric Stubbs. "The Information Ratio and Performance." *The Journal of Portfolio Management*, Fall 1999.

Kahn, Ronald N., and Andrew Rudd. "Does Historical Performance Predict Future Performance?" *Barra Newsletter*, Spring 1995.

Mays, Timothy, Nancy Jay, and Robin Thurston. "A Returns-Based Style Analysis Examination of Asset Classes." *The Journal of Financial Planning*, August 2000.

Shein, Jay L. "It is More Than Just Performance: Tracking Error and the Information Ratio." *The Journal of Investing Consulting*, Volume 2, Number 2, June 2000.

Stewart, Scott D. "Is Consistency of Performance a Good Measure of Manager Skill?" *The Journal of Portfolio Management*, Spring 1998, pp. 22-32.

Endnotes

1. In our reference section we provide a partial list of some papers that present an excellent review of the use of these tools.

2. In this paper we use the terms *manager, investment manager, money manager,* and *fund* interchangeably.

3. Sharpe Ratio = (Total Return – Risk Free Return) / Standard Deviation of Total Return. See Shein for a thorough definition and treatment of both the Selection (Information) and Sharpe Ratio.

4. Selection Ratio = Active Return / Active Risk, where Active Return = Manager Return – Benchmark Return.

5. Here we deem statistical significance to be found at a p-value of 0.05 or less. Simplistically, the p-value is the probability of the observed event happening as a function of randomness. For example, a p-value of 0.05 would signify a 5 percent probability of the event occurring due to chance.

6. Some periods included an odd number of funds in a quadrant, and thus the expectation would be to have half a fund above and below the median.

The authors would like to thank Koby Tanzer for his immense help as research assistant.

Published by Investment Management Consultants Association Inc.
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This report was written in 200X, and the analysis presented in the report does not include data since that date. Had more recent data been included, some of the conclusions reached in the article may have been different.

Asset allocation/diversification cannot guarantee a profit nor prevent loss in a declining market.

The indices are presented to provide you with an understanding of their historic long-term performance and are not presented to illustrate the performance of any security. Investors cannot directly purchase any index.

Past performance is no guarantee of future results.

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Definition of terms:

Jenson alpha: An index that uses the capital asset pricing model to determine whether a money manager outperformed a market index.

Beta: A quantitative measure of the volatility of a given stock, mutual fund, or portfolio, relative to the overall market, usually the S&P 500.

Treynor Ratio: A measure of a portfolio's excess return per unit of risk, equal to the portfolio's rate of return minus the risk-free rate of return, divided by the portfolio's beta.

Returns-based style analysis: A tool, developed by William Sharpe in 1989, for asset allocation and investment performance measurement.

Correlation: A relationship between two variables.

Ex-post: Latin for "After the fact."

Growth & Income: An investment style whose aim is to provide both growth and income, often by investing in companies which have earnings growth as well as dividends.

Growth & Income CDA Average: A methodology used to measure seasonal performance when purchasing or selling stocks. Users often also consider the number of times a stock increases or decreases for any given month.

Frank Russell 1000 Value Index: A stock index that tracks the 1000 U.S. stocks with the largest market capitalization values.

Chi-squared test: any statistical hypothesis test in which the sampling distribution of the test statistic is a chi-square distribution when the null hypothesis is true, or any in which this is *asymptotically* true, meaning that the sampling distribution (if the null hypothesis is true) can be made to approximate a chi-square distribution as closely as desired by making the sample size large enough.

P-value: the probability of obtaining a test statistic at least as extreme as the one that was actually observed, assuming that the null hypothesis is true.