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Abstract

A broker has an obligation to ensure that his client incorporates suitable assets into his portfolio. Greater objectivity can be brought to assessments of suitability by comparing the performance of the aggrieved investor's portfolio to a benchmark portfolio using the Modigliani & Modigliani risk-adjusted performance measure. The applicable counterfactual benchmark could be either a "market" portfolio or a suitable alternative portfolio. The calculation of confidence intervals associated with the measured difference in risk-adjusted returns is demonstrated. Castaneda-like standards can be used as criteria for whether defendant's actions negatively impacted portfolio performance rather than outside events.

KEYWORDS: suitability, expert testimony, risk, securities litigation, securities law

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Introduction

In arbitration and litigation an expert is often called in support of allegations by a plaintiff investor as to the unsuitability of particular assets or financial instruments in the accounts managed by a defendant-broker. The suitability or “appropriateness” of an asset is derived from the suitability doctrine found in federal securities law. The doctrine obliges a broker to recommend to a customer only those securities which are suitable to the investment objectives and particular needs of that customer.

The difficulty with the suitability doctrine arises because of the broadness of its language. The doctrine is broad by design because it reflects a historical and palpable tension in the securities industry. On the one hand, everyone recognizes that unscrupulous brokers must be removed. Everyone also recognizes that at any given moment, the natural impulses of a salesman may result in him shading the riskiness of any financial instrument if the sale is hanging on the balance. Clearly, it is important to establish parameters because of the gray area between good salesmanship and downright lying. The imposition of regulatory oversight may increase the confidence of investors that lack the necessary information or expertise to make value-maximizing decisions. Increased confidence translates naturally into a willingness to invest in the markets.

On the other hand, it is important to preserve the efficiency of an industry that is highly innovative in developing financial instruments to suit any taste, risk profile or condition. The financial industry is a bedrock institution of our economy and a key participant in a system that quite capably marshals capital to its highest and best use. For the capital markets to work effectively and efficiently, the industry must not be hamstrung with prospectively chilling guidelines or directives that will erode incentives to financial engineering innovators.

As is the case when statutes or regulation remain broad, the need for clarity among participants to financial transactions spills into the courts, although binding arbitration has largely been the avenue offered to settle disputes in the financial industry (Eccleston, 2003). When applicable, resulting case law is likely to provide some clarity but there is no record keeping or precedential value in arbitration proceedings. Thus, guidance from case law is sparse.

Practitioners and academics join the marketplace of ideas, resulting in a vigorous debate over the parameters of the suitability doctrine (Cozzolino, 1999; Groner, 2002; Lowenfels and Bronberg, 1999; Poser, 2001; Solin, 2002) and attempts aimed at removing the inherent subjectivity of the exercise (Bolster, et. al., 1995; Rapp, 1998; Booth, 1999; Wallace, 2006). The emergence and popularity of derivatives and other instruments over the last decade recharges the suitability debate continuously (Frederick, 1995). In fact, the suitability debate

will never be abandoned because of the nature of the financial industry, one that continuously introduces novel investment products; the erosion of heretofore binding and limiting regulations; advances in the retail distribution and marketing of financial products; and the increased financial savvy and changing risk averseness of the population (Barnett, 2000).

We show in this paper, that it is possible to bring greater accuracy to assessments of suitability by comparing the performance of the aggrieved investor's portfolio to a benchmark portfolio; the benchmark could be either a "market" portfolio such as the S&P 500 or, preferably, a suitable alternative portfolio. The latter portfolio could be selected based on the initial indications of preference revealed by the investor at the outset of the relationship with the brokerage house.

The technique succeeds in removing the inherent subjectivity found in present disputes. Importantly, the method is intuitive and simple to present. Exposition and clarity of an expert's method is of fundamental importance in presenting a coherent case before a trier-of-fact. The technical and computational aspects are minimal and require only familiarity with Excel.

The Elements of the Suitability Doctrine

Regulatory suitability rules prohibit a securities broker-dealer from recommending a security to a customer unless he has a reasonable belief that the security is suitable for that customer (NASD; NYSE). The National Association of Securities Dealers (NASD) through its Rule 2310 and the New York Stock Exchange (NYSE) through its Rule 405 articulate guidelines as to the suitability of an investment. The various rules, collectively and singularly, impose an affirmative duty on the broker-dealer to take the client's particular circumstances and situation into consideration. The conditions that need to be assessed when recommending a particular security include a customer's financial situation, risk threshold, investment sophistication, investment objectives, and other securities holdings. Before agreeing to serve a client, a broker is expected to obtain sufficient information regarding the client's circumstances to be able to determine whether particular investments are suitable.

The difficulty arises because of the deliberate generality of the stated rules. For example, NASD Rule 2310 states:

In recommending to customers the purchase, sale or exchange of any security, a member shall have reasonable grounds for believing that the recommendation is suitable for such customer upon the basis of the facts, if any, discussed by such customer as to his other security holdings and as to his financial situation and needs.

NYSE Rule 405 is equally vague; it states:

Use due diligence to learn the essential facts relative to every customer, every order, every cash or margin account accepted or carried by such organization and every person holding power of attorney over and account accepted or carried by such organization.

The typical forum for airing suitability disputes are arbitration panels. Although a panel's adjudication is subject to review by the courts, the latter are inclined to defer to the panel's decision.

Review of Previous Work on Modeling Suitability

Although commentary on the suitability doctrine is extensive, the literature on its rigorous characterization is modest. Bolster, et. al. recommend an analytic hierarchy process to characterize suitability. Booth proposes a comparative approach based on the bid-ask spread of a security, and subsequently of a portfolio, as a surrogate for the direct measurement of risk. More recently, Wallace proposes to utilize the ratio of beta, which measures the risk of a security or portfolio relative to the overall market, to the proportion of the portfolio that is not leveraged, as a metric. In this section we discuss these three approaches and their limitations.

The Bolster, et. al. analytic hierarchy process (AHP) is a subjective weighting technique that relies upon the judgment of the decisionmaker in setting the appropriate "weights." Specifically, the broker presents an investor with a sequence of binary choices among several financial instruments available to the investor. Because there are many possible attributes that are associated with a particular instrument, the broker must first identify these attributes – risk, liquidity, return, etc, and then guide the investor through a pair wise ranking of the various instruments for each attribute. This selection process operates algorithmically based on the weights assigned to each security and concludes with a security ranking for each criterion. At this point, the investor must establish the relative importance of the various attributes; this is again a pair wise comparison exercise. The final tally is a weighted average of the instrument ranked by attributes times the attribute weights.

The subjective nature of AHP is clearly a shortcoming. Subjectivity creeps in not only in the determination of the relative weights of the financial instrument attribute, but also in the framing of the problem, i.e., the selection of financial instruments available for ranking. Another concern that has been raised in the AHP literature is the possibility of rank reversals. It is possible that with

the introduction of a new alternative to the group of financial instruments, even an irrelevant one, will cause the rankings of the previous alternatives to be reversed (Dyer, 1990).

Perhaps more troubling is the fact that the time and effort required to structure the AHP model is substantive even in the most simple of realistic scenarios and increases rapidly as the number of nodes in the hierarchy increases. For example, for a hierarchy with five securities, five attributes (risk, liquidity, return, familiarity, and dividend payout) and five alternatives (industrial, retail, manufacturing, defense, and pure international), the investor will have to complete 10 pairwise comparisons under each node, for a total of 310 comparisons. Last, our interest is in the applicability of AHP to assist the trier-of-fact in a suitability hearing. Since a suitability proceeding is typically contentious, it is unlikely that an expert could reconstruct the plaintiff's decisionmaking devoid of any bias or ill will.

Booth proposes that spread be used as a surrogate for the direct measurement of risk. Spread is the gap between the bid and ask price of a stock. The "bid price" represents the highest price that somebody will pay for a stock at a particular point in time; the "ask price" is the lowest price at which someone is willing to sell a stock. The bid-ask spread ostensibly compensates market makers for risk associated with holding and dealing the security and keeping the markets liquid.

However, the size of the bid-ask spread on a particular security is ill-suited for suitability considerations because it depends on several factors other than investor risk. In general, the more liquid a financial asset, the smaller its bid-ask spread. For example, the spreads in highly liquid spot currency markets will be minute compared with small cap stocks, which can vary sometimes by several percentage points of the value of the assets.

Wallace proposes the construction of a metric based on risk-adjusting a security (or a portfolio's) beta. Specifically, Wallace calculates a risk quotient by "dividing the beta of the individual security by the equity percentage recommended. The equity percentage is calculated as 100 percent less the percentage of loan recommended to make the purchase." It is clear that Wallace intends to account for the enhanced risk brought about by purchasing securities on margin, a strategy designed to leverage the returns of the security. What is not clear is the treatment to a transaction that was not made on margin.

More troubling is the fact that Wallace proceeds to arbitrarily assign cutoffs to the range of possible Risk Quotients; ranges that establish a safe harbor within which a security should be presumed suitable. In particular, Wallace views a risk quotient of less than or equal to 1.0 to be "presumptively suitable for any investor" and a risk quotient greater than or equal to 2.0 to be "presumptively unsuitable for any investor". Although Wallace claims that these cutoffs are

objective, they appear to be subjective and there is no explanation as to how they are derived.

Risk-Adjusted Performance of Plaintiff's Portfolio

Evaluating the performance of plaintiff's portfolio in terms of the suitability of individual financial instruments is uninformative; neither is a direct comparison of the returns of the various instruments within plaintiff's portfolio. First, the riskiness of a particular instrument cannot be divorced from its effect on the risk and return on the entire portfolio. Second, focusing on a particular seemingly "unsuitable" instrument provides no basis for comparison to a plausible performance counterfactual such as the performance of the market or any suitable representative benchmark over the same period of time. Indeed, it is important to determine if any observed downturn of plaintiff's portfolio would have occurred regardless of the influence of a particular financial instrument, an event that can be examined only in comparison to a suitable alternative portfolio. Even if the portfolio, rather than a particular financial instrument, is ultimately the focus of the analysis, it is unlikely that plaintiff's portfolio will have the same amount of risk as the market. Thus, for proper comparison, it is important to adjust the observed returns to take into account the risk of the impugned portfolio.

Sharpe's (1966) pioneering work resulted in one of the most popular measures of adjusted returns: the Sharpe ratio, which converts total returns to excess returns by subtracting the risk-free rate, and dividing the result by the standard deviation of returns. In effect, the Sharpe ratio offers a "reward per unit of risk." Unfortunately, the Sharpe ratio remains an abstract, de-contextualized number that may not be intuitive either to plaintiff, counsel or the trier-of-fact (Simons, 1998). The focus of a dispute turns on appraising the unattractive performance of the mismanaged portfolio, not a dimensionless number such as the Sharpe ratio.

Modigliani and Modigliani (1997) introduced a risk-adjusted performance measure known as M^2 that is considerably more intuitive than the Sharpe ratio, making it attractive for litigation and arbitration where clarity in exposition is important. Using M^2 , the performance of the disputed portfolio is judged by the return on that portfolio relative to an unmanaged benchmark such as the market portfolio or the selected representative portfolio, but the return is first adjusted so that the portfolio has the same risk as the benchmark.

Our approach turns not only in proposing the M^2 metric as the more intuitive approach but importantly, on structuring relevant confidence levels on the observed difference in returns. We accomplish this by bootstrapping the

returns data in an attempt to provide Castaneda-like guidance to the trier-of-fact.¹ By providing measures of acceptable dispersion for the difference in returns, as in *Castaneda v. Partida* (1977), where the measured distance in returns is beyond two standard-deviations, the trier-of-fact can more easily determine whether allegedly poor portfolio management was significantly different from that of the market portfolio. To those that may object to drawing Castaneda-like thresholds of “two-or three standard deviations” into assessments of suitability, we note that our approach need not turn on pre-established limits. Such limits may be stipulated or set as a matter of law.

Using the M^2 measure for assessing suitability entails relying on the tradeoff between risk and return to adjust plaintiff’s portfolio to the level of risk in the S&P 500, thereby matching the portfolio’s risk to that of the market. One then measures the returns of this risk-matched portfolio. Like the original return, the M^2 is an assessment of performance of the portfolio in terms of basis points – which are intuitively clear to all parties – and can be compared with the performance of any other similarly risk-adjusted portfolio. The difference is expressed in basis points.

In particular, plaintiff’s risk-adjusted portfolio can be compared with the average return of the market over the same period or time or with the average return of a portfolio originally established by the investor based on the risk-assessment and selection criteria of the brokerage-house. The difference between the performance of the suspect portfolio and the comparison(s) portfolio tells us by how much it underperformed the market on a risk-adjusted basis. Because the base portfolio and the market portfolio were viable alternative investments jointly selected, the differential performance can be regarded as a clear and easily computable standard to assess whether the defendant-broker abridged his responsibility and is therefore liable.

An Example: M^2 Operationalized

Consider an arbitration dispute between a divorced, white, 47 year-old man who seeks redress for his portfolio’s performance alleging violations of suitability rules. Plaintiff’s portfolio value fell by \$50,000 over a 3-year period as a result of alleged poor performance by this broker. Plaintiff is alleging that his broker is at fault because, contrary to his original request for income and growth, the broker effectively “doubled-down” or shorted, plaintiff’s portfolio in violation of plaintiff’s original investment goals.

¹ In *Castaneda v. Partida* (1977) and *Hazelwood School District v. U.S.* (1977) the United States Supreme Court accepted hypothesis testing in discrimination cases, deeming a difference of two or three standard deviations between the actual and expected number (Castaneda) and hires (Hazelwood) evidence in supporting a prima facie case.

Obviously, the task for the expert is to assemble investor's portfolio's performance and compare its risk-adjusted returns to those of an appropriate benchmark to establish whether – at the time the decision was made, (i) the securities purchases were unsuitable and (ii) whether the broker/defendant knew or reasonably believed the securities were unsuitable.

What is the correct counterfactual? While a market portfolio provides a tempting alternative, it might not be representative in the sense that it may not offer a realistic counterfactual to what the plaintiff/investor would have selected.

In lieu of actual data on either a suspect portfolio or a suitable counterfactual, we simulate the poor performing portfolio by ascribing to it the returns of a “bear” fund. Bear funds are positioned to make money only when the market is going down. Bear funds are considered an aggressive approach to investing. Similarly, we ascribe a growth and income fund to hypothetically represent the investor's objective of income and growth. Put differently, but for the broker's actions, and based on prior experience, the plaintiff would have opted for a more traditional income and growth objective. Our assumption is based on objectives checked off by the plaintiff when he established an account with the brokerage house. Thus, the proffered benchmarks will be the S&P 500 and a growth and income fund.

For no particular reason other than for expository purposes, we select the Direxion FDS, S&P 500 bear fund (PSPSX) (Morningstar unrated) to represent the investor's fund and Diversified Growth & Income Large Blend fund (DIGIX) with a Morningstar risk rating of “average” to represent the relevant counterfactual in addition to the S&P 500 index fund. All data is monthly, adjusted prices from January 2003 through December 2005, ostensibly, a period that would suitably match the period over which the alleged action occurred. The raw data is found in an appendix to this paper.

Following the M^2 approach, we reduce the risk and return of portfolio i by adding an amount of cash (d_i) to our investment. The amount d_i is chosen to reduce the variability of the new combined portfolio (fund + d_i) so the variability on the leveraged portfolio matches the variability of the benchmark portfolio B . The risk-adjusted return of the leveraged portfolio i is simply the expected return on the leveraged portfolio.

Thus, our optimization algorithm is as follows:

$$\text{Min } d_i: \{ \text{var}(I + (1+r_f)d_i/(1-d_i)-1 - \text{var}(B)) = 0 \}$$

Where:

d_i is cash added to investment so leveraged portfolio yields same risk as benchmark.

I = value in one period of \$1 invested in investment

B = value in one period of \$1 invested in benchmark

r_f = risk free rate during next period

We use Crystal Ball's optimization algorithm, OptQuest, to solve, although Excel's solver is equally capable of solving the model.

Table 1.

	Annualized Risk Adjusted Performance		
	S&P 500	PSPSX	DIGIX
Mean	13.4%	-100.9%	41.8%
Standard Deviation	9.00%	8.98%	8.64%
Coefficient of Variation	0.67	- 0.09	0.21
Sharpe Ratio	1.24	- 11.48	4.58

On a risk-adjusted basis, investor's putative fund did poorly. However, how confident are we that the results obtained are statistically meaningful? Put differently, is the observed difference statistically significantly different from zero. We argue that Castaneda-like standards derived from examining the confidence intervals of the resulting difference in means can provide guidance here.

However, accuracy requires an estimate of a confidence interval for the observed difference in portfolio performance. A conventional t-test of the difference of means may generally be inadequate given the small number of data accumulated. To establish a data-driven accuracy we rely on bootstrapping (Good, 2001).

Bootstrapping Risk Adjusted Performance

We use a bootstrap procedure to generate the necessary data to estimate the accuracy of the observed difference in the mean returns. Procedurally, the bootstrap entails resampling with replacement from the adjusted returns series. The general idea of the bootstrap procedure is to appraise the variability of parameter estimates by resampling the original small sample data. Specifically, we determine how likely it is that the observed result between the investor's portfolio and the two benchmarks resulted as a matter of chance.

Implicitly, we are assuming that the simulated returns of the portfolio instruments are random variations with the same contemporaneous structure. The bootstrap method, originally developed by Efron (1979), is regarded as an effective tool when one is faced with small samples. While the technique generally produces robust results, its implementation must be done with care to avoid two potential pitfalls. First, as a statistical technique, the bootstrap method ignores fundamental economic principles such as the tendency of markets to

revert towards equilibrium. However, by assumption, the period under consideration here is sufficiently short.

The key to obtaining reasonable estimates of standard errors is to make sure that the resampled data are generated in a manner that is consistent with the stochastic structure of the original model. In this way, standard errors are generated using the model's own assumptions and the Monte Carlo distribution of observed errors is used to approximate the distribution of the unobservable true model.

Once corrected for possible autocorrelation, the difference in returns draws are independently and identically distributed. Resampled data are obtained by randomly drawing data realizations with replacement. Drawing data in this way preserves the original stochastic structure among residuals. Resampled data are obtained by recursively solving the model. New model coefficient estimates are obtained from each resampled set and stored. The steps involved in resampling the data are repeated one thousand times. After the 1000 drawings of resampled data, standard errors and bias are computed using Efron's (1982) formulas.

Table 2

Statistics	Difference between portfolio returns (PSPSX) & S&P 500	Difference between portfolio returns (PSPSX) & Alternative Benchmark (DIGIX)
Mean	- 9.5%	- 11.9%
Percentiles	Difference between portfolio returns (PSPSX) & S&P 500	Difference between portfolio returns (PSPSX) & Alternative Benchmark (DIGIX)
0%	-3.8%	- 2.6%
5%	-2.2%	- 2.0%
90%	1.7%	2.0%
95%	2.1%	2.6%

Table 2 contains the results of the bootstrap replication of the difference of the mean returns of the actual portfolio and two benchmarks.² It indicates that the observed difference in the relative performance of plaintiff's portfolio and that of either alternative benchmark is significantly different from zero when compared to either benchmark. The p-value of observing the realized difference in performance between the investor's portfolio and the Growth & Income alternative is 0.0. The p-value of observing the realized difference between the investor's portfolio and the S&P 500 is 0.0. Put differently, the results suggest the observed results in performance difference between the investor's portfolio and both benchmarks are unlikely to have occurred by chance. Thus, if based solely on this piece of evidence, plaintiff would likely prevail.

Concluding Comments

A broker has an obligation to ensure that his client incorporates suitable assets into his portfolio. What is considered a suitable investment or retirement vehicle for one's portfolio? What are the broker's obligations? The boundaries of what constitutes suitability, has come to be informed by economic theory, common sense, regulation and case law. But there remain any number of gray areas, and conflicting incentives that make the issue of suitability a critical one, pitting furious investors versus chagrined financial advisors. These conflicts arise all the time but tend to flare up in market downturns when it may be convenient for an investor to blame losses on the recommendations of the stockbroker.

The matter is often resolved in arbitration or in the courts, where an expert is called to decide whether the broker's asset selections were imprudent or irresponsible given the investor's level of financial sophistication, age, income and other determinative variables. The expert's contribution in resolving the matter is often dispositive amidst cases that present relatively straightforward solutions. It is not difficult to conclude that in one's expert opinion, having purchased a series of put options on margin may not have been the best investment strategy to limit the portfolio risk of a retired couple. But most cases are more difficult and the associated subjectivity of the characterization of suitability is considerably more difficult.

We show in this paper, that it is possible to bring greater accuracy to assessments of suitability by comparing the performance of the aggrieved investor's portfolio to a benchmark portfolio; the benchmark could be either a "market" portfolio such as the S&P 500 or, preferably, a suitable alternative portfolio. The latter portfolio could be selected based on the initial indications of preference revealed by the investor at the outset of the relationship with the

² We use Crystal Ball's lookup table utility; a similar one is available in Excel.

brokerage house. We calculate, by bootstrapping, the confidence intervals associated with the observed difference in risk-adjusted returns. We argue that Castaneda-like standards of accuracy can serve to distinguish the critical point of a dispute: distinguishing between a broker's action and exogenous events. Thus, any observed difference between the investor's portfolio and the benchmark portfolio is considered inconsequential if it does not exceed two standard deviations.

The technique succeeds in removing the inherent subjectivity found in present disputes. Exposition and clarity of an expert's method is of fundamental importance in presenting a coherent case before a trier-of-fact, which is relevant since the method is intuitive and simple to present. Finally, the technical and computational aspects are minimal and require only familiarity with Excel.

Appendix

Table 3. Historical Prices & Yields

Date	S&P 500	PSPSX	DIGIX	T-Bill
Jan-03	856	42.03	4.18	1.17
Feb-03	841	42.52	4.12	1.17
Mar-03	848	41.73	4.17	1.13
Apr-03	917	38.48	4.45	1.13
May-03	964	36.54	4.64	1.07
Jun-03	975	35.96	4.69	0.92
Jul-03	990	35.25	4.78	0.90
Aug-03	1,008	34.49	4.84	1.50
Sep-03	996	34.83	4.77	1.78
Oct-03	1,051	32.90	5.02	1.95
Nov-03	1,058	32.58	5.08	1.97
Dec-03	1,112	30.89	5.31	1.99
Jan-04	1,131	30.22	5.34	1.92
Feb-04	1,145	29.80	5.39	1.85
Mar-04	1,126	30.12	5.31	1.90
Apr-04	1,107	30.58	5.24	2.23
May-04	1,121	30.13	5.31	2.35
Jun-04	1,141	29.52	5.41	2.66
Jul-04	1,102	30.46	5.23	2.65
Aug-04	1,104	30.32	5.22	2.65
Sep-04	1,115	29.99	5.35	1.65
Oct-04	1,130	29.46	5.42	1.76
Nov-04	1,174	28.24	5.68	2.07
Dec-04	1,212	27.30	5.87	2.19
Jan-05	1,181	27.98	5.69	2.33
Feb-05	1,204	27.35	5.82	2.54
Mar-05	1,181	27.84	5.73	2.74
Apr-05	1,157	28.36	5.58	2.78
May-05	1,192	27.49	5.8	2.84
Jun-05	1,191	27.51	5.85	2.97
Jul-05	1,234	26.54	6.10	3.22
Aug-05	1,220	26.89	6.09	3.44
Sep-05	1,229	26.76	6.18	3.42
Oct-05	1,207	27.29	6.02	3.71
Nov-05	1,249	26.40	6.24	3.88
Dec-05	1,248	26.52	6.27	3.89

Source: Yahoo Finance; adjusted prices. Federal Reserve Statistics, Table H.15, Selected Interest Rates

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