Are Wall Street Wolves Actually High Sales Performers?

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**Abstract**

This study defines Wall Street wolves as stockbrokers scoring high on a scale measuring Machiavellianism. The study finds that such wolves have high sales performance consistently while lambs do not—lambs are stockbrokers scoring low on the Machiavellianism scale. The study builds on prior research showing that asymmetric tests provide higher accuracy in predictive outcomes of interest than the use of the dominant logic of symmetric, variable focused, tests (e.g., correlation and multiple regression analysis). Asymmetric tests focus on predicting sufficiency of models of high scores at the case level (e.g., high sales performers among stockbrokers) versus the symmetric testing at the variable level of both low and high scores. The study uses a modified version of Aziz and Meeks’ (1990) Machiavellian Behavior Scale in a survey USA stockbrokers (n = 110); the survey included measures of self-reports on sales performance, age, and gender. The findings include superior predictive ability of identifying stockbrokers using the asymmetric tests separately for high versus low sales performances in comparison to symmetric testing.

**Keywords:** Asymmetric, Machiavellianism, Selling, Stockbroker, Symmetric
**Introduction**

Belfort’s (2008) autobiographical account, *The Wolf of Wall Street*, centers on the belief that manipulative, persuasive, behavior is useful for accomplishing personal objectives—the cornerstone of Machiavellianism as a personality trait. Belfort was the chief executive officer and trainer of 22 stockbrokers he instructed on how to lie to customers to achieve stock sales—sales resulting in substantial profits via insider trading by Belfort and substantial losses of savings by customers. Machiavelli (1513/1952, 1531/1965) expresses the necessity of lying in an imperfect world; where one may need to sacrifice ethical standards to achieve personal objectives.

The relevant literature includes scales to measure individuals’ levels of Machiavellianism (e.g., Aziz & Meeks 1990; Christie and Geis 1970; Dahling, Whitaker, & Levy 2009). The literature on Machiavellianism and job performance is substantial, though the findings are inconsistent. A recent meta-analysis (O’Boyle et al. 2012) on this relationship indicates no strong linear association exists between the two constructs; with prior literature reviews supporting this perspective: “Machiavellianism … does not consistently lead to real-world success. It is best regarded as one of several social strategies, broadly similar to the ‘defect’ strategy of evolutionary game theory, which is successful in some situations [industry contexts] but not others” (Wilson, Near, & Miller, 1996, p. 285). The present study demonstrates that among stockbrokers, high Machiavellianism does associate consistently with high sales performance.

Zettler and Solga (2013) suggest that the inconsistencies in findings might be due to other variables moderating the relationship between Machiavellianism and job performance. The present study offers an additional explanation for the inconsistencies regarding Machiavellianism and job performance: high Machiavellianism is but one path to achieving high job performance in certain professions, the presence of contrarian cases of high performers who are low in Machiavellianism hampers the ability of symmetric tests to find a highly positive Machiavellianism and job performance relationship. Symmetric tests include analysis of variance, correlation, and multiple regression analysis. Unlike symmetric tests, asymmetric tests do not include attempts to predict both low and high scores; algorithms are asymmetric tests that attempt only to predict high scores in an outcome condition, such as high scores in job performance. The findings in the present study indicate that high scores in Machiavellianism associates consistently with stockbrokers having high sales performance.

The present study advocates refocusing Machiavellianism and sales performance theory and research beyond the current dominant logic of applying symmetric testing only. Specifically, the study suggests a paradigm shift to building and testing theory based on asymmetric tests that is, inferring a specific outcome of interest by using simple and complex algorithms. McClelland (1998) provides an early example of how using algorithms improves on explanation and predictive validity of job performance when testing models on additional samples versus using traditional psychometric approaches such as regression analysis. Asymmetric versus symmetric testing represents a radical shift in both theoretical and data analysis logic; asymmetric tests provide models usually representing complex antecedent conditions.
based on Boolean algebraic expressions of recipes of ingredients—such model statements indicate case-level descriptions.

Following this introduction, section two describes complex antecedent conditions as recipes whereby high scores for the recipe infer high scores for an outcome condition; section two describes the compuation of complex antecedent conditions. Section two describes the relevancy of some core tenets of complexity theory to asymmetric testing. Section three provides a literature review covering symmetric testing of Machiavellianism and variable-based sales performance. Section four describes the theories for testing in the present study from symmetric and asymmetric stances. Section five revisits the data from one of the studies in section three to probe symmetric/asymmetric theories and testing of the relationship between Machiavellianism and (individual case-level) sales performance in the context of stockbrokers; section four includes tests and findings for predictive validity. Section six concludes with a summary, limitations, and recommendations for human resources (hiring) decision-making.

**Complex Antecedent Conditions as Recipes (Algorithms) and Complexity Theory**

“Complex antecedent conditions” are recipes indicating that if an individual case has a specific combination of attributes, then the same individual’s outcome score will be high (low). For example, consider the following recipe inference proposal: if an individual has a high score on a Machiavellianism (Mach) scale, is a male (M), and is young, he will have high sales performance (P). This configuration is expressable as model 1:

\[
\text{Mach} \cdot \text{Male} \cdot \sim \text{Old} \leq P
\]

where the mid-level dot (“•”) indicates the logical “AND” condition and the sideways tilde (“~”) indicates negation. Model 1 states that a case (individual) with a high Mach score, who is a male, and who is young will have high sales performance. Model 1 is an expression of sufficiency but not necessity; unlike symmetric models, model 1 makes no predictions about low scores for this model. Model 1 is an asymmetric statement of a recipe that predicts a high score in an outcome condition. High sales performance is an example of an outcome condition. Ordanini, Parasuraman, and Rubera (2014) emphasize that a positive and negative valenced simple condition within different complex antecedent conditions (recipes) may indicate the same outcome (e.g., high sales performance). Woodside (2015) labels this perspective as the first precept of complexity theory: X relates to Y positively, negatively, and not at all to Y with the same data set. Thus, findings in the same data set might support model 2 as well as model 1:

\[
\text{Mach} \cdot \sim \text{Male} \cdot \text{Old} \leq P
\]

where model 2 indicates that individuals high in Mach, who are females, and are old will have high sales performance scores. “Equifinality” is the term used to represent this concept of two or more models (recipes) which infer the same outcome condition. Thus, Ordanini et al. (2014) stress that recipes often are more important than than ingredients in describing, explaining, and predicting behavior.
Asymmetric theory and testing of algorithms applies Boolean algebra not matrix algebra. Thus, using Boolean algebra the score for a complex condition (i.e., a recipe) is equal to the lowest scores among the simple antecedent conditions in the complex expression. For example, using calibrated scores ranging from 0.00 to 1.00 for all simple conditions and a dummy code for gender (male = 1; female = 0), an individual (case) having the following profile would have a score for model 1 equal to 0.66: Machiavellianism = 0.97; gender = 1.00; and age (old) = 0.66. The same individual has a score equal to 0.00 for model 2: Machiavellianism = 0.97; ~male = 0.00; age (old) = 0.66. This individual is a male, and model 2 represents the combination score for Machiavellianism AND female AND old age.

“Causal asymmetry” is an additional tenet of complexity theory (Woodside 2014) and asymmetric testing (Fiss 2010). Causal asymmetry refers to the theoretical perspective that recipes indicating high scores in an outcome condition differ in ingredients from recipes indicating the negation of outcome condition. This asymmetric stance is opposite to the view of symmetric testing. A symmetric test is a statistical model where high model scores predict high dependent variable scores and low model scores predict low dependent variable scores. Asymmetric tests offer two or more algorithms that differ in recipe ingredients for predicting high versus low scores in an outcome condition. Figure 1 displays symmetric and asymmetric relationships for a simple or complex condition (X) and a simple outcome (Y). The present study includes testing for the presence of alternative algorithms (complex antecedent conditions that include different ingredients) for high Y and low Y outcomes.

![Figure 1: Possible associates of causal conditions and an outcome condition](image-url)
Prior Research Testing for a Machiavellianism and Sales Performance Association

The findings from prior research range from reports of no statistically significance to one study finding a highly significant positive association for Machiavellianism and sales performance. All prior studies rely on symmetric testing for significant relationships; all use the current dominant logic of not testing for predictive validity via additional samples and some do not provide estimates of effect sizes of the significant relationships. For example, Ricks and Veneziano (1988) analyzed survey responses by 225 professional sales people and their managers in both business-to-consumer (B-2C) and business-to-business (B2B) contexts; participants completed the Christie and Geis (1970) “Mach V Scale” for Machiavellianism and self-reports on his/her own sales performance. Ricks and Veneziano (1988) report non-significant associations for Machiavellianism and self-report sales performance, as well as for the interaction of gender by Machiavellianism and self-report sales performance.

While not citing Ricks and Veneziano (1988) or discussing the findings of this earlier study, Ricks and Fraedrich (1999) use the same data reported by Ricks and Veneziano (1988); they breakdown the data into low and high Mach’s for B2B versus B2C salespersons. Rick and Fraedrich (1999) report a significant main effect for differences between sales volume means for low versus high Mach B2-B salespersons and a non-significant relationship for the means for between low and high Mach B2C salespersons.

Using a Machiavellianism scale (Mach-B) developed by Aziz and Meeks (1990), in a series of four studies of Machiavellianism and sales performances Aziz and colleagues provide a range of findings from refuting to supporting a positive relationship between the two variables for salespersons in four different industries. Aziz, May, and Crotts (2002) report a significant positive relationship ($r = .76, p < .01$) between Mach-B and self-reported sales performance among 110 stockbrokers. Among 80 automobile car salespersons selling new and used vehicles, Aziz (2004) reports a significant positive relationship between Mach-B and number of vehicles sold ($r = .37, p < .01$). Crotts, Aziz, and Upchurch (2005) find no significant relationships between Machiavellianism and four different measures of sales performance among resort timeshare salespersons ($n = 85$). Aziz (2005) report a positive relationship ($r = .37, p < .01$) for scores using Mach-B and sales performance among 72 real estate salespersons. The present study revisits the data for Mach-B stockbrokers’ self-reports on sales performance in the Aziz, May, and Crotts (2002) study in an attempt to deepen and enrich both theory and empirical findings by using asymmetric testing of relationships among Mach-B, sales performance, age, and gender of the stockbrokers. Details about Mach-B, analysis, and findings appear in the following sections of the present paper.

Schultz (1993) is the final study in this review. Shultz (1993) studied the sales performance of stockbrokers from companies differing in their organizational structure. NYNEX is a tightly structured, rule-bound corporation that allows little room for improvisation. Employees are required to abide by a two-volume sales manual, they are assigned potential clients, and it is virtually impossible to manipulate transactions to affect commissions. In contrast, corporations such as Merrill Lynch and Shearson, Lehman and Hutton are loosely structured and encourage
unscrupulous negotiations (e.g., wheeling and dealing) by their representatives; employees receive a brief “suggestion pamphlet” rather than a sales manual, their pool of clients is unlimited, and ample opportunities exist to manipulate commissions. Findings in the Shultz (1993) study are that in loosely structured organizations, high-Machs had more clients and earned twice as much in commissions than low-Machs; in tightly structured organizations, low-Machs earned twice as much as high-Machs. Models 3 and 4 are algorithm statements of low and high Machs’ high performances depending upon loose versus tight organization structures.

\[ P \geq \text{Mach}\cdot\text{Loose} \quad (3) \]
\[ P \geq \sim\text{Mach}\cdot\text{Tight} \quad (4) \]

where \( P = \) high stockbroker sales performance.

**Theory and Hypotheses for Testing Using Symmetric and Asymmetric Perspectives**

The present study examines the selling performance of stockbrokers by Mach scores in a loosely structured organizational design. Thus, the principal hypothesis is that Mach scores relate to sales performance positively. Applying a symmetric stance, the present study tests the following symmetric hypotheses:

\[ P = \beta^* \text{Mach} \quad (5) \]
\[ P = (\beta_1^*\text{Mach}) + (-\beta_2^*\text{Age}) + (\beta_3^*\text{Gender}) \quad (6) \]
\[ P = (\beta_1^*\text{Mach}) + (\beta_2^*\text{Age}) + (\beta_3^*\text{Gender}) + (-\beta_4^*(\text{Mach}\cdot\text{Age})) \quad (7) \]

where \( \beta^* \)s indicate standardized partial regression coefficients; “\( \cdot \)” indicates multiplication; gender equals 1 for males and 0 for females; “\( \text{Mach}\cdot\text{Age} \)” indicates the interaction of Mach and age scores. \( \beta_4 \) is negative to indicate the hypothesis that high Mach scores are effective among younger but not effective among older stockbrokers.

Model 5 indicates a positive relationship occurs between Mach scores and sales success in the context of stockbrokers selling in a loosely structured organization. The context of a loosely structured organization applies for all hypotheses. Model 6 indicates improvement in model fit and predictive validities by estimating sales performance using three variables: Mach, age, and gender. Model 6 indicates additional improvement in model fit and predictive validities by including an interaction term for Mach by age.

Model 8 is an asymmetric model indicating that high Mach scores in combination with loosely structured organizations results in high sales performance. Model 9 is a recipe proposal that stockbrokers in loosely-structured organizations who are young and males have high sales performances. Model 10 is a recipe indicating high sales performance will occur in loosely structured firms among older female stockbrokers. The study incudes proposing and testing model 2 for two reasons: model 10 illustrates the complexity theory tenet that cases occur that represent associations directly opposite to a main effect hypothesis; second, older females low in Mach may be effective because they are apt in building trust with customers and project the desire to do what is best for their customers.

The symmetric data analysis by Aziz, May, and Crotts (2002) indicate a positive relationship ($r = 0.76$, $p < .001$) between self-reported sales performance and Mach-B; Cohen (1977) informs that positive and negative correlations greater than 0.50 in absolute size represent large effect sizes. “The first of the two performance questions (PERF) asked respondents to rate their own individual performance relative to those of other stockbrokers in the company on a scale of 1 to 10, with 10 being high” (Aziz, et al. 2002, p. 455). Aziz et al. (2002) also report a large effect-size correlation (0.68) for stockbrokers’ self-reports of their firms’ evaluations of their sales performance, that is, the numerical performance rating the company had assigned to them in the formal performance evaluation process, on a 5-point scale with anchors of 5: very high and 1: very low. The two performance ratings have a high correlation (0.84).

The Mach-B Scale

The items in the Mach-B scaled used in the Aziz et al. (2002) study are available from anyone of the authors by request. Aziz et al. (2002) describe the psychometric metrics for the Mach-B scale; they measure the internal consistency of the scale using Cronbach’s alpha and report a scale correlation equal to 0.70. Using maximum likelihood factor analysis, Aziz et al. (2002) report the emergence of single factor loading accounting for 31.45% of the variance. However, the fourth and fifth items in the seven item scale have substantially lower correlations with the other items in the scale in comparison to the correlations among the other five items. The fourth and fifth items offer short stories interpretable to represent Todd helping a fellow employee competing for a promotion (item 4) and salesman Moe helping a couple by telling them to postpone their purchase (item 5); such interpretations do not appear to indicate Machiavellian actions. The low correlations of items 4 and 5 with the other five items supports this interpretation as well as the improvement in the scale’s psychometric properties in using items 1-3 and 6 and 7: Cronbach alpha equal to 0.77 and a single factor loading accounting for 53.06% of the variance following a varimax rotation. Consequently, the present study applies a revision to the Mach-B scale—the revision included using only survey participants’ responses to items 1-3, 6, and 7. We identify this revision as the Mach-BR.

To further test the validity of the scale, Aziz et al. (2002), performed a median split on the sample of 100 stockholder respondents and found substantial differences in the means between the two samples in sales performance—much higher for the high versus low Mach-B scoring group. However, a median test is less useful than a “spotlight” split, that is, examining the sales performances of respondents with Mach-BR scores below one standard deviation versus respondents with Mach-B scores above one standard deviation (cf. Fitzsimmons, 2008) or by examining average scores by lowest to highest cases by using quintile segments of Mach-BR. Figure 2 includes testing for the nomological validity of the Mach-BR scale by applying McClelland’s recommendation to use quintiles to reduce noise in showing the validity of relationships among variables.
The findings in Figure 2 include the averages for the calibrated “confirmed” sales performances of the 100 stockbrokers in the Aziz et al. (2002) study. Confirmed sales performance was estimated using the following steps. The two self-report scales in the Aziz et al. (2002) study were transformed (calibrated) into a 0.00 to 1.00 logarithmic scales; the confirmed estimate is the lower of the two calibrated scores for each case. Thus, assume Joan was a stockbroker who completed the survey; Joan’s scores on the two calibrated sales performance scales equal 0.82 and 0.44; using a Boolean algebra rule for estimating how much these two estimates share in common, Joan’s confirmed score is equal to 0.44. Aziz et al.’s (2002) first self-rating performance question asked respondents to rate their own individual performance relative to those of other stockbrokers in the company on a scale of 1 to 10, with 10 being high. The second performance question asked the brokers to report the numerical performance rating the company had assigned to them in the formal evaluation process, on a 5-point scale with anchors of 1 for very low to 5 for very high. The correlation for these two ratings is very high (r = .84, p < .001). Unfortunately, Aziz et al. (2002) did not report (may not have had access) to independent assessments of the stockbrokers’ sales performance.

A comparison of the confirmed sales averages include a calibrated confirmed mean (and standard error) equal to 0.22 (.006) for the quintile lowest to a mean equal to 0.96 (0.01) for the high quintile on the Mach-BR scale. The findings include a large effect size (eta² = .43) and a linear relationship (test findings for linearity: F = 59.01, DF = 1/105, p < .001). These findings support the general conclusion that the Mach-BR scale has high nomological validity; the findings support a symmetric based theory that stockbrokers with high Mach-BR scores have high sales performances and stockbrokers with low Mach-BR scores have low sales performances.
Unfortunately, the Aziz et al. (2002) data file does not include information on the cases (individuals) for tight/loose organization structure. Thus, this revisit of the data could not include the impact of this aspect of organizational structure on sales performance.

Findings

The first set of findings in this section includes testing the models for the symmetric modes. Testing for the symmetric models includes correlation and multiple regression models; all symmetric tests are applications of matrix algebra. The section reports the findings for the asymmetric models second. Testing for the asymmetric models includes “fuzzy-set Qualitative Comparative Analysis” (fsQCA); fsQCA includes testing for recipes (configurations) of simple and complex antecedent conditions that associate with high scores in an outcome condition (e.g., high sales performance) or the negation of high sales performance (~performance) via applications of Boolean algebra. Ragin (2008) provides a useful primer on how and why asymmetric theory and testing are useful; Woodside (2014) proposes that asymmetric tests in general and fsQCA specifically rests on the main tenets of complexity theory (e.g., equifinality in the occurrence of multiple solutions for the same outcome of interest; reversals in valence occur in how simple conditions affect an outcome; and solutions may be sufficient but are not necessary for the occurrence of the outcome of interest).

Findings for the Symmetric Models

Table 1 includes the correlations of the relationships among the four variables of the study. The findings in Table 2 confirm the principal symmetric hypothesis that Machiavellianism scores (via Mach-BR scale responses) have a positive association with sales performance ($r = .66$, $p < .01$). The effect size of this relationship is so large that the findings indicate that no contrarian cases may exist; that is, all respondents high in Mach-BR scores are likely to be high in sales performances and all respondents low in Mach-BR scores are likely to be low in sales performance. However, taking an asymmetric stance, the findings do include a number of contrarian cases whereby some salespersons having low in Mach-BR scores are high in sales performances; these findings appear in the next subsection.
Additional findings in Table 1 do not support the secondary a priori hypothesis that a negative hypothesis occurs between age and Mach-BR scores. In fact, the symmetric findings indicate a significant positive relationship between age and Mach-BR scores ($r = .37, p < .001$). Again taking an asymmetric stance, the findings do not support the second a priori hypotheses that young stockbrokers outperform older stockbrokers; in fact, the findings indicate a significant positive relationship between age and confirmed sales performance ($r = .48, p < .001$).

**Test of Model 5: $P = \beta\star\text{Mach}$**. Using the data for all 110 cases, the findings from the regression analysis supports model 5: $P = .66$ (Mach-BR), where .66 is the standardized partial regression beta coefficient and P equals sales performance; the adjusted $R^2$ is equal to .43. A beta equal to .66 indicates a large increase in sales performance (calibrated score) with an increase in a Mach-BR score.

**Test for Model 6: $P = (\beta_1\star\text{Mach}) + (-\beta_2\star\text{Age}) + (\beta_3\star\text{Gender})$**. The findings do not provide full support for model 6. The empirical model supports a positive contribution of age (old) in model 6 and no significant contribution by gender to the model: $P = (.56\star\text{Mach-BR}) + (.26\star\text{Old}) + (-.04\star\text{Male})$; adjusted $R^2 = .49$. Deleting gender from model 6 results in a more parsimonious model with the same effect size as model 6 with gender included. Conclusion: gender does not play a significant or a substantial influence on sales performance.

**Test for Model 7: $P = (\beta_1\star\text{Mach}) + (\beta_2\star\text{Age}) + (\beta_3\star\text{Gender}) + (-\beta_4\star(\text{Mach}\star\text{Age}))$**. Given the non-significant impact of gender, model 7 was tested without gender. The empirical symmetric findings do not support model 7. Gender and the interaction term for Mach by age are not significant statistically.

**Testing for Predictive Validity Using Split Samples**. To test for predictive validity using additional samples, the total sample was divided into two subsamples consisting of 55 respondents in each. Symmetric empirical modes of were run for Mach-BR and
age influences on sales performance. Here are the empirical models for the two subsamples:

subsample 1: \(-0.033 + (0.494 \times \text{Mach-BR}) + (0.450 \times \text{Old}), \text{adjusted } \text{R}^2 = 0.568\)
subsample 2: \(+0.147 + (0.695 \times \text{Mach-BR}) + (0.112 \times \text{Old}), \text{adjusted } \text{R}^2 = 0.473\).

The models for the two subsamples are different but sufficiently similar in showing impacts for both Mach-BR and age to support testing for predictive validation. Consequently, subsample model 1 was computed as a variable in subsample 2 and the correlation between the resulting predicted versus actual scores for subsample 2 was computed. The correlation between predicted versus actual calibrated sales performance scores for subsample 2 indicates a high effect size \((r = 0.62, p < 0.001)\). Using the empirical model from subsample 2 to predict the scores for calibrated sales performance in subsample 1, the correlation indicates a large effect size \((r = 0.70, p = 0.001)\). These findings indicate high predictive validity for both empirical models.

**General Conclusion for the Symmetric Tests.** The findings from testing the empirical symmetric models support the hypotheses that Machiavellianism likely has a symmetric relationship with stockbroker sales performance. However, the findings in this section do not include testing for occurrence of contrarian cases--even with a high correlation, contrarian cases may occur (Woodside, 2014) whereby a few stockbrokers with high Mach-BR scores have low sales performance and a few stockbrokers with low Mach-BR scores have high sales performance. The asymmetric findings in the next section support the presence of the second type of contrarian cases.

The symmetric findings do not support the view that young stockbrokers outperform old stockbrokers--evidence for the reverse occurs. The symmetric findings do not support the view that males outperform females; gender is not a substantial influence on sales performance of stockbrokers--at least in the Aziz et al. (2002) data set and when using symmetric tests.

**Findings for the Asymmetric Models**

Consistency and coverage indexes indicate the usefulness of the asymmetric models. Consistency is the level of uniformity in finding a high score (above the main diagonal) of a model in the relationship between a simple or complex antecedent condition and the outcome condition. Woodside (2013) provides an example for calculating the consistency index for findings. Ragin (2008) recommends a minimum consistency equal to 0.75 to conclude a model to be reasonably highly consistent in predicting high Y for X scores. The coverage index indicates the share of cases relevant for a given model. Woodside (2013) provides example calculations for the coverage index. Coverage might be quite low for a given model (e.g., coverage = 0.02) for a complex antecedent model having high consistency (0.95); this indicates that few cases fit the profile for the given complex antecedent model but for those that do fit the profile, almost all of them have calibrated scores for Y higher than scores for calibrated scores for X.

**Findings for Model 8: \(P \geq \text{Mach\cdotLoose}\).** All the stockbrokers worked in firms without elaborate written requirements on communicating with clients; thus, the study
classifies “Loose” equal to 1.00 for all stockbroker respondents. Consequently, the empirical test of model 8 reduces to sales performance is greater than Mach-BR. Figure 3 presents the findings from testing model 8. The findings support model 8: high scores in the simple antecedent condition for Mach-BR only are sufficient (but not necessary) for high scores in sales performance. Sight inspection of Figure 3 indicates that all respondents having a calibrated score above 0.80 have high sales performance.

Note that 8 respondents have low Mach-BR scores and high sales performance—but the asymmetric test only refers to the issue of whether or not high scores on X (i.e., Mach-BR scores here) associate consistently with high scores on Y (i.e., sales performance here). An implication here is that a sales manager does not need to consider age or gender if a job applicant for a stockbroker scores if the applicant has a very high score on Mach-BR, the very high score on the Mach-BR scale indicates that the applicant will deliver high sales performance.

Findings for Model 9: \( P \geq \text{Mach} \cdot \text{Loose} \cdot \sim \text{Age} \cdot \text{Gender} \). Given the assumption that all the stockbrokers work in firms with loose instructions in communicating with customers, model 9 (the same as model 1) reduces to \( \text{Mach} \cdot \sim \text{Age} \cdot \text{Gender} \). This model predicts that stockbrokers with high Mach-BR scores who are young and male will score high in sales performance. The findings from testing this asymmetric model do not indicate acceptably high consistency (consistency = 0.705). Only 5 of the respondents fit the profile of having high Mach-BR scores AND young AND male; 3 of the 5 had high confirmed sales performance. Thus, this complex antecedent model does not work well in predicting high sales performance.

Findings for Model 10: \( P \geq \sim \text{Mach} \cdot \text{Loose} \cdot \text{Age} \cdot \sim \text{Gender} \). Model 10 (also model 2) predicts that older females with high Mach-BR scores will be high sales performers. Model 10 works well. All (4 of 4) older female stockbrokers with very high Bach-BR scores \( (X \geq 0.80) \) all have high sales performances. However, high scores on Mach-
BR alone are sufficient for consistently finding high scores on sales performance. Building more complex models does not improve sufficiency or create necessity in predicting high sales performance.

**Asymmetric Models for Low Sales Performance.** The study includes testing for causal asymmetry, that is, models accurately predicting low sales performance are not the mirror opposite of models predicting high sales performance. The findings support the causal asymmetry tenet. Two models indicate highly consistent low sales performances: young stockbroker AND low Mach-BR scores OR males with low Mach-BR scores. Thus, either being young or being male couple with low Mach-BR scores consistently associate with low sales performance. For example, Figure 4 presents the details of the findings for the ~old AND ~Mach-BR model; Figure 4 shows that 27 of 35 respondents with high scores on this complex antecedent condition have high scores for the negation of sales performance (i.e., low sales performances).

![Figure 4: Useful asymmetric model for predicting low sales performance: Young•~Mach-BR ≤ ~ Sales Performance](image)

**Summary, Limitations, and Recommendations**

**Summary.** The findings support the perspective that asymmetric theory and testing provide useful additional information beyond the use of only symmetric-based theory and testing. Asymmetric testing avoids the issues of multi-collinearity of variables that usually occur in multiple regression analyses, especially when researchers include more than 3 terms in their regression models. Asymmetric testing provides several additional benefits, including maintenance of a case-based focus in data analysis that permits the researcher to easily identify each case in the outputs when testing models. Also, asymmetric testing fits well with the core tenets of complexity theory, which are more isomorphic to real-life relationships (Woodside 2014).

**Limitations.** The present study is limited to a relatively small sample size and few variables. The study relies of self-report measures, which are always suspect (Nesbitt
& Wilson 1977). The study is cross-sectional and does not include testing the performance of new stockbrokers longitudinally using the heuristic of only hiring candidates scoring very high on the Mach-BR scale and monitoring their performances for several years.

**Recommendations.** Both applied and academic researchers may benefit from adopting the stance of building and testing both symmetric and asymmetric models. The use of symmetric models only fails to examine nuances almost always occurring in data sets; nuances that include cases showing relationships contrary to main effects even when the symmetric data analyses indicate high effect sizes in the main effects. Examining the consistencies of the predictions of complex antecedent conditions is easier to do than examining three-way and four-way interaction effects in symmetric tests. McClelland (1973, 1998) emphasize the usefulness of going beyond regression analysis by analyzing by combinations of very high/low quintiles in identifying highly competent executives (i.e., using asymmetric tests).

**References**