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# *Acceptable Risk: A Study of Global Currency Trading Rooms in the US and Japan*

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# Acceptable Risk: A Study of Global Currency Trading Rooms in the US and Japan [1]

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Abstract: In this study, I explore the idea of "acceptable risk" at the organizational level of analysis in a sample of currency-trading rooms embedded in different national cultures, and develop and test a multi-level model of how national culture and the organizational context, in particular the control strategies and the norms of acceptable risk within risk-taking units, shape their risk-taking behavior and performance. The results show that "acceptable risk" as defined within the micro-environment of the trading room does influence actual organizational risk-taking, though national culture does not. In addition, market control strategies were related to better risk-transformation in these trading rooms.

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## ACCEPTABLE RISK: A STUDY OF GLOBAL CURRENCY TRADING ROOMS IN THE US AND JAPAN

The influence of context on risk-taking has begun to receive an increasing amount of theoretical and empirical attention in the literature on risk (Tetlock, 1985; March and Shapira, 1987; Schoemaker, 1989; Bromiley and Curley, 1992). Studies of risk-preferences expressed by samples of managers exposed to different situational contexts have shown little consistency in individual risk-taking across situations (MacCrimmon and Wehrung, 1986 and 1990;). At the same time, theorists in sociology have begun to stress the role of social and institutional influences on the norms that define what risks are considered "acceptable" (Douglas and Wildavsky, 1982; Douglas, 1985) or legitimate at the *societal* level of analysis. Yet there has been little systematic work on the norms of "acceptable risk" that might exist *at the organizational level* and how these might influence risk-taking in business organizations. In this study, we explore the idea of acceptable risk at the organizational level of analysis in a sample of real organizations embedded in different national cultures, and develop and test a multi-level model of how national culture and the organizational context, in particular the control strategies and the norms of acceptable risk within risk-taking units, shape their risk-taking behavior and performance.

The global currency-trading industry is particularly well-suited to the development and testing of grounded hypotheses on contextual influences on risk-taking. In particular, risk-taking is a core value-adding activity in this industry, and one of the key sources of competitive advantage of firms in this industry is their risk transformation capability, which is simply the ability of the trading room to take 'good risks', to simultaneously maximize return while minimizing risk. The level of speculative activity in this industry has grown rapidly (Ohmae, 1990; Bank for International Settlements, 1993). Further, this industry is one in which two clear organizational forms -- the market-control oriented 'investment banking' type of organization and the more traditional 'commercial banking' type of organization compete in the same global marketplace,

providing a variety of organizational contexts in which to study which organizational risk-taking and performance.

This study was conducted in three phases. An exploratory, inductive phase of observation and interviews in nine trading rooms led to the development of a model, derived from both theory and from observations in the field, on the influence of national culture and organizational context on risk-taking and performance. The model was then tested in a sample of 28 currency-trading rooms of Western and Japanese banks in New and Tokyo. Finally, the results were validated through a set of follow-up interviews in a subset of the trading rooms in the sample.

A word of explanation is required on the use of the term "national culture" in this paper. The hypotheses developed in this paper on the influence of national culture relate to the effect of the broader social context, which is most readily identifiable with the nation in which the risk-taking units are either located (the host-country or location), or from which they originate (the home-country or the nationality of the parent-bank), on the organizational context, on actual risk-taking and on performance. One could conceivably argue that the "national cultures" referred to in this paper are really the cultures of two cities, New York and Tokyo, which overwhelmingly dominate the activity we investigate in their two nations. In developing our hypotheses, we draw from the literature that has essentially categorized the business cultures of different nations (Hofstede, 1980; Hofstede et al., 1990). The term "national culture" as it is used in this paper, might therefore best be defined as the business culture of the US compared to the business culture of Japan, as manifested in the financial services industry in New York and in Tokyo.

## THEORETICAL BACKGROUND

Research on risk-taking behavior has traditionally taken one of three major approaches on how the entity being studied (whether an individual, a firm or a society) takes risks: the economic, the behavioral and the sociological. The economic perspective (von Neumann and Morgenstern, 1947; Arrow, 1971) which permeates much of the research in economics, finance and statistical decision analysis, essentially treats decision-making agents as unitary and free of

contextual influences, whether they are individuals, firms or teams within firms. The role of context in this perspective has been largely restricted to the interaction of individual wealth and risk aversion (Pratt, 1964; Arrow, 1971) and in the finance literature to portfolio effects (Markowitz, 1959; Ball and Brown, 1969).

The second approach is that of the behavioral decision theorists (Slovic, 1972; Payne, 1973; Kahneman & Tversky, 1979; Goldstein and Einhorn, 1987). These researchers tend to describe the actual risk-taking behavior of individuals in relation to their information-processing limitations. In this perspective, context begins to play a role in influencing risk-taking behavior, but it is largely the immediate decision context (for instance, the framing of the problem, the order of presentation or the salience of the alternatives) rather than the broader organizational or social context in which the decision-maker is embedded. As Tetlock (1985:300) puts it,

> . . .the dominant research program on judgment and decision-making has clearly been the cognitive or information-processing approach. . . Thought and action are seen as products of the cognitive operations of the individual thinker, rather than as products of the social, organizational and technological settings in which the individual is embedded.

The third perspective on risk-taking is that of sociology (Douglas and Wildavsky, 1982; Douglas, 1985; Johnson and Covello, 1987) where risk-taking is seen as having little to do with individual preferences. acceptable risk (Douglas, 1985), which drives risk-taking in this perspective, is socially constructed and determined largely by the social and institutional contexts within which choice takes place. In a similar vein, the work of Hofstede (1980) and of Cummings, Harnett and Stevens (1971) has tended to attribute the different levels of uncertainty avoidance exhibited by individuals to their respective nationalities.

**Risk-taking behavior in organizations**

The reality of risk-taking behavior in organizations probably lies somewhere along a continuum between the largely unsocialized view of the decision-making entity taken by the economists to the view of risk as a collective construct proposed by sociologists. Other researchers (Tetlock, 1985; March and Shapira, 1987; Schoemaker, 1989; Bromiley and Curley,

1992) are converging to a similar view of the factors influencing risk-taking, as is evident in the following remarks:

> Although they (managers) undoubtedly vary in their individual propensities to take risks, those variations are obscured by processes of selection that reduce the heterogeneity among managers and encourage them to believe in their ability to control the odds, by systems of organizational controls and incentives that dictate risk taking behavior in significant ways, and by variations in the demand for risk taking produced by the context within which choice takes place.
>
> (March and Shapira, 1987:1414.)

As for the specific contextual factors that might influence risk-taking behavior in organizations, the influence of structural factors such as incentive and control systems (March and Shapira, 1987) have been mentioned in the strategy and organization literature. Bureaucratic control strategies (Ouchi, 1980), with their association with uncertainty avoidance (Thompson, 1967) can be expected to result in lower organizational risk-taking. Market control mechanisms, on the other hand, are considered efficient and should result in risk-neutral behavior (Arrow, 1974). The influence of these two types of control strategies is particularly interesting in the financial services industry as both types are clearly identifiable -- the bureaucratic control pattern (little discretion to traders, strict limits and controls, low incentive compensation) typically associated with a "traditional commercial banking" type of organization, and the market-control pattern (high authority to traders, no limits, high incentive compensation) with an "investment-banking" type of organization, both organizational types increasingly competing in some of the same segments (including currency trading) in the global financial services industry.

As for the norms of acceptable risk, Douglas and Wildavsky (1982:186) developed the idea of risk as a collective construct essentially at a societal level of analysis "to understand the social forces that speak on behalf of environmental protection in America". The exploratory part of this study revealed that the idea of a collectively constructed view of acceptable risk appeared to be equally valid at the organizational level of the currency trading room.

Finally, the organizations I study are themselves embedded in national cultures, sometimes in multiple national cultures (if they are located in a country other than their country of origin), which could affect both their norms of acceptable risk and their actual risk-taking behavior.

**Currency Trading Rooms as a Research Context**

Currency trading, also known as Foreign-exchange (FX) trading is a setting in which a major part of value-added comes from speculative risk-taking (Ohmae, 1990). The FX trading room is thus an ideal context in which to test for the influence of organizational patterns and practices on risk-taking. While the foreign-exchange market originally grew out of a need to service corporate customers in buying and selling foreign exchange for their import and export requirements, after the breakdown of the Bretton Woods agreement and fixed exchange rates in 1973, the door was open to speculation in foreign-exchange and the market saw an explosive growth in volumes. The volume of currency trading currently stands at over a trillion dollars *a day* currently. Only 12% of that volume is related to genuine trade and investment flows (Bank for International Settlements, 1993), the rest being largely speculative inter-bank trading.

In this research context, the decision problem is identical across all organizations in the sample, i.e. what speculative risk-positions should the room take at this point in time. Competitive and technological factors are very similar across all trading rooms worldwide because technology suppliers in this industry are global (essentially three major technology supply firms supplying all rooms worldwide) and many of the customers are also global. Regulatory influences are minimal. The macro-economic risk that comes from exchange-rate volatility is identical across all trading rooms. This setting therefore enables us to concentrate exclusively on organizational and economic drivers of risk-transformation in financial services.

**Risk taking, as defined in this study**

Risk has been interpreted in many ways even within the academic community, the most common interpretation being the variance of the probability distribution of possible outcomes

(Pratt 1964; Arrow 1971). Criticisms of variance definitions of risk (Markowitz 1959) as confusing downside risk with upside opportunity led to models where risk was interpreted as the negative semi-variance of a distribution of outcomes (Fishburn, 1977; Coombs 1983). Researchers on risk in financial markets have chosen instead to estimate risk from the covariance of stock returns with returns on a market portfolio (Jensen, 1972; Blume and Friend, 1975).

Recent research (Macrimmon and Wehrung, 1990; March and Shapira, 1987) suggests that conceptions of risk and risk taking held by managers differ substantially from the views of classical decision theorists. These studies point out that managers do not equate the risk of an alternative with the variance of the probability distribution of possible outcomes. For these managers, the probability distribution of outcomes was a background factor, to which they did not seem to pay much attention. The magnitude of possible poor outcomes was far more salient to their decision making than the magnitude weighted by its likelihood.

In the currency trading rooms of major US and Japanese banks where the initial exploratory research was carried out, risk was viewed by traders in much the same way - as the magnitude of open positions (the speculative holdings) on each currency, particularly the overnight (rather than the intra-day) positions, and the magnitude of the possible loss that could arise from carrying such a position. Most of the trading rooms had set limits, valid for six months to a year, on these "overbought" or "oversold" positions for each currency or for the room as a whole. Limits were not adjusted during periods of higher or lower volatility in the foreign-exchange markets. The actual exposures to any particular currency that trading-rooms carried varied day by day (and minute by minute). However, on examining the exposures over longer periods, it was apparent that there was a fairly consistent range of exposure in any one currency, and it was in this respect that there were major differences between one trading room and another. In the setting in which the model is to be tested where all organizations face the same exogenous volatility in exchange rates, we have decided to measure risk-taking simply by looking at the magnitude of the organization's usual exposure (the open position) to a potential loss over a

period of time. This is analogous to measuring risk as "bet-size" when the odds are the same (March and Shapira, 1993).

This measure of organizational risk taking has the benefit of being the measure of risk that is understood in the trading rooms. It avoids the problems that arise in attempts to measure subjective probabilities (Wallsten and Budescu, 1983; Budescu and Wallsten, 1985) through questionnaires or experimental methods. It is also an ex-ante measure of organizational risk taking, while most empirical research on organizational risk taking has tended to use ex-post measures, based, for instance on the variance of historic accounting returns (Libby and Fishburn, 1977), despite risk being essentially an ex-ante concept (Ball and Brown, 1969).

## A MODEL OF ORGANIZATIONAL RISK-TAKING AND PERFORMANCE

The hypotheses that are tested in this study are built from theory and from the inductive exploratory phase of this research. The links among the hypotheses and the overall model are given in Figure 1. In brief, the culture of the trading room's location (host-country) and that of its parent bank's nationality (home-country) are expected to be associated with its control strategies (market or bureaucratic control) and its shared norms of acceptable risk. In turn, we expect the control strategies to be associated with performance, and both control strategies and the norms of acceptable risk to be associated with actual risk-taking, which in turn is related to performance. In the model, I control for certain economic explanations for risk-taking and performance. Some of the behavioral explanations for risk-taking (such as nature of the decision and exogenous uncertainty) are controlled for by the choice of setting.

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Insert Figure 1 about here

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We begin a detailed discussion of the formal hypotheses by drawing on extant research on differences in risk-taking between Japanese and Western organizations. We then go on to discuss the organizational factors that are the specific object of this study, such as the organization's

control strategies and its shared values toward risk (acceptable risk). This leads to two sets of hypotheses -- the first set links the societal-level effects to the organizational-level factors, and the second set links the organizational factors to actual risk-taking and performance.

**National culture and Organizational Risk-taking**

Studies of risk-taking in organizations appear to support the idea of greater risk-aversion among both managers of Japanese ethnicity (Cummings, Harnett and Stevens, 1971) and in organizations located in Japan (Hofstede, 1980), with researchers essentially reporting a much greater degree of uncertainty-avoidance in Japanese managers and organizations than in American managers and organizations. Drawing a parallel from this research to the organizational level of analysis, we come to the first set of hypotheses:

> ***H1:*** *Trading rooms of Japanese banks will take lower risks than those of Western banks, all else being equal.*
> ***H2:*** *Trading rooms in Tokyo will take lower risks than trading rooms in New York, all else being equal.*

**Organizational context**

**"Acceptable Risk"**: One of the key observations that emerged from the exploratory research was that there were significant differences between trading-rooms in the way acceptable risk (Douglas, 1985) was defined within the room (perhaps what could be called the room's "risk-culture"). In interviews with traders within each room, it was clear that they had a shared understanding of the orientation towards risk that prevailed in their trading rooms, in particular whether aggressive risk-taking was positively regarded or not, and were influenced by it. These values appeared to have developed and been reinforced through the past history of the trading room, and been disseminated to succeeding generations of traders through the socialization process (Van Maanen and Schein, 1979) and through the controls and sanctions in place in the

trading room. The risk-cultures of these trading rooms were evident in the stories that were told in these rooms of traders who had "succeeded" or "failed" in the past.

One story that I heard in several of the trading rooms was particularly revealing in its insights. In different rooms I heard different opinions about the same legendary trader (let us call him Joe) who was rumored to have made over $300 million in profits in one year for a major bank some years ago. In some rooms, traders were unabashedly admiring of Joe. Joe was said to have been given a more or less free hand by his bank, and was rumored to have taken enormous (and successful) risks. In other rooms, traders had very negative impressions of him ("that couldn't happen here") -- I was told Joe took excessive risks and had not really made anywhere near as much money as was claimed.

It is possible that these shared values toward risk within the micro-environment of a particular trading room are influenced by the parent bank, in particular by its economic strength. In this study, I examine the influence of these internally-developed shared values (acceptable risk) on actual risk-taking behavior in the trading rooms, controlling for the economic strength of the parent bank.

**Control Strategies**: The organization's control strategies, whether 'bureaucratic'control (Weber, 1946; Crozier, 1964; Thompson, 1967; Ouchi, 1979; Meyer, 1990), or 'market' control (Arrow, 1974) , should influence the shared values about risk in the room, by providing a formal system of limits and sanctions on acceptable behavior. These control strategies should also influence the actual risk-taking and performance in the trading rooms.

As a general rule, control strategies legitimize the level of acceptable risk within the organization. For instance, 'bureaucratic' control (Ouchi, 1980), which is high on formalization, centralization and standardization (Pugh et al., 1969) is a method of uncertainty avoidance and is therefore likely to result in lower risk-taking. 'Bureaucratic' control is also likely to lower the levels of acceptable risk within the room by its emphasis on the enforcement of position-limits and stop-loss limits in the trading room.

'Market' control mechanisms, on the other hand, should result in more risk-neutral behavior on the part of the organization. In foreign-exchange trading, there appears to be a fairly straightforward relationship between risks and returns because of the presence of fixed costs. Given a fixed investment in technology and in a trader's base salary, taking larger open positions (higher risk) should, on average, yield higher returns on investment at a particular level of volatility, so one would expect firms exhibiting risk-neutral behavior to take larger positions at any particular level of market volatility. The "investment banking" type rooms where market-controls are most likely to be practiced, also typically do not have strict limits on overnight and intraday risk positions. Both of these factors should be reflected in greater risk-taking by trading rooms that are 'high' on market control, compared to rooms that are 'low' on market control. By extension, market controls should also go with higher levels of acceptable risk within the trading room. Finally, one could argue that market control, as it is usually associated with incentive-based compensation, will result in better performance at the organizational level.

These theoretic and inductive underpinnings lead us to a set of hypotheses linking control strategies, acceptable risk, organizational risk-taking and performance:

> ***H3****: High reliance on bureaucratic control will be associated with low levels of acceptable risk in the room.*
> ***H4****: High reliance on bureaucratic control will be associated with low levels of organizational risk-taking.*
> ***H5****: High reliance on market control will be associated with high levels of acceptable risk in the room.*
> ***H6****: High reliance on market control will be associated with high levels of organizational risk-taking.*
> ***H7****: High reliance on market control will be associated with high trading-room performance.*

**The risk-return relationship**

Recently, researchers in strategic management (Bowman, 1980 and 1982; Bettis, 1983; Baird and Thomas, 1985; Jemison 1987) have begun to address the relationship between risk and return in firms. Bowman's study showed a negative relationship between firm-level risk (defined

by him as variance of return on equity) and average return in several industries. In the trading room, however, we do expect the traditional positive relationship between risks and returns, as discussed earlier, because of the presence of fixed costs.

Several authors (Bowman, 1982; Bromiley, 1991) have also shown in longitudinal studies that there is a feedback effect from performance to risk-taking. However, certain features of the trading room context render the modelling of a feedback effect difficult, and perhaps unnecessary. First, in a trading room, there can be no return without an antecedent risk-position having been consciously taken, i.e. a particular risk-position has to precede the return associated with that position. While I have no doubt that how a trader has performed in the last few minutes or hours influences her immediately following risk-taking behavior, in this study, we are interested in the *habitual, institutionalized* element of risk-taking, measured as the "usual positions over the last year" rather than in the immediate cognitively-driven variations. At this macro-level, we expect that the traditional direction of the risk-return relationship to hold. This leads us to the hypothesis:

***H7**: Higher levels of risk-taking will be associated with higher levels of performance.*

**Control variables**

**Economic strength**. The economic strength of the bank to which the trading room belongs is expected to affect its risk-taking as the strength of the bank should reflect the banks' economic value and its ability to raise risk capital. Following the postulates of the top end of the Friedman & Savage (1952) preference curve (that wealthy decision-makers should be more risk-neutral), rooms of banks that have high economic value should also have the ability to take greater risks. In this sample of 16 banks, all of which are among the largest in the world, we can expect to see the behavior of the top end of the Friedman-Savage curve, and we therefore control for the bank's economic strength.

**Economies of scale, scope and information and the home-court advantage**: That skills influence risk-taking is both logical and established at an individual level. At the

organizational level, skills can be taken to refer to the sources of competitive advantage in risk-taking that the organization has, such as its economies of scale, scope and information, and the home-court advantage of operating in its home country (Hymer, 1976; Kindleberger, 1969). Both these factors are controlled for in the model.

## RESEARCH DESIGN

The research consisted of three phases. The first phase was an exploratory phase, conducted to understand the setting and to flesh out some of the ideas that went into the contextual model; the second was a model-testing phase where traders and trading-room managers in a paired sample of trading rooms in New York and Tokyo were surveyed; in the third phase, a few of the rooms that participated in the study were revisited to validate the findings.

### Exploratory phase

In this exploratory phase, nine trading rooms (three in the US, five in Tokyo and one in Singapore) belonging to six parent banks (four US, one European and one Japanese) were visited for observation of trading and interviews. The nine heads of trading in these rooms were interviewed, and typically one to two traders were observed as they traded (and periodically asked clarifying questions). At three of these banks, managers in charge of accounting for trading operations were also interviewed. The visits to these banks lasted from half a day to two days. A key informant was particularly helpful in initiating the researcher into the language of trading. In addition to these site visits, over twenty other traders, trading room managers, senior bankers, and suppliers to trading rooms were also interviewed with the intention of thoroughly understanding the context, and developing hypotheses on the influence of context on risk-taking.

### Model-testing phase: Sample and Data Collection

Initially, I decided to use a paired sample of trading rooms of US and Japanese banks in New York and in Tokyo, in order to focus on the two levels of analysis I was interested in -- the national level, and the trading room level, with the trading room as the unit of analysis. A paired design (two trading rooms of the same parent bank in New York and Tokyo) would effectively

control for unmeasured parent-bank effects (say, for example, how important trading was in the overall scheme of things for the parent bank, in assessing the role of national cultures and the trading-room context on risk-taking and performance). The exploratory phase had revealed that trading rooms of the same parent in different locations differed in their organizational contexts -- their control and incentive systems differed as did their shared values about risk. They also worked independently in the currency markets, at a different time of day, and as independent profit centers. What interdependencies existed across these pairs of trading rooms appeared to exist at the individual level, whereby a trader in New York might ask his counterpart in Tokyo to wake her up if say, Dollar-Mark reached some specified level during Asia-Pacific trading (but even in this, the parent-bank connection was not universal -- some of the traders interviewed mentioned calling 'friends' in other banks.for this purpose).

Using the list of foreign-banks in Tokyo published by the Federation of Bankers Associations of Japan (Zenginkyo, 1989) and the Hambros Bank Foreign Exchange and Bullion Dealers Directory (1989) as a guide, nine New York-based US commercial and investment banks were identified as having operations and being 'authorized foreign-exchange banks' in Tokyo. Of the nine, six agreed to participate. Of the ten Japanese commercial and wholesale banks identified as having trading operations in New York and Tokyo, eight agreed to participate in the study. All the banks were promised confidentiality and a summary of the results.

As the study proceeded, it was discovered that one of the US banks that had agreed to participate had operations but no FX trading in Tokyo. At this point, it was decided to include two European banks in the sample, to increase the number of non-Japanese participants. This required the hypotheses to be framed as a contrast between Japanese and Western banks, rather than as a contrast between Japanese and American banks.

A total of 251 questionnaires were distributed to all spot and forward foreign-exchange traders who took overnight positions. This left out junior traders and traders dealing in the domestic money-market and in derivative products whose risk-positions are often more difficult to evaluate. The final sample consisted of responses from 198 traders belonging to 28 trading

rooms of 8 Western and 8 Japanese banks, located in New York and Tokyo. The fully 'paired' sample consisted of 24 rooms of 6 Western and 6 Japanese banks.

The banks in the sample are all prominent players in the global foreign-exchange (FX) market. Ten of these 16 banks feature in a list of top 50 worldwide FX dealers over the 1979-91 period, six feature in the list of top 15 interbank FX dealers in 1991, seven feature in the list of the top 10 in Tokyo and four in the list of the top 10 in New York (Euromoney, 1991). Together, these 16 banks account for approximately 20% of the total annual worldwide volume in FX which is currently over $150 trillion.

**The questionnaires**

The questionnaires were personally administered to all spot and forward FX traders at each of these trading rooms and a separate questionnaire was given to each of the heads of trading, who were also interviewed. The aggregated responses of all the traders on room-level constructs were used in the analyses that follow. This meant that though the sample consisted of only 28 trading rooms, the room-level measures aggregated from the responses of 198 traders were robust and free from position-bias (Phillips and Bagozzi, 1982). A Japanese version of the traders' questionnaire which went through translation, back-translation and pre-testing, was used in Tokyo. To verify the accuracy of the translation, the reliability of all the constructs was separately calculated for the Japanese and English questionnaires and found to be stable (Table 1). The overall response rate was 79% with a 63% response-rate from New York and 92% from Tokyo.

**THE CONSTRUCTS**

This section first discusses the structure and reliability of the performance measures, followed by a discussion of the predictor variables. Where scales have been used, the details of the variables making up the scales and the reliabilities of the scales (Cronbach's Alpha) for the full

sample and across the subsamples of traders responding to the English and Japanese versions of the questionnaire, are given in Table 1.

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Insert Table 1 about here

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All the scales discussed below are simple additive scales with equal weight given to each variable. In only one case (economies of scale, scope and information) were z-scores of the underlying variables used in the construction of the index, as the variable for economies of scale (number of trades per day in the room) was differently scaled than the other measures (which were drawn from 7-point Likert-type scales).

**The performance measures**

All the variables in the model have been measured at the level of the trading room. Two measures of trading room performance were used in the analysis. The first, used in model 1, was the profits from currency trading per trader (LFITDOLP), which was available from the questionnaire given to the head of the trading room. This measure is a proxy for return on investment, as the fixed investment in a trading room tends to track the number of traders in it. The exploratory research and a pre-test of the questionnaire revealed that it would be difficult to obtain comparable figures across trading rooms of the actual return on investment because of inherent problems in defining and measuring investment in the trading room. A second performance criterion was used in model 2, and that was profits normalized by risk (NORMDOLP), which has been computed from the profit per trader reported in the FX head's questionnaire and the average of the 'usual individual overnight positions' reported by the FX traders in that room. This measure is a measure of a room's 'Risk-transformation' capability, or how well a room simultaneously maximizes returns while minimizing risk, arguably a better measure of a trading room's performance. Logarithmic transformations of the dollar values were used in the path analysis models.

In addition, a perceptual measure of room performance (ARMPERF) was constructed from the aggregated responses to four perceptual indicators of performance drawn from the FX trader's questionnaire. The reliability of this construct ranged from 0.93 to 0.95 across the sub-samples (see Table 1). An external check on its validity was also provided by the fact that it showed high correlations with the head's ratings of the rooms total profit (0.7, $p< 0.01$) and profit per trader (0.6, $p<0.01$).

There was a problem of missing data on the basic criterion variable, profits per trader (LNDOLPRT) drawn from the FX head's questionnaire. Only 18 out of the 28 heads of trading room reported this figure. This level of missing data is understandable, as this information is not publicly available anywhere and it is remarkable that this study generated the level of support and confidence it did from the 18 rooms that did report this figure.

The question then arose of whether to test the model using only the perceptual measure of performance. While the perceptual measure is a good measure, it was decided that these 18 data points on actual profits per trader were too valuable to ignore. The missing data were therefore estimated from the perceptual data, and a derived variable (LFITDOLP) was created, which consists of actual profits per trader for the 18 cases, and predicted profits per trader for the other 10 cases. Some of the heads of trading-rooms who we were able to subsequently contact on the phone verbally confirmed that our fitted figures were approximately correct. This fitted measure is at least as good as the perceptual measure (as it basically rescales the perceptual data into dollar figures for the missing cases, to make them comparable to the others), and it benefits from having taken into account the available hard data on actual profits per trader. The parameters of the estimation model for fitted dollar profits are $R^2=0.29$ (Sig. F=0.003) and Beta=0.54 (Sig. t=0.003).

**Actual Risks taken**

As discussed earlier, in the FX trading room, actual risk-taking is easily operationalized by two elements: the average net open position on a particular day, and the average level at which

traders take their losses in each room. This is partly analogous to operationalizing risk as "bet-size" (March and Shapira, 1993) when the odds are the same.

Individual traders have a good sense of what overnight positions each of them individually, and their currency groups as a whole, usually hold. These data were requested and obtained in the questionnaires, and these variables, together with an indicator of at what level individual traders usually took losses, were used to form an index of actual risks taken (ARISKACT) in the room. This index has very high reliability (Cronbach's Alpha=0.91 to 0.92) across the subsamples and is a reasonable proxy for the room's actual risk taking (Table 1). An independent check on the validity of this measure was provided by the fact that it showed high correlation (0.63, $p<0.01$) with the head's rating of risk-taking by the room.

**Organizational context variables**

**"Acceptable Risk"**

This are the shared values towards risk that prevail in the trading room. This construct has been operationalized through a scale (ARISKCUL) composed of three variables that capture the mean perception among traders of the room's orientation towards risk -- 'Compared to other bank trading rooms, our trading room is, in terms of risk-taking, one of the most conservative, average, one of the most aggressive' (7 point scale with these values anchoring the points); 'In this room, aggressive risk-taking is frowned upon' (Strongly Agree to Strongly Disagree); 'The limits set by the bank are very conservative (Strongly Agree to Strongly Disagree). The reliability of this scale ranges from 0.81 to 0.87 across the sub-samples, being 0.83 for the full sample.

**Control Strategies**

I decided to classify the twenty-eight trading rooms into those following market-control strategies or bureaucratic-control strategies. This dichotomous classification was done both in the interests of parsimony, and because the inductive phase of the study revealed that banks claiming to follow "investment-banking" types of market-based control strategies tended to have a

combination of controls and incentives (for instance -- large limits, high incentive compensation) that differed markedly from those that could best be described as banks following more bureaucratic "traditional commercial banking" types of strategies. To do the classification, the twenty-eight trading rooms were clustered on four control variables (three capturing aspects of bureaucratic control, and one capturing aspects of market control). The three bureaucratic control variables and the market control variable used in the cluster analysis are described below.

**Bureaucratic control**

The concept of bureaucratic control (Weber, 1946; Crozier, 1964; Thompson, 1967; Meyer, 1990) is essentially a system of control based on rules and on the legitimacy of authority, rather than on prices (market control) or on socialized commitment (clan control). In most empirical studies (Khandwalla, 1976; Ghoshal and Nohria, 1989), it has been operationalized as formalization, centralization and standardization after the Aston studies (Pugh et al. 1969). While the constructs of formalization and centralization could be readily adapted to the trading-room environment, the construct of standardization needed to be modified by taking into account the extent to which different rooms relied on what I call 'micro-controls' - detailed limits on intra-day and overnight positions by currency and by trader, institutionally dictated stop-loss limits, and strict enforcement, emphasizing standardization of process rather product.

**Formalization**: Formalization (AFORMAL) was operationalized, as in the Aston studies, as the extent to which policies and job descriptions were clear and in writing. The reliability of this construct (Cronbach's Alpha) ranged from 0.71 to 0.73 across the sub-samples.

**Centralization**: Centralization (ACENTRAL) was also operationalized as in the Aston studies from four variables capturing the distribution of authority in the trading room. The reliability of this construct ranged from 0.77 to 0.80 across the English and Japanese versions of the questionnaire.

**Standardization -- The prevalence of limits**: This construct (ALIMPRE) was operationalized as the average values across four dichotomous variables capturing the existence of

overnight and intra-day limits by currency and by trader. The reliability of this construct ranged from 0.76 to 0.95 across the subsamples. As expected, this construct was strongly correlated ($r=0.63$, $p<0.01$) with the seriousness with which limits were enforced and with the existence of institutionally set stop-loss limits ($r=0.55$, $p<0.01$).

**Market control**

This essentially implies a market-mode of control within the organization in which "the firm can simply reward each employee in direct proportion to his contribution" (Ouchi, 1979). Organizational practices that can best be defined as 'market'-type controls include indicators such as a high proportion of traders' total incomes based on performance-linked bonuses, a tendency to hire experienced traders from the external labor market, and high turnover. This construct (AMARKET) was operationalized from three variables capturing pay for performance, hiring from the external labor market and high turnover.

**Clustering the trading rooms by control strategy**

The twenty-eight trading rooms were then clustered on these control strategies using Ward's method. The two cluster solution had high face validity and a dendrogram revealed a large distance from the three cluster solution. In the two cluster solution, cluster 1 consisted of eight trading rooms, all of Western parentage, six located in New York and two in Tokyo. These trading rooms consisted of investment bank trading rooms and of trading rooms of commercial banks in New York that were "trying to look like investment banks" (this characterization of their strategies captures the expressed views of heads of trading in these banks). Cluster 2 consisted of 20 rooms, 13 Japanese banks' trading rooms in New York and Tokyo, six American commercial banks' trading rooms in Tokyo, and a lone American commercial bank in New York which more closely resembled the Japanese banks in its bureaucratic and non-market modes of control.

Key differences between the two clusters are given in Table 2. Cluster 1 rooms were higher on market modes of control than Cluster 2 rooms and significantly lower on each of the three dimensions of bureaucratic control.

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Insert Table 2 about here

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In the rest of the analysis, Cluster 1 rooms are referred to as 'market control' rooms and Cluster 2 rooms as 'bureaucratic control' rooms. Cluster membership has been reverse coded into a dichotomous variable (MKTCTRL) where 'market-control' rooms are coded '1' and the 'bureaucratic-control' rooms are coded '0', and this variable is used in the multivariate analyses that follow.

**Control variables**

**Economies of Scale, Scope and Information**: Scale (ASCALE) was measured by the number of trades per day in the room. Scope (ASCOPE) was a construct based on three variables: 'Our bank has one of the largest client bases of corporate customers in this country', 'Our bank has very strong ties with institutional investors (fund managers) in this country' and 'Our bank has one of the largest networks of individual customers in this country' (the reliability of this scale ranged from 0.84 to 0.92 across the subsamples). In the foreign-exchange trading industry, there are likely to be significant information economies from occupying a position of high centrality in the organizational field, as this could lead to early information on demand and supply and early knowledge of central bank interventions. These information economies (AREPUT) were operationalized from five variables: 'Our bank would be one of the first to be contacted by other banks in this city for FX trading', 'Our bank has a close relationship with the Federal Reserve/Ministry of Finance', 'The Fed/MOF often intervenes in the FX markets through us', 'We are a major force in the FX markets in this city' and 'We are a major force in FX markets worldwide'. The reliability of this construct ranged from 0.77 to 0.84 across the subsamples.

These three constructs, scale, scope and information economies were normalized to equalize the ranges on the scales and the z-scores were combined into one index (ECSCASCO). The reliability of this index ranged from 0.85 to 0.92. While scale, scope and information economies were separately analysed in the bivariate analyses, in the multivariate model, we use the combined variable ECSCASCO, in the interest of parsimony.

**The 'home court advantage'**: This construct was operationalized as a dummy variable (ABROHOME) where Japanese rooms in Tokyo and American rooms in New York were coded '1' and the others '0'.

**Economic Strength**: The average market to book value over 1989 and 1990 (Morgan Stanley, 1990, 1991) was chosen as a measure that captured the economic value of the parent bank and therefore the capacity of the trading room to take risks. However, market-to-book values in Tokyo are far higher than those in New York because of the very high P/E ratios that prevail in the Tokyo stock market. While some of these high market-to-book values perhaps reflect the inherent strength of Japanese banks, much of it can be traced to institutional differences between the US and Japan on stockholding patterns, accounting practices and tax regulations. I wanted to distinguish between the influence on risk-taking that came from being Japanese and the impact of the parent-banks' economic capacity, the influence of Japan was partialled out of the average market-to-book values leaving a measure of relative market-to-book values (RELMKTBK) for each group of trading rooms (Japanese and Western). This measure was used as an indicator of the room's economic capacity to take risks. What this meant was that we expect trading rooms to be influenced in their risk-taking by their parent banks' relative economic strength compared to other banks from their home country, a not unreasonable assumption.

## ANALYSES AND RESULTS

Two path analysis models (Models 1 and 2) were tested, essentially varying only in that different measures of trading room performance were used as the criterion variable - profit per trader, which is akin to a 'return' measure in Model 1; and profits per trader normalized by risk taken (a measure of risk-transformation capability) in Model 2. The analyses were run on both the strictly 'paired' sample and the full sample, and the coefficients were stable in order of magnitude and sign, and so only the results of the full sample of 28 rooms are reported here.

In Model 2, as the actual risk taken has been controlled for in the model, the room's shared values about risk, i.e. acceptable risk has been taken out of the model, as the latter construct is only expected to influence actual risk taken. Further, Model 1 is an overidentified model (relationships not drawn from theory are not included), while Model 2, which has fewer variables is a "just-identified" model (Pedhazur, 1982), with relationships between all the predictor variables and the criterion variable retained in the model, and both models are recursive (no feedback loops). The overidentification in Model 1 helps us measure the goodness of fit of this model (Specht, 1975) when compared to a "just identified" model that would cover all possible relationships among the variables, whether plausible or not, to explain all of the zero-order correlations. The regressionresults are given in Table 3.

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Insert Table 3 about here

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A caveat to bear in mind as one looks at the path analysis models is that the causal structure in these models has been imposed on these variables from theory, and these models therefore *do not* test for causality. The best we can hope to understand from the path analysis models is that the causal structure imposed is *not implausible* and that it explains the total relationship between the criterion and predictor variables (as given by the zero order correlations) reasonably well.

**Model 1: Risk and return**

All the regressions except for the one on acceptable risk had significant overall explanatory power in Model 1. While acceptable risk has been modelled as partially endogenous, the main purpose of the model is to explain *actual risk-taking* and *performance*. The model's role in explaining acceptable risk is limited to the investigation of the influence of control strategies, of home and host-country, and of the bank's economic strength on acceptable risk.

The test of a good path analysis model is to what extent the effect coefficients, which explain the total effect of predictor variable on criterion variable (i. e. the total of the direct and indirect effects in the model) approximate the zero-order β (the Pearson's correlation coefficient). By this measure, model 1 (Table 4) is reasonably good, as most of the effect coefficients are within 0.1 of the zero-order β (Pedhazur, 1982; Cohen and Cohen, 1983).

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Insert Table 4 about here

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In addition, we used a formal 'goodness-of-fit' test useful with small samples and an 'over-identified' model which has been suggested by Specht (1975). This involves first setting up a 'just identified' and fully recursive model (one with every possible relationship defined in the model, even if some of the relationships are implausible) and calculating the generalized squared multiple correlation , $R^2_m$ of the 'just identified' model, which is

$$R^2_m = 1 - (1 - R^2_1)(1 - R^2_2) \ldots (1 - R^2_p)$$

where $R^2_i$ is the squared multiple correlation coefficient ($R^2$) of the ith equation. A similar statistic M is calculated for the overidentified model that is being tested (which has some paths deleted). As some of the $R^2$s do not exist in the overidentified model, M can take on values between zero and $R^2_m$. If the overidentified model is a perfect fit (i.e if the correlation matrix is exactly reproduced), $M = R^2_m$. For Model 1, M=0.84, and with a just identified (though not theoretically meaningful) model with all paths included, $R^2_m$=0.99.

**Model 2: Risk transformation capability**

In this model, the criterion variable is the natural logarithm of profits per trader in each room normalized by the average individual overnight position taken in that room. It can be argued that this is the best measure of a trading room's performance as it captures a trading room's risk transformation capability.

As both actual risks taken (ARISKACT) and the shared values towards risk (ARISKCUL) were removed from this model, there were few predictor variables and a set of hierarchical reduced-form equations (Cohen and Cohen, 1983) could be used to estimate the path coeficients (Table 5). However, this method, while computationally more efficient, cannot be tested for goodness of fit as it is a 'just-identified' model.

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Insert Table 5 about here

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The overall explanatory power of this model was good ($R^2$=0.47, Sig. F=0.02). As additional variables (in particular, market control strategy), were introduced into the model, the economic strength of the bank and the 'home-field' effect which were significant in the earlier stages, lost their explanatory power, and the use of market control strategies emerged as the only significant predictor of profits per trader normalized for risk. The direct, indirect and total effects in Model 2 (Table 6) are discussed below.

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Insert Table 6 about here

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## DISCUSSION AND IMPLICATIONS

Overall, the influence of acceptable risk on actual organizational risk-taking were borne out in the study. In addition, some of the key findings on the role of national culture and organizational context on risk-taking and performance were that market control was related to

better risk-transformation in these trading rooms, and that the expected relationship of lower risk-taking in Japanese banks, and in banks located in Japan, did not hold.

**Acceptable risk in an organizational context**. As expected, the shared values towards risk in the trading room were the best predictor of actual organizational risk-taking. This result has implications for research and practice. It points to a great need for researchers studying organizational risk-taking and related concepts in a variety areas (for instance, in innovation or in market-entry or in research and development), to develop a better appreciation of the organizations' shared values toward risk, and the role that acceptable risk at the organizational level plays in constraining or facilitating organizational decisions involving risk.

**"National culture" influences on Risk-taking:** One of the results of the organizational level of analysis is that the 'Japan' factor (belonging to a Japanese bank or being in Tokyo) did not have the expected negative effect on organizational risk-taking. In fact, contrary to Hofstede's findings which rated Japanese individuals as low risk-takers, Japanese banks appeared to take larger open positions than Western banks.

There could be several theoretical explanations for the absence of the negative 'Japan' effect on risk-taking. For one, the high level of global integration in this industry could mean that 'home-country' effects are diluted. Second, the positive relationship (Japanese banks appear to take greater risks) could be explained at the organizational-level by the 'risky shift' phenomenon (Stoner, 1961; Bem, Wallach and Kogan, 1965; Dion, Baron and Miller, 1970) where group decision-making (which is higher in the sample of Japanese banks) results in riskier decisions. A third explanation can be found in Agency theory (Jensen, 1972; Shavell, 1979; Nalbantian, 1987) whereby the fact that there is little incentive compensation in Japanese banks implies that risk-averse traders do not share in the risk, which therefore results in more risk-neutral decision-making (i.e. traders in Japanese banks can take large risks because they do not have to worry about their own compensation being significantly affected).

Clearly, further research is required to determine which of these theories best explain greater risk-taking by Japanese organizations. Further, this finding perhaps also should serve as a

caution to researchers who attempt to take empirical findings at the individual level of anlaysis and apply them to the organizational level of analysis.

**Control Strategies and Risk-transformation**: Contrary to conventional wisdom, though limits on risks (net open positions in different currencies) are typically larger or there are no limits in 'market control' rooms, traders in 'market control' rooms did not take larger risks than did traders in 'bureaucratic-control' rooms. However, the average profit per trader and the average profit per trader normalized for risk (which is an indicator of the toom's risk-transformation capability) were both significantly higher in trading-rooms that followed 'market-control' strategies. Market control strategies therefore do appear to go with better risk-transformation capability in FX trading-rooms, though they are not associated with higher risk-taking. This may be due to self-selection, which would provide an economics-based explanation, whereby smarter traders are drawn towards organizations that provide high incentive compensation, or it may be due to traders trading smarter when their compensation is heavily influenced by what they do. The latter points the way to studies of the influence of context on cognition and the processes of decision-making, in trying to understand what the phenomenon of 'trading smarter' involves.

As predicted, market control strategies had a positive and significant effect on shared values towards risk (acceptable risk) in the trading room. Market control had a small negative 'direct effect' on actual risk-taking, but the positive 'indirect effect' on risk through the influence of market control on acceptable risk essentially rendered the association insignificant. Market control rooms were positively and significantly associated with higher profits per trader. The most startling finding is that, *even when normalized for risks taken, rooms that followed market modes of control did significantly better than rooms that followed bureaucratic modes of control*. What this means is that rooms that follow market-control strategies appear to generate higher profits per trader taking smaller open positions. While Japanese banks, none of which are in the 'market control' cluster, do significantly worse on risk transformation, even within just the sample of Western trading-rooms, 'market-control' rooms were better at risk-transformation than the 'bureaucratic-control' rooms. Jemison's 1987 study in twenty small community banks in

Indiana showed a similar result on risk-taking though not on returns -- in his study, decision-centralization (bureaucratic control) did not result in lower risk-taking though it was related to higher returns.

The results of the present study that bureaucratic control is associated with lower risk-transformation capability supports the empirical findings of several earlier studies which have shown that bureaucratic organization often produces dysfunctional behavior and inefficiency (Merton, 1940; Gouldner, 1954; Meyer, 1990) rather than the efficiency Weber ascribed to it. These results are also consonant with some of the newer thinking on appropriate control strategies in organizations which are characterized by distributed knowledge and decision-making at the periphery rather than at the center (Hedlund, 1986 and 1993; Zuboff, 1988).

**Caveats.** Several words of caution are also required before implications can be suggested from this study. For one, the small population of comparable trading rooms in New York and Tokyo and the attendant small numbers in the sample (though a substantial portion of the population of interest was represented in it) do restrict both the kinds of analyses that can be done and the strength and generalizability of any conclusions we can draw from the study. The follow-up visits to a few of the trading-rooms to discuss the results were useful in that they acted to further validate the data and results.

From a normative point of view, while market-control mechanisms are related to greater normalized profits even within the subgroup of Western trading-rooms, the small sample of market-control rooms prevented our testing for more complex interaction effects -- for instance, with technology or size -- which could influence the relationship between market-control and performance. For instance, the exploratory work seemed to indicate that market control requires a great deal of attention to be paid to the selection and retention of high-quality 'disciplined professionals', because in the atmosphere of relative autonomy that prevails in market-control organizations, even small errors can have large impacts. If the room is so large that assuring quality becomes a problem, a market control system may need to be supplemented by other control mechanisms. Some of the 'market-control' rooms that were observed during this study

already do this; they have substituted micro-level individual limits and controls with non-intrusive 'global' controls, where netted positions worldwide can be monitored by top management on a real-time basis through technology, giving traders a great deal of freedom and responsibility to take whatever individual risk-positions they choose. This form of 'virtual' control could perhaps minimize dysfunctional responses to bureaucratic controls at the individual level while simultaneously ensuring control occur at the organizational level. Certainly, the literature on control would benefit from research that explores these new forms of control, and the relationships between the organizational context in structural and social terms and behavior.

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## TABLE 1: RELIABILITY OF TRADING-ROOM LEVEL SCALES

R=Reverse coded

| **Construct** SCALE NAME | **Variables in Scale** These room-level variables are aggregated from all respondents in each trading room | **α Full Sample n=28** | **α English Questi-onnaire** | **α Japanese Questi-onnaire** |
|---|---|---|---|---|
| Perceived room performance ARMPERF | ABESTIND: Room has some of the best traders in cit<br>APRTRCIT: Most profits of any room in city<br>ARPROFIT: Rating of total profit<br>ARPRFTRD: Rating of room's profit/trader | 0.93 | 0.93 | 0.95 |
| "Acceptable Risk" ARISKCUL | ARRISKOR: Compared to other bank trading rooms, our trading room is, in terms of risk-taking, one of the most conservative, average, one of the most aggressive<br>ARISKNEG: In this room, aggressive risk-taking is frowned upon R<br>ALIMCONS: The limits set by the bank are very conservative R | 0.83 | 0.81 | 0.87 |
| Actual Risks taken ARISKACT | AUSONPOS: Usual overnight positions of individual traders<br>AUSTPLOS: Usual stop-loss positions of individual traders<br>AGUSONPO: Usual overnight positions of each grou | 0.91 | 0.92 | 0.91 |
| Market control AMARKET | APAYPERF: Pay traders for performance<br>AHIREEXT: Hire from the external labor market<br>AHITURN: High turnover of traders | 0.83 | 0.65 | 0.91 |
| Bureaucratic control: Formalization-Standardization AFORMAL | APOLCLR: Clear, written policies exist<br>AJOBDCLR: Clear, written job descriptions exist | 0.73 | 0.73 | 0.71 |
| Bureaucratic control: Centralization ACENTRAL | ADECCENT: Decision-making centralized<br>AMINAPP: Even minor exceptions need approval<br>ATRAUTH: Traders have a lot of authority here R<br>ACANEXCE: Traders can exceed overnight limitsR | 0.77 | 0.80 | 0.77 |
| Bureaucratic control: Microcontrols - The prevalence of limits ALIMPRE | There are:<br>ALIMONCY: Overnight position limits by currency<br>ALIMIDCY: Intraday position limits by currency<br>ALIMONTR: Overnight position limits by trader<br>ALIMIDTR: Intraday position limits by trader | 0.92 | 0.95 | 0.76 |
| Economies of Scope ASCOPE | Large base of:<br>ABLGCORP: Corporates ABLGINST: Institutions<br>ABLGIND: Individuals | 0.91 | 0.93 | 0.84 |
| Information economies AREPUT | ABBKFIRS: Our room would be called first<br>ABCLOSFD: Close to Fed<br>ABFEDINT: Fed* intervenes through us<br>ABMJCITY: Big in city FX<br>ABMJWRLD: Big worldwide in FX | 0.80 | 0.77 | 0.84 |
| Economies of Scale, Scope and Information ECSCASCO | ZAREPUT: Information economies<br>ZASCOPE: Economies of scope<br>ZASCALE: No. of trades per day. | 0.85 | 0.92 | 0.84 |

* In Tokyo, 'Fed' was replaced by 'Ministry of Finance/Bank of Japan'

**TABLE 2**

**Characteristics of 'Market Control'**
**versus 'Bureaucratic Control' trading rooms**

Means, standard deviations and significance of t.

| Variable | Bureaucratic control strategy n=20 | Market control strategy n=8 | T-test, 2-tail prob |
|---|---|---|---|
| ***Clustering Variables:*** Aggregated from traders' questionnaires | | | |
| **Market control** AMARKET | 1.49 (0.55) | 1.89 (0.45) | 0.08 |
| **Micro-controls** ALIMPRE | 3.58 (0.5) | 2.12 (1.20) | 0.00 |
| **Formalization** AFORMAL | 1.17 (0.25) | 0.75 (0.18) | 0.00 |
| **Centralization** ACENTRAL | 2.55 (0.40) | 1.96 (0.50) | 0.00 |
| ***Related Variables:*** (Head's questionnaire) | | | |
| **Average Bonus to Salary** HAVBONSA Head's report | 25.4% (33.0) | 60.0% (26.6) | 0.03 |
| **Highest Bonus to Salary** HHIBONSA | 46.8% (90.4) | 361.4% (548.7) | 0.18 |

## TABLE 3

## MODEL 1: RISKS AND PROFITS/TRADER OR TOTAL ROOM PROFITS

| **Criterion Variable** | **Log Avg profit/ trader LFITDOLP** | **Actual risk positions taken ARISKACT** | **'Acceptable Risk' in the room ARISKCUL** | **Control Strategy Market=1 Bureac=0 MKTCTRL** | **Economies of Scale, Scope & Information ECSCASCO** |
|---|---|---|---|---|---|
| Equation | 1a | 2 | 3 | 4 | 5 |
| $R^2$ | 0.62 | 0.73 | 0.23 | 0.47 | 0.40 |
| Adj. $R^2$ | 0.55 | 0.66 | 0.05 | 0.42 | 0.38 |
| F | 9.20 | 9.6 | 1.31 | 10.93 | 17.65 |
| Sig. F | 0.000 | 0.000 | 0.290 | 0.000 | 0.000 |
| **Predictor Variables** | **β Sig T** | **β Sig T** | **β Sig T** | **β Sig T** | **β Sig T** |
| ARISKACT | +0.62 (0.000) | - | - | - | - |
| ARISKCUL | - | +0.83 (0.000) | - | - | - |
| MKTCTRL Mkt=1 / Bur=0 | +0.38 (0.016) | -0.23 (0.20) | +0.51 (0.07) | - | - |
| ECSCASCO | -0.22 (0.229) | +0.09 (0.47) | +0.20 (0.34) | - | - |
| RELMKTBK Rel Mkt to Book | - | +0.15 (0.24) | -0.22 (0.29) | - | - |
| ABROHOME Abroad=1/Home=2 | +0.31 (0.108) | - | - | - | +0.64 (0.000) |
| BRANCH NY=1 / Tokyo=2 | - | +0.06 (0.63) | +0.05 (0.83) | -0.30 (0.049) | - |
| JPNONJP West=1/Jap=2 | - | +0.18 (0.26) | +0.28 (0.28) | -0.59 (0.000) | - |

## TABLE 4

## TOTAL , DIRECT AND INDIRECT EFFECTS ON PROFITS/TRADER AND ON ACTUAL RISKS TAKEN

| Effect on LFITDOLP | Direct Effect | Indirect Effect@ | Effect Coefficient | Unanalyzed Effect | Zero Order β |
|---|---|---|---|---|---|
| ARISKACT | +0.62*** | - | **+0.62** | - | +0.58*** |
| ARISKCUL | - | +0.51 | **+0.51** | - | +0.63*** |
| MKTCTRL | +0.38*** | +0.12 | **+0.50** | - | +0.41** |
| ECSCASCO | -0.22 | +0.16 | **-0.06** | +0.06 | +0.15 |
| RELMKTBK | - | -0.02 | **-0.02** | +0.20 | +0.19 |
| ABROHOME | +0.31 | -0.04 | **+0.27** | +0.04 | +0.43** |
| BRANCH | - | -0.08 | **-0.08** | - | +0.13 |
| JPNONJP | - | -0.05 | **-0.05** | - | -0.04 |

**p<0.05 ***p<0.01 @ No significance test

| Effect on ARISKACT | Direct Effect | Indirect Effect@ | Effect Coefficient | Unanalyzed Effect | Zero Order β |
|---|---|---|---|---|---|
| ARISKCUL | +0.83*** | - | **+0.83** | - | +0.76*** |
| MKTCTRL | -0.23*** | +0.42 | **+0.19** | - | -0.11 |
| ECSCASCO | +0.09 | +0.17 | **+0.26** | +0.01 | +0.33 |
| RELMKTBK | +0.15 | -0.18 | **-0.03** | -0.08 | -0.09 |
| ABROHOME | - | +0.17 | **+0.17** | +0.01 | +0.26 |
| BRANCH | +0.06 | -0.06 | **0.00** | - | +0.13 |
| JPNONJP | +0.18 | +0.12 | **+0.30** | - | +0.33 |

**p<0.05 ***p<0.01 @ No significance test

## TABLE 5

## MODEL 2: RISK TRANSFORMATION CAPABILITY

| **Criterion Variable** | **PROFIT PER TRADER NORMALIZED FOR RISK TAKEN** (NORMDOLP) | | |
|---|---|---|---|
| Equation | 1 | 2 | 3 |
| $R^2$ | 0.29 | 0.43 | 0.47 |
| Adj. $R^2$ | 0.16 | 0.30 | 0.32 |
| F | 2.3 | 3.33 | 3.16 |
| Sig. F | 0.09 | 0.02 | 0.02 |
| **Predictor Variables** | **β**<br>**Sig T** | **β**<br>**Sig T** | **β**<br>**Sig T** |
| RELMKTBK | +0.33<br>(0.08) | +0.24<br>(0.16) | +0.14<br>(0.43) |
| JPNONJP<br>West=1/Jap=2 | -0.39<br>(0.08) | -0.02<br>(0.92) | -0.06<br>(0.78) |
| ABROHOME<br>Abroad=1/Home=2 | +0.17<br>(0.34) | -0.03<br>(0.88) | +0.22<br>(0.41) |
| BRANCH<br>NY=1 / Tokyo=2 | +0.09<br>(0.62) | +0.26<br>(0.16) | +0.30<br>(0.11) |
| MKTCTRL<br>Mkt=1 / Bur=0 | - | +0.60<br>(0.03) | +0.52<br>(0.06) |
| ECSCASCO | - | - | -0.33<br>(0.20) |

## TABLE 6

## MODEL 2: RISK TRANSFORMATION CAPABILITY -- TOTAL, DIRECT AND INDIRECT EFFECTS

| **Effect on NORMDOLP** | **Direct Effect** | **Indirect Effect** | **Total Effect** | **Zero-order β** |
|---|---|---|---|---|
| MKTCTRL | +0.52 | +0.08 | **+0.60** | +0.57*** |
| ABROHOME | +0.22 | -0.05 | **+0.17** | +0.17 |
| BRANCH | +0.30 | -0.21 | **+0.09** | +0.02 |
| JPNONJP | -0.06 | -0.33 | **-0.39** | -0.39** |
| ECSCASCO | -0.33 | - | **-0.33** | -0.21 |
| RELMKTBK | +0.14 | +0.19 | **+0.33** | +0.36 |

**p<0.05 ***p<0.01

**Figure 1**

**Path analysis model for the trading room**
**Actual positions taken risk and profits per trader return.**