CULTURE, GLOBALIZATION, AND STOCK PRICE VOLATILITY

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Draft: June 27, 2010

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The primary purpose of this paper is to examine the impact of culture on stock price volatility. The focal causal chain links dimensions of culture (i.e., linguistic structure and values) to globalization to the volatility of prices in 50 stock markets around the world. Other explanatory variables included in the model are characteristics of individual stock markets (age and market capitalization) and countries (per capita income and population). Partial least square regression is used to estimate the parameters of a comprehensive model using stock price volatility as the dependent variable. Our findings suggest that stock price volatility is influenced by both aspects of culture included in the study. While the linguistic influence was found to be direct, the influence of cultural values was found to be mediated by the extent of globalization of the countries. The generality of our theory is supported by our analyses of the volatility of prices for other categories of consumer purchases as well.

Key words: pricing, stock market, international, culture, volatility, globalization, linguistics, investor behavior

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"Apple … has made few missteps over the last decade, but it angered many of its most loyal customers by dropping the price of its iPhone to $400 from $600 only two months after it first went on sale" (Hafner and Stone 2007).

There are two fundamental pricing decisions – setting prices and changing prices. Both require a comprehensive knowledge about market and consumer behavior (cf. Davis and Hamilton 2003). The latter decision requires an understanding of the dynamics of price volatility in markets, the topic of focus in this research.

The most sensible area to study the volatility of prices is in stock markets. Stocks are sold around the world in a sort of continuous auction and prices can and do vary dramatically and quickly. Moreover, the theories explaining stock price volatility have received much attention in the financial markets literature and stock price data are copious. While we are also seeing fast price changes in online contexts, the qualities of data and associated theories and methods in this new area make studies of this phenomenon worthwhile for another day.

Perusal of the literature on the volatility of stock prices demonstrates its parochial nature, focused on the U.S. stock markets in terms of data and theory. The question of the generality of U.S. based theories is virtually unaddressed. Moreover, the area of study generally is susceptible to the criticism of "unobservable fixed effects bias" (cf. Jacobson 1990) as it ignores the influence of cultural differences.

The strength of marketing science has always been its eclectic theoretical underpinnings. The understanding of markets and marketing phenomena has been advanced through the application of theories ranging across economics and psychology to anthropology and, most recently, brain science. With the theories have come an equally broad array of methods and

measures including econometrics, psychometrics, structural equations modeling, experimental design, ethnography, and fMRI. This paper pushes this cross-disciplinary based research paradigm by combining measures of cultural values and linguistic variation with structural equations analyses toward better understanding the functioning of stock markets globally.

Some have argued that financial markets should be seen as outside the domain of marketing research (Arndt 1978). We do not share that view. Indeed, there is a tradition of using financial variables such as stock price as measures (e.g., Mizik and Jacobson 2007) and/or predictors (Markovitch and Golder 2008) of marketing success of firms. Our study is different from the latter in that we move beyond the micro level in studying the functioning of national markets around the world.

While some might regard the extant knowledge about the workings of financial markets as deep, in reality knowledge in the area is limited by the narrow set of theories and methods applied by financial researchers. That is, marketing scientists have tended to heed Arndt's (1978) advice, and we have seldom developed or applied well tested marketing theories and tools to understand markets for investment goods and services. Herein we find the use of broader sets of theory and methods to be useful in raising new questions and providing preliminary answers in a marketing context infrequently addressed by marketing scholars.

Generally, volatility in markets is disruptive, indeed, almost by definition (Bishop et al. 1984, Srivastava et al. 1998, Golder 2000, Yergin 2009). It is commonly accepted that *stock price* volatility is not only detrimental to investors, but can also be harmful to the stability of national and global economic systems (Gerlach et al. 2006). Some countries' stock prices are more volatile than others. As mentioned, a great deal of literature is devoted to the study of volatility within national markets (mainly the United States), especially toward understanding

what gives rise to volatility, and how it can be predicted and measured (e.g., Turner and Wiegel 1993). But, there is little understanding of why global stock prices suffer from volatility, why national stock prices vary in their volatility, or how to predict which markets will be more volatile than others.

This paper investigates whether aspects of national cultural have an impact on stock price volatility. In other words, do differences in cultural values and linguistic structures across countries offer any insight into how and why financial markets react and adjust to pricing and information changes? Toward answering such questions, we have attempted to integrate the literature regarding financial markets, cross-cultural psychology, and comparative linguistics. Our empirical analyses of stock price volatility across 50 countries demonstrate that national culture is indeed related to financial market behavior, and in particular, to volatility. The generality of our theory is supported by our analyses of the volatility of prices for other categories of consumer purchases as well.

Literature Review

Numbers, language, and relationships are the media of markets.

Explaining Stock Price Volatility

The efficient market hypothesis (EMH) is commonly used to explain and predict the movement in stock prices and is used to justify the use of probability calculus in analyzing capital markets (Peters 1991). An inherent assumption of EMH is that investors are rational. Efficient markets pricing is based on public information that is already discounted. Equilibrium pricing is found by the collective whole assimilating and assessing information and risks. There are three common forms of EMH: the weak form efficiency, semi-strong form efficiency, and strong form efficiency. If stock prices display weak form efficieny, then we should not be able to

accurately forecast future returns using information available today (Fama 1970). Yet interestingly, there is evidence that international markets may violate the weak form efficiency. Several studies have demonstrated that international stock prices can be forecasted although they focus mostly on spillover effects which are defined as the effect of one stock market's volatility on other stock markets around the globe (Durand et al. 2001, Eun and Shim 1989, Ghosh et al. 1999, Kahya 1997, Theodossiou et al. 1997). Such studies open the door for considering factors beyond the traditional macroeconomic ones, such as psychological or cultural effects, that might explain international stock prices.

Behavioral Finance

Traditional finance models based in economics have had been criticized for their mixed descriptive and predictive power (Olsen 1998). This suggests that financial asset pricing may be due to statistically complex, non-linear effects, and perhaps unmeasured effects. Thus, researchers in the relatively new area of behavior finance have sought to challenge the fundamental assumptions of economics and finance to offer a more empirically complete view of financial behavior. These studies have been able to show that powerful psychological effects often produce results that counter the predictions of the efficient market hypothesis (Shefrin and Statman 1993, Shiller et al. 1984). For example, the behavioral finance framework suggests that stock prices may be affected by the collective effect of individual investors' decision making biases and heuristics. One example of this effect is momentum (Morrin et al. 2002) which is reflected in positive serial correlations in stock prices. Another example is herding – applying a social psychology perspective, this suggests that a herdlike mentality may influence stock valuations (Shefrin and Statman 1993, Shiller et al. 1984). Herding behavior can affect market prices when participants and/or analysts converge in their advice (Graham 1999) or behavior to

buy or sell securities, which securities to trade, etc. as a result of observing the actions of others (Bikhchandani and Sharma 2001, Hirshleifer and Teoh 2003).

Supporting the aforementioned EMH view, Duffee (1990) developed a model that demonstrated how a change in the beliefs of rational agents can lead to a shift in the volatility of stock prices. Yet, some researchers such as Shiller (1998) believe that market psychology plays a pivotal role. In contrast to theories based on EMH, some have advocated in recent years a more controversial view of financial market behavior – namely, that psychological and sociological factors can have large effects on such phenomena as stock price volatility (Shiller et al. 1984, Summers 1986). For example, there is evidence that stock price volatility is higher on average during recessions, as well as, during major and minor banking crises which is not explained well by the existing EMH theory (Schwert 1989). Essentially, these researchers found evidence for the belief that investing in speculative assets is to a great extent a social activity (Shiller 1993). Graham (1999) reports evidence that financial analysts are also susceptible to herding behavior, particularly with respect to their advice about market timing.

Regarding stock price volatility specifically, there is a body of empirical research that indicates that macroeconomic factors and stock fundamentals do not sufficiently explain stock price volatility. Moreover, there is accumulating evidence that "irrational" behavior from investors – both individual and institutional, novice and professional – can significantly affect stock price returns and volatility (Chang and Dong 2006). Thus, it would follow that movements in social behavior, such as differences in thinking (e.g., Hofstede's (2001) "collective mental programming"), can affect prices in financial markets. However, the bulk of academic research in finance has for the most part avoided behavioral explanations for investments market

behavior. Shiller et al. (1984) argue contrarily that, "…mass psychology may well be the dominant cause of movement in the price of the aggregate stock price."

This is the underlying tenet of the area of behavioral finance. If this belief has validity, then it makes sense to investigate how culture as a potential "unobserved effects bias" influences key financial variables such as stock prices.

Studies in Marketing Research

Srivastava et al. (1998) and Garmaise (2009) well articulate the relationship between the fields of finance and marketing research. Most often in the marketing literature stock price has been used as a measure of success of marketing efforts, that is, as a dependent variable (e.g., Aaker and Jacobson 1994, Fornell et al. 2006, Aksoy et al. 2008). The findings of other marketing researchers have coincided with those in the behavioral finance. For example, Oliver and DeSarbo (1988) used an experimental design to demonstrate that subjects' investment attitudes were influenced by their shared response tendencies (i.e., disconfirmation, performance, and equity). Johnson et al. (2005) and Johnson and Tellis (2005) demonstrate that consumers' biases toward stocks with positive histories yield suboptimal investment decisions.

Mizik and Jacobson (2009) lament, "Marketing does not have a long track record of working with the financial markets theory and methods…" (page 320). But, there is an advantage to having a short track record of experience – marketers can provide fresh perspectives on financial markets building new theories and applying new methods beyond the purview of finance scholarship. Indeed, Kohli (2009) has entreated, "Marketing scientists should develop their own theories." Specifically, Mizik and Jacobson (2009) elicit approaches such as ours, "We encourage further research to take into account the dynamic properties of financial measures and

not to rely on results from previous analyses making use of level models that ignore effects of autocorrelation on the statistical properties of the results." (page 323).

National Culture Dimensions as an Explanation of Stock Price Volatility

Why should one believe that any information regarding stock price phenomena could be gleaned from cultural dimensions of the market's home nation? Several papers have found evidence of a relationship between national culture and other financial variables such as corporate capital structure (Chui et al. 2002, Sekely and Collins 1988, Stonehill and Stitzel 1969), banking systems (Kwok and Tadesse 2006), and stock trading decisions (Grinblattt and Keloharju 2001,). Moreover, there exists an unusual bias for domestic assets, a phenomenon that has puzzled macroeconomists for the last 25 years. The home bias portfolio puzzle has been shown in studies where, for example, Americans held 94% of their equity wealth in the U.S. stock price and the Japanese held approximately 98% of the equity wealth in their home country (French and Poterba 1991). However, as mentioned above, we note that in a novel study Grinblattt and Keloharju (2001) provide the beginnings of an explanation reporting that *language and culture variables* do explain investment decisions in intracountry investment behavior.

Support for cultural influences on stock price volatility can also be found in the aforementioned momentum strategy, which proposes that above average returns can be made by investing with the momentum of the market. This strategy goes against the traditional contrarian view of buy low and sell high, and is based on Jegadeesh and Titman's (1993, 2001) findings from U.S. stock price data that investors are subject to overconfidence, which causes them to weight and overreact to private information and self attribution bias, which causes them to believe success is due to their own abilities and failure is due to outside circumstances. Interestingly, the above average returns from momentum strategy investing does not appear to

hold for non-U.S. stock prices (Chui et al. 2005, Rouwenhorst 1998). This might indicate that a difference in cultural effects on information processing is responsible for this differential return on the strategy.

Paralleling the Grinblattt and Keloharju (2001) study we also employ two indicators of cultural constructs – cultural values and linguistic distance. First, the very well-established cultural values dimensions delineated by Hofstede (2001) were considered. Second, a new measure of linguistic structure (West and Graham 2004) was also included.

While Hofstede has developed five dimensions (Individualism/Collectivism, Uncertainty Avoidance, Power Distance, Masculinity/Femininity, Long Term Orientation), this paper will focus on two of the dimensions. Collectivism/Individualism (IDV) and Power Distance (PDI) have consistently demonstrated both predictive and nomological validity in a wide variety of behavioral studies (West and Graham 2004, Hofstede 2001), and we them believe to be the most applicable to the study's hypotheses. The cultural value dimension of individualism vs. collectivism captures the relationship between the individual and the collective society. It is manifested in how people choose to live together within the family, community or tribal unit and, according to Hofstede, has a significant impact on values, social norms and beliefs. Collectivist countries tend to be more group focused, whereas individualistic societies tend to value the individualist self concept. Power distance has to do with how a culture views inequality. High power distance societies tend to have a large degree of inequality in power and wealth and may even follow a caste system. Societies with low power distance tend to have much more upward mobility and there is a de-emphasis on differences in power and wealth. Cateora et al. (2009) advocate an integration of Hofstede's dimensions of IDV and PDI and Hall's (1976) high/low context cultures into what they call Information-Oriented Cultures (IOCs)

vs. Relationship-Oriented Cultures (ROCs). In particular, they point out the high intercorrelation among the three culture variables ($r > 0.6$). We also note that the broader concept of relationship orientation is becoming more prominent in marketing science with respect to customer relationship management (cf. Anderson 2006) and in organizational behavior (Gelfand, Major, Raver, Nishii, and Obrien 2006). Using this approach the United States and Norway would be classified as countries where information-oriented values predominate (IOCs) and China and Japan as relationship-oriented (ROCs).

The second dimension of culture considered is linguistic structure as measured by linguistic distance from English. West and Graham (2004) have demonstrated a strong relationship between linguistic distance from English and information-oriented cultures (IOC). And as linguistic structure biases thinking it may also bias individual decision making in markets, and in the aggregate, observable behavior of the markets themselves. Indeed, the medium of markets is not just numbers – it is mainly language used in the conversations between buyers and sellers. With these two dimensions of national culture, values and linguistic structure, as background we now present a series of hypotheses that comprise a comprehensive model of how culture influences stock price volatility across the globe.

Hypotheses

The Cushion Hypothesis

Hsee (1998) reports Americans to be considerably more risk-averse than Chinese. One explanation offered for this is the cushion hypothesis developed by Weber and Hsee (1998). The cushion hypothesis posits that in individualistic cultures, with an emphasis on personal freedom, there is less of a societal safety net to protect persons against adverse results of a risky choice. On the other hand, collectivist societies emphasize social relatedness and interdependence of

family and community which allows individuals to have different perceptions of risk. Individuals in collectivist societies such as China are more likely to receive help from family and the community in the case of failure. Thus, they appear more risk seeking due to this societal "cushion." Thus, we might expect that consumers in individualistic countries will take lower risks in investment decisions and this will yield lower stock price volatility.

The Herding Hypothesis

There is evidence that some investors are more inclined to herding behavior (Morrin et al. 2002). Social interaction effects such as herding or conforming to the crowd are one of the factors found to affect financial advice (Graham 1999) and decision making (Hirshleifer 2001). Herding behavior and the momentum effect can be factors in market crashes and bubbles (Jegadeesh and Titman 1993). A study looking at how culture affects managerial decision making found that managers from individualistic cultures were less likely to engage in herding behavior, while those from collectivist cultures were more likely (Beckmann et al. 2005). Indeed, Kwok and Tadesse (2006) provide some indication for herding of another kind being more prevalent in Continental European and Asian markets. That is, they report that banks play a much larger role in financial markets there, and thus bankers can be seen to act as "shepherds" of herds of investors, that is, depositors. The first hypothesis is based on a direct relationship between cultural dimensions underlying information-oriented cultures and stock price volatility.

> **H1A**: Countries with national cultures that tend to be more information-oriented (i.e., more individualistic and with lower power distance) will have lower stock price volatility.

Information-Oriented Cultures and Stability, A Competing Hypothesis

Seemingly contrary to the greater risk aversion on the part of Americans versus Chinese reported by Hsee (1998) is the relative savings rates of the two cultures. Over most of the last

few years, the American savings rate has been negative, while savings rates in Asian cultures remain among the highest in the world. Similarly, Hodgson et al. (2000) and Anterasian et al. (1996) have described Japan as a culture highly valuing stability. Jing and Graham (2007) argue that ROCs place high values on stability, thus innovations and new businesses are eschewed as disruptive. This last view is congenial with the most recent findings reporting culture's influence on the diffusion of innovations (Chandrasekaran and Tellis 2008, Tellis et al. 2003, Talukdar et al. 2002). That is, innovations have been found consistently to diffuse slower in ROCs. Thus, faster new product adoption may be related to a broader kind of market volatility, that reflected in faster changes in stock prices.

Nisbett (2003) adds a deep cultural/psychological explanation for these observed cultural differences in risk taking behavior. Based on series of experiments he concludes that Westerners (that is, IOC North Americans and Western Europeans) and Easterners (ROC East Asians) differ in fundamental thinking patterns regarding the future. Westerners tend to focus on individual trends and expect them to continue. Holistically thinking Easterners believe that an observed trend has many causes and changes are certain (see page 105 for his central argument). Such Eastern psychology on an aggregate level would yield conservatism in investment behavior and tend to moderate volatility at the macroeconomic level, if not in national stock prices. Thus, we propose a competing hypothesis:

H1B: Countries with national cultures that tend to be more information-oriented will have higher stock price volatility.

The Global Capital Market Argument

The global capital market view argues that there are risk-sharing benefits to maintaining strong global ties among nations (Stulz and Williamson 2003). In addition to reducing market risk premiums, globalization affects systematic risk (or beta) of individual companies. It could be

argued that globalization affects systematic risk for countries' stock price volatility as well. The second and third hypotheses are based on a mediated relationship between the cultural dimensions underlying information-orientation and stock price volatility by the extent of global integration.

> **H2:** Countries that tend to be more information-oriented will be more globally integrated (higher globalization).

Support for this hypothesis comes from evidence outlined in Cateora et al. (2009) and elaborated in Early and Erez (1997) which finds that information-oriented cultures tend to be, by definition, less in-group focused and less insular, leading to higher levels of globalization.

> **H3**: Countries with higher globalization ties will have lower stock price volatility.

In addition, the Global Capital Market Argument states that global ties cause more stability in financial systems (Obstfeld and Taylor 2004). International financial markets allow participants to mitigate risk, gain access international sources of capital and debt, and dampen economic shocks. Since the late nineteenth century, as international capital mobility has increased, it can be argued that integrated financial markets serve to stabilize and improve global economic systems.

Linguistic Distance from English, the Fundamental Antecedent

An often investigated construct in international business is cultural distance. Tihanyi et al. (2005) describe both the concept's usefulness and its nuances as a predictor of a variety management decisions in their call for more research in the area. Almost exclusively cultural distance has been operationalized as differences in values. However, we employ a newer, and arguably more fundamental measure of cultural distance in this study. As mentioned at the beginning of the paper, West and Graham (2004) demonstrated the causal relationship between language learned and cultural values, to be specific Hofstede's dimensions of values (primarily

individualism and power distance). Further, they showed that the language → values relationship was valid disregarding the language serving as the origin of the distance scale – that is, English, French, Hebrew, and Japanese. Nisbett's (2003) most recent work also recognizes the influence of language on thinking processes.

Imbedded in West and Graham's theoretical development and Hall's (1976) discussion of high/low context cultures is the notion that English is more focused on information than relationships. For example, children learning Spanish or Chinese must learn multiple words for the second person (*tu* and *usted*, and *ni* and *nin*, respectively). And, in both languages the social relationship determines the proper use of one or the other, thus making social context more salient for Spanish and Chinese speakers vis-à-vis English speakers that simply use *you* in all contexts. Similarly, Pinker (1994) at some length talks about the most conspicuous ways English differs for other languages. Foremost he describes English as "an isolating language, which builds sentences by rearranging immutable word-sized units, like *Dog bites man* and *Man bites dog*" (p. 232). The words are not much affected by the structure of the language. In many other languages, adjectives, nouns, and verbs are modified by case, number, or person affixes. The term doctor in Spanish depends on gender – *doctora* for a female doctor. Obviously, these two simple examples are not intended by themselves to justify the hypotheses involving linguistic distance. However, considering West and Graham's (2004) empirical results in the context of Nisbett's findings it can be said that, relative to many other languages, the "isolating" structure of English helps English speakers ignore social context and subtly tends to elevate *information* and individuals vis-à-vis their groups and *relationships.*

H4: Countries whose languages are structurally more distant from English will be less information-oriented (more relationship-oriented).

To our knowledge the relationship between linguistic distance and globalization has not been considered previously. However, a reasonable *prima facie* argument for including a direct relationship between distance from English and the extent of globalization regards the notion of *lingua franca*. *Merriam-Webster's Dictionary* defines the latter as "any of the various languages used as common or commercial tongues among people of diverse speech" (2003, p. 694).[1] If there is a global commercial language in the 21st Century, it is certainly English. And, facility in English and/or similar languages can be expected to promote globalization. Moreover, the "isolating" structure of English in particular, as described above, has proven to be an advantage in digital communications systems that some think is reflected in economic performance (Hodgson et al. 2007).

H5: Countries whose languages are structurally more distant from English will have lower globalization ties.

Finally, how might language affect stock price volatility directly? Nisbett (2003) hints that such a relationship may exist: "There is clearly an effect of language [on thinking processes] independent of culture [that is, cultural values][2]…" (p. 162). Indeed, English is one of the simplest languages, at least in terms of written symbols. Its relatively short alphabet (and simple computer keyboard) is relatively uncluttered with contextualizing cues unlike French or Turkish, as examples. While the main use of English is to transfer information, the main use of Japanese, for example, is to build and maintain relationships (Hodgson *et al.* 2007). Nisbett continues, "So there is good evidence that for East Asians the world is seen much more in terms of relationships than it is for Westerners, who are more inclined to see the world in terms of static objects…" (p. 162).

[1] The irony here is that *lingua franca* literally means Frankish language.
[2] […] = our comments added for clarity.

All markets, including stock prices, involve interactions between people. Sometimes the interactions are mediated by brokers, institutional investors, and/or electronic systems. But, at their bases all markets consist of buyers and sellers conversing about and agreeing to transactions. Buyers and sellers communicate using language and some languages are better suited to exchange information and others are better suited to build and maintain relationships. For example, consider the case of a Japanese banker talking with the CEO of a smaller firm controlled by the bank. Both executives will be concerned about the information exchanged about company performance, etc., and both executives will also be attentive to the quality of their interpersonal relationship simply through the structure of their relationship-oriented language. Contrarily, an American fund manager talking with the CEO of a company in which the fund is invested, is more likely to focus mostly on "the numbers" and other information that might yield a competitive advantage. In the latter case efficiency is achieved in the economic system through complete information exchange, consistent with the aforementioned Efficient Market Hypothesis. But in the Japanese example the financial information involved in the meeting will be less important than the qualities of the interpersonal relationship conveyed by the use of the indirect and imprecise Japanese conversational style (i.e., linguistic structure and nonverbal signals). Obviously, economic efficiencies are achieved in the Japanese business system as well, but more through transaction cost savings yielded by strong, long-lasting personal relationships (Hodgson, et al. 2007).

Thus, the arguments we used regarding H1B above become pertinent here as well. That is, the use of languages more distant from English tends to promote relationships, and almost by definition stability; and stock price volatility is indeed the opposite of stability.

H6: Countries whose languages are structurally more distant from English will have less volatile stock prices.

Research Design and Methods

Data and Measurement

Please see Table 1 for a complete listing of the constructs and indicators employed in the study. Stock price volatility has been estimated using the Morgan Stanley Capital International (MSCI) Equity Indices which are widely used international equity benchmarks employed in a number of studies (Jorion and Goetzmann 1999, Dwyer and Hafer 1988). The standard national indices for each country in the study were used with the standard index performance price at the last day of each *month* for each year in U.S. dollars. While the MSCI is an indirect measure of global stock prices, it has been used in a number of studies as a means of tracking stock prices across many markets. The MSCI index data for the major stock market in each country were used to calculate historical volatility using the month to month price in U.S. dollars.

(Insert Table 1)

Historical volatility is a measure of price changes of a security or return over a specific period of time using the standard deviation of the continuously compounded return. There are a number of ways to calculate single-state historical volatility models, including the random walk model, historical average method, moving average method, exponential smoothing method, exponentially weighted moving average method (EWMA) and simple regression method (Poon 2005). Volatility can be examined in short (e.g., intra-day) or long (across years) term time frames and with differing price intervals. However, as long as price changes are measured in regular intervals, the annualized volatilities calculated using these differing parameters are usually comparable.

The following formula calculates the historical volatility (VOL) for a given period over a specific time span.

$$HV = \sqrt{\frac{SSS}{N-1}} * \sqrt{TP}$$

where SSS = $\sum \left(X - \bar{X}\right)^2$

N = number of periods for time span

TP = total number of trading periods for the year.

In this study, historical volatility is used, which relies on standard deviation which is similar to other studies (Schwert 1997).

A total of 50 countries were selected for this analysis with the criteria that they each have at least one stock market established and an index on that market is maintained by Morgan Stanley Capital International (MSCI) (Morgan Stanley Capital International Inc. 2005). The stock price data used were for the years 2003, 2004 and 2005. We considered using longer time frames for the dependent construct, but were initially limited by data availability across the 50 countries. The three separate years of data were modeled as formative indicators for the analysis. Colleagues have also suggested different approaches to modeling the dependent construct (e.g., focusing on one year at a time or averaging the three years together). However, our formative indicator approach maximizes the information available in the measures, yet allows for discernment of variation across them.

The measure of linguistic distance from English (DISTENG) is that developed by West and Graham (2004) and reported in Cateora et al. (2009). The measure used was constructed using the ideas of Grimes (1992), which lists some 6,500 languages based on the linguistic classifications of Bright (1992). Every language is part of an explicit family tree. We use

English as the focal language and calculate the distance (DISTENG) by coding each language for the number of branches used to connect it to English. Examples of these scores are: Mandarin = 6, Hebrew = 5, Japanese = 4, Spanish = 3, Swedish = 2, and Dutch = 1.

The indices for Individualism/Collectivism (IDV) and Power Distance (PDI, reverse coded) from Hofstede (2001) were used as the indicators for the variable Information-Oriented Cultures (IOC) for the 50 countries. They are modeled as reflective indicators. Other researchers (e.g., Chandrasekaran and Tellis 2008) have suggested using alternative data sources for developing the measure of IOC, for example, House et al. (2004). However, the construct and systemic validity of the Hofstede measures is the best established among the several alternatives (cf. West and Graham 2004, Yoo and Donthu 2002), and most often used in marketing studies (e.g., Van den Bulte and Stremersch 2004 and Tellis et al. 2003). We also note that convergence of House's et al. (2004) and Hofstede's measures of individualism, i.e., $r > .0.8$, $p < 0.05$.

The Globalization Index is generated annually by A.T. Kearney and is made up of fourteen variables grouped into four components: economic integration (GLOBe), personal contact (GLOBp), technological connectivity (GLOBt), and political engagement (GLOBpo) to determine the ranking of 62 countries (A.T. Kearney Inc. and the Carnegie Endowment for International Peace 2003). Economic integration includes data on trade, foreign direct investment (FDI), portfolio capital flows and investment income payments and receipts. The personal contact component is made up of data tracking international travel and tourism, international telephone traffic, cross border remittances, and personal transfers. The technological connectivity component is made up of data on the number of internet users, internet hosts, and secure servers. The political engagement component is made up of each country's membership in international organizations, personnel and financial contributions to U.N. Security Council

missions, ratification of selected multilateral international treaties, and the amount of governmental transfer payments and receipts. In this study, we are using the Globalization Index for 2003. The four separate aspects of the globalization index were modeled as formative indicators.

Control Variables

To guard against the potential confounding influences of macroeconomic conditions and characteristics of individual stock prices, four control variables were used in latter stages of the analyses. All four – size of the country in terms of population (POP), age of the stock market (AGE), personal income of residents ($/cap), and total stock market capitalization (MKTCAP) – might be expected to dampen the volatility of their respective stock prices. Colleagues have suggested a long series of additional control variables such as, macroeconomic volatility, industrial production volatility, level of stock price development, liquidity, recessions, stock price turnover, country credit rating, etc. Many of these factors have been found to be related to stock price volatility, but the causality has been difficult to sort out. The four controls we have chosen to include in our model reflect more fundamental causal relationships. Moreover, many of the alternatives suggested, including those recommended by colleagues above, are often contemporaneous with the dependent variables studied and might themselves be expected to be influenced by the more fundamental and long temporally precedent cultural variation. That is, Hofstede's data on cultural values were collected in the 1970s and linguistic distance has been determined even further back in time.

Analyses

All the theoretical constructs are represented in Figure 1. The hypotheses were tested using a partial least squares regression analysis to examine the relationships among cultural

dimensions and global stock price volatility. Often used in the hard sciences (e.g., Geladi (1988) in chemistry and Navarro, Zatarian, and Montuire (2004) in biology), used previously in marketing by Fornell and Bookstein (1982), and Graham et al. (1994), and elaborated by Diamantopoulos and Winklhofer (2001), partial least squares regression was chosen as the method of analysis since it can be used with data that come from non-normal distributions and less than interval level data (Falk and Miller 1992). Unlike LISREL (cf. Bagozzi 1977) and other covariance structure analysis modeling approaches, partial least squares seeks the minimization of error or equivalently the maximization of variance explained which can be determined by examining the R^2 values of the dependent or endogenous constructs (Falk and Miller 1992, Hulland 1999). This functions as an indicator of the model's goodness of fit. Partial least squares was chosen over other regression techniques or forms of structural equation modeling due to the non-normal aspects of the data and the relatively small sample size, n = 50 (Falk and Miller 1992). Partial least squares regression is also well suited to handle problems of multicollinearity and non-linearity, and allows complex measurement and theoretical models to be estimated simultaneously. Finally, partial least squares has been found to be more robust than some other more traditional methods of estimation (Naik et al. 2000).

(Insert Figure 1 about here)

To test the hypotheses, parameter estimates were calculated for five models – each successively more complex and therefore more comprehensive.

Results

Table 1 includes descriptive statistics and the correlation matrix for the variables used in the study.

Measurement Models

As described above, three constructs were measured using multiple indicators. Reported in Table 2 are the latent variable loadings and weights for those measures used in Models III and V. The relative importance of the indicators is reflected by their magnitudes; and these values are consistent across all five models. Information-Oriented Cultures (IOC) was measured using individualism (IDV) and power distance (PDI, reverse coded) as reflective indicators. Both latent variable loadings are high and virtually equal. The extent of Globalization (GLOB) was determined by combining the four separate aspects using a formative indicator approach. Personal and technological globalization proved to be salient in the contexts of the structural equation models, while economic and political were substantially less so. Stock price Volatility (VOL) was determined by combining the volatility for each of three successive years, 2003-2005, as formative indicators. Among the three, the volatility for 2004 proved least useful while the volatility for 2003 and 2005 were relatively consistent and important in the context of the structural equation models.

(insert Table 2 about here)

Model I

The competing Hypotheses 1A and 1B were initially tested in the context of the simplest model possible. As predicted in H1A stock price volatility (VOL) was lower in information-oriented cultures (IOC), thus refuting H1B. The parameter estimate was -.41, $p < 0.05$ and IOC explained 17% of the variance in stock price volatility. See Table 3.

(insert Table 3 about here)

Model II

The second model demonstrates that the extent of globalization mediates the relationship between information-oriented countries and stock price volatility. Both Hypotheses 2 and 3 are

strongly supported with parameter estimates of .76 and -.70, respectively, both statistically significant, $p < 0.05$. While the causal chain IOC → GLOB → VOL is thus supported, the direct relationship between information-oriented cultures (IOC) and volatility (VOL) disappears in the context of the more comprehensive model. Therefore, in the context of the more comprehensive model, both Hypotheses 1A and 1B must be rejected.

Model III

Linguistic distance from English is added as an antecedent in Model III and it proves useful in two ways. As predicted in Hypothesis 4, countries that have languages more distant from English (DISTENG) are lower in information-oriented cultural values (IOC) with a relatively large parameter estimate of -.71 ($p < 0.05$). Hypothesis 5, a direct relationship between distance from English and globalization (GLOB) is not supported by the analysis. Finally, and perhaps most interestingly, Hypothesis 6 is supported indicating that countries whose languages are more distant from English also tend to have lower stock price volatility (-.32, $p < 0.05$). A check for this suppressor effect (i.e., the relationship is not evinced in the correlation matrix; cf. Bagozzi 1980, Maassen and Bakker 2001) was conducted by removing the DISTENG → VOL path, and as should be expected the model R^2 declines by .04, from .31 to .27.

Model IV

The four potential covariates included in the analysis proved to be unimportant. That is, all four parameter estimates were statistically insignificant. Stock price volatility (VOL) appears to be uninfluenced by a country's population (POP) and personal income levels ($/cap), and by the stock price's age (AGE) and capitalization (MKTCAP).

Model V

Finally, for the sake of completeness, in Model V we include six additional, plausible parameters yielding the most comprehensive model of the relationships among the eight variables. The age of the stock price was found to be a consequence of its distance from English (DISTENG → AGE = -.61, $p < 0.05$). Personal incomes tended to be higher in information-oriented cultures (IOC → $/cap =.65, $p < 0.05$). Older stock markets tended to be have higher capitalizations (AGE → MKTCAP =.25, $p < 0.05$). Countries with higher personal income levels tended to be more integrated into the global community ($/cap → GLOB =.58, $p < 0.05$).

This most comprehensive model provides the context for the most rigorous tests of the various hypothetical relationships. On the basis of the parameter estimates listed for Model V Hypotheses 2, 3, 4, and 6 must be accepted, and Hypotheses 1A, 1B, and 5 rejected. 39% of the variation in stock price volatility across the 50 countries is explained by the variables and structures comprising Model V. Finally, Model V yielded the best overall fit statistic among the models, that is the lowest RMS COV (E,U) =.084.

Tests of Generality

The generality of the results was tested using volatility statistics gleaned from a different data base, using different products, and over different time periods. Five variables were employed from the Euromonitor Global Market Information Database (2009, GMID): (1) the cost of milk/liter; (2) the index of housing prices; (3) the index of consumer prices; (4) aggregate stock prices (i.e., market capitalization), 2003-2008; and (5) aggregate stock prices, 2007-2008. These data were available for the years 2003-2008 and corrected to year-on-year dollars when appropriate for comparison purposes. The volatilities of prices in each of the first four dependent variables were measured by calculating the coefficient of variance (i.e., cv = standard variation/mean) across the six years of data. Please notice the difference in the data used in the

initial analyses (i.e., stock prices varying *monthly*) versus those in the tests of generality (i.e., market prices varying *annually*). The one year decline in stock prices during 2008 comprised the fifth variable.

Milk and housing prices were selected from a broad array of consumer goods and services available from GMID because we expect that those products would be least influenced by global prices and trade. Of course, the index of consumer prices includes a market basket of products and services, many of which are imported. Perhaps the most interesting of the GMID variables used in this part of the analyses is the decline in stock price capitalization during 2008. That year the stock markets declined in price in all 50 countries of analysis, averaging 30% and ranging from 3% in Sweden to 74% for Russia.

The generality of the central theory was tested and reported with the alternative dependent variables in the context of a trimmed Model III based on the results reported for Model V. That is, the control variables were excluded because they displayed no substantial effects on stock price volatility in the more comprehensive Model V. Additionally, stock market age and capitalization should have no effect on milk price volatility, for example. However, to be complete, all models were tested with all data, and the lack of substantial effects of the control variables justifies our simplified reporting approach of focusing on the trimmed Mode III.

[Insert Table 4 about here]

As can be seen in Table 4 our initial findings regarding the relationships among the cultural variables, globalization, and price volatility are well supported across the various tests. Additionally, the fundamental IOC → VOL relationship is evident across the tests of Model I with PLS parameter estimates of -.41 for monthly stock price volatility (as reported in Table 3),

-.38 for milk prices, -.33 for housing prices, -.30 for CPI, -.53 for stock prices (annual 2003-08), and -.41 for stock price declines in 2008, all statistically significant at $p < 0.05$. The suppressor effect discovered in the context of the initial model development is repeated across the milk, housing, and CPI tests (including the expected declines in R^2 when the DISTENG → VOL path is eliminated: milk at -.14, housing at -.10, and CPI at -.05). The glaring anomaly in the results reported in Table 4 is the lack of the suppressor effect for the latter stock price volatility measures. We consider this inconsistency in the discussion section to follow.

Discussion

The fundamental finding of this study is that culture does indeed influence stock price volatility. Shiller (1984) was right about "mass psychology" causing stock price price movements. That is, we suppose cultural values can be seen as one sort of mass psychology. But, deeper than Shiller's psychology, we also find indications that the language itself used in the market influences stock price volatility. Both the direct and indirect influences of culture explain 39% of the variation in stock price volatility across international markets. While we are quite confident in the rigor of our analysis, our findings and conclusions must be taken as indicative because this study is the first of its kind. We also note that the importance of cultural variables we report is consistent with other work in marketing (e.g., Van den Bulte and Stremersch 2004 and Chandrasekaran and Tellis 2008).

The fundamental causal chain (i.e., DISTENG → IOC → GLOB → VOL) underlying our hypotheses has proven quite plausible. That is, strong evidence is provided that countries whose languages are linguistically closer to English tend to be more information-oriented, and in turn tend to be better integrated into the global economy, and in turn tend to have stock prices that are less volatile. Indeed, the mechanisms connecting distance from English, information-oriented

cultures, and globalization also seem to be supported by the pattern of latent variable weights in Table 3. That is, the dimensions of globalization that are most important in the model both have to do with conversations between citizens, both personal (GLOBp) and via electronic technologies (GLOBt). The cushion (Hsee 1998) and herding (Morrin et al. 2002) hypotheses are not supported in our comprehensive analyses. Rather culture affects globalization level which in turn dampens stock price volatility.

But, we also find distance from English to have an opposing *direct* effect on stock price volatility. Countries whose languages are more linguistically distant from English tend to have less volatile stock prices. This latter relationship is suppressed (as described by Bagozzi 1980 and elaborated on by Maasen and Bakker 2001) in the correlation matrix and only becomes evident in the more comprehensive (i.e., rigorous) structural equation analyses. Languages whose structures elevate the role of personal relationships tend to deliver stability in stock prices in the ways suggested by Hodgson et al. (2000), Nisbett (2003), and others. Thus, our comprehensive analyses illuminate both edges of the sword, and we begin to see the sort of complexity of the influences of cultural constructs on behavior and decision making as described by Tihanyi et al. (2005), particularly with regard to a key aspect of financial markets.

We also note two other findings of interest in the study that are tangentially related to our hypotheses. First is the strong relationship between linguistic distance from English and stock price age. Indeed, the historically innovative Dutch invented the stock market in 1611. The Germans copied the idea first in 1685, and then the British in 1698, and the latter spread the idea around the world. Indeed, the New York Stock Exchange opened in 1792, just four years following the ratification of the U.S. Constitution. Second, we know from other research (e.g., Jing and Graham 2007, Hofstede 2001) that information-oriented cultural values tend to

stimulate economic development, at least as measured by personal income ($/cap). It also seems that high-income countries are more globally integrated, particularly because their citizens can afford to travel more (GLOBp) and stay connected technologically (GLOBt). Thus, our analyses show personal income to mediate the relationship between information-oriented cultures and globalization (IOC → $/cap → GLOB).

Generality of the Initial Findings

As reported in the Results section and evinced in Table 4 the veracity of the causal chain linguistic structure → cultural values → globalization → price volatility is well supported. The direct negative influence of linguistic structure on price volatility is also supported across the three alternative product categories – milk, housing, and CPI – in addition to the initial finding for stock price volatility. However, the suppressor effect is not evident when the two additional measures of stock price volatility are included in the analysis. This discrepancy might be an artifact of (1) the differences in time periods studied (i.e., 2003-2005 vs. 2003-2008 or just the 2008 decline), or (2) the difference in calculating the volatility statistics over the time periods (month-to-month vs. year-to-year volatility). We ran the model using only the first three years of data for the GMID stock price data, but found no support for the first explanation. We could not think of a good way to investigate the second explanation with these data, but this is a topic worthy of future research. However, we do note that the discrepancy may have to do with the frequency of decisions made by investors in stocks. That is, cultural variation may affect day traders or institutional investors differently from buy-and-hold strategists. The more active participants (higher-frequency traders, i.e., evinced in the monthly stock price data) may depend more on their investor relationships imbedded in cultures/countries linguistically distant from English.

The findings reported in Table 4 also allow for *the beginnings* of a comparison of the dual effects of linguistic structure on price volatility. That is, the three parameter estimates embedded in the causal chain can be multiplied together to estimate the strength of the indirect influence of linguistic distance on price volatility. For the volatility of stock prices monthly, $.39_{indirect}$ (calculated as .76 X -.73 X -.70) corresponds to the strength of the indirect effect of linguistic distance on price volatility, and this dominates the direct effect of $-.27_{direct}$. Indeed, looking across all three stock price dependent variables (see Table 4), the indirect positive influences of linguistic distance on volatility dominate the direct effects. The opposite is true for both milk and housing, $-.46_{direct}$ dominates $.31_{indirect}$ and $-.39_{direct}$ dominates $.36_{indirect}$, respectively. For CPI the indirect and direct effects are almost equal. These differences in strength perhaps can be attributed to the lower exposure both milk and housing have to international markets – notice the lower GLOB → VOL parameter estimates in each case.

In summary, the overall findings are consistent across the product categories. But a close examination provides hints that influences of both the product category and the time frame of the volatility calculation may be important considerations in future research in this area.

Limitations and Future Research

Imbedded in the discussion above are both mentions of limitations of this initial study and implications for future research. Here we add to the list directly. There may be an issue with determining causality due to an unmeasured across country heterogeneity such as savings rates, banking industry structure, regulatory policy liberalization (Filer et al. 1999), and/or education levels (Xing 2004). However, it should be noted that both cultural variables are temporally antecedent to the other variables in the study *and* those mentioned by Filer et al. just

above. That is, Hofstede's (2001) data were collected more than thirty-five years ago, and, of course, linguistic structures are at least centuries old.

An important limitation of this study regards the potential cultural biases of its English-speaking authors.

In addition, there are other types of financial market variables that could be studied in a cross cultural study. Previous studies have looked at cross cultural differences in banking structures and firm debt structures using Hofstede's cultural dimensions as a predictor (Chui et al. 2002, Kwok and Tadesse 2006). For example, stock price growth rates, national interest rates, and currency exchange rates could be possible variables that could be examined using national culture variables. The often observed, but yet to be satisfactorily explained investors' overwhelming preferences for domestic investments might also be explored using culture variables (cf. French and Poterba 1991).

Linguistic distance has proven useful in this study and might be worthwhile in a broad variety of marketing analyses. The construct holds two particular advantage over Hofstede's (2001) and related *values* measures: (1) the measure is not limited to the set of countries included in previous studies such as Hostede or House et al. (2004); and (2) the measure may be used for ethnic markets (such as Spanish speakers versus English speakers in the United States) or even individuals in any country based on their language of primary fluency. Indeed, there is some indication that linguistic distance may be important in studies of new product given our findings about its influence on the spread of stock markets historically.

As we have found both language and values to be of interest in this study, other aspects of culture may also be important in other marketing studies – rituals, symbols, beliefs, and thought processes may vary systematically and perhaps measurably across countries and cultures

(Cateora et al. 2009). Indeed, Max Weber (1934, 2002) argued the importance of the "Protestant work ethic" and values for individualism in determining economic success. Of course, Adam Smith presaged Weber with "All money is a matter of belief."

Finally, perhaps most important will be the development of a measure of cultural values for *stability*. The notion of stability is central in the arguments for both Hypotheses 1B and 6. To our knowledge, this apparently important construct has not been considered previously.

Management Implications

The comments in this section must be considered in the context of the novelty of this study. Strong advice can be given about such matters only after confirmation in related studies.

Knowing that price volatility varies across cultures in a systematic way provides international marketing executives with information about how often prices should be reviewed and changed across global markets. For example, our findings suggest that in China (or among Chinese speaking market segments within other countries) stock prices will tend to be more volatile than in the United States (or in other English speaking countries and market segments). Indeed, in our data the coefficient of variation for stock prices 2003-2008 were $cv_{China} = .96$ and $cv_{USA} = 12$. Alternatively milk prices may be more volatile in the United States ($cv_{USA} = .16$) and less so in China ($cv_{China} = .12$). That is, the influence of culture on price volatility appears to interact with product category. Relatedly, the extent that products and services are exposed to global competition and global markets appears to be a key consideration affecting how culture influences price stability/volatility. Furthermore, since we understand at least part of the causal mechanisms leading to the differences, we can make reasonable predictions about differences in price volatility/stability in such countries in the future and in other markets not included in the Hostede or House et al. data sets.

In their explanation for sticky prices, Davis and Hamilton (2003) emphasize "..strategic considerations of how customers and competitors will react to price changes" (page 1). High volatility pricing environments will require greater flexibility in pricing, perhaps both in frequency and quantity of price changes. In countries where consumers are more accustomed to higher volatility in prices, those consumers may be more amenable to price adjustments. Indeed, as the market for cellular phones is one of the most global, it is not at all surprising that American customers for iPhones strongly objected to Apple's fast changing prices during 2007. Consumers in countries such as China or Japan, where relationship-oriented languages and values prevail, might have anticipated fast changing prices and been more accepting of Apple's early pricing strategies and adjustments. Moreover, competing cell phone companies, particularly those from Asia, may have been faster to adjust prices in response to Apple's new product offerings in such countries.

Additionally, our findings regarding the predictable volatility of stock prices based on cultural variables holds important implications for the design of financial services and investment products. Such considerations may be particularly important in developing prices in initial public offerings (IPOs) and the like. Indeed, Garmaise (2009), a finance scholar, supports this view: "Studying the beliefs of investors is a form of marketing research for a firm that is planning to sell a security" (page 324). Stock prices in countries whose languages are more structurally distant from English, those more relationship-oriented can be expected to display greater price volatility. Alternatively, housing prices, relatively insulated from the global markets, may be more stable in those very same countries.

Perhaps the most important management implication of our findings is the fundamental lesson that cultural variation is important and fundamental. While both good information and

good relationships are important for commercial efficiency, markets differ in their emphasis. Marketing managers must consider such differences as they impact all aspects of the marketing mix, *including* pricing decisions. And, as marketing scholars continue to focus on stock price as a measure of marketing decision quality it may prove useful to control for systematic cultural variation across countries.

Conclusion

Using a comparative approach and data from 50 countries, our analyses offer evidence that culture has both direct and indirect effects on stock price volatility. This is one of the first papers to offer an empirical investigation to include global stock price data in order to make the connection between stock price volatility and national culture. Secondly, in the tradition of work done by Kwok and others (Grinblatt and Keloharju 2001, Chui et al. 2002, Kwok and Tadesse 2006), this paper attempts to bridge the gap between the finance literature and the cross-cultural literature. The most novel finding of the paper regards the importance of linguistic distance in the model. Language, as an element of culture, affects both cultural values and aggregate market behavior. This novel finding deserves attention in future work. The generality of our theory is supported by our analyses of the volatility of prices for other categories of consumer purchases as well.

Finally, theoretical models can be incomplete in two ways: (1) Important variables can be missing; and/or (2) important relationships can be omitted. This paper is responsive to both kinds of errors. The use of partial least squares regression establishes and supports a comprehensive and complex predictive model describing and elucidating new relationships between national culture and stock price volatility. The paper also illuminates new ways to

measure and to integrate an entire class of previously regarded "*unobservable* fixed effect biases" (cf. Jacobson 1991) into the study of markets and economic behavior.

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Table 1. Constructs, Indicators, Descriptive Statistics, Correlation Matrix

			Correlation Matrix (n = 50)																	
Constructs	Indicators	Mean (sd)	DISTENG	POP	IDV	PDI	AGE	$/cap	MKTCAP	GLOBe	GLOBp	GLOBt	GLOBpo	VOL 2003	VOL 2004	VOL 2005	MILK	HOUS-ING	CPI	VOL 2003-2008
Linguistic Distance	Distance from English (DISTENG)	3.2 (2.1)																		
Size of Country	Population in millions in 2003	95.3 (231.9)	.148																	
Information-Oriented Cultures (IOC)	Individualism (IDV)	48.3 (24.4)	-.676*	-.167																
	Power Distance (PDI) [reverse coded]	49.8 (21.9)	-.588*	-.296*	.616*															
Stock Market Age	Age in years	132.5 (77.6)	-.614*	-.292*	.604*	.312*														
Income per capita	GDP/capita in U.S.$ ($/cap)	15,922 (14,475)	-.596*	-.259	.702*	.653*	.551*													
Size of Stock Market	Stock Market Capitalization in billions in 2003 (MKTCAP)	6.7 (2073.6)	-.267	.142	.325*	.125	.245	.327*												
Globalization [all reverse coded]	Economic (GLOBe)	29.7 (18.2)	-.189	-.380*	.404*	.407*	.345*	.547*	-.141											
	Personal (GLOBp)	30.4 (19.4)	-.484*	-.392*	.534*	.628*	.421*	.654*	.002	.731*										
	Technological (GLOBt)	25.8 (16.7)	-.522*	-.342*	.603*	.689*	.433*	.846*	.310*	.608*	.651*										
	Political (GLOBpo)	28.1 (17.7)	-.452*	.233	.537*	.244	.472*	.443*	.319*	.089	.215	.272								
Stock Price Volatility	Monthly (VOL 2003)	.034 (.012)	.128	.271	-.336*	-.169	-.206	-.442*	-.219	-.411*	-.511*	-.439*	-.018							
	Monthly (VOL2004)	.020 (.014)	-.073	-.115	.115	.064	-.038	-.143	-.227	-.030	-.030	-.174	.032	.170						
	Monthly (VOL 2005)	.018 (.014)	.083	.072	-.298*	-.131	-.261	-.408*	-.181	-.505*	-.433*	-.398*	.012	.495*	.400*					
Milk Price Volatility	Milk price per/liter Annual, 2003 – 2008 (MILK)	0.182 (0.071)	-.119	-.037	.121	-.244	.126	-.291*	-.134	-.214	-.151	-.351*	.024	.133	.328*	.268				
Housing Price Volatility	Housing Cost Index, Annual, 2003-2008 (HOUSING)	0.068 (0.049)	.002	.106	-.090	-.368*	.082	-.360*	-.060	-.349*	-.324*	-.485*	.113	.332*	.178	.302*	.582*			
Consumer Prices Volatility	CPI, annual 2003-2008 (CPI)	0.098 (.121)	.030	.033	-.194	-.322*	-.037	-.290*	-.096	-.319*	-.296*	-.407*	.071	.283*	-.109	.334*	.400*	.667*		
Stock Prices Volatility	Annual, 2003-2008 (VOL 2003-2008)	0.388 (0.176)	.396*	.560*	-.531*	-.418*	-.480*	-.607*	-.310*	-.465*	-.510*	-.607*	-.178	.389*	.322*	.484*	.272	.105	.097	
Stock Prices Volatility	Stock prices, % decline during 2008 (DECLINE 2008)	29.8 (20.8)	.452*	.352*	-.432*	-.529*	-.357*	-.670*	-.248	-.459*	-.628*	-.597*	-.132	.401*	.007	.402*	.426*	.315*	.351*	.663*

$p < 0.05$

Table 2. PLS Parameter Estimates
Latent Variable Loadings (for IOC) and Weights (for GLOB and VOL)

	Model III	**Model V**
Information-Oriented Cultures (IOC)		
Individualism (IDV)	.92	.91
Power Distance (PDI)	.89	.89
Globalization (GLOB)		
Economic	-.20	-.11
Personal	.67	.55
Technological	.50	.61
Political	.21	.08
Stock price Volatility (VOL)		
2003	.71	.73
2004	-.40	-.20
2005	.50	.46

Table 3. PLS Parameter Estimates, Theoretical Models

		MODEL				
		I	**II**	**III**	**IV**	**V**
H1	IOC→VOL	-.41*	.18	-.07	.0	.09
H2	IOC→GLOB		.76*	.67*	.67*	.27*
H3	GLOB→VOL		-.71*	-.65*	-.59*	-.68*
H4	DISTENG→IOC			-.71*	-.71*	-.71*
H5	DISTENG→GLOB			-.17	-.17	-.04
H6	DISTENG→VOL			-.31*	-.36*	-.33*
C1	POP→VOL				.10	.05
C2	AGE→VOL				-.07	-.10
C3	$/cap→VOL				-.14	-.05
C4	MKTCAP→VOL				-.10	-.11
C5	DISTENG→AGE					-.61*
C6	DISTENG→$/cap					-.13
C7	POP→GLOB					-.14*
C8	IOC→$/cap					.67*
C9	AGE→MKTCAP					.25*
C10	$/cap→GLOB					.59*
	VOL R^2	.17*	.34*	.31*	.37*	.39*
	GLOB R^2		.57*	.63*	.63*	.78*
	IOC R^2			.50*	.50*	.50*
	AGE R^2					.38*
	$/cap R^2					.58*
	MKTCAP R^2					.06
MODEL RMS COV (E,U)		.098	.096	.092	.089	.084

$p < 0.05$

Table 4. PLS Parameter Estimates
Alternative Dependent Variables in a Nested Model (Model III, trimmed)

	Price Volatility of…					
	Stocks, monthly for 2003, 2004, 2005 separately	Milk, annually 2003-2008	Housing, annually 2003-2008	CPI, annually 2003-2008	Stocks, annually 2003-2008	Stocks, % decline in 2008
H2 IOC → GLOB	.76*	.77*	.75*	.77*	.79*	.78*
H3 GLOB → VOL	-.73*	-.59*	-.69*	-.56*	-.59*	-.53*
H4 DISTENG → IOC	-.70*	-.70*	-.70*	-.70*	-.70*	-.70*
[DISTENG → $VOL_{indirect}$]#	[.39]#	[.31]#	[.36]#	[.30]#	[.33]#	[.29]#
H6 DISTENG → VOL	-.27*	-.46*	-.39*	-.29*	.03	-.08
VOL R^2	.38*	.24*	.33*	.21*	.33*	.24*
GLOB R^2	.58*	.59*	.56*	.59*	.62*	.61*
IOC R^2	.49*	.49*	.49*	.49*	.50*	.49*
MODEL RMS COV, (E,U)	.092	.088	.092	.087	.083	.085

*$p < 0.05$
#The indirect influence of DISTENG → VOL is calculated by multiplying the parameter estimates associated with the causal chain DISTENG → IOC → GLOB → VOL. For example, in the first column above (for Stocks, monthly….) .39 = .76 x -.73 x -.70.

FIGURE 1
A Simplified Version of the Theoretical Model with Controls