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ACADEMY OF ACCOUNTING AND FINANCIAL STUDIES JOURNAL

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LETTER FROM THE EDITORS

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As has been the case with the previous issues of the *AAFSJ*, the articles contained in this volume have been double blind refereed. The acceptance rate for manuscripts in this issue, 25%, conforms to our editorial policies.

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MANUSCRIPTS

NUANCES OF CHAOS IN FOREIGN EXCHANGE MARKETS

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Gerald Kohers, Sam Houston State University

ABSTRACT

Is the economy an evolutionary process? Recently, scientists have begun to think that the economic dynamics of free-market societies can be explained by evolutionary dynamics. If so, on the aggregate level then, foreign exchange markets may be driven by a collective "image of the future" that societies are driven by. When economies are viewed as evolutionary processes, it is just possible that on the aggregate, but a subconscious level, competitive forces in foreign exchange markets become endogenous in a system that drives exchange rates towards a collective futuristic image. Moreover, such a system could be deterministic. This paper investigates such possibility in the daily dollar price movements of five major trading currencies and three less actively traded currencies over a 25-year time span beginning with the inception of the floating exchange rate system in 1973. The results of this study suggest that none of the examined currencies are influenced by low-dimensional chaotic determinism. Although three of the examined exchange rates do exhibit signs of being driven by higher-dimensional chaos, this finding does not significantly favor the possibility of predicting these currency movements. As such, very little evidence of a deterministic driving force behind foreign exchange rates is uncovered in this study.

INTRODUCTION

Of late, there has been some deliberation about viewing economies as evolutionary processes. In such a case, it is just possible that on the aggregate, but a subconscious level, competitive forces in foreign exchange markets become endogenous in a system that drives exchange rates towards a collective "image of the future". Grabbe [1996] presents the possibility of self-organization of human societies, and thus by implication of the economy, with a shared image or a vision of the future. At the singular level, this vision might be subconscious or nonexistent, but at the aggregate level such a vision might be discernible. In the foreign exchange markets, most of the trading occurs while traders are marketmakers or speculators. They may not afford the luxury of acting late on any relevant news. Very often, the trader must anticipate other traders' moves and try to preempt such moves. As such, each trader must not just act on his or her expectations but rather act on anticipation of other traders moves who themselves are trying to anticipate the first's and everyone else's moves and so on. Evolutionary dynamics provide a solution in the form of spontaneous order involving dynamic feedback at a higher, or aggregate, level. In the foreign exchange markets context, what appears to be competition amongst traders and

central banks at the lower level, where expectations are generated, functions as co-ordination at the higher (global) level (Grabbe [1996]). Recent research in behavioral economics has also yielded explanations of chaotic influences in economic and financial data series based on equilibrium solutions under conditions of imperfect foresight (Sorger [1996]).

If such is the case, foreign exchange rates may be driven by nonlinear deterministic systems. Recent advances in the study of nonlinear dynamics and chaotic processes have yielded tools that can distinguish stochastic variables from seemingly random data that are, in fact, generated by low-complexity nonlinear deterministic processes. Tests for informational efficiency in foreign exchange markets can now be strengthened by employing these tests for chaotic dynamics among time series of security returns. Since some forms of chaotic determinism can generate seemingly random variates, it is imperative that tests for nonlinear dependencies become an integral part of market efficiency tests.

In examining the pricing efficiency of foreign exchange markets, the vast majority of research has relied on linear modeling techniques, which have serious limitations in detecting multi-dimensional patterns. This study intends to broaden the scope of previous research on the subject. This approach employs a battery of tests designed to avoid the problem of nonstationarity often associated with financial data and proceeds in its attempts to detect any driving influence of low-dimensional deterministic chaos in exchange rate movements of five major trading currencies and three less actively traded currencies. More specifically, this study examines the spot markets for the exchange of dollars for the following currencies: the Canadian dollar, the German mark, the Japanese yen, the Swiss franc, the British pound, the Australian dollar, the Malaysian ringgit, and the Spanish peseta. Foreign exchange rate movements exhibiting low-dimensional deterministic chaos may contain some informational inefficiency (in the weak form sense); thus, it may be possible to use nonlinear dynamics to predict future currency exchange rates.

Several recent studies on foreign exchange rate movements have ascertained that these rate changes depict a high level of non-normality. Aggarwal [1990] detected a high degree of skewness and kurtosis in the forward price movements of foreign currencies. He also observed that significant non-normality plagued the spot rates for foreign exchange.

Upon reviewing some prior literature on the statistical properties of foreign exchange rate movements, Hsieh [1991b] concludes that daily changes in foreign exchange rates are not identically and independently distributed. Furthermore, he ascertains that higher order moments characterize the distribution of foreign exchange rates.

The observations made in the above mentioned studies suggest the possibility that nonlinear dynamics may be driving foreign exchange price changes. The fact that statistical properties characterizing the distribution of foreign exchange rate movements display significant third and fourth order moments makes the possibility of mean or variance nonlinearities influencing exchange rates a plausible issue. Although international stock markets have undergone intense scrutiny regarding nonlinear properties and chaotic behavior inherent in their return movements (e.g., Pandey *et al.* [1998, 1999], Sewell *et al.* [1997]), very few studies have investigated the possibility of the existence of nonlinear dynamics in foreign exchange rate movements. Hsieh [1989] investigated the movements of the dollar exchange rates for the British pound, the Canadian dollar, the German mark, the Japanese yen, and the Swiss franc over the ten year period spanning 1974 through 1983.

His conclusions confirm the existence of variance nonlinearities (significant GARCH effects) in the examined foreign exchange rate movements. However, the above study was unable to confirm the presence of chaotic dynamics in any of the examined currencies.

Some recent studies have successfully attempted to forecast foreign-exchange rate movements using nonlinear deterministic models. Fernandez-Rodriguez *et al.* [1999] use a simultaneous nearest neighbors (SNN) predictor to daily exchange rate data for nine emerging market currencies during the period 1978-1994. They report that the nonlinear SNN predictors outperform the traditional (linear) ARIMA predictors by a significant margin. Lisi and Schiavio [1999] use monthly exchange rates for four major European countries from 1973-1997 and apply a vector valued local linear approximation (VLLR) method to mimic chaotic predictions. They conclude that the performance of this chaotic prediction technique was inferior to that of a neural network trained on the same data. It must be noted that while the above studies have examined the performance of specific chaotic models or approximation techniques, the results cannot be generalized to the whole universe of chaotic processes.

This study undertakes the task of examining the daily exchange rate movements of eight foreign currencies for almost a twenty-five year period spanning from March 1973 through December 1997. The focus of this research is restricted to identifying the presence of chaotic dynamics in the examined series. Nonlinearities of variance are not investigated in this study as their detection does not have any significant implications on the pricing efficiency of the examined foreign exchange markets.

The remainder of this paper is organized as follows. The methodology, including a brief description of the nonlinear dynamics approach, time frame, and data selection for the eight foreign currencies is explained in Section II. The findings are discussed in Section III. The paper concludes with a summary in Section IV.

DATA AND METHODOLOGY

This study examines five major trading currencies and three less actively traded currencies for the existence of low-dimensional deterministic chaos. Specifically, the following spot markets are analyzed for the exchange of U.S. dollars for these currencies: the Canadian dollar, the German mark, the Japanese yen, the Swiss franc, the British pound, the Australian dollar, the Malaysian ringgit, and the Spanish peseta. The prices for these currencies are noon buying rates in the interbank market for cable transfers of foreign exchange, certified for customs purposes by the Federal Reserve Bank of New York.

The period examined in this study extends from March 1973, the beginning of the floating exchange rate system, through December 1997. The prices analyzed are on a daily basis. To avoid biases arising from possible structural shifts from regime changes and other shifts in market dynamics, the overall time frame is also subdivided into four subperiods, that is March 1, 1973 - February 6, 1979, February 7, 1979 - August 30, 1984, August 31, 1984 - December 28, 1990, and December 31, 1990 - December 31, 1997.

Testing for Nonlinear Dynamics:

In examining the efficiency of foreign exchange markets, the first step lies in testing for the randomness of security or portfolio returns. Such an approach was adopted in earlier studies of market efficiency using linear statistical theory and very general nonparametric procedures. Examinations of chaotic dynamics have revealed that deterministic processes of a nonlinear nature can generate variates that appear random and remain undetected by linear statistics. Hence, this study employs tests that have recently evolved from statistical advances in chaotic dynamics. One of the more popular statistical procedures that has evolved from recent progress in nonlinear dynamics is the BDS statistic, developed by Brock *et al.* [1987], which tests whether a data series is independently and identically distributed (IID).

The BDS statistic, which can be denoted as Wm,T(e) is given by

$$W_{m,T}(\varepsilon) = \sqrt{T}\left[C_{m,T}(\varepsilon) - C_{1,T}(\varepsilon)^m\right] \div \sigma_{m,T}(\varepsilon) \tag{1}$$

where:

	T	=	*the number of observations,*
	e	=	*a distance measure,*
	m	=	*the number of embedding dimensions,*
	C	=	*the Grassberger and Procaccia correlation integral, and*
	s	=	*a standard deviation estimate of C.*

For more details about the development of the BDS statistic, see Brock *et al.* [1987]. Simulations in Brock *et al.* demonstrate that the BDS statistic has a limiting normal distribution under the null hypothesis of independent and identical distribution (IID) when the data series consists of more than five hundred observations. The use of the BDS statistic to test for independent and identical distribution of pre-whitened data has become a widely used and recognized process (e.g., Brorsen and Yang [1994], Hsieh [1991a,b, 1993], Philippatos *et al.* [1993], Sewell *et al.* [1992]). After data has been pre-whitened and nonstationarity is ruled out, the rejection of the null of IID by the BDS statistic points towards the existence of some form of nonlinear dynamics.

Rejection of the null hypothesis of IID by the BDS is not conclusive evidence of the presence of nonlinear dynamics. Structural shifts in the data series can be a significant contributor to the rejection of the null. To avoid biases arising from structural shifts from regime changes and other shifts in market dynamics, the overall sample period is also subdivided into four subperiods of equal length, which are examined individually for the violation of the IID assumption.

Furthermore, in order to ascertain whether the data series are, indeed, a result of chaotic processes, two other tests are performed. The Rescaled Range (R/S) analysis is a powerful indicator of the persistence of a series where the influence of a set of past price changes on a set of future price changes is effectively captured. In addition, the *three moments test* effectively distinguishes deterministic (mean) nonlinearities from nonlinearities of variance, the latter of which could result from a stochastic rather than deterministic influence.

The R/S statistic, which was developed by Hurst (1951), has been used in several studies for the purpose of detecting long term dependencies in time series data, (see, for example, Greene and Fielitz (1977), Booth and Kaen (1979), Booth, Kaen, and Koveos (1982), Helms, Kaen, and Rosenman (1984), and Lo and MacKinlay (1988, 1990)). Over the years, a number of modifications and refinements have been made to the classical R/S statistic (e.g., see Mandelbrot (1972, 1975), Mandelbrot and Taqqu (1979), and Lo (1991)). According to Lo (1991), one of the drawbacks of the classical R/S statistic is that it detects short range as well as long range dependency, but does so without distinguishing between them. Thus, if a time series were to have strong short range dependencies, the R/S statistic may be biased towards an indication that long range dependence also exists.

Both the R/S statistic and the Modified R/S statistic have been utilized by researchers as a measurement for detecting long range dependencies in time series data. In these studies, the classical R/S statistic is computed along with the Modified R/S for comparison purposes (for example, see Lo (1991) and Pan *et al.* (1996)).

The classical R/S statistic is defined as:

$$\widetilde{Q}_n \equiv \frac{1}{s_n}\left[\underset{1\le k\le n}{Max} \sum_{j=1}^{k}\left(X_j - \overline{X}_n\right) - \underset{1\le k\le n}{Min} \sum_{j=1}^{k}\left(X_j - \overline{X}_n\right)\right] \tag{2}$$

where:

$$s_n \equiv \left[\frac{1}{n}\sum_j \left(X_j - \overline{X}_n\right)^2\right]^{1/2} \tag{3}$$

The Modified R/S statistic differs from the classical R/S in that, in addition to the variance, it incorporates the autocovariance of X in the denominator (see equations below). (For a more detailed description of the Modified R/S statistic, see Lo (1991).)

$$\hat{\sigma}_n^2(q) \equiv \left[\frac{1}{n}\sum_j \left(X_j - \overline{X}_n\right)^2\right] + \frac{2}{n}\sum_{j=1}^{q}\omega_j(q)\left\{\sum_{i=j+1}^{n}\left(X_i - \overline{X}_n\right)\left(X_{i-j} - \overline{X}_n\right)\right\} \tag{4}$$

where:

$$\omega_j(q) \equiv 1 - \frac{j}{q+1}, q < n \tag{5}$$

The adjusted variance/covariance function, which is used to scale the ranges for the Modified R/S statistic may then be denoted as:

$$\hat{\sigma}_n^2(q) \equiv \hat{\sigma}_x^2 + 2\sum_{j=1}^{q} \omega_j(q)\hat{\gamma}_j \tag{6}$$

When properly normalized, as the sample size *n* increases without bound, the rescaled range converges in distribution to a well-defined random variable *V*, that is,

$$\frac{1}{\sqrt{n}}\tilde{Q}_n \Rightarrow V \tag{7}$$

The cumulative distribution function of V takes on the following form:

$$F_V(v) = 1 + 2\sum_{k=1}^{\infty}(1-4k^2v^2)e^{-2(kv)^2} \tag{8}$$

Fractiles of this cumulative distribution function are used as benchmarks for the evaluation of R/S statistics presented in Table 7.

Hsieh [1989, 1991a] and Brock *et al.* [1991] developed the *three moments test* to specifically capture mean nonlinearity in a given series. Briefly stated, this test uses the concept that mean nonlinearity implies additive autoregressive dependence, whereas variance nonlinearity implies multiplicative autoregressive dependence. Using this notion and exploiting its implications, Hsieh [1989, 1991a] constructed a test that examines the third order moments of a given series. Additive dependencies will lead to some of these third order moments being correlated. By its construction, this test will not detect variance nonlinearities.

The third order sample correlation coefficients are computed as:

$$r_{(xxx)}(i,j) = \left[\tfrac{1}{T}\sum x_t x_{t-i} x_{t-j}\right] \div \left[\tfrac{1}{T}\sum x_t^2\right]^{1.5} \tag{9}$$

where: $r_{(xxx)}(i,j)$ = *the third order sample correlation coefficient of* x_t *with* x_{t-1} *and* x_{t-j}, *and*
T = *the length of the data series being examined.*

Hsieh [1991] developed the estimates of the asymptotic variance and covariance for the combined effect of these third order sample correlation coefficients which can be used to construct a c2 statistic to test for the significance of the joint influence of the r(xxx) (i,j)'s for specific values of j, such that 1 £ i £ j. If the c2 statistics for relatively low values of j are significant, this outcome would be a strong indicator of the presence of mean nonlinearity in the examined series. As chaotic determinism is a form of mean-nonlinearity, the *three moments test* provides strong evidence of the presence of chaos.

Hence, first the examined index returns are filtered for linear influences using autoregressive filters. The lag lengths for these AR processes are determined by using the Akaike Information Criteria (AIC) (see Akaike [1974]). Next, each of these series is tested for the null of IID using the BDS statistic. The above process is then repeated for four shorter time periods, which subdivides the sample period into four subperiods of equal lengths, to rule out the possibility that any observed rejection of the IID assumption in the previous step was due to nonstationarity of the data series. Further, an examination of the rescaled ranges, traditional and modified R/S statistics, will reveal if the rejection of IID, in case it is observed, results from nonlinear dynamics. Finally, the *three moments test* is used to determine if the observed nonlinearities are, indeed, mean (deterministic) nonlinearities to provide conclusive evidence of the existence of chaotic determinism.

Strengths and Limitations of the Tests Used in this Study

All of the statistical procedures employed in this study have originated from studies of physical and natural phenomena. Due to the fact that, unlike data in the physical sciences, financial data are severely restricted in size and consistency across time, these tests have been modified to make them more applicable to financial data. However, all limitations of data sets analyzed are not overcome by the modified tests employed in this study. Ramsey *et al.* [1990] observe that with the techniques used to date, no evidence of the presence of simple chaotic attractors exist for economic time series. The BDS statistic, which is an adaptation of the correlation integral (standardized with an asymptotic variance estimate) has good power against the null of independence, but does not point towards the existence of a chaotic attractor. In this analysis, the BDS statistic is only used to reject the null of independence, a task at which it has demonstrated robustness.

Further, Ramsey *et al.* [1990] assert that bearing the limitations of small data sets in mind, "Finding a nonlinear evolutionary dynamical path, possibly subject to sporadic shocks, is a much more feasible task." This paper assumes precisely such a task in its search for chaotic deterministic influences in the examined data sets. Since chaotic systems are highly dependent on initial conditions, such a system, if discovered, could only be employed for short-term predictions. Shocks to such systems could make its path highly deviant in a short span. Given that such sporadic shocks are not uncommon in foreign exchange markets, a grandiose aspiration of finding a long-term steady-state dynamical path by locating a chaotic attractor would be impractical. This paper makes no attempt or pretense of locating a chaotic attractor.

Although Ramsey and Yuan [1989] and Ramsey *et al.* [1990] do not examine the R/S analysis, (perhaps because the R/S analysis was not popular in the study of economic data sets before Peters [1991]), it does not claim to locate a chaotic attractor either. However, the R/S analysis is a good indicator of temporal dependency in a time series. Lo [1991] points out that the R/S analysis is not robust to short-term dependencies, and hence, cannot be employed to study long-term dependencies. He further suggests a Modified R/S analysis which addresses this weakness. This paper addresses these shortcomings of the Classical R/S statistics by employing Lo's [1991] Modified R/S statistics.

Hsieh's *three moments test* is one of few existing direct test for nonlinear deterministic influence in noisy data. The attractiveness of this test lies in its ability to distinguish deterministic

influences from stochastic influences. No published work appears to exist that brings out any significant weaknesses in the application of this test to data sets with more than 1,000 observations. The biggest limitation of the *three moments test* lies in its inability to capture all forms of chaotic influences (Hsieh [1991a]). Yet, once a data set is identified as having significant third-order correlations in low-order embedding dimensions, then one can be fairly certain that it is driven by a chaotic process.

RESULTS

The BDS statistics, by its very design, is very sensitive to linear as well as nonlinear processes. Since this study concerns itself with the detection of a specific type of nonlinear dynamics, all linear autocorrelations are filtered out using suitable autoregressive models. The appropriate lag lengths used for linear filtration were determined using the Akaike Information Criterion (AIC). Table 1 shows the lag lengths used to filter each currency's exchange rate movements.

Table 1
Autoregression Lags Used to Filter Movements in Foreign Exchange Rates Analyzed

Country Stock Market Index:	Autoregressive Model Used to Filter:
Canadian Dollar	AR(5)
German Mark	AR(1)
Japanese Yen	AR(9)
Swiss Franc	AR(3)
British Pound	AR(10)
Australian Dollar	AR(2)
Malaysian Ringgit	AR(7)
Spanish Peseta	AR(1)

NOTE: AR(x) = Autoregressive model with (x) lags. Lags are determined via the Akaike Information Criterion.

Table 2 lists the BDS statistics for the overall period (March 1973 - December 1997) for each of the eight exchange rates. The BDS statistics for each examined series is computed using dimensions m = 2, …, 10 and the distance measure e = 0.5s, 0.75s, and 1.00s. There is an intuitive explanation for the BDS statistic. For example, a positive BDS statistic indicates that the probability of any two m histories ($x_t, x_{t-1}, \ldots, x_{t-m+1}$) and ($x_s, x_{s-1}, \ldots, x_{s-m+1}$) being close together is higher than in truly random data. In other words, some clustering is occurring too frequently in an m-dimensional space. Thus, some patterns of exchange rate movements are taking place more frequently than is possible with truly random data.

An inspection of Table 2 reveals that all BDS statistics are significantly positive. For each exchange rate examined, the BDS statistics are computed for e = 0.5s, 0.75s, and 1.00s. A lower e

value represents a more stringent criteria since points in the m-dimensional space must be clustered closer together to qualify as being "close" in terms of the BDS statistic. Hence, e = 0.50s reflects the most stringent test while e = 1.00s is the most relaxed criterion used in this analysis.

In this study, the values of m examined go only as high as 10. Two reasons dictate the choice of 10 as the highest dimension analyzed. First, with m = 10, only 621 non-overlapping m-history points exist in each series. Examining a higher dimensionality will restrict the confidence one may place in the computed BDS statistic. Second, and more importantly, the interest of this study lies only in detecting low dimensional deterministic chaos. High dimensional chaos is, for all practical purposes, as good as randomness (see, e.g., Brock *et al.* [1987]).

One must remember, however, that the BDS statistic only reveals whether or not an examined data series is different from an identically and independently distributed (IID) series. The results in Table 2 present a summary rejection of the null hypothesis of IID for all the foreign exchange movement series examined. However, it is possible that nonstationarity of the examined data series is the root cause of this rejection of the null. Exogenous influences such as regime changes or regulatory reforms, among others, could impact the exchange rate series in such a way that they give the appearance of not being random (although they are truly random in stable times) over the 25 year period under investigation in this study.

Tables 3 through 6 provide the BDS statistics for the same foreign exchange rate movements for the four subperiods. Each subperiod covers approximately six years of exchange rate movements. As is evident from a quick review of these tables, a summary rejection of the null is provided for each examined currency over each one of the four subperiods. Consistent rejection of the null of IID over each of the four subperiods and across the overall period rules out the possibility that such rejection of the null is entirely an artifact of latent nonstationarity in these currencies.

The next step in this examination is to attempt to determine if the observed rejection of the IID hypothesis is indeed a result of latent memory effects, more specifically, chaotic dynamics present in these foreign exchange rate movements. The two tools employed for further evaluation are the *rescaled range* analysis and the *three moments* test.

Table 2: BDS Statistics for Filtered Movements in Foreign Exchange Rates
March 1, 1973 - December 31, 1997

e/s	m:	Canadian Dollar	German Mark	Japanese Yen	Swiss Franc	British Pound	Austral. Dollar	Malaysian Ringgit	Spanish Peseta
0.50	2	17.55	14.18	19.99	25.85	19.45	27.62	24.80	19.45
0.50	3	22.43	21.66	30.31	29.01	28.82	37.18	32.04	28.82
0.50	4	28.72	29.47	44.79	32.99	41.23	46.96	38.95	41.23
0.50	5	36.37	40.46	68.19	38.27	60.72	60.46	47.02	60.72
0.50	6	48.39	57.88	108.88	46.07	94.47	79.04	57.45	94.47
0.50	7	65.26	86.70	181.87	56.82	152.19	105.76	71.61	152.19
0.50	8	89.95	134.27	318.02	72.38	262.36	145.57	91.74	262.36
0.50	9	127.23	217.54	588.52	95.19	477.17	203.89	120.77	477.17
0.50	10	186.29	369.48	1124.5	129.79	903.92	291.67	162.61	903.92
0.75	2	17.48	13.29	16.77	25.89	17.58	25.71	24.32	17.58
0.75	3	21.59	18.83	22.72	27.79	23.61	32.39	29.69	23.61
0.75	4	26.22	23.81	29.80	30.02	29.96	37.96	33.81	29.96
0.75	5	31.23	29.60	38.40	32.62	38.09	44.25	38.37	38.09
0.75	6	38.07	37.17	50.25	35.85	49.76	51.67	43.71	49.76
0.75	7	46.57	47.57	66.81	39.57	65.23	60.91	49.97	65.23
0.75	8	57.68	61.78	90.10	44.14	86.87	72.49	57.84	86.87
0.75	9	72.04	81.43	125.29	49.89	117.96	87.46	67.93	117.96
0.75	10	91.04	109.11	178.38	57.44	165.61	106.88	80.92	165.61
1.00	2	17.49	12.60	14.98	25.69	15.92	23.82	23.63	15.92
1.00	3	21.02	16.89	19.24	27.05	20.59	28.68	27.30	20.59
1.00	4	24.57	20.63	23.66	28.37	24.64	32.43	29.71	24.64
1.00	5	27.97	24.43	27.96	29.68	29.19	35.78	32.28	29.19
1.00	6	32.33	28.83	33.01	31.24	35.18	39.31	35.22	35.18
1.00	7	37.21	34.08	38.97	32.82	41.93	43.22	38.35	41.93
1.00	8	42.94	40.33	46.10	34.62	49.86	47.67	41.93	49.86
1.00	9	49.64	47.89	55.88	36.76	59.27	53.00	46.10	59.27
1.00	10	57.46	57.21	68.38	39.37	71.71	59.24	51.14	71.71

Note: m = embedding dimensions; Number of observations = 6,214 per currency; All BDS statistics are significant at the .01 level.

Table 3: BDS Statistics for Filtered Movements in Foreign Exchange Rates
March 1, 1973 - February 6, 1979

e/s	m:	Canadian Dollar	German Mark	Japanese Yen	Swiss Franc	British Pound	Austral. Dollar	Malaysian Ringgit	Spanish Peseta
0.50	2	12.00	12.08	17.02	16.79	14.89	8.40	12.58	11.47
0.50	3	16.11	17.60	23.43	20.53	20.52	9.38	16.03	14.13
0.50	4	19.09	24.25	30.47	26.15	26.31	10.25	20.44	15.81
0.50	5	22.67	33.65	39.45	34.76	35.29	11.33	25.40	17.02
0.50	6	28.44	48.27	51.92	48.23	49.53	11.83	31.20	18.31
0.50	7	35.41	70.62	69.08	68.70	72.09	12.26	39.21	19.73
0.50	8	44.80	106.07	93.67	99.71	109.43	12.71	51.04	21.17
0.50	9	59.49	163.02	131.67	147.32	170.95	13.03	68.42	22.64
0.50	10	79.77	254.98	188.51	223.29	273.43	13.31	92.58	24.19
0.75	2	11.92	10.97	13.48	16.09	13.10	7.55	12.62	9.59
0.75	3	15.12	14.93	17.85	18.80	16.58	9.18	15.21	11.67
0.75	4	17.16	19.00	21.92	22.19	19.23	9.95	17.88	12.91
0.75	5	19.29	23.50	26.15	26.69	22.41	10.53	20.79	13.64
0.75	6	22.41	29.31	30.92	32.64	26.52	10.70	23.84	14.15
0.75	7	26.08	36.70	36.17	40.46	31.78	10.66	27.61	14.53
0.75	8	30.59	46.40	42.63	50.96	39.10	10.69	32.57	14.93
0.75	9	36.76	59.30	51.28	65.08	49.37	10.62	38.85	15.23
0.75	10	45.83	76.53	62.01	84.81	62.92	10.55	46.85	15.57
1.00	2	11.62	10.16	11.48	15.71	12.06	5.01	12.07	9.04
1.00	3	14.45	13.24	14.97	18.07	14.23	6.49	13.99	9.57
1.00	4	15.94	15.90	17.86	20.45	15.50	7.06	15.66	10.2
1.00	5	17.42	18.55	20.42	23.25	16.81	7.70	17.20	10.89
1.00	6	19.21	21.40	23.04	26.46	18.48	8.09	18.91	11.31
1.00	7	21.27	24.67	25.76	30.08	20.30	8.18	20.73	11.49
1.00	8	23.57	28.47	28.74	34.51	22.43	8.30	23.02	11.64
1.00	9	26.29	33.03	32.40	40.22	25.33	8.28	25.70	11.68
1.00	10	29.74	38.32	36.57	47.61	28.79	8.20	28.93	11.79

Note: m = embedding dimensions; Number of observations = 1,491 per currency; All BDS statistics are significant at the .01 level.

Table 4: BDS Statistics for Filtered Movements in Foreign Exchange Rates
February 7, 1979 - August 30, 1984

e/s	m:	Canadian Dollar	German Mark	Japanese Yen	Swiss Franc	British Pound	Austral. Dollar	Malaysian Ringgit	Spanish Peseta
0.50	2	8.05	4.07	5.32	11.80	3.63	10.80	11.80	13.56
0.50	3	9.68	7.53	7.17	13.08	5.23	12.89	15.87	22.00
0.50	4	11.82	10.88	8.94	15.25	6.92	14.16	19.99	35.95
0.50	5	14.56	15.64	10.28	18.23	8.47	16.15	25.89	62.75
0.50	6	19.56	22.49	11.86	22.92	11.16	18.82	34.55	110.22
0.50	7	26.34	30.54	14.49	29.74	13.65	21.70	46.51	198.08
0.50	8	37.62	42.21	19.41	38.23	17.51	25.23	65.67	377.32
0.50	9	54.39	62.40	27.05	54.36	23.24	29.42	96.53	745.07
0.50	10	81.14	93.94	40.36	84.30	36.40	35.44	147.97	1524.00
0.75	2	8.37	4.31	5.64	12.03	3.77	11.96	10.69	10.15
0.75	3	10.04	7.42	7.45	13.26	5.10	13.72	13.27	14.83
0.75	4	11.44	10.27	9.11	15.00	6.52	14.90	15.06	21.27
0.75	5	13.24	13.49	10.46	16.93	7.98	16.60	17.45	31.00
0.75	6	16.04	17.69	11.91	19.68	10.40	18.49	20.72	43.74
0.75	7	19.20	22.36	13.68	22.85	12.61	20.54	24.33	62.45
0.75	8	23.47	28.34	15.43	26.75	15.12	22.72	29.11	90.87
0.75	9	28.54	36.96	18.13	32.71	18.17	25.22	35.31	134.74
0.75	10	34.88	48.61	21.88	41.56	22.37	28.63	43.99	206.01
1.00	2	8.98	4.43	5.95	12.10	3.72	12.68	10.14	8.49
1.00	3	10.59	6.93	7.73	13.13	4.81	14.27	11.64	11.51
1.00	4	11.68	9.29	9.10	14.54	5.78	15.13	12.37	15.37
1.00	5	12.89	11.57	10.14	15.89	6.66	16.35	13.60	20.34
1.00	6	14.61	14.19	11.24	17.56	8.20	17.44	15.13	25.53
1.00	7	16.29	16.84	12.41	19.35	9.48	18.61	16.65	32.07
1.00	8	18.36	20.04	13.57	21.52	10.75	19.71	18.50	40.03
1.00	9	20.59	24.16	15.27	24.33	12.17	20.99	20.50	50.16
1.00	10	22.95	29.03	17.21	28.08	14.06	22.68	23.15	64.35

Note: m = embedding dimensions; Number of observations = 1,491 per currency; All BDS statistics are significant at the .01 level.

Table 5
BDS Statistics for Filtered Movements in Foreign Exchange Rates
August 31, 1984 - December 28, 1990

e/s	m:	Canadian Dollar	German Mark	Japanese Yen	Swiss Franc	British Pound	Austral. Dollar	Malaysian Ringgit	Spanish Peseta
0.50	2	6.86	3.31	5.01	12.35	5.24	9.08	11.83	5.71
0.50	3	8.75	4.78	6.64	12.30	6.07	10.75	15.48	6.73
0.50	4	10.97	5.81	8.47	12.48	6.87	12.70	18.43	7.84
0.50	5	13.48	6.35	10.09	13.47	7.63	13.87	22.23	8.54
0.50	6	16.56	7.54	12.15	14.85	9.03	14.78	27.66	9.59
0.50	7	21.05	8.70	15.73	16.43	10.75	15.91	35.11	10.30
0.50	8	26.69	10.55	21.49	19.63	12.52	17.46	45.07	11.68
0.50	9	35.32	13.54	27.75	19.06	14.05	20.69	58.04	11.81
0.50	10	49.88	16.87	37.01	21.73	11.78	25.20	76.27	12.87
0.75	2	7.36	2.76	4.44	12.07	5.37	9.88	11.81	5.96
0.75	3	9.01	4.00	5.59	11.98	6.21	11.63	14.85	7.16
0.75	4	10.82	5.01	7.14	12.30	7.03	13.37	16.90	8.44
0.75	5	12.54	5.28	8.21	12.84	7.89	14.43	19.31	9.31
0.75	6	14.56	5.91	9.50	13.77	9.30	15.29	22.43	10.38
0.75	7	16.96	6.49	11.45	14.54	10.65	16.20	26.13	11.21
0.75	8	19.57	7.37	13.80	15.96	11.53	17.16	30.52	12.30
0.75	9	23.20	8.18	16.93	17.12	12.44	19.00	36.37	13.41
0.75	10	28.21	8.81	20.92	18.82	13.50	21.59	44.00	14.34
1.00	2	7.78	2.53	4.23	11.92	5.45	10.91	11.54	6.00
1.00	3	9.34	3.60	4.95	11.68	6.46	12.66	13.73	7.04
1.00	4	10.76	4.61	6.16	11.91	7.40	14.07	15.10	8.23
1.00	5	12.06	5.00	6.88	12.31	8.33	14.97	16.58	9.16
1.00	6	13.37	5.79	7.62	13.12	9.68	15.60	18.51	10.20
1.00	7	14.73	6.52	8.52	13.74	10.90	16.19	20.55	10.99
1.00	8	16.10	7.31	9.52	14.76	11.84	16.75	22.74	11.88
1.00	9	17.62	8.08	11.03	15.89	12.65	17.97	25.53	12.76
1.00	10	19.45	8.75	12.86	17.23	13.59	19.57	28.93	13.62

Note: m = embedding dimensions; Number of observations = 1,490 per currency; All BDS statistics are significant at the .01 level.

Table 6
BDS Statistics for Filtered Movements in Foreign Exchange Rates
December 31, 1990 - December 31, 1997

e/s	m:	Canadian Dollar	German Mark	Japanese Yen	Swiss Franc	British Pound	Austral. Dollar	Malaysian Ringgit	Spanish Peseta
0.50	2	6.20	7.34	5.52	12.06	8.75	4.39	10.17	9.02
0.50	3	6.99	9.01	5.84	11.72	11.46	5.15	12.65	11.17
0.50	4	9.58	9.75	6.13	11.53	13.81	5.29	14.38	12.54
0.50	5	12.18	11.35	7.19	11.60	16.98	5.56	15.83	14.27
0.50	6	16.57	12.74	8.80	11.71	21.85	6.64	17.49	16.34
0.50	7	23.33	15.94	9.28	12.05	27.67	7.78	20.08	19.35
0.50	8	34.35	19.45	10.05	12.44	37.78	9.03	23.50	22.71
0.50	9	50.33	20.51	11.79	12.94	50.47	10.98	27.76	25.56
0.50	10	73.52	19.95	13.68	13.76	70.28	14.20	33.09	29.67
0.75	2	6.20	7.18	4.88	13.89	8.26	4.17	11.42	9.46
0.75	3	6.80	8.43	5.15	12.99	10.85	5.01	13.13	11.05
0.75	4	8.84	8.92	5.65	12.50	12.65	5.32	13.90	12.02
0.75	5	10.48	10.35	6.69	12.12	15.06	5.57	14.50	13.40
0.75	6	13.29	11.85	7.85	11.86	18.43	6.00	15.25	15.04
0.75	7	17.02	14.45	8.61	11.74	22.61	6.59	16.35	17.27
0.75	8	22.29	17.57	9.39	11.61	28.50	7.53	17.93	20.01
0.75	9	29.01	20.49	10.10	11.64	35.19	8.89	19.81	22.82
0.75	10	37.64	24.92	10.78	11.83	44.26	10.35	22.10	26.95
1.00	2	6.15	7.55	4.59	16.44	7.55	3.70	12.15	9.66
1.00	3	6.59	8.53	4.74	14.90	9.90	4.73	13.17	10.85
1.00	4	8.14	8.93	5.21	13.95	11.21	5.04	13.42	11.70
1.00	5	9.12	10.01	6.04	13.03	12.96	5.28	13.63	12.86
1.00	6	10.96	11.15	6.80	12.39	15.03	5.73	13.85	14.13
1.00	7	13.20	12.81	7.32	12.02	17.40	6.25	14.26	15.62
1.00	8	16.04	14.55	7.70	11.74	20.29	6.90	14.85	17.38
1.00	9	19.26	16.24	8.01	11.53	23.34	7.68	15.56	19.31
1.00	10	22.89	18.55	8.25	11.42	27.19	8.51	16.41	21.91

Note: m = embedding dimensions; Number of observation = 1,641 per currency; All BDS statistics are significant at the .01 level.

Table 7 reports the results of the rescaled range analysis for each examined foreign exchange rate movement series. The table contains the Classical R/S (n_n) and the Modified R/S ($n_n(q)$) statistics. The four Modified R/S statistics are computed with q-values of 90, 180, 270, and 360 days. In each case, the "%-Bias" is also reported. The "%-Bias" is the estimated bias of the Classical R/S statistic and is computed as $[(n_n)/(n_n(q) - 1] \times 100$. This bias term indicates an inclination of the Classical R/S statistic to be influenced by short-term dependence in its search for long-term dependence.

Table 7
Classical R/S and Modified R/S (q=90, 180, 270, and 360) Statistics with %-Bias ((Vn/Vn(q)-1) x 100)

Currency:	Vn	Vn(90)	%-Bias	Vn(180)	%-Bias	Vn(270)	%-Bias	Vn(360)	%-Bias
Australia									
All (3/73-12/97)	1.37	1.34	2.3%	1.45	-5.7%	1.43	-3.8%	1.46	-5.7%
Subperiod 1	1.35	1.60	-15.9%	**1.78	-24.4%	**1.79	-24.9%	*1.88	-28.2%
Subperiod 2	1.63	1.42	14.7%	1.50	8.6%	1.46	11.6%	1.46	11.5%
Subperiod 3	1.16	1.27	-8.9%	1.44	-20.0%	1.39	-16.8%	1.44	-19.9%
Canada									
All (3/73-12/97)	1.56	1.62	-3.7%	1.60	-2.8%	1.47	6.1%	1.42	9.8%
Subperiod 1	1.69	1.43	18.1%	1.34	26.3%	1.33	26.9%	1.40	20.7%
Subperiod 2	1.48	1.73	-14.2%	1.70	-12.9%	1.53	-2.9%	1.42	4.3%
Subperiod 3	1.53	1.66	-7.4%	**1.83	-16.3%	1.62	-5.5%	1.58	-3.0%
Germany									
All (3/73-12/97)	1.58	1.41	12.3%	1.43	10.3%	1.37	15.1%	1.34	17.9%
Subperiod 1	1.26	1.02	23.3%	1.20	5.3%	1.16	8.5%	1.19	5.6%
Subperiod 2	0	0	10.6%	**1.79	20.2%	1.68	28.5%	1.57	37.6%
Subperiod 3	0.97	0.94	2.8%	1.07	-10.0%	1.11	-13.1%	1.22	-20.8%
Japan									
All (3/73-12/97)	1.49	1.33	11.5%	1.29	14.7%	1.25	19.1%	1.23	21.1%
Subperiod 1	1.65	1.47	12.2%	1.34	22.9%	1.28	28.1%	1.31	25.9%
Subperiod 2	**1.80	1.59	12.8%	1.49	20.5%	1.41	27.2%	1.37	31.0%
Subperiod 3	**1.84	1.72	6.8%	*1.87	-1.8%	*1.87	-1.9%	**1.81	1.8%
Malaysia									
All (3/73-12/97)	1.13	1.03	9.6%	1.12	0.8%	1.25	-10.1%	1.31	13.7%
Subperiod 1	1.01	0.88	13.9%	1.00	1.2%	1.07	-6.1%	1.13	10.8%
Subperiod 2	0.87	0.92	-5.7%	1.01	-13.5%	1.26	-30.8%	1.40	37.5%

Table 7
Classical R/S and Modified R/S (q=90, 180, 270, and 360) Statistics with %-Bias ((Vn/Vn(q)-1) x 100)

Currency:	Vn	Vn(90)	%-Bias	Vn(180)	%-Bias	Vn(270)	%-Bias	Vn(360)	%-Bias
Subperiod 3	1.16	1.05	10.9%	1.17	-0.6%	1.39	-16.4%	1.48	21.5%
Spain									
All (3/73-12/97)	0	1.71	13.0%	1.58	22.4%	1.46	32.0%	1.41	37.0%
Subperiod 1	1.47	1.30	13.3%	1.23	19.9%	1.16	26.5%	1.18	24.5%
Subperiod 2	0	??	10.9%	1.71	28.9%	1.53	43.4%	1.40	56.8%
Subperiod 3	1.46	1.29	13.4%	1.31	11.7%	1.28	14.1%	1.36	7.6%
Switzerland									
All (3/73-12/97)	1.45	1.34	8.4%	1.35	7.4%	1.32	10.1%	1.31	10.8%
Subperiod 1	0	1.43	59.7%	1.50	51.5%	1.47	55.4%	1.48	53.5%
Subperiod 2	0	**1.83	63.0%	1.73	72.5%	1.66	79.7%	1.58	88.5%
Subperiod 3	1.01	1.42	-29.1%	1.59	-36.5%	1.61	-37.2%	**1.76	-42.5%
U. K.									
All (3/73-12/97)	1.45	1.32	9.9%	1.31	10.8%	1.28	13.3%	1.28	12.6%
Subperiod 1	0	**1.82	16.0%	1.72	22.3%	1.57	34.4%	1.49	41.1%
Subperiod 2	??	**1.81	5.0%	**1.78	7.1%	1.71	11.6%	1.66	15.0%
Subperiod 3	1.09	0.99	10.0%	1.06	2.1%	1.16	-6.2%	1.35	-19.4%

* Significant at the .05 level; ** Significant at the .10 level.

Fractiles of the Distribution $F_v(v)$

$P(V<v)$	.005	.025	.050	.100	.200	.800	.900	.950	.975	.995
v	0.721	0.809	0.861	0.927	1.018	1.473	1.620	1.747	1.862	2.098

From the reported results in Table 7, one may conclude that some evidence of temporal dependence exists for the exchange rate movements of the Australian dollar, the German mark, the Japanese yen, the Spanish peseta, the Swiss franc, and the British pound. The Australian dollar exhibits evidence of long-term dependence only for the first subperiod examined. The later subperiods do not show signs of any temporal dependence. The temporal dependence observed for the German mark is of a short-term nature (less than 270 days) and exists only for the second subperiod. The Japanese yen appears to be influenced by temporal dependence during subperiods 2 and 3 of the sample period. This nonlinear influence appears to have been of a long-term nature in more recent times (subperiod 3). The Spanish peseta seems to be driven by a short-term (less than 180 days) nonlinear influence that is mostly present in the second subperiod examined. The exchange rate movements of the Swiss franc display long-term temporal dependence for the last subperiod examined. For subperiods 1 and 2, evidence of short-term dependence (less than 180

days) can be gleaned for this currency. The British pound exhibits strong evidence of short-term dependence (less than 270 days) only for subperiods 1 and 2 of the sample period.

In summary, the evidence of temporal dependence obtained from the R/S analysis is sporadic and mainly of a short-term nature. Only in the case of the Japanese yen, the Spanish peseta, and the Swiss franc, may one conclude that temporal dependence might exist during the most recent subperiod analyzed.

The results presented in this study so far suggest the presence of nonlinear dynamics in all the examined foreign exchange rate movements. In order to ascertain whether this observed nonlinearity is deterministic in nature, the results of the *three moments test* are presented in Table 8. This table shows the c2 statistics for a combined test of significance of all examined three moment correlations r(xxx)(i,j) up to a certain lag length. Where 1=i=j=5, the c2 statistic has 15 degrees of freedom. On the other hand, when three moment correlations up to a lag length of 10 are examined (i.e., 1=i=j=10), the c2 statistic has 55 degrees of freedom. As one may observe from Table 7, none of the c2(15) statistics are significant for any of the examined exchange rate movements. Hence, one is unable to find evidence of low-dimensional chaos in any of these currencies while 1=i=j=5.

The c2(55) statistics reveal that the exchange rate movements of the Canadian dollar, the Japanese yen, and the British pound are, in fact, influenced by chaotic dynamics. However, this detected deterministic nonlinearity is only high dimensional in nature. Consequently, even though the driving influence of deterministic chaos is detected in the above three currencies, predictability of these exchange rates is highly improbable as this deterministic influence is high-dimensional.

Table 8
Chi-Square Statistics for the Joint Influence of Three Moment Correlations for the Filtered Foreign Exchange Rate Movements

Foreign Exchange:	Lags/Statistic:	
Currency:	1 £ i £ j £ 5 c2(15)	1 £ i £ j £10 c2(55)
Canadian Dollar	11.73	257.94*
German Mark	3.63	8.96
Japanese Yen	3.12	121.91*
Swiss Franc	4.99	54.02
British Pound	2.59	130.77*
Australian Dollar	3.83	10.48
Malaysian Ringgit	4.38	5.82
Spanish Peseta	8.88	19.33

*Significant at the 1% level for a right-tailed test.

To sum up the findings of this study, the exchange rate movements of all examined currencies exhibit non-IID behavior. None of this rejection of the null of IID is purely an artifact of nonstationary data. The *rescaled range* analysis suggested the existence of some form of nonlinear dynamics in the exchange rate movements of the Australian dollar, the German mark, the Japanese yen, the Spanish peseta, the Swiss franc, and the British pound. Moreover, most of these observed dependencies are of a short-term nature. Furthermore, only the Japanese yen, the Spanish peseta, and the Swiss franc exhibit nonlinear dependence during more recent times. Finally, the *three moments* test revealed that none of the examined currency price changes appear to be driven by low dimensional chaos. The exchange rate movements of the Canadian dollar, the Japanese yen, and the British pound are, however, influenced by high dimensional chaos.

SUMMARY AND CONCLUSIONS

This study examined the daily exchange rate movements of the following eight foreign currencies: the Canadian dollar, the German mark, the Japanese yen, the Swiss franc, the British pound, the Australian dollar, the Malaysian ringgit, and the Spanish peseta over the floating exchange rate period from March 1973 through December 1997. The results provide evidence to suggest that some form of nonlinear dynamics appears to be influencing some of the examined foreign exchange rate movements. However, further examination reveals that none of the observed nonlinear dynamics manifest themselves in the form of low-dimensional chaos. High dimensional chaos is detected in the exchange rate movements of the German mark, the Japanese yen, and the British pound. However, this observation is not encouraging to the technical analyst as it renders the probability of being able to predict these movements as being very slim.

The above observations have important implications concerning the efficiency of the eight examined foreign exchange markets. Although evidence of nonlinear dynamics abounds in these markets, none of the evidence appears to be in the form of low-dimensional chaos. As such, the possibility of predictability of foreign exchange price changes appears to be an improbable task with currently available technology. Moreover, the examined foreign exchange markets appear to be at least weak-form efficient. The significance of this observation lies in the breadth of the foreign exchange rates examined in this study, which include major currencies as well as less actively traded currencies.

It may be important to recall that the *three moments test* does not detect all forms of deterministic influences. In light of this observation, one cannot rule out the possibility that a chaotic deterministic mechanism lies latent in the examined foreign exchange returns, awaiting discovery by more powerful tests at a later date.

Some recent studies such as Fernandez-Rodriguez *et al.* [1999] and Lisi and Schiavio [1999] have successfully attempted to forecast foreign-exchange rate movements using nonlinear deterministic models. It must be noted that while the above studies have examined the performance of specific chaotic models or chaotic approximation techniques, the results cannot be generalized to the whole universe of chaotic processes. The tests employed in this study investigate the generalized possibility of using certain classes of chaotic models to predict the exchange rate movement series examined. Although three of the examined exchange rates do exhibit signs of being

driven by higher-dimensional chaos, this finding does not significantly favor the possibility of predicting these currency movements, for reasons mentioned earlier. As such, very little evidence of a deterministic driving force behind foreign exchange rates is uncovered in this study.

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PERCEPTION OF ISLAMIC FINANCIAL SYSTEM: ITS OBSTACLES IN APPLICATION, AND ITS MARKET

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ABSTRACT

It is often misunderstood that the Islamic financial system involves only the absence of interest and only applies to those who practice the Islamic faith. Although the paying or receiving of interest is strictly forbidden to the many million practicing Muslims all over the world, this system can be an alternative to the existing method for everyone. Further, the concept of Islamic finance involves more than zero interest. There are other principles such as prohibition of guaranteed earning, transactions to comply with a set of Islamic laws known as Shari'a, and the emphasis on the element of business risk.

The central theme of this paper is (1) to provide an overview of the theoretical concept of Islamic finance, (2) to discuss the various instruments available in Islamic finance, the obstacles involved in its application, and its growing market trend, and (3) to analyze the perception of Islamic financial system in the U.S.

INTRODUCTION

The conventional banking and financial institutions exist today based entirely on the concept of interest-bearing instruments. It is hard to imagine that there is an alternative to the interest-bearing financial system. This alternative method is commonly known as Islamic finance because of its deep roots in the Islamic religion. The objective of this study is to understand the basic concept of Islamic finance, to have an overview knowledge of the various instruments available, and to determine whether or not this interest-free economy is a viable alternative to the conventional financial system.

The Islamic financial system is based upon the sharing of profit and loss, rather than on the payment of interest. Although the system does not allow for the payment or receiving of interest, there are a wide variety of instruments allowed that investors can choose from depending on his or her risk tolerance. The main idea behind the Islamic financial system is more than generating wealth. It is a financial system intended to promote economic growth while maintaining the morals of the communities.

Although the method of interest-free economy has not been very well known by the general public, there is an emergence in the understanding and application of this concept by the Muslim communities as well as the traditional financial institutions. This is partly due to the growing

interest by the Muslims for options that do not involve interest to satisfy their religious obligations. Further, the Western financial institutions are taking a closer look at this system not only to reach the niche market but because there is money to be made.

The objective of this paper is three fold: (1) to provide an overview of the theoretical concept of Islamic finance, (2) to discuss the various instruments available in Islamic finance, the obstacles involved in its application, and its growing market trend, and (3) to analyze the perception of IFS in the U.S. he next section reviews the literature, followed by the various financial instruments within this system, its obstacles in application, its potential market, and finally the conclusion.

LITERATURE REVIEW

The subject of a zero interest based economic system has been around for over 1400 years yet only in the past two decades has there been studies and writing on the subject within the scope of the modern finance industry. Not only is the application of the Islamic financial system growing, but also, the academic writings and studies are also increasing. There are many misconceptions about the Islamic financial system and studies such as Zineldin (1990), Al-Omar and Abdel-Haq (1996), Khan (1987), and Saeed (1996) are truly instrumental in establishing the principles and the definition of various Arabic terms that can cause much confusion because of multiple meanings.

After the basic knowledge about the concept is set, the next step is to see how the theory is put into practice. In this regard, there are several studies that specifically analyze practicing Islamic institutions via case studies. Some of these studies include Kazarian (1993), Wilson (1990), and El-Ashker (1987). Kazarian specifically compares the Islamic banking versus conventional banking as practiced in Egypt. These three studies provided financial comparison that is useful in establishing the viability of the Islamic system. Due to the scope of this paper, detail comparison of financial information has to be deferred. Others such as Ali (1992), Iqbal (1997), Freeland (1998), De Belder and Hassan (1993), Drexhage (1998), Iqbal and Mirakhor (1999), Kahf (1999), and Hamwi and Aylward (1999) have addressed various aspects of Islamic finance and the success of the Islamic system in this new millennium.

CONCEPTS AND OBSTACLES IN APPLICATION

The Islamic financial system is complicated and rooted in a deep religious belief. Therefore, to understand the concept, one must first understand and appreciate the basic principle of the religion. Islamic financial history is traced back to the religion of Islam that began over 1400 years ago. The Muslims' lives are bound by the Islamic laws known as the Shari'a. According to El-Ashker (1987), the sources of the Shari'a are The Holy Qur'an, the Traditions known as Sunnah which are the practices and saying of the Prophet Muhammad, and the Jurisprudence composes of religious scholars from the various schools of opinion.

The Islamic financial system is shaped by the Qur'an strict forbidden of riba. As Al-Omar and Abdel-Haq (1996) defines, Riba as "an excess or increase". Technically meaning an increase which is a loan transaction or exchange for a commodity accrued to the owner (lender) without giving an equivalent counter-value or recompense ('iwad) in return to the other party; every increase

which is without an 'iwad or equal value" (p. XVI). Riba has often been interpreted as being synonymous with interest. However, some schools of thought define riba to include not only interest but also speculation, unlawful capital gains, monopoly, hoarding, and absentee rents. Riba is stated explicitly in the Qur'an thus not open for interpretation. The paying or receiving of interest or dealing with interest-bearing instruments is strictly prohibited to the Muslims. As Iqbal (1997) states, "describing the Islamic financial system simply as 'interest-free' does not provide a true picture of the system as a whole. Undoubtedly, prohibiting the receipt and payment of interest is the nucleus of the system, but it is supported by other principles of Islamic doctrine advocating risk sharing, individuals' rights and duties, property rights, and the sanctity of contracts" (p.42). The definition of riba consequently determines the prescribed structure of Islamic banking and also the permissible banking instruments. One key element of Islamic finance is the requirement of an element of risk normally associated with doing business. However, one must keep in mind that risk in business sharing is allowed whereas risk in the form of gambling or mere speculation is prohibited by Islamic Law. The main idea is that investors should spend their effort searching for projects that are sound, that adhere to the Shari'a, and share in the success or failure of the project. The objective is that investments should provide a stimulus to the economy and encourage entrepreneurs to maximize their efforts. The profit or losses should be shared by all parties involved and earnings may not be guaranteed or predetermined.

In addition, Islamic financial system restricts investments in certain business sectors whose products are forbidden by the Shari'a such as alcohol, pornography, or gambling to name a few. This limitation also extends to those with questionable moral values that may not have been directly stated in the Islamic laws such as tobacco industries, anything that may harm the environment, or genetic experiments such as cloning. The latter is open for various interpretations depending on the various schools of thought. The need to clarify certain aspects of the laws resulted in the involvement of the religious council known as the Shari'a Board. The Board is an advisory board which acts as Islamic legal counsel in certifying the compliance of activities with Islamic principles. These restrictions are not unlike the idea of Socially Responsible Investments now available among the Western conventional financial institutions.

In short, there is more to the Islamic financical system than the absence of interest. In addition, the system also restricts any activities that do not comply with the Shari'a, and there needs to be an element of business risk involved by the participating parties. Within these parameters there are many investment products currently available that are permissible under Islamic laws.

FINANCIAL INSTRUMENTS

One of the key concepts in the Islamic financial system is the idea of profit and loss sharing. The techniques allowed in the Islamic financial system can be classed in two broad classes; profit and loss sharing or equity-like contracts and mark-up or debt like contracts. According to Hamwi and Aylward (1999), the equity-like contracts consist of Musharaka (partnership), and Mudaraba (trust financing). The debt-like products are composed of Murabaha (cost-plus financing), Ijara (leasing), and Istisna (progressive payment).

Musharaka (Partnership)

First, Musharaka is a joint venture agreement whereby money is the main investment. The institution funds the working capital requirements of an entrepreneur. Both parties bear any losses incurred or share in the profits according to the previously agreed terms. Therefore, this instrument is also known as the profit sharing or partnership. This product is similar to the modern concept of a partnership. There are two schools of thought among the Muslim scholars; limited and unlimited partnership.

Khan's (1987) showed that one school's emphasis is on the equality of the partners in personal and financial status and thus in the contribution to the partnership. Liability is unlimited, and the partnership is based on the principle of mutual agency; each partner being an agent of his colleague's action. Therefore, each partner is fully liable for the actions and commitments of the other in financial matters. Dissolution of the partnership could result from either the death of any partner or by consensus agreement amongst the involved parties. Another view is a more restricted form of partnership. In this form, the equality of the partners is not mandatory. Also, the mutual agency extends only to those commodities and areas of trade agreed upon. Liability is strictly limited according to each partner's contribution to the total investment.

Under the Musharaka the share in the profit and the duration of the joint venture are agreed upon in advance. Loss is shared in proportion to the contribution of each party to the capital, unless the individual is proven to be the cause of loss due to negligence or willful action. The research shows that this form of Islamic financial instrument is similar to the conventional partnership business organization. The difference is under the Islamic financial system, the partnership can be between a bank and individuals; whereas in the conventional financial system, banks are not allowed to be a partner in this type of contract.

Mudaraba (Trust Financing)

Another type of equity-like instrument is known as Mudaraba, or trust financing. Mudaraba requires two parties; the beneficial owner(s) and the managing trustee. The institution may act as a trustee with the responsibility of investing funds provided by the client. Alternatively, the institution may act as the owner providing the funds to the client. The ratio of distribution of profit is agreed on by both parties prior to any undertaking of business. According to Khan (1987), the key to this particular instrument is that the profit sharing must be proportional and cannot be a guaranteed return. The profit may not be predetermined or specified for either party. Instead, the parties involved are to share profits in accordance with an agreed upon formula. The contract is legally terminated when the investor receives his principal after profit is shared.

Another key element of this instrument is the investor is not liable for losses beyond the capital he has contributed, and the trustee does not share in the financial losses except for the loss of his time and efforts. However, it is important to point out that the agent is liable for a proven loss resulting from his negligence. Sometimes, the agent is obliged to repay the original sum of capital to the owner in case of negligence.

The study done by Zineldin (1990) indicates that the Mudaraba certificates can be issued as nominal or bearer. These can mature at a fixed date, at a fixed interval after issue, or at call. These certificates entitle the holder to share in the profits of the investment activities being undertaken by the company. This aspect of issuing certificates makes the Mudaraba instrument similar to the conventional stock market. Shares are issued in form of certificates, the certificates are transferable, and the holders of the certificates entitled to a portion of the profit or loss of his capital if the project fails. Similar to stock, neither the return of the principal nor profit is guaranteed to the holder. The main difference is that the project certificate issued must comply to the Shari'a.

Although trading stock is permissible from an Islamic viewpoint, a transferable contract would lead to riba if it allows capital gains from speculative activity. In other words, the buying or selling of stock resulted in riba, is forbidden, when an attempt is made to acquire a return by manipulation of a market rather than by contribution to real production. As Khan (1987) pointed out in his book, "it is due to the possibilities of earnings via manipulation that some scholars have urged the elimination of the stock market, despite the impact it may have on the mobilization and allocation of funds" (p.67).

Also according to Khan (1987), a way around this speculation issue has been attempted by the Islamic Investment Company of the Gulf. The experiment was to state the value of the certificate at regular intervals based on the actual progress of the project. The value of the certificate at a given time reflects the principal plus or minus the profit or loss incurred, which is added as a dividend or subtracted as a penalty. Exchange would be transacted on the basis of this value. This procedure prevents the face value of a certificate from differing from its market value, but it does cater to individual needs for liquidity.

This solution does not entirely resolve the problem of speculation. A premium will arise on certificates which represent the better performing companies. Similarly, liquidity may remain an illusion for certificates of poorly performing companies. In the end, the solution for manipulation and other stock market abuse may require careful regulation similar to the conventional stock market. For now, the wide prevalence of manipulation necessitates fine discrimination to distinguish between acceptable and non-acceptable from the viewpoint of the Islamic principles.

Hence, there are two Islamic financial instruments which are based on the idea of profit sharing such as Musharaka or partnership, and Mudaraba or trust financing. Next, the focus will be on debt-based products.

Murabaha (Cost-Plus Profit)

The first debt-like form of Islamic financial instrument is known as Murabaha. Although this type of contract is not based directly on any text of the Qur'an or the Sunnah, it has been allowed in Islamic Law by the Jurists. Ali (1992) defines it as a "contract in which a client wishing to purchase equipment or goods requests the Islamic financial institution to purchase these items on his behalf then sell them to him at cost plus a reasonable profit. Capital and profit are due and payable on terms agreed between the parties" (p.33). It is important to clarify that only a legitimate profit in addition to the actual price is considered lawful under Islamic laws. Any excessive addition because of deferred payments is not allowed since it would become a payment based on the value

of money over time which is the same as interest. Hence, this concept is sometime known as cost-plus financing or sale with stated profit. Per Josh (1997), this method is the most familiar substitute for conventional interest-based finance, most commonly used in trade and commodity finance.

According to Saeed (1996), the basic features of a Murabaha contract consist of four key features. First, the buyer should have full knowledge of all related costs and the original price of the commodity, and the profit margin should be defined as a percentage of the total price plus costs. The costs can include but not be limited to a fee covering handling charges, transaction costs, or risk premium. Second, the subject of the sale should be goods or commodities and not money. Third, the subject of sale should be in the possession of the seller and owned by him and he should be capable of delivering it to the buyer. Finally, the payment is deferred with specific terms clearly stated in the contract.

This form of financial instrument is very popular because of the element of predetermined earnings. In fact, Saeed's (1996) research shows that "Islamic banks in general have been using Murabaha as their major method of financing, constituting approximately seventy-five percent of their assets. This percentage is roughly true for many Islamic banks as well as Islamic banking systems in Pakistan and Iran. As early as 1984, in Pakistan, Murabaha-type financing amounted to approximately eighty-seven percent of total financing in the investment of PLS (profit and loss sharing) deposits" (p. 77). Yet this very point of predetermined and guaranteed earnings have caused controversy among the Muslims and critics of Islamic financing. Some Muslims and critics take the view that Murabaha is not legitimate Islamic trade. Zineldin (1990) stated that there are some who feel that the fact that Murabaha enables a buyer to finance his purchase with deferred payment, as against accepting a mark-up on the market price of the commodity, means that the financier earns a profit without bearing any risk hence falls under riba.

Saeed (1996) also points out that financing a venture on the basis of Murabaha to be repaid at a particular point in time does not differ greatly from financing a venture on the basis of fixed interest. In both cases, it is a debt, and the cost of financing, whether it is called interest or profit, is fixed, and the time allowed for repayment is also fixed. The most significant difference should be in the case where the debtor fails to repay the debt at the specified time. The loan at interest would generally incur an extra interest penalty if the loan is not paid upon maturity, whether the debtor was able to pay or not. In the case of Islamic finance, the debtor should be given time for repayment if he is unable to pay. However, in practice, Islamic institutions, with support of the Religious Supervisory Boards, have narrowed the meaning to close the potential loophole for debtors who might be remiss in paying their debts despite being able to do so. To address this loophole, the Religious Boards allowed for 'fine' to be incorporated in the contract, Al-Omar and Abdel-Haq (1996). The Islamic institutions use the name 'fine' whereas the traditional bank refers to it as 'interest'.

From an economic point of view, there is no substantial difference between mark-up and interest. The main difference between the two is a legal one based on religious theories; the basis for interest is loan contracts while the mark-up is founded on the sale contract. In economic terms, financing on the basis of mark-up in price has no significant economic merit over the interest-based system, except in the name. There is a genuine fear among the Islamic circles that if interest is largely substituted by mark-up, it would represent a change just in name rather than in substance.

Therefore, some scholars are pushing for the exclusion of this instrument altogether (Saeed, 1996) However, for now, this form is allowed and is binding among the practicing Islamic financial institutions.

Ijara (Leasing)

The second debt-based instruments available in Islamic finance is the leasing concept. There are two forms of leasing concept known as Ijara, which is similar to conventional leasing, and lease to purchase option known as Ijara wa Iktina. First, with Ijara, the institution owns the equipment, buildings, or other facilities as requested by a client for the purpose of leasing to the same client on a previously agreed rental contract. Leasing is common in the conventional financial system as long-term financing. In the past, it is generally associated with real estate such as land and buildings. However, today, it is possible to lease virtually any kind of fixed asset.

There is no effective difference between the Islamic and conventional operation of the leasing concept. However to be acceptable in an Islamic framework, the leasing contract must meet certain conditions as discussed by Al-Omar and Abdel-Haq (1996). First, the service that the asset is supposed to provide and for which it is being rented should be definitely and clearly known to both parties. Further, its usage must comply to the Islamic laws. Second, the asset remains in the ownership of the lessor who is responsible for its maintenance so that it continues to give the service for which it was rented. Third, the leasing contract is terminated when the asset ceases to give the service for which it was rented. If the asset becomes damaged during the period of the contract, the contract will remain valid. Fourth, the price of an asset that may be sold to the lessee at the expiration of the contract cannot be pre-determined. It can be determined only at the time of the expiration of the contract.

Another form of leasing is the lease to buy option which has been used for major asset financing. Under the lease purchase, the financial institution agrees to buy the equipment, buildings, or what ever is requested by the client. Then the assets are rented to the client based on negotiated terms agreed upon. In return, the client is to make incremental payments into an investment account that will contribute toward the purchase of the asset. Any profits accumulated in this account are for the benefit of the client and to be applied toward the purchase price. The client thus becomes the owner of the financed equipment and the contract with the financial institution ends.

According to Saeed (1996), some Muslims feel that this method is similar to the cost-plus financing concept called Murabaha, discussed earlier. Therefore, it also includes all the arguments of whether or not this form of instrument is allowed under Islamic laws. Similarly, this leasing concept is currently permissible and binding by the various Islamic institutions and by the Religious Supervisory Boards. As Iqbal (1997) pointed out, leasing accounts for about 10 percent of Islamic financial transactions.

Istisna (Progressive Payment)

Another form of debt-like instrument which is relatively new is what is known as Istisna. According to Hamwi and Aylward (1999), this type of investment is “a contract for acquisition of

goods by specification or order, where the price is paid progressively in accordance with the progress of a job completion. This is utilized, for example, for purchases of houses to be constructed where payments made to the developer or builder are according to the stage of work completed" (p.409). This is very similar to the conventional make to order where the seller receives payment based on the progress of the project. Therefore, the seller bears the risk of completing the project. As mentioned, this is still a very new product in Islamic finance.

Qard Hasan (Humanitarian Loan)

This is not an investment for investor to make return. Rather it is viewed as a good deed which the reward will be earned from God. As Al-Omar and Abdel-Haq (1996) pointed out, this is a pure loan transaction in which the client obtains cash from individuals or institutions to be returned at a stipulated future date, absolutely free of interest. The borrower has the right to reward the lender for the loan by paying any amount above the amount of the loan even though he does not have to. Also, the return of the principal is not guaranteed and usually not expected by the lender. This does not excuse the borrower from paying his debt. Under Islamic laws, the borrower is obligated to honor his contract and repay the debt if he is able to. If he encounters difficulty, he should return the debt at a later date when it is not a burden for him to do so. This is sometimes known as a good will loan, and is usually extended to the poor who need it for basic living. It is not known how widely this loan is applied in practice.

THE OBSTACLES IN APPLICATION

Although the concept of Islamic financing existed for over 1400 years, it is still in an early stage of development in order to compete with the conventional system. During the research, there is a common theme among the various sources regarding the challenges encountered in implementing the theoretical concept. Iqbal and Mirakhor (1999) suggest that "these challenges can be classified in two groups; (a) financial engineering challenges to apply principles of Islamic finance for further innovation and (b) challenges to make operation of the system more efficient, stable, and well integrated with international capital markets" (p.397).

First, one of the major problem with Islamic investment instruments is the lack of liquidity and safety. This is in part due to lack of understanding and partly due to the nature of the instrument. According to Iqbal (1997), the secondary market for Islamic products is very shallow and illiquid, and money markets are almost non-existent. So far, the Islamic instruments available are mostly short and medium-term; products need to be developed to handle extreme short-term such as overnight deposits by banks, and long term investments needed for economic development. In addition, there is a need for risk-management tools to provide clients with instruments to hedge against the high volatility in currency and commodities markets. Further, the market currently lacks the alternative option for public debt financing. Iqbal and Mirakhor (1999) stated that "financial engineering in Islamic finance will have to focus on the development of products that foster market integration and attract investors and entrepreneurs to the risk-return characteristics of the product

instead of whether it is Islamic or not" (p.398). In the end, the majority of the public will be drawn to the products because of the potential earning more so than because of their religious choice.

Second, the operational challenges need to be addressed for the movement to grow. Another obstacle is the lack of standard interpretation on various instruments by the various jurists. Currently, there is much confusion regarding which transactions are allowed and which are not because of the different rulings by various religious boards. Currently, each Islamic institution elects their own religious board consisting of religious scholars from the various schools of opinion. Therefore, a transaction may be considered Islamic at one institution and may not be at another, hence causing confusion and incompatibility. It is very important to have a unified Shari'a council whose decision is binding for all practicing Islamic institutions. This will eliminate confusion and inconsistency thus promoting interaction with other conventional financial institutions.

Also, the lack of accounting principles and stardards is a serious limitation. Similar to the conventional financial system, well-defined principles and standards are crucial for information disclosure, building investor's confidence, for monitoring, and surveillance as Iqbal (1997) pointed out in his study. It is not possible to use the conventional accounting principles and apply it to the Islamic financial concepts because the framework for the two systems is too different.

Further, the Islamic financial movement lacks the technical staffs who are familiar with the system and have adequate knowledge to enhance the implementation of the moral and social values of the system. Currently, the majority of the staff in the Islamic institutions are made up of either one extreme or the other, thus limiting the growth of the system. Most of the staff working in Islamic institutions come from conventional banks and are familiar only with the conventional approach. These employees lack the knowledge of Islamic laws which limits their ability to convey the laws to customers or conventional bankers. On the other extreme, there are those who are well versed in the Shari'a but are very limited in mechanics of the financial industry. There is a desperate need for committed Islamic financiers as well as a training program specifically in Islamic finance.

In summary, there are various obstacles which limit the growth of the Islamic financial system as a competitive financial alternative to the traditional financial system. As discussed, these challenges are lack of liquidity for the instruments, more products for extreme short-term and long-term maturity, a lack of religious council's ruling, a lack of standard accounting methods, and lack of trained professionals in the field. However, despite the challenges, the market for Islamic finance is growing.

THE MARKET

Currently, the Islamic financial system is mostly practiced in countries with "Islamic" governments. Even then most Muslim countries have conventional banking as the main system, and the Islamic institutions exist alongside it. Examples include Malaysia, Egypt, Saudi Arabia, Jordan, and many other Middle East countries. Only three countries so far solely utilize the Islamic financial system, and they are Iran, Pakistan, and Sudan. According to Iqbal's study (1997), the industry has been growing at a rate of more than 15% annually for the past five years. Iqbal's study

also suggests that the market's annual turnover was estimated to be $70 billion in 1997 compared to $5 billion in 1985, and is projected to be over $100 billion by the turn of the century.

The growth of Islamic finance is a reflection of the "Islamization" movement within the Muslims communities where Muslims are returning to teaching of The Qur'an. As such, the demand for ethically acceptable financial mechanisms is increasing. According to Josh (1997), there are 8 million to 10 million Muslim residents in the United States alone who are seeking Islamic financial tools. This presents a huge niche market that has yet to be explored. In addition, the industry is growing not only among the Muslim communities but among western financiers as well.

Following are some examples to illustrate the growing trend of the Islamic financial system being utilized by both Muslims and non-Muslims. A very high profile example is the Hub Power Project in Pakistan. This is a $1.6 billion project which began in 1985 by the Pakistani government as an initiative to encourage private participation in power generation (Hamwi & Aylward, 1999). As Hamwi and Aylward (1999) point out, the importance about this project from the Islamic financing standpoint is that it is the first project financing "featuring an Islamic mark-up based limited recourse facility and the first project to receive mobilization finance in the form of an Istisna facility" (p.417).

Another indication that the concept is extending into to the conventional financial institutions is set by Citibank. According to Drexhage (1998), Citibank is the first conventional international bank to set up an Islamic institution called CitiIslamic Investment Bank in 1996 located in Bahrain, Saudi Arabia. In addition, Josh (1997) indicated that multinational companies such as General Motors, IBM, and Xerox have raised money through a U.S. based Islamic leasing fund set up the United Bank of Kuwait. Also, oil giants such as Enron and Shell have used Islamic banks to finance their activities in the Arabian Gulf and Malaysia.

PERCEPTION OF ISLAMIC FINANCIAL SYSTEMS IN THE U.S.

As of the end of 1996, there are about 166 of Islamic financial institutions in 34 countries according to Timwell (1998). Table I provides financial highlights based on 1996 results which are helpful in comprehending the scale of the overall market. In summary, most of the existing Islamic institutions are currently in the Middle East and South East Asia. There is a huge potential for expansion in Europe and North America.

Table I: Financial Highlights of Islamic Banks and Financial Institutions in 1996 (in $ million)

Region	No. of Banks	Capital	Total Assets	Deposits	Reserves	Net Profit
South Asia	50 (31%)	962 (13%)	45,201 (33%)	27,042 (27%)	1,849 (325)	350 (21%)
Africa	35 (21)	213 (3%)	1,951 (1%)	603 (1%)	418 (7%)	39 (2%)
South East Asia	30 (18%)	136 (2%)	3,801 (3%)	1,572 (2%)	1944 (34%)	184 (11%)
Middle East	24 (14%)	4,060 (56%)	67,142 (49%)	54,288 (53%)	347 (6%)	373 (22%)

Gulf Corp. Council	19 (11%)	1,344 (18%)	18,084 (13%)	16,494 (16%)	1,095 (19%)	686 (41%)
Europe and U.S.	8 (5%)	559 (8%)	952 (1%)	1,164 (1%)	93 (2%)	53 (3%)
Total	166	7271	137,131	101,163	5,746	1,685
Source: Timwell (1998)						

Even though there is a market for Islamic financial instruments and the trend is growing, this study also seeks to analyze the perception of the Islamic financial system in the U.S. Hence a brief survey was conducted to gather this information. The survey has two sections, first to gather the reaction and perception to an Islamic financial system, and second, to gather the demographics of those surveyed. (The survey is available from authors upon request.)

Only 102 out of 150 surveys are usable, which represents about sixty eight percent of the total survey conducted. Table II represents the demographic information of those surveyed and Table III shows the summary results of the alternative payment perception.

Table II: Demographics Summary

Marital Status	Single: 74 (72.6%)	Married: 20 (19.6%)	Divorced: 8 (7.84%)	Widow(ed): 0 (0%)
Age (years)	25 and <	26 to 30	31 to 35	36 and >
	66 (64.7%)	30 (29.4%)	0 (0%)	8 (7.84)
Gender	Female: 46 (45.1%)		Male: 56 (54.9%)	
Ethnicity	Blacks: 18 (17.7%)	White: 74 (72.6%)	Hispanic: 8 (7.8%)	Others: 2 (1.9%)
Religiouse Affliation	Christian: 94 (92.2%)	Islam: 0 (0%)	Others*: 6 (5.88%)	None**: 2 (1.96)

Note: * Include Buddhist, Hindu, Jewish, and others (except Islam)
** Atheist

A typical person responded to the survey is a twenty-three year old, single, white, and Christian male. The survey results indicate that sixty percent of the respondents do not see the Islamic financial system as a viable system for use in the U.S. and only about eighteen percent see an Islamic financial system as good or better then the conventional systems used in the U.S. By the same token, only thirty seven percent of the respondents said that they would use an Islamic financial type system in the U.S. Partial explanation for the disappointing results is that the respondents are not very familiar with the Islamic financial system and its innovative concepts nor its application. Though it is very difficult to prove using these results, the author of this study wonders about a possible racial bias. The summary result also shows that about ninety two percent of the respondents were Christian, whereas there is no single Muslim respondent in the survey. It

should be noted that before the survey was conducted, respondents were told to look at the Islamic financial system strictly from a financial standpoint. It would be interesting to compare these results with a different group.

Table III: Perception on the Alternative Payment Method (in percentages)

	1	2	3	4	5
Sharing of Profit	11.76%	15.69%	50.98%	15.69%	5.88%
Trust Financing	9.80%	15.69%	39.22%	25.49%	9.80%
Progressive Payment	5.88%	13.73%	31.37%	31.37%	17.65%
Cost plus profit concept	7.84%	11.76%	41.18%	29.41%	9.80%
Humanitarian Loan	19.61%	15.69%	13.73%	29.41%	21.57%
Leasing	9.80%	19.61%	52.94%	7.84%	9.80%
IFS - viable system	31.37%	27.45%	21.57%	15.69%	3.92%
IFS - a good system	25.49%	31.37%	25.49%	11.76%	5.88%

Note: Scale of 1 through 5, where 1 means strongly unacceptable, and 5 means strongly acceptable.

Table II shows that the other results support the notion that the respondents do not support the Islamic financial type system and they do not understand the system very well. For instance, on the question of progressive payment (see question three in the survey), only forty nine percent of those surveyed said that they would accept this alternative payment method where payments are made to the supplier according to the stage of completion. This notion is very similar to the conventional financial type system, yet many of the respondents did not support this notion. The results on the other alternative payment method are similar except for the humanitarian loan. Only in this alternative method, fifty percent of the respondents either (strongly) accept the notion that money is loaned without stated interest rate and that the borrower determines how much interest he can pay in the future.

Therefore, in summary the results indicate that the respondents do not perceive the Islamic financial systems very well. They either do not understand this alternative system or they are biased against it because of the religious connotation attached to it.

SUMMARY AND CONCLUSIONS

Islamic finance is not only a technique but a whole economic system of finance. The system framework is based on the Islamic faith thus the name. The key elements to this system are the

prohibition of interest, the compliance with the Islamic laws, and the prohibition of a guaranteed or a predetermined earning.

Within the guidelines of the Shari'a, there are a variety of investment options allowed in both equity-based and debt-based instruments. The profit sharing products are Musharaka also known as a partnership, and Mudaraba known as trust financing. In addition, the debt-like instruments are Murabaha which is cost-plus profit; Ijara similar to leasing; and Istisna also called progressive payment method. In addition to the equity and debt-like products, there is a humanitarian loan known as Qard Hassan which does not result in any return.

As with any industry struggling to establish itself, Islamic finance faces a number of obstacles in its development. These challenges are a lack of liquidity in the instruments, a lack of standard interpretations by the religious boards, a lack of standard accounting principles, and a lack of technical staff. However, despite the challenges, the market continues on an upward trend. The paper also points to examples such as the Hub Power Project in Pakistan, and Citibank's commitment in Bahrain to show that Western financial institutions are getting involved as well.

The survey results indicate that those surveyed did not perceive the system very well and further study is warranted to make any additional conclusions. Also this study should be repeated where the respondents are more balanced in terms of ethnicity in order to get a true picture.

In conclusion, Islamic finance is a legitimate financial system with various instruments to meet the guiding principles. The system is not limited to Muslims only, it is open to anyone who is looking for an alternative to the interest based system. There is a huge potential market for Islamic finance to thrive, and it is believed that it will compete alongside the existing conventional system in the near future. Its success will be mainly due to the fact it is a profitable system and not so much due to its religious philosophy.

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AN EXAMINATION OF THE DIVERSIFICATION MOTIVE OF CONGLOMERATE MERGERS

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ABSTRACT

This paper examines the effect of conglomerate mergers on the risk of the combined company. Findings of the extant financial literature are not definitive. We compared the difference between pre and post merger systematic risk and total risk of the merging companies. It has been found that in all cases risks of the merged companies were higher than their pre-merger level, but for conglomerates the change was significantly lower.

INTRODUCTION

Conglomerates are composed of two or more units that are producing products or services that are significantly different from one another. That is conglomerate structure is typically an assemblage of separate firms having different products in different markets but operating together under one corporate umbrella. Conglomerates are designed without a real customer-technology product fit among their different businesses. As a consequence, conglomerates should not get the synergistic benefits generally associated with strategic fit - benefits that evolve from growth that focuses on distinctive competence in a single line of business and that take advantage of existing economies of scale and experience curve effects already possessed by a firm. So what are the motives of conglomerate mergers? According to Gauhn (1991), of the three types of mergers - conglomerate, vertical, and horizontal - conglomerate mergers are mainly seen as vehicles for external growth and diversification, and are generally expected to reduce the risks of the merged company. Weston and Mansinghka (1971) did a comprehensive analysis of the performance of conglomerate firms. Their study supports the growth and risk reduction incentive of conglomerates. But Weston, Smith, and Shrieves (1972) studied 50 conglomerate firms and rejected risk reduction motive of conglomerate mergers and concluded conglomeration creates portfolios that are inefficient.

Purpose of this study was to examine the changes in the risk of the companies involved in conglomerate vs. non-conglomerate mergers. We compared the pre and post merger total risk and systematic risks of the companies and examined if there were any significant difference - increase or decrease - of the two risk measures mentioned.

DATA AND SAMPLE DESIGN

Mergers included in the study occurred between 1975-1992. The sample was selected from Mergers and Acquisition magazine. Acquiring and acquired firms had to be listed on the NYSE,

AMEX, or OTC. Firms engaged in any kind of restructuring (e.g., other merger activities, new offerings of securities, repurchases etc.) within six months of the merger announcement date, were excluded from the sample. The relative sizes of the target were also considered in selecting the sample. Relative size is defined as the ratio of the book value of the assets of the target to the book value of the assets of the bidder [Lev and Mandelker (1972)]. If a target firm is too small compared to the acquiring firm, it is not expected to have impact on the performance of the merged company. For our study, following Choi and Philippatos (1983), if the relative size of the was less than ten percent, it was excluded from the sample. We finally stratified the sample according to the type of merger - conglomerate vs. non-conglomerate. This classification was done by using the 4-digit SIC number. If the first two digits of the bidder and target companies were the same, they were placed in the non-conglomerate group. For those whose first two digits were different, were classified as conglomerates. The final sample contained 265 mergers, of which 148 were conglomerates and 117 were non conglomerates.

METHODOLOGY

To examine the changes in the risk of the companies involved, we compared their pre and post merger systematic risk (as measured by beta) and total risk (measured by standard deviation and variance). As in Travlos (1987), the pre-merger estimation period covered days -136 to -16 days relative to the announcement day and the post merger period extended from +16 to +136 relative to the announcement date. The period covering days -16 to +16 were excluded to avoid any announcement related changes.

Estimation of the Systematic Risk

To estimate the effect of merger on systematic risk, pre and post merger beta for each combination were calculated, using daily returns available on the tapes of the Center for Research in Security Prices (CRSP). Beta was estimated using the following model:

$R_{i,t}$	=	$A_i + B_i R_{m,t} + e$
$R_{i,t}$	=	*return on security I on day t*
$R_{m,t}$	=	*return on the CRSP equally weighted index for day t*
A_i	=	*intercept*
B_i	=	*slope* = $cov(R_i,R_m)/Var(R_m)$
$cov(R_i,R_m)$	=	*covariance between the return on security I and the market index*
$Var(R_m)$	=	*variance of return on CRSP equally weighted index*

A_i and B_i are OLS values from the estimation period. Pre merger beta was estimated over the period mentioned above. Pre and post merger difference in systematic risk was calculated as follows:

d	=	$B_{xy} - E(B_{xy})$
	=	$B_{xy} - [W_x B_x + (1-W_x)B_y]$
B_{xy}	=	post merger beta for the combination of the firms x and y
$E(B_{xy})$	=	pre-merger expected beta of the combined firms, calculated as the weighted average of the beta of the merging firms
B_x, B_y	=	pre merger beta of the merging firms
W_x	=	ratio of the book value of the total assets of x to the book value of the total assets of x and y

The difference between the pre and post merger systematic risk was tested for significance to examine if merger affected the risk profile of the firms. Null hypothesis is that merger does not change the systematic risk. A two-tailed t-test was used to test the hypothesis, where the test statistic was:

$$t = SQRT(N)\ [(B_{xy} - E(B_{xy})]/S(d)$$

where:	N	=	number of firms in the sample
	$S(d)$	=	standard deviation of the difference between the pre and post merger risk
	B_{xy}	=	mean of the post merger risk
	$E(B_{xy})$	=	mean of the pre merger risk

In an attempt to study if effects of merger on the change of the systematic risk was different for different sub-samples, the significance of the difference of changes in systematic risk was be tested. The net difference in changes in systematic risks between two sets of merging firms was calculated by -

$$D = [\ B_{xy} - E(B_{xy})] - [\ B_{ab} - E(B_{ab})]$$
$$= D_1 - D_2$$

where

B_{xy}, $E(B_{xy})$	=	post and pre-merger systematic risk of the merging firms x and y from sample 1
B_{ab}, $E(B_{ab})$	=	post and pre-merger systematic risk of the merging firms a and b from sample 2
D_1, D_2	=	difference in post and pre-merger systematic risk for the two groups of firms.

The mean of the change in systematic risk for a sample was computed as:

$$D = 1/N\ Sum_{\ i=1,N}\ (D_i)$$

where

D_i	=	difference in risk
N	=	number of mergers in the sample

If merger had no effect on the systematic risk, the mean of the pre-merger beta would be equal to post merger beta. If the measures for the sampled population were zero, then the pre and

post merger difference, and also the net difference across sub-samples would be approximated by normal distribution. To test the significance of the differences in beta across samples, we calculated:

$$t = (D_1 - D_2)/(SQRT(Var_1/N_1 + Var_2/N_2))$$

Where

N_1, N_2 = *number of observations in sample 1 and 2*

Var_1, Var_2 = *variance of changes in beta for the two samples being compared*

Estimation of Total Risk

Like systematic risk, changes in variance was compared over the pre-merger period of day -136 to +16, to the post merger period of day +16 to +136. Significance of the change in variance was tested by a one-tailed F-test where:

$$F = VAR_{xy} / E(VAR_{xy})$$

VAR_{xy} = *post merger return variance of the merged firms x and y*

$E(VAR_{xy})$ = *pre-merger expected variance of the combination*
$= W^2_x VAR_x + (1-W_y)^2 VAR_y + 2W_x(1-W_x)cov(x,y)$

W_x = *ratio of the book value of the assets of x to the sum of the book values of assets x and y*

$cov(x,y)$ = *covariance of returns for the merging firms:*

$$cov(x,y) = [1/(N-1)] \text{ Sum }_{t=1,N} [(R_{x,t} - R_x)(R_{y,t} - R_y)]$$

The one-tailed F-test was used to test the significance of the difference in total variance of the portfolio:

$$F = PVAR_a / PVAR_b$$

$PVAR_a, PVAR_b$ *are the post and pre merger variances of a merger portfolio*

PVAR is the pooled variance, calculated as:

$$PVAR = SUM_{i=1,j} (N_j - 1) VAR_i / Sum_{i=1,j} (N_j) - j$$

N_i = *number of observations for company I*

VAR_i = *variance of I*

j = *number of firms in the sample*

Using a procedure similar to that used in case of systematic risk, we tested for the significance of difference in changes in return variance across sub-samples. Difference of the changes in variance between two samples was also be tested for significance by a one-tailed F-test:

$$F = DPVAR_1 / DPVAR_2$$

$DPVAR_1$, $DPVAR_2$ are the pooled variance of the difference in variance of sample 1 and 2

FINDINGS

Consistent with the findings of Lev and Mandelker (1972) and Choi and Philippatos (1983), post merger betas showed an increase in both cases. In the case of conglomerate mergers, the increase is .08 (t=1.73) which is significant at .10 level. Beta for non-conglomerate mergers increased by 0.153 (t=2.82), significant at 0.02 level. These findings are contrary to Choi and Philippatos (1983), but support the accepted view that conglomerates do a better job in controlling their risk. We also conducted paired sample analysis, i.e., estimated the difference in change in beta between two samples. The difference in change in beta of conglomerate and non-conglomerates were found to be insignificant (t= 0.98).

Table 1
Estimation of the Increase in Beta for Different Sub-Samples

Type of Merger	Pre-merger beta	Post-merger beta	Change	t
Non-conglomerate	1.1805	1.3339	0.15	2.82**
Conglomerate	1.1083	1.1892	0.08	1.73*

**Significant at .01 level
* Significant at .10 level

Table 2
Paired Sample Test for Post Merger Change in Beta

Merger Type	Change in beta
Non-Conglomerate	0.15
Conglomerate	0.08
Difference in change	0.07
t	0.98

We examined the change in total risk of the merger portfolios by estimating their pre and post merger return variances. As in systematic risk, the total risk increased in all cases. Significance of the increase is tested by a one tailed F-test. Change in variance for non-conglomerate mergers (0.00020) is greater than conglomerate mergers (0.00007). The former is significant at 0.01 level (F=1.5), while the level of significance for the latter group is 0.10 (F=1.13). In paired sample

analysis for changes in variance, difference between the change in total risk of two samples were significant at 0.01 level (F=2.86).

Table 3
Analysis of the Change in Total Risk (Return Variance)

Type of Merger	Pre-merger Variance	Post-merger Variance	F
Non-conglomerate	0.00040	0.00060	1.50**
Conglomerate	0.00046	0.00052	1.13*

**Significant at .01 level
* Significant at .10 level

Table 4
Paired Sample Test for Post Merger Change in Variance

Merger Type	Change in Variance
Non-Conglomerate	0.00020
Conglomerate	0.00007
F of the Difference	2.86*

*Significant at .01 level

Table 5
Comparative Analysis of the Change in Total Risk and Systematic Risk

Type of Merger	Change in Variance	Change in Beta
Non-conglomerate	0.00020**	0.15**
Conglomerate	0.00006*	0.08*

**Significant at .01 level
* Significant at .10 level

CONCLUSION

Comparing the changes in total risk to the changes in systematic risk reveals some interesting facts. For conglomerate mergers, changes in both types of risk are significant at 0.10 level. For non-conglomerates, increase in both types of risk is significant at .01 level. This supports the view that conglomerates are better able to diversify their risk, but contradicts the findings by Joehnk and Nielsen (1974), Brenner and Downes (1978) and Elgers and Clark (1980). Results of the paired sample analysis indicate that the difference in risk between the two groups of mergers is due to the difference in their non-systematic risk.

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ON COMMODITIES, RISK MANAGEMENT, AND DERIVATIVES

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ABSTRACT

We often assume that risk is beyond the control of farmers. Farmers are exposed to weather, unpredictable changes in seed prices, tax rates, technology, fuel prices, chemical prices, and constantly changing commodity prices, Brorsen and Irwin (1996). However to some extent, farmers can control some of their risks by the use of financial instruments for hedging, Bessembinder (1992). Farmers can consciously affect the risk of their equipment by building in flexibility.

In the next section, hedging will be explained. In the following sections, options, futures contracts, (forward contracts, a specialized financial instruments that have been devised to help manage risk), and derivatives will be described. Each of these instruments provide a payoff that depends on the price of some underlying commodity (corn in the following examples). Because their payoffs derive from the prices of other assets, these instruments are often known collectively as derivative instruments (or derivatives for short). Derivatives often conjure up an image of wicked speculators, and they attract their share of speculators (some of whom may be wicked). But derivatives are also used by sober and prudent farmers who simply want to reduce risk.

WHY HEDGE?

Some risk can be hedged or offset. The idea behind hedging is straightforward. First, two closely related assets are found. Then, one asset is purchased and the other sold in proportions that minimize the risk of the net position. If the assets are perfectly correlated, the net position can be risk free. However, hedging is seldom free, Smith and Stultz (1985). Most farmers hedge to reduce risk, that is to reduce uncertainty, Martines-Filho (1996). Why then bother to hedge? For one thing, reducing the risk makes financial planning easier and reduces the odds of an costly shortfall. A shortfall might mean only an unexpected trip to the bank, but in extreme cases it could trigger bankruptcy. Why not reduce the odds of these awkward outcomes with a hedge?

Financial distress can result in indirect as well as direct costs to a farmer. (Direct costs include legal fees and administrative costs. Indirect costs reflect the difficulty of managing a farm under watchful eyes of a "friendly" banker). Costs of financial distress arise from disruption to normal farming operations as well as from the effect financial distress has on the farmer's investment decisions. The better the risk management policies, the less risk and expected costs of financial distress. As a side benefit, better risk management increases the farmer's debt capacity.

In some cases hedging also make it easier to decide whether the farmer deserves a stern lecture or a pat on the back. Hedging extraneous events can help focus the farmer's attention. While the farmer should not have to worry about events outside of his control, most people (and farmers are people) worry anyway. It is naive to expect the farmer not to worry about changing corn prices

if his "bottom line" depends on them. Still, the time spent worrying could be better spent if the farmer hedged against such movements.

REDUCING RISK WITH OPTIONS

Farmers regularly buy options on commodities to limit their downside risk. Many of these options are traded on option exchanges, but often they are simply private deals among farmers, millers and bankers.

Suppose your neighbor, and employee of Illinois Milling, Incorporated (IMI), is concerned about potential increase in the price of corn, which is one of its major inputs, Gerht and Good (1993). To protect IMI against such increases, your neighbor on behalf of IMI buys 6-moth options to purchase 1,000 bushels of corn at an exercise price of $2 per bushel. These options might cost $0.10 per bushel.

If the price of corn is above the $2 exercise price when the option expires, IMI will exercise the option and receive the difference between the corn price and the exercise price. If the corn price falls below the exercise price, the options will expire worthless. The net cost of corn will therefore be:

	Corn Price, Dollars per Bushel		
	$1.50	$2.00	$2.50
Cost of 1,000 Bushels	$1,500	$2,000	$2,500
less Payoff on Call Option	-0-	-0-	$ 500
Net Cost	$1,500	$2,000	$2,000

By buying options, IMI protects itself against increase in the corn price while continuing to benefit form corn price decreases. If corn prices falls, it can discard its call option and buy its corn at the market price. If the corn prices rise, however, it can exercise its call option to purchase corn for $2 a bushel. Therefore, options create an attractive asymmetry. Of course, this asymmetry comes at a price: the $100 cost of the options (1,000 options as $0.10 each).

Hedging with Options

Consider now the problem of your uncle, a Georgia corn farmer, who supplies IMI with corn. His problem is the mirror image of IMI's: he losses when corn prices fall and gains when corn prices rise.

Your uncle wants to lock in a minimum price of his corn but still benefit from rising corn prices. He can do so by purchasing put options that give him the right to sell corn at an exercise price of $2 per bushel. If corn prices fall, he will exercise the put. If corn prices rise, he will disregard the put and sell corn at the market price:

	Corn Price, Dollars per Bushel		
	$1.50	$2.00	$2.50
Revenue from 1,000 Bushels	$1,500	$2,000	$2,500
less Payoff on Put Option	$ 500	-0-	-0-
Net Revenue	$2,000	$2,000	$2,500

If corn prices rise, your uncle reaps the benefit. But if corn prices fall below $2 a bushel the payoff of the put option exactly offsets the revenue shortfall. As a result, your uncle realizes net revenues of at least $2 a bushel, which is the exercise price of the put option.

Once again, it is important to remember that one "does not get something for nothing". The price your uncle pays for "insurance" against a fall in the price of corn is the cost of the put option. Similarly, the price that IMI paid for "insurance" against a rise in the price of corn was the cost of the call option. Options provide protection against adverse price changes for a fee, the option premium!

Notice both your uncle, the corn farmer, and your neighbor, the milling company employee, use options to insure against an adverse move in corn prices. Bu the options do not remove all uncertainty. For example, your uncle may be able to sell corn for much more than the exercise price of the option.

FUTURES CONTRACTS

Suppose your uncle, the corn farmer in Georgia, is optimistic about next year's corn crop, he still has trouble sleeping at night. He is worried that when the time comes to sell the corn, prices may have fallen through the floor. The cure for your uncle's insomnia (or just the start of bigger worries) is to sell corn futures. (see Irwin et al. (1996) for a Monte Carlo Analysis). In this case, he would agree to deliver so many bushels of corn in (say) September at a price that is set today. This future contract is not to be confused with an option. With an option, the holder has the right but not obligation to make delivery. The futures contract is a firm promise to deliver what at a fixed selling price, Garcia et al (1988). While options are great in theory, human emotions can be an obstical.

Your neighbor in Minneapolis, the employee of IMI, is in the position opposite to your uncle: she needs to buy corn after the harvest. If she would like to fix the price of this corn ahead of time, she can do so by buying corn futures, Kastens and Schroeder (1996). In other words, she agrees to take delivery of corn in the future at a purchase price that is fixed today. The miller dose not have an option either; she is obligated to take delivery if she still holds the contract when it matures.

Now suppose your uncle the farmer and your neighbor the miller strike a deal. They enter a futures contract, see Tomek (1997) for a review of futures prices as forecasts. What happens? First, essentially no money exchanges hands when the contract is initiated. (Actually, each party will be required to set up a margin account to guarantee performance on the contract. Despite this, the futures contract still may be considered as essentially requiring no money down. First, the

amount of margin is small. Second, it may be posted in interest-bearing securities, so that the parties to the trade need not suffer opportunity cost from placing assets in the margin account.) Your neighbor, the miller, agrees to buy wheat at the futures price on a stated future date (the contract maturity date). Your uncle, the farmer, agrees to sell at the same price and date. Second, the futures contract is a binding obligation, not an option. (Recall, options give the right to buy or sell if buying or selling turns out to be profitable). The futures contract requires that your uncle, the farmer to sell and your neighbor, the miller, to buy regardless of who profits and who losses. While no money changes hands when a futures contract is entered into, the contract is a binding obligation to buy or sell at a fixed price at contract maturity.

The profit on the futures contract is the difference between the initial futures price and the ultimate price of the corn when the contract matures. For example, if the futures price is originally $2.00 and the market price of the corn turns out to be $2.25, your uncle, the farmer, delivers and your neighbor, the miller, receives the corn for a price $0.25 below market value. Your uncle, the farmer, loses $0.25 per bushel and your neighbor, the miller, gains $0.25 per bushel as a result of the futures transaction. In general, the seller of the contract benefits if the price initially locked in turns out to exceed the price that could have been obtained at contract maturity. Conversely, the buyer of the contract benefits if the ultimate market price of the asset turns out to exceed the initial futures price. therefore, the profits on the futures contract to each party are:

Profit to Seller	=	initial futures price - ultimate market price
Profit to Buyer	=	ultimate market price - initial futures price

Now it is easy to see how the farmer and the miller can both use the contract to hedge. Consider your uncle the farmer's overall cash flows:

	Cash Flow
Sale of Corn	Ultimate Price of Corn
Futures Profits	Futures Price less Ultimate Price of Corn
Total	Futures Price

The profits on the futures contract offset the risk surrounding the sales price of corn and lock in total revenue equal to the futures price. Your neighbor, the miller, also has a fixed price for the corn, the futures price. Any increase in the cost of corn will be offset by a commensurate increase in the profit realized on the futures contract.

Both your uncle, the corn farmer, and your neighbor, the miller, have less risk than before. You uncle has hedged (that is offset) risk by selling corn future; your neighbor has hedged by buying corn futures. However, neither has eliminated all risk. For example, your uncle the farmer, still has quantity risk. He does not know for sure how many bushels of corn he will produce.

Hedging with Futures

Suppose that your uncle originally sold 5,000 bushels of December corn futures at a price of $2.00 per bushel. In December, when the futures contract matures, the price of corn is only $1.50 per bushel. Your uncle, the farmer, buys back the corn futures at $1.50 just before maturity, giving him a profit of $0.50 a bushel on the sale and subsequent repurchase. At the same time he sells his corn at the spot price of $1.50 a bushel. His total receipts are therefore $2.00 a bushel. Basically involving:

Profit on Sale and Repurchase of Futures	$0.50
Sale on Corn at the September Spot Price	$1.50
Total Receipts	$2.00

The futures contract has allowed your uncle, the farmer, to lock in total proceeds of $2.00 a bushel.

The Mechanics of Futures Trading

In practice, your uncle, the farmer, and your neighbor, the miller, would not sign the futures contract face to face. In stead, each would go to an organized futures exchange. Your neighbor would not be prepared to buy future contracts if your uncle were free to deliver half-rotten corn to a leaky barn at the end of a cart track. Futures trading is possible only because the contracts are highly standardized. For example, in the case of corn farmers, each contract calls for delivery of specified quantity of corn at a specified quality at a specified warehouse.

When a futures contract is bought or sold, the price is fixed today, but payment is not make until later. However, each party will be asked to put some cash or securities as margin to demonstrate that they are able to honor their side of the bargain.

In addition, futures contracts are "marked to market". This means that each day any profits or losses on the contract are calculated; the exchange is paid any losses and receive any profits. For example, assume your uncle, the farmer, agreed to deliver 5,000 bushels of corn at $2.00 a bushel. Suppose the next day the price of corn futures increases to $2.05 a bushel. Your uncle now has a loss on his sale of 5,000 * $0.05 = $250 and must pay this sum to the exchange. In a way, your uncle is "buying back" his futures position each day and then opening up a new position. Thus after the first day your uncle has realized a loss on his trade of $0.05 a bushel and now has an obligation to deliver corn for $2.05 a bushel.

Of course your neighbor, the miller, is in the opposite position. The rise in futures price leaves her with a profit of 5 cents a bushel. The exchange will therefore pay her this profit. In effect your neighbor sells her futures position at a profit and opens a new contract to take delivery at $2.05 a bushel.

The price of corn for immediate delivery is known as the spot price. When your uncle sells corn futures, the price he agrees to take for his corn may be very different from the spot price. But the future eventually becomes the present. As the date for delivery approaches, the futures contract becomes more and more like a spot contract and the price of the futures contract approaches the spot price.

Your uncle, the farmer, may decide to wait until the futures contract matures and then deliver corn to the buyer. But in practice such delivery is rare, for it is more convenient for the farmer to buy back the corn futures just before maturity.

Additional Price Increase

Suppose that 2 days after taking out the futures contract the price of September corn increase to $2.20 a bushel. What additional payments will be made by or to your uncle, the farmer, and your neighbor, the miller? What will be their remaining obligations at the of this second day?

Your uncle, the farmer, has a further loss of 15 cents a bushel ($2.20 - $2.05) and will be required to pay this amount to the exchange. Your neighbor, the miller, has a further profit of 15 cents per bushel and will receive this from the exchange. Your uncle is now committed to delivering corn in September for $2.20 per bushel and your neighbor is committed to paying $2.20 per bushel.

Your uncle, the farmer, and your neighbor, the miller can both use corn futures to hedge their risk; however, actual implementation has behavioral issues dealing with basic human emotions, which can lead to the wrong application. Because corn prices can fluctuate widely, a large corn buyer like your neighbor's employer IMI could be knocked badly financial "off course". IMI therefore reduces its exposure to movements in corn prices by hedging with corn futures.

Forward Contracts

Each day billions of dollars of futures contracts are bought and sold. This liquidity is possible only because futures contracts are standardized. Futures contracts mature on a limited number of dates each year, and the contract is standardized. For example, a contract may call for the delivery of 1,000 bushels of corn. If the terms of a futures contract do not suit either the buyers or sellers needs, they may be able to buy or sell a forward contract.

Forward contracts are custom-tailored futures contracts. One difference between forward and futures contracts is that forward contracts are not "marked to market". Thus with a forward contract, one settles up any profits or losses when the contract matures. A forward contract can be written with any maturity date for delivery of any quantity of goods.

DERIVATIVES

The earlier examples of your uncle, the farmer, and your neighbor, the miller. showed how derivatives (futures and options in these cases) can be used to reduce risk. However, if your brother-in-law, a private investor, was to copy your uncle without an offsetting of corn, your brother-in-law would not be reducing risk; rather, he would be speculating.

A successful derivatives market needs speculators who are prepared to take on risk and provide your uncle and your neighbor with the protection they need. For example, if an excess of farmers wished to sell corn futures, the price of futures would be forced down until enough speculators were tempted to buy in the hope of a profit. If there is a surplus of millers wishing to buy corn futures, the reverse will happen. The price will be forced up until speculators are drawn to sell. Speculators are necessary to a thriving derivatives market, but it can get your brother-in-law, an investor, into serious trouble. Does this mean that your brother-in-law should not use derivatives? No! However, speculation is foolish for your brother-in-law unless he has reason to believe that the odds are "stacked" in his favor; informational anomalies represent another dimension beyond the scope of this paper. If your brother-in-law is not much better informed than the highly paid professionals in banks and other institutions, he should leave the use of derivatives to your uncle and neighbor and avoid speculation involved in the market.

SUMMARY AND CONCLUSIONS

Fluctuations in commodity prices can make planning difficult and throw farmers and millers alike badly off "financial" course. So, both farmers and millers look for opportunities to manage these risks, and a number of specialized instruments have been invented to help them. These instruments are collectively known as derivative instruments, or commonly derivatives.

Options are often used by both farmers and millers to limit their downside risk. For example, owning a commodity and having the option to sell it at the current price is effectively "insurance" against loss.

Futures contracts are agreements made today to buy or sell commodities in the future. The price is fixed today, but the final payment does not occur until the delivery date. Futures contracts are highly standardized and are traded on organized exchanges. Commodity futures allow farmers and millers to "fix:" the future price of commodities. Forward contracts are equivalent to tailor-made contracts.

Speculation is foolish unless you have reason to believe that the odds are "stacked" in your favor, but it is difficult to "beat" the professional traders. If you are not much better informed than the highly paid professionals in banks and other institutions, you should use derivatives for hedging and not for speculation. There are no "money machines" Derivatives are not the answer to all of the farmers and millers problems. The farming turmoil of the 1980s could happen again, and the use of derivatives will not warn or protect the farmer and miller from all disasters.

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TERMINATIONS ANALYSIS OF REAL ESTATE SYNDICATIONS: 1971-1989

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ABSTRACT

This article is based on a study that examines syndicated real estate industry in the United States 1971 to 1989. The financial data involves 66 underwriters, covering 577 syndication projects, representing $25.7 billion in capital raised and $21.7 billion in borrowing. It evaluated variables which determined the success or failure for underwriters and projects. The results showed the industry reported steady falling yields over 19 years. However, investment increased even after the 1986 changes in tax laws, when returns were greatly negative. By 1990, 79 of 577 projects resulted in a terminal action outcome; 23 paid-out, 28 terminated, 28 rolled-up with the remainder of the 577 continuing. Twenty-three were considered "positive" results, such as paid-out, and 28 were roll-ups or ceased operations.

NATURE OF THE SYNDICATION INDUSTRY

Securitized real estate is described as real estate that is placed in an ownership organization, such as a limited partnership, land trust, or real estate investment trust. The partnership or beneficial shares are sold in the open financial market, pursuant to the securities acts or securities exemption. The 1980's was a decade of expansion for syndication companies and corporations specializing in commercial real estate. That era of expansion emerged with the wide appearance of companies and individuals whose experience has been limited to individual business ventures, and failures were the result (Commerce Clearing House, 1986). That prediction by the US Department of Commerce, of impending losses, proved accurate for this area of financial services (Commerce Clearing House, 1986). This study is directed toward the understanding of the commercial real estate syndications 1971 - 1989 as the principal means of funding new commercial construction, and analysis those factors which affected project success or failure (Smith, Kennedy, Haring, 1998).

This study addressed funding, investigation, tax changes, time, and ownership. It is concerned with the array of risk conditions which affect how syndication projects performed in a timely and cost efficient fashion. It uses a data base and materials developed through reports compiled by the Robert A. Stanger and Company. It includes 577 syndicated projects and 66 syndicators. The material was organized into actual project, syndication and industry specific factors and variables

DATA BASE ORGANIZATION FOR ANALYSIS

The real estate projects examined in this study were developed, promoted and financed by numerous syndicators and commercial real estate specialists. Sixty-six company names were compiled from the Stanger Reports as the predominate commercial real estate underwriters during 1971-1989. Participation in Stanger's performance operations study was voluntary, and therefore the series does not include all public partnerships sales participants. The data presented is a complete record, not a sample, of Stanger voluntary files. Those underwriters, represent 75% of the United States market (Robert A. Stanger & Co., 1991). The projects sponsored by the underwriters included in this study have outcomes that fall within the four categories under consideration and described in Table 1. An extensive set of syndication performance and sponsor data was formulated into a series of Lotus 1-2-3® financial spread sheets. From these spread sheets a concise set of 577 projects with the original 32 variables was compiled into three SPSS/PC+ data sets.

During the development of and revision to the data sets, two types of variables were added: (1) alternative forms of the variable, and (2) new variables. Alternate forms of a variable are mathematically equivalent. An example of the first; variables YR and YRN which are equivalents, where the former is used in cross-tabulations, the latter in regression equations. The second type of variable refers to "string" characteristics of the raw data. Several of those variables were recast with "grouped" values, and thus organized for analysis and cross-tabulation presentation. The evaluation variables are capital raised, investment-borrowing and cash flow. The investment-borrowing portion provides an average for measuring and testing the influences of debt ratios as it pertains to the performance survivability of the syndication. The cash flow section is another measure of financial performance of the real estate development project (Grasskamp, 1985).

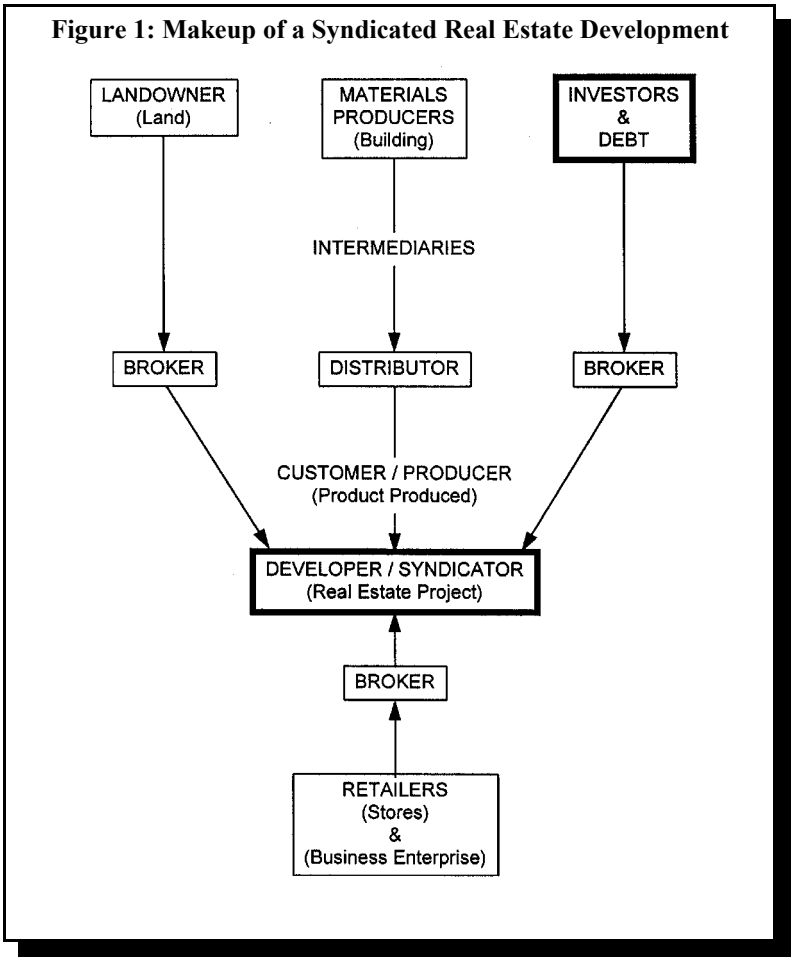
Barton and Matthews (1989) write that unrealistic assumptions often are made in developing theoretical financial models of small businesses. What is often omitted are management values, spiraling environmental threats, and internal corporate strengths and weaknesses. In addition, the purposes and goals of the corporate or partnership owners are not taken into account. Decisions on financing do not rely on the valuation of stock and the owners' attitudes toward personal risk. Instead, the following concerns are important:

1. *The characteristic of return is directly related to financial risk. How much risk is the management comfortable with in the project.*
2. *Top management's goals vary significantly from firm to firm and may have goals other than profitability.*
3. *Managers prefer to finance their firm's needs from internally generated funds rather than external credit/stock. Managers are not only concerned from the standpoint of how it affects the overall risk/return profile of the firm and its specific goals, but also from the perspective of how it may affect the control and flexibility top mangers have in decision making.*
4. *The risk propensity of top management and financial characteristics of the firm affect the amount of debt lenders are willing to offer and on what terms. The close familiarity between banks and business is apparent in their borrowing patterns.*
5. *The financial condition of the firm, particularly as it relates to risk, management control and flexibility taken to affect what management wants or is able to do with respect to capital structure.*

Real estate syndications require participant investors who, for the most part, accept higher risks than representative investments in traded stocks and bonds. It is logical that the syndication investors expect commensurate higher financial gains. Syndication investments are non-proprietary investments, but the underwriter and developers often exercise management roles in property selection, leverage, planning, and the hiring of managers. The syndication investment is "illiquid", even when marketing and trading prices are later quoted. Subsequent financial reorganization or liquidation of the project typically is accomplished without investor advise or consent.

Figure 1 illustrates the of the organizational components of syndicated commercial real estate project. The two components highlighted are the main focus of this study.

Figure 1: Makeup of a Syndicated Real Estate Development



Figures 2 and 3 illustrates the financial make-up of the market over the span of this study and the number of projects rolled-up per year.

Figure 2: Financial Syndication, 1971-1989

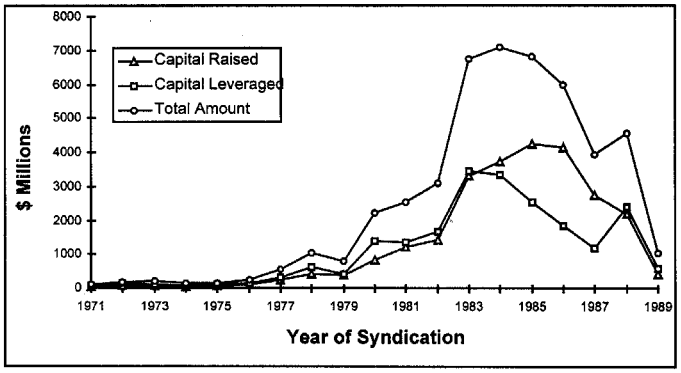
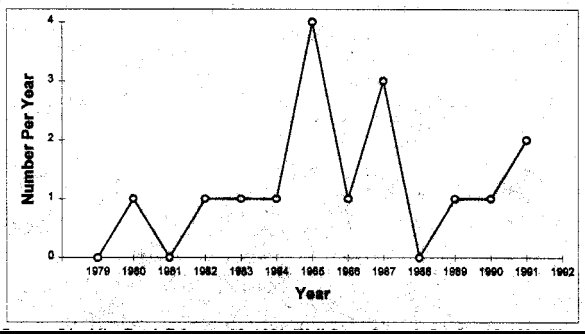


Figure 3: Major Syndication Project Roll-Ups, 1980-1991



Source: *Liquidity Fund*, February 19, 1991; *Wall Street Journal*, October 15, 1990; *Financial Planning*, April, 1991

"Less than 25% of the 66 underwriters accounted for 50% of the invested capital. One-fifth of the underwriters were responsible for half of the leveraged capital, and 62% of the syndicators were inexperienced" (Smith, Kennedy, Haring, 1998). Regression analysis of underwriters produced an equation, for $\alpha \leq 0.05$, indicating that the percentage of leverage impacts the pre-tax R^2 yield. The review of the 577 individual syndicated projects covered additional variables, including the number of years in syndication, and timing of entry. The debt-to-equity ratio was significant in several equations. The number of years in syndication and the year of entry into syndication were consistently significant regression equation variables. Four modeling equations were accepted in determining the outcomes of after tax IRR, after tax yield, internal rate of return, after tax yield, pre-

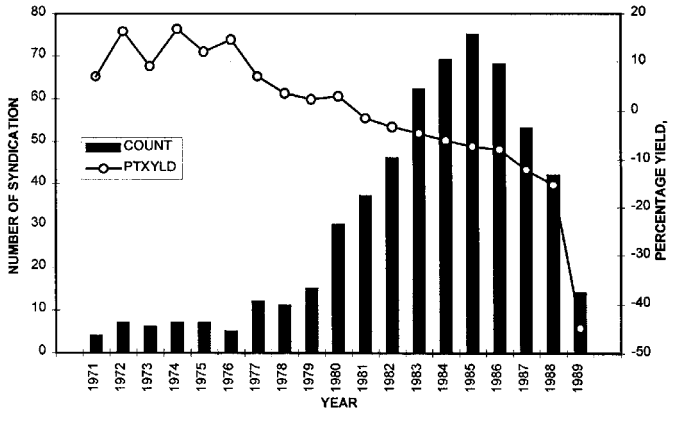
tax IRR, and pre-tax yield. The analysis of syndications produced five equations with dependent performance variables, and two equations for terminal outcome variables.

Table 1		
Terminal Action	Results	Nature of Entry
Continuous	Project is still in operation	As of 1990
Capital Returned	Project is still in operation, however the initial capital investment was returned to the investors	By or Before 1990
Rolled Up	Several projects were reorganized by roll-up	Actual Year Before 1990
Liquidated	Project was ended by parcel distribution, even if an investment loss	Actual Year Before 1990

SYNDICATION ACTIVITIES AND PERFORMANCE OVER 22 YEARS

The real estate project is the basic unit for evaluation in this study. Typically, a real estate project's investment value is based on its cash flow pattern during its operations phase, its tax sheltering capabilities, and its re-sale value and the initial venture capital financing. Each of these components contributes to the investment's overall after-tax rate of return (Haight & Smith, 1987). Using pre-tax yield as a measure of success the following Figure 4 illustrates the steady decline of return over the life of this study.

Figure 4: Annual Pre-Tax Yield and Year of Syndication, n=577

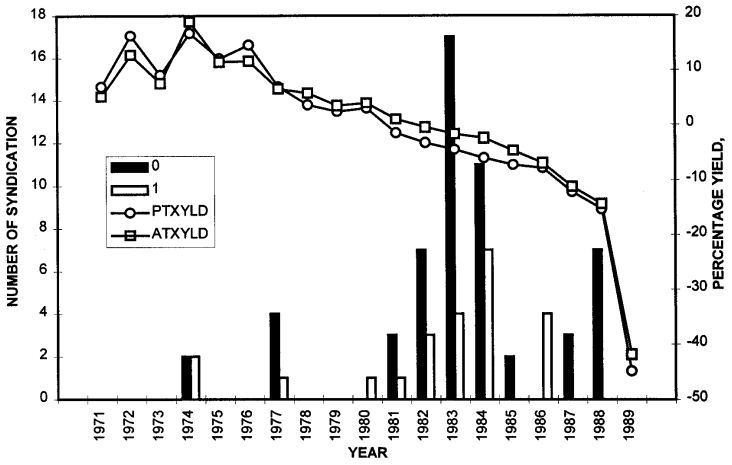


The Pre-Tax Yield was reasonably positive until 1980 when it began a downward trend passing into negative yield around 1981 and continued negative through the end of the study. The

data shows that even with the negative yield the number of syndications continued to grow well into 1985. The pre-tax yield as compared to the number of years that the projects were in syndication indicates that the aggregate number of years in syndication generally follows the same trend as with the number of years that the projects were in original syndication, continuing to grow for approximately 7 years after the yields went negative. This reflects the continued growth in syndications even with a downward turn in yield.

Figure 5 illustrates the trend in successful verses failed syndications and again their was a downward movement in 'successes' verses the failures.

Figure 5: Annual Number of Successful and Failed Projects, n=79



The "0" code in illustrates the number of projects that were "terminated", i.e., rolled-up and liquidated. Roll-ups are those projects that essentially failed and were combined with other similar syndications to form a new entity. The "1" graph represents the number of projects that succeeded, i.e., paid out. Terminations increased as yields fell through 1983. This is the expected result that is entirely logical.

SUMMARY

Our analysis concentrated on the 79 "known" survival projects culminated from the 577 individual syndications where the actual "outcome" is known (identified as Terminal Action Code Revised. The study used cross-correlation regression, extensive graphical analysis, and ANOVA. The step-wise regression analyses provides the following supporting equations.

Terminal Action Code Revised = - 233.116 + 0.161174 (Number of Years in Syndication) + 0.11706 (Year of Syndication)

$R^2 = 0.494; \alpha \leq 0.05$

Terminal Action Code Revised = - 0.39127 + 0.066334 (Number of Years in Syndication) - 0.094387 (Debt-to-Equity Ratio)

$R^2 = 0.32137; \alpha \leq 0.05$

In addition to the results of the regression analysis ANOVA tests confirmed the time series analysis on the survival variable for the n=79 projects. The variables for Number of Years in Syndication and the Year of Entry both were significant in tests. Group ANOVA tests on Debt-To-Equity Ratio, was significant at $\alpha \leq 0.05$ for most variables.

CONCLUSIONS

Several conclusions are clear. Terminal Action Code (TAC) and revised Terminal Action Code (TACR) variables are not tightly constrained as performance outcomes. While "continuous" Terminal Action includes poor performances (TACR=0) many projects classified continuous report finances as bad or worse as those projects that were terminated. It appears a few underwriters brought these TACR=0 projects to conclusion as roll-ups or liquidations, while other underwriters did not bother to do so. As a result, it is not surprising the two TACR prediction equations, while technically accepted, are not impressive.

The lack of industry data, organized for investor evaluation, clearly contributed to syndication marketing long after financial outcomes were certain losses. It is clearly evident most underwriters continued to "sell" projects based upon their tax benefits after 1986 when the projects overall ability to generate a positive yield had passed.

Because of the huge financial losses which occurred, coupled with reliance on underwriters as practically the only source of investment information at the time, litigation against select sponsors is likely. Obviously the data sets developed and utilized in this study are capable of providing financial comparison information for underwriters (Part A) and individual projects (Part B) with precise traces to sponsor identification number and project name. In other words, this study has treated the data sets anonymously, but the data base imposes no such requirements. Sponsor-specific performance and project name-specific financial particulars are easily retrieved.

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THE OPPORTUNITY COST OF E-V OPTIMAL PORTFOLIOS

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ABSTRACT

This paper examines empirical common stock data sets to investigate the opportunity costs of mean - variance optimal portfolios as compared to an investor's direct expected utility maximization. We investigate whether the opportunity cost can be attributed to (1) the investor's utility function, (2) the number of securities included in the data sets, (3) the number of observation used to determine the optimal portfolios, or (4) the investor's preferences for skewness and kurtosis. We have found, that the E-V model provides a very low cost approximation to the actual optimal portfolio. Eighty-one percent of the mean-variance optimal portfolios all the cases have an opportunity cost that equal zero.

INTRODUCTION

Investing has two stages. The first is to determine which assets to invest in and the second is to determine how much should be put in each asset. Markowitz' (1952) developed the Mean - Variance model (hereafter, E-V) portfolio optimization model to solve the second stage. Using this model, investors maximize their portfolio by finding the efficient frontier -- selecting securities with the highest return for the given amount of risk or the lowest risk for the given amount of return.

However, many argue that those who use the E-V model might not be maximizing their utility. Some argue that for E-V to hold one of two conditions must exist: (1) the individual must have a quadratic utility function, or (2) security returns must be normally distributed. The first condition is argued to be invalid because the quadratic utility function possesses undesirable properties, such as increasing absolute risk aversion. The second condition doesn't hold since securities aren't normally distributed.

Though these conditions may not hold, existing evidence shows that the E-V model accurately approximates an investor's optimal portfolio. Evidence from Levy and Markowitz (1979); Pulley (1981 and 1982); Kroll, Levy, and Markowitz (1984); and Tew, Reid, and Witt (1991) shows that E-V performs well, even when the investor's utility function differs from the quadratic. To test how closely the results of the E-V model approximated the direct expected utility maximization model (EUM) results Levy and Markowitz used the correlation coefficient; Pulley developed the Pulley Score; and Kroll, Levy, and Markowitz developed the KLM Index. However, it has been shown that the Pulley Score is not invariant to a linear transformation of the utility function. Also, the Kroll, Levy, and Markowitz Index is not linearly invariant to a transformation of the naive portfolio.

Another method used to find the goodness of fit for the E-V approximation is Simaan's (1986) Opportunity Cost Approach. This method can be explained as follows: suppose an investor has a choice between the free use of the E-V approximation to the optimal portfolio or the use of a costly direct EUM optimal portfolio. Let E(r) equal the return on the EUM portfolio and E(r') equal the E-V portfolio's expected return. Then it follows that the investor will be indifferent between the choice if:

$$E (r - O) = E (r') \qquad (1)$$

where O equals the opportunity cost of the E-V solution. Tew, Reid, and Witt (1989) simulated farm data to find the opportunity cost of an E-V approximation. They found that for 76% of their samples, the opportunity cost equaled zero. In only six percent of the cases did the costs exceed $0.00025 and the highest opportunity cost amounted to $0.04175. They concluded that an E-V approximation adequately represented the actual situation.

The purpose of this research is to provide information on the opportunity cost of E-V optimal common stock portfolios. By examining empirical data, the research investigates whether the opportunity cost can be attributed to (1) the investor's utility function, (2) the number of securities included in the data sets, (3) the number of observations used to determine the optimal portfolios, or (4) the investor's preferences for skewness and kurtosis.

DATA AND METHODOLOGY

As previously mentioned, this paper examines the opportunity cost of the E-V approximation to the direct EUM optimal solution. Thus, for each data set we need to find the EUM optimal portfolio and the E-V approximate solution for each utility function. Direct expected utility maximization will be computed with the use of non-linear mathematical programming. The general form of the model to maximize EU:

$$= SUM (U (SUM r_{jt} \; X_j)) \qquad (2)$$

subject to,

$X, \; a > b$

$X >= 0$

$Sum \; X_j = 1.0$

Where r_{jt} is the daily return of asset j for observation t; X_j is the percentage of available capital devoted to asset j; n is the number of securities from which a portfolio is selected; $U(Sum(rjtX_j))$ is the value of the utility function for the portfolio of assets for observation t where U is the specific utility function; a is a (q * n) matrix of constraint coefficients. This constraint, a budget constraint, requires that all available funds are spent. Thus, the program is put in the return form. Also, b is the q-dimensional column vector of constraint resource levels; x is the n-dimensional column vector of $X_{j,}$, the weight for each asset in the portfolio. Finally, 0 is a n-dimensional column vector of zeros.

Thus the user specifies the right-hand side of the constraint matrix (-1.0), the return matrix, the upper bounds (maximum investment allowed for investment in security j), the lower bounds (the minimum amount to be invested in each security), and the initial starting position.

We will compare the optimal portfolios obtained through direct utility maximization with the optimal portfolios obtained through an E-V approximation. The algorithm used to determine the E-V optimal portfolio involved several steps. First, it used a linear programming subroutine to solve for the top half of the efficient frontier. The second step involves finding the minimum variance for each expected value. Thus, it traced out the E-V efficient frontier by each combination of E and minimized variance. During this search, the program calculated the expected utility of each of the utility functions to see if it had reached a maximum along the frontier. The solution from this second search was determined to be the optimal E-V utility (denoted as E*U).

In both the direct EUM and the E-V approximation we will find the optimal solutions for several different utility functions. We use the same utility functions as the papers by Levy and Markowitz (1979), Pulley (1981), and Kroll, Levy, and Markowitz (1979). They are:

Logarithmic:	$U(TR) = LN(TR)$	*(3)*
Power:	$U(TR) = W^{-a}$	*(4)*
Negative Exponential:	$U(TR) = -e^{-aW}$	*(5)*

where "TR" equals the terminal total return value and "a" equals the risk aversion parameter. We will calculate the risk aversion parameter over the same range as used in the previous studies. As given in Pulley (1981) these ranges for the Power and Negative Exponential functions are:

Power:	$a = .1, .5, .9$
Negative Exponential:	$a = 1, 2, 3, 4, 5$

The objective function for the programming will be from a Taylor's series expansion. To represent investors who consider the mean, variance, skewness, and kurtosis, four forms of the Taylor's series expansion will be used. The first one represents investors who only consider the security's expected return:

$$F(x) = f(x)/0! + (f'(x)/1!)\ (x-x_0) \qquad (6)$$

The second form represents those who consider the expected return and variance:

$$F(x) = f(x)/0! + (f'(x)/1!)\ (x-x_0) + (f''(x)/2!)\ (x-x_0)^2 \qquad (7)$$

The third form adds consideration of skewness:

$$F(x) = f(x)/0! + (f'(x)/1!)\ (x-x_0) + (f''(x)/2!)\ (x-x_0)^2 + (f'''(x)/3!)(\ (x-x_0)^3 \qquad (8)$$

Finally, the last form considers expected return, variance, skewness, and kurtosis:

$$F(x) = f(x)/0! + (f'(x)/1!)\,(x-x_0) + (f''(x)/2!)\,(x-x_0)^2 + (f'''(x)/3!)(x-x_0)^3 + f''''(x)/4!)(x-x_0)^4 \quad (9)$$

Thus, after the user inputs the relative risk aversion level (a) and the initial weights, the procedure checks to find out what the value of the objective function is (it seeks to maximize the investor's utility). Then, through an iterative process, it changes the weight of each security. With each iteration, it calculates what the value of the objective function is, as it tries to find the weights that provide the highest utility to the investor.

In collecting the data we had several considerations. We wanted to examine the issue empirically.. We also wanted to examine whether the number of securities or observations, or the investor's preferences for skewness or kurtosis provides for differences in the opportunity cost. The empirical data sets are taken from the returns of those firms that make up the Standard & Poor's 500 Stock Index. We chose these securities for several reasons: (1) many large institutional investors are restricted to investing in these securities because of size or other constraints such as the Prudent Investor rule, and (2) Since these are among the largest securities (in terms of market value), they are among the most liquid securities. The time period for the data was chosen randomly. We gathered daily returns, including dividends, from Nov. 1987 to Dec. 1988.

To examine if the number of securities makes a difference in the opportunity cost of the E-V approximation, we vary the number of firms in the data sets. Though they have not explicitly explored this issue, other studies such as Burgess and Bey (1988), have also varied the number of firms included in the data set. We randomly selected firms for portfolios of size ten (an amateur portfolio) , twenty, thirty, and forty firms (a small professional portfolio) . Since as many as three portfolios are selected randomly for each size, the portfolios are not necessarily mutually exclusive. We also examine whether the number of observations will matter. To examine this issue, we vary the number of observations for each firm in the portfolio. We will use data sets with 100, 200, and 300 observations. We have chosen these observations for the following reasons. First, as Lau and Wingerter (1989) point out, a problem with calculating skewness and kurtosis is the large sampling errors. With less than a few hundred observations, Lau and Wingerter say, skewness and kurtosis may have misleading and erratic behavior. And, as Ederington (1988) mentions, using a small sample of annual returns may not include any observations from the tails of the distribution. However, by expanding a data set of annual returns (if enough data would be available), Ederington adds there may be a problem in that the distribution has changed from the original one. Thus to get large enough samples from within the same distribution, we have chosen to use daily data. Table 1 shows the number of firms and observations that are used in each of the data sets.

The measurement method to determine the quality of the E-V solution is the opportunity cost approach. For a constant relative risk aversion function, we can directly solve for the opportunity cost. For other utility functions we employ a search routine to find the opportunity cost. The search routine involves specifying the returns for the data set, the E-V and EU portfolio weights for each asset, the utility function, risk aversion level, and initial value for the opportunity cost. The routine calculates and compares the value of EU(R-C) and EU(R'). Then it adjusts the value of C in small increments until the difference between EU(R-C) and EU(R') becomes negligible.

TABLE 1:
Number of Firms and Observations

Data Set	number of firms in portfolio	number of observations
1	10	100
2	10	200
3	10	300
4	20	100
5	20	200
6	20	300
7	30	100
8	30	200
9	30	300
10	40	100
11	40	200
12	40	300

RESULTS

The results show that generally E-V provides a very good approximation of the direct EUM optimal portfolio. Table 2 provides the opportunity costs of the E-V approximation for the data sets. Eighty-one percent of the portfolios have an opportunity cost of zero.

Table 2:
Summary of Opportunity Cost Results

Opportunity Cost				
0.00000	0.00000 to 0.0000025	0.0000025 to 0.00025	greater than 0.00025	Totals
321 (81%)	34 (8%)	6 (2%)	35 (9%)	396 (100%)
Opportunity Cost is per dollar invested.				

Next, we broke the results down to examine whether the investor's utility function would account for any differences in the opportunity costs. As seen in Table 3, the utility function does not make a significant difference in the opportunity cost of the E-V portfolio. Though the results for the negative exponential utility function with a risk parameter of 1, have the lowest percent of cases with an opportunity cost of zero (fifty-nine percent) , it still has a high percentage with an opportunity cost of $0.0000025 or less (eighty-two percent). And all of the other utility functions

have higher percentages of cases with an opportunity cost of $0.0000025 or less (and greater percentage of case with a zero costs).

Table 3:
Summary of Opportunity Cost Results As a Function of Investor's Utility Function

	Opportunity Cost				
Utility Function Negative Exponential	0.00000	0.00000 to 0.0000025	0.0000025 to 0.00025	greater than 0.00025	Totals
1	26 (59%)	10 (23%)	3 (7%)	5 (11%)	44 (100%)
2	30 (68%)	7 (16%)	3 (7%)	4 (9%)	44 (100%)
3	30 (68%)	9 (20%)	0 (0%)	5 (11%)	44 (100%)
4	39 (89%)	1 (2%)	0 (0%)	4 (9%)	44 (100%)
5	41 (93%)	0 (0%)	0 (0%)	3 (7%)	44 (100%)
Power					
.1	40 (91%)	0 (0%)	0 (0%)	4 (9%)	44 (100%)
.5	40 (91%)	0 (0%)	0 (0%)	4 (9%)	44 (100%)
.9	40 (91%)	0 (0%)	0 (0%)	4 (9%)	44 (100%)
Logarithmic	35 (80%)	7 (16%)	0 (0%)	2 (4%)	44 (100%)
Totals	321 (81%)	34 (8%)	6 (2%)	35 (9%)	396 (100%)
Opportunity Cost is per dollar invested.					

Since one criticism of E-V is that it assumes the investor only considers a security's mean and variance, we wanted to see if inclusion of skewness and kurtosis would result in a larger opportunity cost for the E-V optimal portfolio. Table 4 summarizes the opportunity cost results as a function of the number of moments included in the utility function. The results show that the E-V approximations with the fewest cases with a zero opportunity cost are the utility functions that only include the first moment. For the first moment investors, seventy-f our percent of the cases have an opportunity cost of zero. However, eighty-eight percent of the cases for the first moment category have an opportunity cost of $0.0000025 or less per dollar invested, similar to the other categories.

With ten percent of the cases having an opportunity cost more than $0.00025 per dollar invested or more, the utility functions that contain the first three moments have the most cases in the highest cost category. However, the other ninety percent of the cases have opportunity costs of $0.0000025 or less, similar to the other categories. The E-V approximation performs best for the utility functions that include all four moments. In this category, eighty-three percent of the cases have an opportunity cost of zero with an additional nine percent having an opportunity cost of $0.000025 or less.

Table 4:
Summary of Opportunity Cost Results As a Function of Number of Moments Included in Utility Function

	Opportunity Cost				
Number of Moments	0.00000	0.00000 to 0.0000025	0.0000025 to 0.00025	greater than 0.00025	Totals
1	73 (74%)	14 (14%)	5 (5%)	7 (7%)	99 (100%)
2	81 (82%)	8 (8%)	1 (1%)	9 (9%)	99 (100%)
3	83 (84%)	6 (6%)	0 (0%)	10 (10%)	99 (100%)
4	84 (85%)	6 (6%)	0 (0%)	10 (9%)	99 (100%)
Totals	321 (81%)	34 (8%)	6 (2%)	35 (9%)	396 (100%)

Opportunity Cost is per dollar invested.

Table 5 breaks down the results by the number of securities included in the data sets. This table shows there is little difference among the ten, twenty, and forty securities sets. These categories respectively have ninety-six, ninety-five, and one hundred percent of their cases with an opportunity cost of $0.000025 or less. The twenty securities category has ninety-two percent of its cases with an opportunity cost of zero. The forty securities category is close behind with ninety percent of the cases with an opportunity cost of zero. The ten security data set has a total of seventy-nine percent of its cases with an opportunity cost of zero. Though most of the thirty security cases (sixty-six percent) have an opportunity cost of zero, twenty-nine percent of the cases have a cost between zero and $0.00025 per dollar invested. In general, the results show that the E-V model results in a low cost approximation of the investors direct expected utility maximization portfolio at a low cost.

Finally, we examined the empirical results of the opportunity cost as a function of the number of observations. Table 6 summarizes this information. The 200 and 300 observation categories each provide E-V approximations with very low opportunity cost. Respectively, Ninety-seven and ninety-five percent of the cases have an opportunity cost of $0.0000025 or less. Eighty-three percent of the cases for the 200-observation category have an opportunity cost of zero, with just two cases having a cost of $0.00025 or more. For the 300-observation category, ninety-three percent of the cases have a cost of zero, with a single case that has an opportunity cost of $0.00025 or more. The 100-observation category has a majority of cases that have an opportunity cost of zero, sixty-nine percent; however, a greater percentage of cases, sixteen percent, have an opportunity cost of $0.00025 per dollar invested or higher.

Table 5:
Summary of Opportunity Cost Results As a Function of Number of Securities Included in Data Set

	Opportunity Cost				
Number of Securities	0.00000	0.00000 to 0.0000025	0.0000025 to 0.00025	greater than 0.00025	Totals
10	85 (79%)	19 (17%)	0 (0%)	4 (4%)	108 (100%)
20	100 (92%)	3 (3%)	5 (5%)	0 (0%)	108 (100%)
30	71 (66%)	5 (4%)	1 (1%)	31 (29%)	108 (100%)
40	65 (90%)	7 (10%)	0 (0%)	0 (0%)	72 (100%)
Totals	321 (81%)	34 (8%)	6 (2%)	35 (9%)	396 (100%)
Opportunity Cost is per dollar invested.					

Table 6:
Summary of Opportunity Cost Results As a Function of Number of Observations

	Opportunity Cost				
Number of Observations	0.00000	0.00000 to 0.0000025	0.0000025 to 0.00025	greater than 0.00025	Totals
100	100 (69%)	12 (6%)	0 (0%)	32 (16%)	144 (100%)
200	120 (83%)	20 (14%)	2 (1.5%)	2 (1.5%)	144 (100%)
300	101 (93%)	2 (2%)	4 (4%)	1 (1%)	108 (100%)
Totals	321 (81%)	34 (8%)	6 (2%)	35 (9%)	396 (100%)
Opportunity Cost is per dollar invested.					

CONCLUSIONS

We have used the opportunity cost approach to examine common stock portfolios to evaluate how closely the E-V model approximates the direct EUM optimal portfolio. We find that the E-V model provides a very low cost approximation to the actual optimal portfolio. Eighty-four percent of all the cases have an opportunity cost that equal zero.

These results are similar to the results reported by Tew, Reid, and Witt, as well as the other studies using different comparison methods. Thus we conclude that investors can use the E-V model and closely approximate their actual optimal portfolio.

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ACCESSING 401(k) AND 403(b) RETIREMENT ACCOUNTS: LEGAL AGE DISCRIMINATION

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ABSTRACT

While the business world seems increasingly wary of discriminating against different classes of employees, such discrimination remains and, at times, is apparently legal. The provision of 401(k) and 403 (b) retirement benefits is one such instance. Because the law requires that these benefits be offered only to individuals at least 21 years of age, there is clearly age discrimination inherent in the letters of this law. However, in the United States and in the state of Utah, in particular, young women tend to begin work at a younger age than do young men. Thus, this age discrimination translates into legal gender discrimination against women.

INTRODUCTION

Consider a full-time (40 hour per week) employee who has to wait three years to be eligible for the retirement benefits offered by her employer in the form of a 401(k) plan. This period isn't a standard probationary term imposed on all new employees but an example of legal age discrimination. The individual in question is 18 years old; current tax law does not require the employer to extend the same benefits to an 18 year-old as to a 21 year-old employee.

Employers are concerned about the rising costs, both direct and indirect, of labor. Benefits currently account for as much as 40 percent of total compensation costs for each employee. What was considered a "fringe" a decade ago is an "expectation" in today's market. Benefits have grown for several reasons (Cascio, 1995):

▸	Benefits are used to attract, retain, and motivate employees in addition to wages.
▸	Union interest in bargaining over benefits has grown where employers are pushing for more cost sharing by employees.
▸	Internal Revenue Service Code treatment of benefits makes them preferable to wages. Even after the Ominibus Budget reconciliation Act of 1993, many benefits remain nontaxable to the employee and are tax deductible expenses for the employer. With other benefits, taxes are deferred, resulting in an increase in employees' disposable income, since they receive benefits and services that they would otherwise have to purchase with after-tax earnings.

▸	Granting benefits implies "social responsibility" on the part of employers as they take care of employees and on the part of employees as they take care of themselves. In addition, attracting and retaining quality employees by offering benefits packages to employees ultimately benefits the shareholders of the company.

Young employees just entering the workforce are likely to be more concerned with direct pay (e.g. tuition, car, home purchases) than a generous retirement program. Older workers may desire the reverse. Employers that hire large numbers of temporary or part-time workers may offer entirely different benefits than employers who hire predominantly full-time employees. Only about 16.5 percent of firms give part-time employees the same health, retirement, and vacation benefits that full-time employees receive (Cascio, 1995).

The government plays a central role in the design and regulation of any benefit package. While controlling the cost of benefits in a competitive labor market is a major concern of employers, the social and economic welfare of citizens is a major concern of government as evidenced by the *Social Security Act (1935)*, *Federal Unemployment Tax Act (1935)*, state *Workers' Compensation* laws and *Employee Retirement Income Security Act (1974)* (Cascio, 1995).

Many employee benefits are required by law and therefore do not need to be negotiated individually or by a union. Few employees fully understand the difference between statutory and company specific benefits when they are presented at new employee benefits orientations. Some benefit plans, such as supplementary unemployment benefits (SUB), are specifically designed to supplement those required by law so that the employee is guaranteed a greater level of benefit than provided by state or federal law. A few union leaders have expressed opposition to government-imposed benefit programs, such as the Occupational Safety and Health Act (1970), the Pension Reform Act (1974), and the Health Maintenance Organization Act (1973), because the federal government has provided, in effect, to all employees benefits previously negotiated for union employees (Carrell, Elbert, & Hatfield, 1995). Other union opposition has arisen because such federal legislation has taken from union negotiators the ability to bargain for benefits that might be preferable to those provided by government. Thus, benefits that are provided for all restrict negotiators' ability to bargain for specific programs their membership might prefer.

On the other hand, *unemployment insurance*, *Social Security*, *workers' compensation*, and *family leave* represent important government-required benefits that are costly to management. In competitive markets the corporation must signal or communicate both direct and indirect compensation. Providing benefit flexibility allows employees to select those benefits they prefer and also makes them aware of the benefits they are gaining and increases their morale (they feel provided for) as well as their commitment to the organization. The organization, through a superior benefit program, should gain some competitive advantage in the labor market. Many employees, and especially young or first time employees, are unaware of the benefits they are receiving or of the impact of benefits on the labor costs of the employer. If employees have no knowledge of their benefits, there is little reason to believe the organization's benefits program objectives will be attained (Schuler, 1998).

Employment Hiring Scenario

Assume the following three scenarios and "equally qualified applicants":

- a male applicant and female applicant both are hired for the identical position only the male applicant receives benefits
- a white applicant and an Hispanic applicant both are hired for identical positions only the white applicant receives benefits
- a Southern Baptist applicant and a Catholic applicant both are hired for the identical position only the Southern Baptist receives benefits

All three scenarios are potentially legal, though perhaps not "fair." This distribution of benefits are legal if the female, Hispanic, and Catholic applicants are all eighteen years old and the male, white, and Southern Baptist applicants are twenty-one.

THE LAW [Internal Revenue Code of 1986, Section 410(a)]

Named after an obscure section of the IRS code, the 401(k) for corporations and the 403(b) for government and tax exempt organizations are often considered the blue ribbon of retirement plans. These plans allow the investor (employee) to defer taxes on part of his or her salary by contributing to a special account set up by the employer. Employees do not pay taxes on the earnings until the money is withdrawn, usually at retirement. However, the IRS sets minimum age and service conditions. Section 410(a)(1)(A) of the Internal Revenue Code states,

PARTICIPATION.-

(1) MINIMUM AGE AND SERVICE CONDITIONS.-

(A) GENERAL RULE. - A trust shall not constitute a qualified trust under section 401(a) if the plan of which it is a part requires, as a condition of participation in the plan, that an employee complete a period of service with the employer or employers maintaining the plan extending beyond the later of the following dates-

(1) the date on which the employee attains the age of 21; or the date on which he completes 1 year of service.

(2) MAXIMUM AGE CONDITIONS.- A trust shall not constitute a qualified trust under section 401(a) if the plan of which it is a part excludes from participation (on the basis of age) employees who have attained a specified age.

DEFINITION OF YEAR OF SERVICE.-

GENERAL RULE. - For purposes of this subsection, the term "year of service" means a 12-month period during which the employee has not less than 1,000 hours of service. For purposes of this paragraph, computation of any 12-month period shall be made with reference to the date on which the employee's employment commenced, except that, under regulations prescribed by the Secretary of Labor, such computation may be made by reference to the first day of a plan year in the case of an employee who does not complete 1,000 hours of service during the 12-month period beginning on the date his employment commenced.

Effectively, 18 year-old, full-time employees may be legally excluded from participation in 401(k) or 403(b) programs and may be denied company matching funds into these retirement programs. This applies to all employees under the age of 21.

LITERATURE

Compensation Decision

Lewin and Mitchell (1995) note that when employers address decisions on compensation whether direct or indirect, they face four basic problems. First, for jobs for which there are comparable workers outside the firm, they must decide how much to pay relative to the external market. Second, for jobs for which it is difficult to find comparable workers externally, employers must determine pay levels relative to other occupations in the firm. Third, for all jobs a decision must be made concerning the mix of pay versus benefits. A fourth consideration employers must face is compliance with federal, state and local statutes and regulatory restrictions. Where minimum wage or benefit standards are mandated (e.g., minimum wage) employers may choose to exceed the minimum requirement.

While not covered in the original 1938 law, the fourth provision of the *Fair Labor Standards Act* was added as an amendment in 1963. Called the *Equal Pay Act*, this extension prohibits an employer from discriminating (Schuler, 1998):

> *. . . between employees on the basis of sex by paying wages to employees . . . at a rate less than the rate at which he pays wages to employees of the opposite sex . . . for equal work on jobs the performance of which requires equal skill, effort, and responsibility, and which are performed under similar working conditions.*

The act mandates that employees on the same jobs be paid equally, except for differences in seniority, merit, or other conditions unrelated to gender. Direct as well as indirect compensation are included in the term paid equally. Thus, men and women on the same job, other factors being equal, by law must receive the same level of direct and indirect compensation, including retirement benefits.

Economic and Financial Perspective

The labor market differs significantly from financial and commodity markets. There is no single "going" price for labor within a firm or across firms, rather, there is a range of pay rates. These variations reflect such factors as individual workers differences, alternative pay policies followed by employers, and organized labor pressures and bargaining. In addition, the labor market, does not always "clear," meaning that some workers remain unemployed (Lewin & Mitchell, 1995).

In a financial or commodity market, both buyers and sellers, have an incentive to learn the price at which a given asset is trading. Although investors are generally unable to influence a market price, the price information is essential in deciding whether or not to enter into a transaction. If inefficiencies exist in financial markets (e.g., Merck selling for $100 dollars on one exchange and

$120 on another) arbitrageurs will enter, forcing the price to equilibrium. In a labor market, where there is an array of prices, the "18-year-old" employee may be inexperienced in distinguishing the economic implications between the "take-home wage" and "total compensated wage" or the classic differences between "benefit versus wage" dollars.

Economic Considerations and Pensions

Pension plans come in two basic varieties: "defined contribution" and "defined benefit." The latter are associated with larger firms, unionization, and situations in which large employer investments have been made in employees. Under a defined contribution plan, the employer contributes a sum, on behalf of the employee, to a trust fund. The contributed sum is typically fixed by formula and geared to the employee's current wage (e.g., employee voluntary contribution plus an employer match and/or fixed contribution, such as five percent of the wage). When the worker retires or leaves the firm, he or she receives the employee and employer contributions plus whatever has been earned as a return on the investment (Lewin & Mitchell, 1995).

At the time of separation, the funds accumulated under a defined contribution plan can be rolled over into another tax-deferred vehicle (such as an IRA account) by the departing employee or, at retirement age, used to purchase an annuity. Defined contribution plans typically do not have prolonged vesting periods. Often vesting is immediate. The employee can take whatever is in his or her account upon departure from the firm. However, the employee has no guarantee concerning the eventual monthly payment that will be received. Thus, under a defined contribution plan the risk resulting from uncertainty over future market returns and future individual health costs falls to the employee rather than the employer.

In contrast to a "defined contribution" plan, a "defined benefit" plan assumes most or all of the risk. The employee's monthly pension is set by a formula rather than by market considerations. These formulas typically reflect the employee's wage, years of service to the firm, and age. Under the Employee Retirement Income Security Act (1974), the employer is required to put aside sufficient resources to fund future liabilities. The risk assumed by the employer results from the future actual cost of the obligation. This cost depends on the future earnings of the pension fund portfolio and the age composition of the workforce.

In addition, "defined contribution" plans typically do not have prolonged vesting periods; often vesting is immediate. The investment is "portable" in that the employee can take whatever is in his or her account upon departure from the firm (Lewin & Mitchell, 1995). In a "defined contribution" plan each employer contributes in part (in proportion to wages paid) to the retirement of each and every employee.

Equal employment opportunity requirements also affect the administration of benefits with health-care coverage and pensions as prime examples. *The Older Workers Benefit Protection Act of 1990* restored age discrimination protection to employee benefits, after the legality of such protection had been eroded by a 1989 Supreme Court decision (Cascio, 1995).

With regard to pensions, the IRS considers a plan discriminatory unless the employer's contribution for the benefit of lower-paid employees covered by the plan is comparable to contributions for the benefit of higher-paid employees. An example of this is a salary reduction plan

known as a 401(k). The plan permits significant savings out of pretax compensation, produces higher take-home pay, and results in lower Social Security taxes. However, the plan has to be available to full- and part-time employees in any company that implements it. Maximum employee contributions each year ($9600 currently) are indexed to changes in the cost of living. About 60 percent of those eligible, at all income levels, are sheltering part of their earnings in such plans. Currently, 86 percent of employers with 401(k) plans "match" employee contributions, typically at a rate between 50 cents and a dollar for each dollar the employees contributes. In combination, the tax deferral and employer matching features can combine to produce handsome results (Cascio, 1995).

The U.S. Social and Political Perspective

The *Economic Report of the President* for 1998 reports in a section entitled *The Personal Saving Rate*,

> *The personal saving rate has been trending downward since the mid-1980s. According to the preliminary figures current available, the personal saving rate in 1997 was only 3.8 percent, down from 4.3 percent in 1996. Given the exuberant level of consumer sentiment and the large gains in household wealth last year, the fact that there was a modest (the authors would argue that an 11.6 percent decline is more than "modest") decline in the saving rate from 1996 to 1997 is neither surprising nor disturbing: such modest annual fluctuations are of little consequence. The longer term decline in personal saving, however, has aroused considerable concern among academic economists and policy-makers, for at least three reasons. First, because national saving is the sum of personal, business, and government saving, low personal saving has a variety of negative consequences…. Second, the falling saving rate raises questions about whether many American consumers are preparing adequately for their retirement. Finally, families with too little savings may be unprepared to deal successfully with financial emergencies such as a spell of unemployment or large medical expenses.*

In discussing personal saving and retirement the report notes,

> *One of the most obvious reasons for households to save is to provide for a comfortable standard of living in retirement. One way to judge whether personal saving is too low, then is to ask whether consumers appear to be saving enough for retirement. Several recent studies have examined whether the baby-boom generation, in particular, is doing enough retirement saving. One set of studies has concluded that typical bay-boomers need to roughly triple their saving rates if they hope to maintain their living standards in retirement… (The) set of studies begins by calculating the gap between the income that baby-boomers can expect to receive from the combination of Social Security and traditional pensions, and the income that would be required to maintain their preretirement standard of living. These studies than calculate the "target savings rates that baby-boomers would need to achieve to plug that income gap, and show that the savings rates of typical baby-boom households are only about a third of the target rates, leading to a "baby-boom retirement adequacy index" of 33 percent.*

There are differing studies with more optimistic conclusions but the section ends with,

Even the optimists, however, acknowledge that current savings rates of most baby-boom households are not enough to provide much of a cushion against the many uncertainties that they face. In particular, if their retirement savings earn low rates of return, or if rising medical costs or other unexpected expenses increase their spending needs in retirement, or if retirement income from sources other than personal savings falls substantially short of the projections made on the basis of current pension and social insurance programs, then many baby-boomers may end up wishing they had saved much more. And even under optimistic assumptions, it appears likely that unless they boost their saving, most unmarried boomers will reach normal retirement age with insufficient assets to fully maintain their pre-retirement standard of living.

On the whole, therefore, it does appear that unless tier saving rates rise, a very substantial proportion of the baby-boom generation is at risk of reaching retirement are with insufficient assets to maintain their standard of living. One response may be for them to delay retirement. Since Social Security and many other pension benefits are adjusted upward for those who delay retirement, some of the boomers who are not saving enough to retire at the normal retirement age may nevertheless be able to retire in relative comfort several years later. Of course, those who have saved little but whose state of health or line of work prevents them from remaining in the work force may have no choice but to accept significantly lower living standards in their retirement years.

SURVEY ADMINISTRATION

The companies and organizations surveyed were chosen from a list of the 50 largest Utah employers(1997-98 Utah Directory of Business Industry, 1998). The list of organizations was expanded to include 150 organizations by supplementing the list with other Utah employers in similar industries (selected by SIC codes). Employers included public and private corporations, governmental employers and not-for-profit organizations.

A telephone survey was conducted from December 1997 through April 1998, with a 39% response rate. For each organization, the benefits director or benefits officer was interviewed. The following tables summarize the results of the 58 responding organizations.

SURVEY RESULTS

Relevant survey results are summarized below.

Table 1:
Health Insurance Benefits

Characteristic	Number	Percent of Total Respondents
Organizations offering health insurance benefits	57	98%
Organizations not offering health insurance benefits	1	2%
Total respondents	58	100%

Table 2:
401(k) and 403(b) Retirement Plans

Characteristic	Number	Percent of Total Respondents
Organizations offering 401(k) or 403(b) retirement plans	52	90%
Organizations not offering 401(k) or 403(b) retirement plans	4	7%
Organizations for which unions provide all non-health insurance benefits	2	3%
Total respondents	58	100%

In addition to the survey information provided by the benefits officer for each organization, information about the number of employees in each organization is publicly available (1997-98 Utah Directory of Business Industry, 1998). The mean number of employees for the 52 organizations offering 401(k) or 403(b) retirement plans to their employees was 2,062 with a standard error of 2,697. The mean number of employees for companies not offering 401(k) or 403(b) retirement plans to their employees was 912 with a standard error of 992. A test for a difference of means yields a z statistic of .400, which is not significant at any traditional level. This indicates that there is no significant difference in the number of employees of organizations which offer 401(k) / 403(b) retirement plans compared to those, which do not.

Table 3:
Age Contingency of Retirement Plans

Characteristic	Number	Percent of Relevant Respondents
Organizations offering 401(k) or 403(b) retirement plans to employees younger than 21	29	56%
Organizations not offering 401(k) or 403(b) retirement plans to employees younger than 21	23	44%
Total respondents	52	100%

The mean number of employees for organizations offering 401(k) or 403(b) plans to all employees, regardless of age, was 2,093 with a standard error of 2,819. The mean number of employees for companies offering 401(k) or 403(b) plans to employees age 21 and older and not offering the same benefits to employees younger than 21 was 2,023 with a standard error of 2,595. A test for a difference of means yields a z statistic of .018 which is not significant, indicating that the difference in the availability of 401(k) / 403(b) retirement plans for employees younger than 21 is not a function of the size of the organization.

DISCUSSION AND OBSERVATIONS

The data shows that a majority of responding employers provide retirement benefits to all employees, regardless of age, though the irs does not require them to. In contrast to these optional retirement benefits, these same employees pay, and their employers match, social security taxes. Employees earn social security credits (by paying social security taxes) whenever they work in a job covered by social security. In 1997, employees received one social security credit for each $670 of earnings, up to the maximum of four credits per year. In subsequent years, the amount of earnings needed for a credit is indexed to average earnings levels.

A comfortable retirement requires an estimated income of approximately 70% of what an employee earned while working. However, low wage earners receive approximately 60%, average wage earners about 42%, and high wage earners about 26% of pre-retirement income. Social security plays a role in retirement planning, but the employee who wishes a comfortable retirement needs to plan to supplement social security retirement payments. Social security was not originally intended to provide full financial support for retirement; it was intended to supplement the employee's pension, savings, and investments.

The data also indicate for 44 percent of the surveyed organizations which offered 401(k) or 403(b) plans, access to the employer sponsored retirement programs is only available to those employees which current irs code mandated. However, 56 percent of employers voluntarily extend non-mandated retirement benefits to employees under the code-specified age of 21. One possible explanation for this behavior is that employers are taking the equivalent of the "ethical or moral high ground" with respect to their employees. Alternatively, in this situation, private initiative may have preceded governmental intervention and/or regulation. Or a competitive work environment may have provided employers with an incentive to make such benefits available in order to compete for the best talent and to reduce turnover in the labor market. Finally, the expense incurred to differentiate between employees and to modify benefits as under-age employees mature may exceed the savings to organizations of withholding this benefit from the small proportion of their labor force, who typically have the lowest pay levels.

CONCLUSION

where powerful demographic, federal and state fiscal policy, economic and social forces are placing increasingly severe financial and solvency strains on the social security system, employee access to company sponsored retirement plans, regardless of age, is essential. The financial realities of money compounding over long periods of time make it essential that all employees have access to retirement plans and be encouraged to participate and plan for retirement beginning with their first job.

As the united states faces an aging population, fewer workers to support retirees, governmental budget deficits and increasing political pressure for social security reform and/or privatization, there must of necessity be a corresponding shift to more individual responsibility and involvement in retirement planning and saving.

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INTERPRETATIONS OF THE CAPM, DIVERSIFICATION, AND BETA: CLARIFICATIONS

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ABSTRACT

It is now common for finance textbooks to discuss the concepts of the CAPM, diversification benefit, and systematic risk, as measured by beta. The purpose of this paper is to clarify aspects of these concepts and make the textbooks readers aware of them. In particular, this paper seeks to: (1) clarify the notion that "diversification reduces risk," (2) provide geometric expositions and algebraic expressions of portfolio benefits in the context of both total risk and market risk, and (3) improve the interpretation of beta.

INTRODUCTION

It is now common for finance textbooks to discuss the concepts of the CAPM, diversification benefit, and systematic risk, as measured by beta. The purpose of this paper is to clarify aspects of these concepts and make the textbooks readers aware of them. In particular, this paper clarifies the notion of "diversification reduces risk," defines the benchmark portfolio, provides geometric expositions and algebraic expressions of portfolio benefits, and improves the interpretation of beta. This study examines thirty-two finance textbooks supplied by major publishers. The sample consists of: Block-Hirt (2000), Brealey-Myers (2000), Brigham (1995), Brigham-Gapenski (1999), Brigham-Gapenski (1996), Brigham-Houston (1998), Chambers-Lacey (1999), Cooley (1994), Dickerson-Campsey-Brigham (1995), Emery-Finnerty (1997), Gitman (1995), Gitman (1997), Hickman-Hunter-Byrd (1996), Kaen (1995), Keown-Scott-Martin-Petty (1999), Kolb-Rodriguez (1994), Kolb-Rodriguez (1996), Kolb-Rodriguez (1995), Levy-Sarnat (1994), Marsh (1995), Moyer-McGuigan-Kretlow (1998), Peterson (1994), Pinches (1996), Rao (1995), Ross-Westerfield-Jaffe (1999), Ross-Westerfield-Jordan (1999), Ross-Westerfield-Jordan (1995), Van Horne (1998), Van Horne-Wachowicz (1998), Weston-Besley-Brigham (1996), and Weston-Copeland (1992).

The paper first investigates how current textbooks illustrate the notion of diversification. In their illustration, the textbooks show the roles of two factors in the diversification benefit: (i) the number of assets in the portfolio, and (ii) the correlation among assets in the portfolio.

This paper notes that the textbooks, in their illustrations of the role of the number of assets (in the portfolio) in diversification, might seem inconsistent. This is because, on the one hand, they show that as the number of assets in the portfolio increases, the riskiness of the portfolio decreases. On the other hand, they show that portfolio construction might actually increase the riskiness of the portfolio. This study suggests how to eliminate the source of inconsistency. It suggests using the qualifier, "average," when referring to the riskiness of portfolios consisting of a given number of assets. That is, whereas the riskiness of a portfolio may increase as the number of assets in the

portfolio increases, the "average" risk of the portfolios, consisting of a certain number of assets, decreases.

Further shown is that textbooks, in their illustration of the role of correlation (among assets in the portfolio) in diversification, do not explicitly refer to any benchmark portfolios. This paper raises the question: Compared to which portfolio does "diversification reduce risk?" It then defines the proper benchmark portfolio, in the context of both total risk and market risk. It defines the benchmark portfolio as the portfolio with the highest risk. The study then shows how the degree of riskiness of other portfolios can be geometrically and algebraically compared with that of the benchmark portfolio. In this way, the extent of risk reduction, due to portfolio construction, can also be discerned.

Second, the paper examines how current textbooks interpret the concept of beta. It shows that the textbook interpretation of beta might imply that there is an exact linear relationship between the rates of return of the asset, or portfolio of assets, and the market portfolio. The analysis shows the source of such implication and how to eliminate it. It suggests using the qualifier, "average," when referring to the movements of the rate of return of the asset, or portfolio of assets, with respect to the movements of the rate of return of the market portfolio.

In what follows, Section 2 discusses the notion of "diversification reduces risk." This section shows how current textbooks illustrate the benefit of diversification, and how to improve it. It also defines a benchmark portfolio and provides geometric expositions and algebraic expressions of portfolio benefit, in the context of both total risk and market risk. Section 3 shows how current textbooks interpret beta and how to improve it. Section 4 is the conclusion. A table summarizing the findings of the study is provided at the end of the paper.

DIVERSIFICATION REDUCES RISK

This section examines current textbook illustrations of the notion of "diversification reduces risk" and discusses the need for defining the benchmark portfolio. Subsection 2.1 shows how current textbooks illustrate the benefit of diversification, and how to improve it. Subsection 2.2 raises the question: Compared to which portfolio does "diversification reduce risk?" It shows why most current textbooks need to define the benchmark portfolio, and emphasizes that the benchmark portfolio should be defined in the context of both total risk and market, or beta, risk. Current textbooks confine attention to total risk and after introducing beta, they do not discuss how portfolio construction reduces risk compared to the benchmark portfolio. This section also shows how the textbooks might incorporate the geometric expositions and algebraic expressions, for the comparison of the riskiness of the portfolios, with that of the benchmark portfolio.

Illustration of "Diversification Reduces Risk"

In their illustration of the notion of "diversification reduces risk," the textbooks show the roles of two factors in the diversification benefit: (i) the number of assets in the portfolio, and (ii) the correlation among those assets.

This subsection notes that the textbooks, in their illustration of the role of the number of assets (in the portfolio) in diversification, might seem unclear. This causes their implications of the two factors to seem inconsistent.

On the one hand, most current textbooks illustrate the benefit of diversification by referring to Figure 1 (sigma designates the standard deviation of the rate of return of the portfolio, and "n" designates the number of assets in the portfolio.) and stating that: Increasing the number of assets in a portfolio, from 1 to 2 to . . . , decreases the variance of the rate of return.

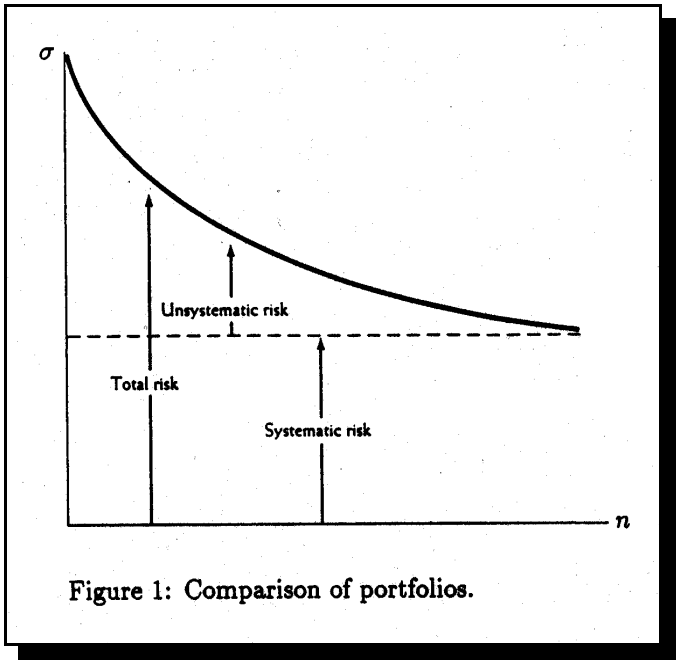

Figure 1: Comparison of portfolios.

On the other hand, most current textbooks, as well, illustrate the benefit of diversification by referring to Figure 2 ("k"designates the expected rate of return on the portfolio.) and stating that: Starting with a single-asset portfolio, "A", and then adding asset "B", results in portfolio P_1, which would have less risk than either assets held alone. This subsection notes that portfolios like P_1 might be riskier than the initial single-asset portfolio, "A".

This subsection states that the two illustrations might seem inconsistent. To see this, compare and contrast the implications of the illustrations in Figure 1 and Figure 2.

According to the textbook illustration in Figure 1, when we start with one asset, i.e., a single-asset portfolio, and increase the number of assets in the portfolio to two, then the risk of the portfolio decreases. However, according to the textbook illustration in Figure 2, when we start with one asset, i.e. a single-asset portfolio "A", and add a second asset, "B", and obtain a portfolio like P_1, then the risk of the portfolio does not necessarily decrease, but might actually increase. In Figure 2, portfolio P_1 is riskier than asset "A".

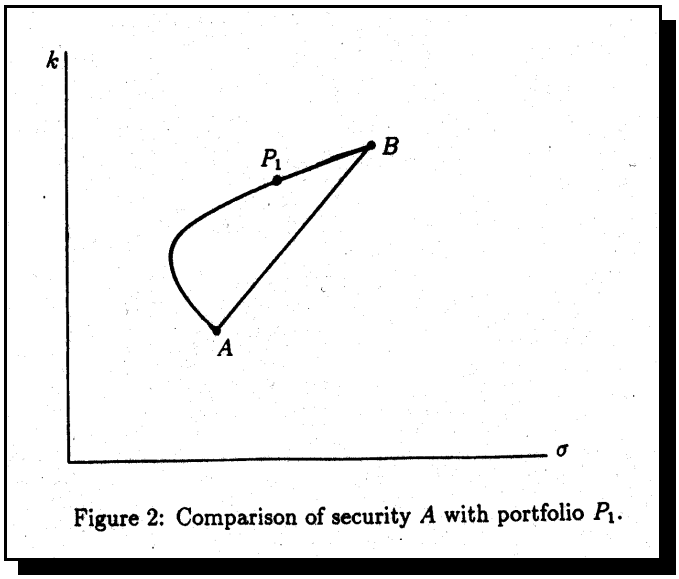

Figure 2: Comparison of security A with portfolio P_1.

Comparing the implications of the illustrations in Figures 1 and 2, we note that they might seem inconsistent. This is because the textbook illustration in Figure 1 states that the risk of the newly constructed portfolio is less than the risk of the initial portfolio, whereas the textbook illustration in Figure 2 states that the risk of the newly constructed portfolio is more than the risk of the initial portfolio.

To eliminate the source of inconsistency, the textbooks should modify their illustration in Figure 1. That is, they should clarify how Figure 1 is obtained. Figure 1 is obtained in four steps. Step one is to construct, for a given number of assets, all equally-weighted and randomly-selected portfolios from among all existing assets. Step two is to measure the standard deviations of these portfolios. Step three is to find the average of the standard deviations. Step four is to plot the average standard deviation against the given number of assets in the portfolio.

In other words, Figure 1 is obtained by plotting the average of the standard deviations, of the rates of return of portfolios, against the number of assets in the portfolio. The average of the standard deviations, for a given number of assets in a portfolio, is obtained over all possible portfolios, from among all existing assets, consisting of equally-weighted and randomly-selected assets. The emphasis, therefore, should be placed on the qualifier: "Average of standard deviations of all portfolios consisting of equally-weighted and randomly-selected assets from among all existing assets," for a given number of assets in the portfolio.

Once the above qualifier is included in the illustration, the source of inconsistency is eliminated. It clarifies that Figure 1 refers to the average of the risk of many portfolios, whereas Figure 2 refers to the risk of one portfolio.

In the above analysis, we started with one asset and then combined it with a second asset to construct a new portfolio. The same analysis applies if we start with a portfolio consisting of any number of assets. In fact, our analysis is independent of the number of assets in the initial portfolio. Among the thirty-two textbooks referenced in this study, no one compares and contrasts the two ways of illustrating the benefit of diversification, and only nine textbooks in passing hint to the way the effect of the number of assets in the portfolio on diversification is technically obtained. They are: Brigham-Gapenski (1999), Brigham-Gapenski (1996), Brigham-Houston (1998), Dickerson-Campsey-Brigham (1995), Kaen (1995), Ross-Westerfield-Jordan (1999), Ross-Westerfield-Jordan (1995), Weston-Besley-Brigham (1996), and Weston-Copeland (1992).

The Benchmark Portfolio

This subsection discusses the need for defining a benchmark portfolio. Subsubsection 2.2.1 starts the discussion in the context of total risk, and Subsubsection 2.2.2 continues the discussion in the context of market, or beta, risk. Both subsubsections show how portfolio construction reduces risk compared to a properly defined benchmark portfolio, and how the benefit can be illustrated geometrically and algebraically.

Total Risk Context (2.2.1): The standard textbook illustration of the notion of "diversification reduces risk" starts with two assets, "A" and "B", in the expected rate of return/standard deviation plane, where "k" is the expected rate of return of the asset, and sigma is the standard deviation of the rate of return of the asset (Figure 3). Then portfolios consisting of these assets (with different portfolio weights and for different values of correlation coefficient between the rates of return of these assets) are constructed and plotted on the same plane (Figure 3). Finally, to demonstrate the benefit of diversification, for a given expected rate of return, e.g. k_1, the textbooks compare standard deviations of portfolios, like P_1 and P_2, and conclude that "diversification reduces risk." The textbooks do not refer to any benchmark portfolios. Consequently, the extent of the benefit of diversification cannot be recognized.

This subsubsection proposes that such a benchmark portfolio should be P_0 (Figure 3), i.e., the portfolio with the highest standard deviation, given the expected rate of return of the portfolio (k_1). P_0 is a portfolio consisting of assets "A" and "B" with the same portfolio weights as in portfolios P_1 and P_2. However, P_0 obtains only when the correlation coefficient, between the rates of return of assets "A" and "B", is at its maximum, i.e., it is +1. To see this, recall the definition of the standard deviation of the portfolio:

$$(\text{Sigma}_{A,B})^2 = (\text{Sigma}_A)^2 + (\text{Sigma}_B)^2 + 2(\text{Rho}_{A,B})(\text{Sigma}_A)(\text{Sigma}_B)$$

where "rho" is the correlation coefficient. The standard deviation of the portfolio is at its maximum when the correlation coefficient is at its maximum, i.e., rho = 1, and other parameters are held constant (Recall that -1 < rho < +1).

Portfolio P_0 is the appropriate choice for the benchmark because it consists of perfectly correlated assets and has the highest standard deviation. Any other portfolio, such as P_1 or P_2, has

a lower standard deviation, showing that "diversification reduces risk." That is, it is with reference to portfolio P_0 that the textbooks should illustrate the benefit of diversification. However, the textbooks illustrate the benefit of diversification without explicit definition of this portfolio.

This subsubsection implies that "diversification reduces risk" should not be illustrated and used in the abstract and in the vacuum. The expression has to be used with reference to some benchmark portfolio. The benchmark portfolio should be the portfolio constructed with the same weights as the one under consideration, but consisting of perfectly correlated assets.

This subsubsection recommends that we should use some qualifier with the expression "diversification reduces risk." The qualifier should reflect the benchmark portfolio. Namely, "diversification reduces the risk of a portfolio compared to a similarly weighted portfolio, but consisting of perfectly correlated assets." Its corollary is "diversification reduces the risk of a portfolio consisting of assets not having perfect correlation with each other." This expression clarifies that "diversification reduces risk" is not a universal phenomenon. It applies only to assets that are not perfectly correlated. It does not apply to assets that are perfectly correlated.

Once the benchmark portfolio, such as P_0, is defined, all other similarly weighted portfolios, such as P_1 and P_2, can be compared with it. In this way, a ranking of portfolios, in terms of their degrees of riskiness, can be obtained. For example, P_2 is riskier than P_1.

Among the thirty-two referenced textbooks, only ten very briefly and implicitly refer to the benchmark portfolio. They are: Brigham-Houston (1998), Dickerson-Campsey-Brigham (1995), Hickman-Hunter-Byrd (1996), Marsh (1995), Moyer-McGuigan-Kretlow (1998), Peterson (1994), Rao (1995), Ross-Westerfield-Jaffe (1999), Van Horne (1998), and Weston-Besley-Brigham (1996).

Market Risk Context (2.2.2): After introducing the security market line and the market, or beta, risk, textbooks do not discuss how portfolio construction reduces risk. This subsubsection shows how such discussion can enhance understanding and completeness of the notion of risk reduction.

Consider assets "A" and "B" in the expected rate of return/beta plane, with beta for asset "A" is less than the beta for asset "B", and the security market line, SML (Figure 4). Portfolio P_1, which consists of assets "A" and "B", has a market, or beta, risk which is the weighted average of the betas of assets "A" and "B". Portfolio P_1 is riskier than asset "A", but is less risky than asset "B". Again, there is a need for defining a benchmark portfolio in order to recognize the extent of risk reduction due to portfolio construction, and to compare and rank market, or beta, risks of portfolios like P_1.

This subsubsection proposes that the proper benchmark portfolio is P_0 (Figure 4), a portfolio coinciding with asset "B", the asset with the highest (Our analysis started with assets "A" and "B". We could have started our analysis with portfolios "A" and "B", without any loss.) beta. P_0 is a portfolio consisting of assets "A" and "B" with the same portfolio weights as in portfolio P_1. However, P_0 obtains only when the betas of assets "A" and "B" are at their maximums. (In Subsubsection 2.2.1, we have a parallel situation. We have: P_0 is a portfolio consisting of assets "A" and "B" with the same portfolio weights as in portfolios P_1 and P_2. However, P_0 obtains only when the correlation coefficient between the rates of return of assets "A" and "B" is at its maximum.) To see this, recall the definition of the beta of the portfolio:

$$(Beta_{A,B}) = w_A (Beta_A) + w_B (Beta_B)$$

where "w" is the weight of the asset in the portfolio. The beta of the portfolio is at its maximum value when the betas of assets "A" and "B" are at their maximums, and other parameters are held constant.

Portfolio P_0 is the proper choice for the benchmark portfolio because it has the highest market, or beta, risk compared with any other portfolio consisting of assets "A" and "B" (The assumption here is that short sales are not allowed.). For instance, P_1 has a lower beta than P_0, showing portfolio construction reduces risk. That is, it is with reference to portfolio P_0 that we should illustrate the effect of portfolio construction.

This subsubsection implies that "portfolio construction reduces risk" should not be illustrated and used in the abstract and in the vacuum. It has to be used with reference to some benchmark portfolio. The benchmark portfolio should be the portfolio constructed with the same weights as the one under consideration, but consisting of assets with the highest beta (Our analysis started with assets "A" and "B". We could have started our analysis with portfolios "A" and "B", without any loss.).

This subsubsection recommends that we should use some qualifier with the expression "portfolio construction reduces risk." The qualifier should reflect the benchmark portfolio. Namely, "portfolio construction reduces the risk of the portfolio, compared to a similarly weighted portfolio, but consisting of assets with the highest beta." In other words, "portfolio construction reduces the risk of the portfolio compared to a similarly weighted portfolio, but consisting of assets with the highest covariance with the market." Its corollary is "portfolio construction reduces the market risk of a portfolio consisting of assets not having the highest covariance with the market." This expression clarifies that "portfolio construction reduces risk" is not a universal phenomenon. It applies only to assets that do not have equal covariances with the market. It does not apply to assets that have equal covariances with the market (Note that the same role that "correlation coefficient between the assets" played in Subsubsection 2.2.1 is now played by "covariance of the assets with the market" in Subsubsection 2.2.2.).

Once the benchmark portfolio is defined, portfolio P_1, and all other similarly weighted portfolios, can be compared with it. For instance, in Figure 4, an increase in the beta of asset "A", i.e., an increase in its covariance with the market, results in asset "A" to move closer to asset "B". Then, portfolio P_2 (consisting of these assets and holding the weights constant as in portfolio P_1) moves closer to portfolio P_0, making the portfolio riskier (This analysis is parallel to the analysis in Subsubsection 2.2.1 where we hold the weights constant, but increase the "correlation coefficient" between the assets. By doing that, in Subsubsection 2.2.1, we move from portfolio P_2 to portfolio P_1 and to portfolio P_0 in Figure 3. That is, we move to riskier portfolios. Now, in this subsubsection, we hold the weights constant and increase the "covariance" of asset "A" with the market. We then move from portfolio P_1 towards portfolio P_0. In other words, we move to a riskier portfolio.). In this way, a ranking of portfolios, in terms of their degrees of riskiness, can be obtained. For example, P_2 is riskier than P_1.

Among the thirty-two textbooks referenced in this study, no one defines a benchmark portfolio, nor do they discuss the benefit of portfolio construction in the market risk context.

To sum up, Subsubsections 2.2.1 and 2.2.2 define benchmark portfolios. These should be used to illustrate the extent of portfolio construction benefits and to compare the degrees of riskiness of similarly weighted portfolios.

Subsubsection 2.2.1 defines the benchmark portfolio in the total risk context. The benchmark portfolio is obtained with the same weights as the one under consideration, but when the assets are perfectly correlated. In other words, they have the highest correlation with each other.
Subsubsection 2.2.2 defines the benchmark portfolio in market, or beta, risk context. It is obtained with the same weights as the one under consideration, but when the assets have the highest covariance with the market.

It is interesting to unify the definitions of benchmark portfolios as offered in Subsubsections 2.2.1 and 2.2.2. Given the weights of the assets in the portfolio under consideration, in the total risk context, the benchmark portfolio obtains when "assets have the highest correlation with each other." Likewise, in market risk context, the benchmark portfolio obtains when "assets have the highest covariance with the market."

Without any loss, this unifying approach is also applicable to portfolios of assets, i.e., in the above analyses one can substitute "portfolios" for "assets."

A SUGGESTION FOR THE INTERPRETATION OF BETA

This section shows how most current textbooks interpret the concept of beta, and how to improve it. When interpreting beta, most current textbooks state: If the beta of asset "A" is equal to 0.5, it means that when the market moves up by 10 percent, then asset "A" moves up by 5 percent, and when the market moves down by 10 percent, then asset "A" moves down by 5 percent. Similarly, if the beta of asset "B" is 2, it means that when the market moves up by 10 percent, then asset "B" moves up by 20 percent, and when the market moves down by 10 percent, then asset "B" moves down by 20 percent. This section shows that, in general, this interpretation is incorrect and illustrates how to correct it.

The textbook interpretation of beta implies that there is a linear relationship between asset "A" and the market, and that asset "A" is perfectly correlated with the market. The following theorem establishes the proof.

Theorem: For random variables "X" and "Y" if [(Partial X)/(Partial Y)] = Beta then: i. There exists a linear relationship between "X" and "Y", and ii. "X" and "Y" are perfectly correlated.
Proof: To prove part (i), take the integral of both sides of the equation given in the theorem and obtain: X = (Alpha) + (Beta)Y. This completes the proof of part (i).

To prove part (ii), recall the definition of correlation coefficient, derive expressions for terms in the definition, substitute them in the definition, and complete the proof.

To see this, recall the definition of correlation coefficient:

(Rho) = [($COV_{X,Y}$)/($Sigma_X$)($Sigma_Y$)]. Now, derive expressions for $Sigma_X$ and $COV_{X,Y}$. From the linear relationship in part (i) obtain: $(Sigma_X)^2 = (Beta)^2 (Sigma_Y)^2$ and $(COV_{X,Y}) = (Beta)(Sigma_Y)^2$. Substitute these expressions in the definition of correlation coefficient and obtain: Rho = 1, i.e., perfect correlation. This completes the proof of part (ii).

According to part (i) of the theorem, the textbook interpretation of beta implies that asset "A" and the market stand in an exact linear relationship with respect to each other. In general, this is not true, as assets move around their linear regression line with the market (Figure 5). More precisely, the linear regression line is expressed as: A = (Alpha) + (Beta)M, where "M" is the market portfolio. The actual values for asset "A" are scattered around this regression line, rather than falling exactly on it. In fact, the actual values for asset "A" are represented by the following extension of the formula for the regression line:, A = (Alpha) + (Beta)M + e, where "e" represents deviations of actual values for asset "A" from the regression line: A = (Alpha) + (Beta)M.

The above paragraph points to the ways that textbook interpretation of beta can be improved. Recall that the regression line between "A" and "M" shows the trend, or average relationship, between "A" and "M". That is, the regression line shows how, on average, asset "A" moves with respect to the market portfolio, "M". The regression line does not show the exact relationship between "A" and "M", but the average relationship between "A" and "M". Recall also that the slope of the regression line represents how, on average, asset "A" moves with respect to movements in "M". Note that the slope of the regression line is beta. So, beta shows average movements of "A" with respect to movements of "M". That is, when $Beta_A = 0.5$, then if the market moves up by 10 percent, asset "A", "on average," moves up by 5 percent, and if the market moves down by 10 percent, asset "A", "on average," moves down by 5 percent. Similarly, when $Beta_B = 2$, then if the market moves up by 10 percent, asset "B", "on average," moves up by 20 percent, and if the market moves down by 10 percent, asset "B", "on average," moves down by 20 percent. It is the qualification "on average" which improves the textbook interpretation of beta.

According to part (ii) of the theorem, the textbook interpretation of beta implies that asset "A" is perfectly correlated with the market. As it was mentioned at the beginning of this section, according to the textbook illustration, movements in the market and asset "A" are exactly in unison. However, in general, assets do not move exactly in unison with the market. Assets move more or less with the market. Recall the formula definition of beta: $(Beta) = [(COV_{A,M})/(Sigma_M)^2]$. That is, beta is a standardized covariance between "A" and "M". Covariance, in turn, shows the "average" movements of random variables with respect to each other. $COV_{A,M}$ shows the "average" movement of asset "A" with respect to the movement of the market, "M". This "average" relationship should be contrasted with the "exact" relationship implied by the perfect correlation interpretation of the textbooks. Again, it is the qualifier "average" which improves the textbook interpretation of beta. Among the thirty-two textbooks referenced, only eleven very briefly interpret beta in this way. They are: Brealey-Myers (2000), Chambers-Lacey (1999), Keown-Scott-Martin-Petty (1999), Kolb-Rodriguez (1994), Kolb-Rodriguez (1996), Kolb-Rodriguez (1995), Marsh (1995), Peterson (1994), Pinches (1996), Schall-Haley (1991), and Van Horne-Wachowicz (1998).

CONCLUSION

This paper first showed that the current textbook illustration of the notion of "diversification reduces risk" might seem inconsistent. It demonstrated how to improve the illustration by using the qualifier "average standard deviation." This study then raised the question: Compared to which portfolio does "diversification reduce risk?" It defined the benchmark portfolio in the context of total risk and market, or beta, risk. It was shown that "diversification reduces risk" is not universal and that it can be made universal by using a qualifier. Namely, "diversification reduces risk of otherwise perfectly correlated assets." The research also showed how most current textbooks interpret beta and how to improve it by using a qualifier. That is, beta shows how, on "average," an asset moves with respect to the movements in the market portfolio.

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Summary of Textbook Illustrations					
Textbooks	Diversification Reduces Risk (1)				Beta (2)
	Risk Reduces (3)	As No. Adds (4)	Benchmark Portfolio (5)		Average Is Used (6)
			Total Risk (7)	Market Risk (8)	
Block-Hirt	yes	no	no	no	no
Brealey-Myers	yes	no	no	no	yes
Brigham	yes	no	no	no	no
Brigham-Gapenski (1)	yes	yes	no	no	no
Brigham-Gapenski (2)	yes	yes	no	no	no
Brigham-Houston	yes	yes	yes	no	no
Chambers-Lacey	yes	no	no	no	yes
Cooley	yes	no	no	no	no
Dickerson-Camsy-Brigham	yes	yes	yes	no	no
Emery-Finnerty	yes	no	no	no	no
Gitman (1)	yes	no	no	no	no
Gitman (2)	yes	no	no	no	no
Hickman-Hunter-Byrd	yes	no	yes	no	no
Kaen	yes	yes	no	no	no
Keown-scott-Martin-Petty	yes	no	no	no	yes
Kolb-Rodriguez (1)	yes	no	no	no	yes
Kolb-Rodriguez (2)	yes	no	no	no	yes
Kolb-Rodriguez (3)	yes	no	no	no	yes
Levy-Sarnat	yes	no	no	no	no
Marsh	yes	no	yes	no	yes
Moyer-McGuigan-Kretlow	yes	no	yes	no	no
Peterson	yes	no	yes	no	yes
Pinches	yes	no	no	no	yes
Rao	yes	no	yes	no	no
Ross-Westerfield-Jaffe	yes	no	yes	no	no
Ross-Westerfield-Jordan (1)	yes	yes	no	no	no

Summary of Textbook Illustrations

Textbooks	Diversification Reduces Risk (1)				Beta (2)
	Risk Reduces (3)	As No. Adds (4)	Benchmark Portfolio (5)		Average Is Used (6)
			Total Risk (7)	Market Risk (8)	
Ross-Westerfield-Jordan (2)	yes	yes	no	no	no
Schall-Haley	yes	no	no	no	yes
Van Horne	yes	no	yes	no	no
Van Horne-Wachowicz	yes	no	no	no	yes
Weston-Besley-Brigham	yes	yes	yes	no	no
Weston-Copeland	yes	yes	no	no	no

1 This heading refers to Section 2 of the paper where the textbook discussion of diversification is examined.
2 This heading refers to Section 3 of the paper where the textbook discussion of beta is examined.
3 This subheading refers to the initial discussion in Section 2 of the paper where the notion of diversification reduces risk is discussed. A "yes" in this column indicates that the textbook discusses this notion.
4 This subheading refers to Subsection 2.1 of the paper where the textbook illustration of the role of the number of assets in the portfolio is examined. A "yes" in this column indicates that the textbook properly explains this effect.
5 This subheading refers to Subsection 2.2 of the paper where the textbook illustration of the role of the correlation among the assets in the portfolio and the proper introduction of the benchmark portfolio are examined. The details of the examination are reported in its two columns, namely, "total risk" and "market risk."
6 This subheading refers to Section 3 of the paper where the textbook explanation of beta as an average phenomenon is examined. A "yes" in this column indicates that the textbook discusses such a phenomenon.
7 This subsubheading refers to Subsubsection 2.2.1 of the paper where the definition of the benchmark portfolio in the total risk context is illustrated. A "yes" in this column indicates that the textbook briefly refers to such a portfolio.
8 This subbusheading refers to Subsubsection 2.2.2 of the paper where the definition of the benchmark portfolio in the market risk context is examined. A "yes" in this column indicates that the textbook refers to such a portfolio.

INTERNATIONAL DIVERSIFICATION WITH MARKET INDEXES

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ABSTRACT

This study examines the development of the optimum investment portfolio utilizing the major stock market index from each of the Group of Seven (G-7) industrialized countries. Results of the study based on data from the 1990s, demonstrate that international diversification may not provide the risk reduction benefits so often reported in the literature and university texts.

INTRODUCTION

International investing is widely recognized as a means to enhance the diversification of portfolios. Investing internationally should reduce the risk (volatility of returns) associated with a portfolio of securities, and, might also increase returns. Much academic research has focused on the risk reduction advantages of international diversification resulting from the theoretical ability of an investor to reduce risk (both systematic and unsystematic) with little or no negative impact on return (modern portfolio theory). The accomplishment of this objective has developed into one of the major goals of portfolio management.

The conventional wisdom in investment strategy encourages investors to diversify internationally to take advantage of the fact that there is less than perfect positive correlation between the financial markets in the United States and the financial markets in other countries. As a result losses in the domestic market may be offset by gains in foreign financial markets which have a low correlation to the financial markets in the U.S. In other words investors hope international investments do well when the U.S. components of the portfolio do not. But do U.S. investors really receive the significant risk reductions they are seeking when they follow the advice to invest internationally? When an investor adds an international asset class to a portfolio's asset allocation, is there really a meaningful reduction in risk or is there an improvement in return?

REVIEW OF THE LITERATURE

Across the last quarter of a century, the academic literature has expounded on the merits of international investing as a component of an overall investment strategy. Solnik (1974) argues the "primary motivation in holding a portfolio of stocks is to reduce risk," and he demonstrates that the systematic risk in a portfolio can be lowered with the use of international diversification. Solnik

concludes that "an internationally well-diversified portfolio would be ... half as risky as a portfolio of U.S. stocks..."

Solnik has not been alone in arguing that international investing reduces risk. According to Black and Litterman (1991), the efficient frontier of portfolios shows less risk for each level of return when international investments are included in the opportunity set. Their conclusion is that international investing does reduce the level of risk beyond investing solely in a United States portfolio. Alternatively, Michaud, Bergstrom, Frashure, and Wolahan (1996) focus on both return and risk and conclude, "international diversification increases return per unit of risk relative to a comparable U.S.-only portfolio."

While many studies have historically argued for international diversification, dissenting views have occasionally emerged. Speidell and Sappenfield (1992) express concern that as economies and global events tie together a shrinking world, the benefits of international diversification between major markets may be fading away. They see evidence that the market indexes for the major world economies are becoming increasingly correlated. Sinquefield (1996) comes to a conclusion similar to Speidell and Sappenfield and suggests that actively managed emerging market portfolios may provide greater potential for diversification than does investment in developed markets. He questions if it is even still correct to use the Europe Australia Far East index (EAFE) and other major indexes to diversify an S&P 500 portfolio. Aiello and Chieffe (1999) find that international index funds fail to deliver a high level of diversification. Similarly, Most (1999) indicates that it is difficult to find the desired diversification benefits in developed international markets.

Erb, Harvey and Viskanta (1994) find that correlation coefficients appear to increase between equity markets during recessions (just when investors would want low correlation coefficients). Shawnky, Kuenzel and Mikhail (1997) report that correlation coefficients between markets appear to increase during periods of increased market volatility. Although Solnik, Boucrelle, and Le Fur (SBL) (1996) find that long-term correlations between markets have not risen significantly, they do find that the financial markets exhibit "correlation increases in periods of high market volatility." Michaud, Bergstrom, Frashure, and Wolahan (1996), like SBL, find that the major market indexes have not experienced increased correlation coefficients.

Melton (1996) shows that pension funds in other countries routinely have greater international allocations than U.S. pension funds do. But, Gorman (1998) shows that U.S. pension plans are moving in the direction of including international investments in their asset allocations. Thus, the proponents of international investing, for its diversification benefits, have swayed many pension fund managers in other countries and appear to be swaying U.S. pension fund managers. Yet, the question still remains "How should international investment be handled?"

METHODOLOGY

The study reported here analyzes the risk and return implications for a hypothetical United States investor who chooses to diversify his portfolio's asset allocation with an international equity component. The study utilizes the primary equity market indexes of the U.S. and the other G-7 countries to construct an efficient frontier of portfolios. Those other six nations were Canada, the

United Kingdom, France, Germany, Italy, and Japan. Data to describe each of the seven markets is based on monthly prices and exchange rates during the 1990s. The data is used to determine or create the efficient frontier of portfolios for an U.S.-based investor who sought to combine the S&P 500 index with an investment in one or more of the market indexes from the other G-7 industrialized nations.

Using data that have been adjusted for exchange rates, geometric mean returns and standard deviations are computed from the monthly return data for each of the seven indexes. These computed values provide a basic risk-return comparison of the seven markets. Correlation coefficients are also calculated to ascertain the relationship between each foreign market index and the S&P 500. The dollar-adjusted variables are then utilized in the analysis to determine the efficient frontier.

Seeking the minimum standard deviation portfolio for each of a variety of return levels develops an efficient frontier. As an additional portfolio, the minimum standard deviation portfolio is also ascertained. For each new portfolio constructed in this process, the portfolio return, standard deviation, and coefficient of variation are reported.

DATA

The particular market indexes under study in this research are the S&P 500, the Toronto Stock Exchange (TSE) 300 Composite Index, the Financial Times Index of London, the Paris CAC 40, the Frankfurt DAX, the Milan MlBtel, and the Tokyo Nikkei 225. This study utilizes the 121 months of monthly equity market data from January 1990, through January 2000. Monthly observations for the S&P 500 and the six foreign indexes are obtained from the first joint trading day of each month, as reported in *The Wall Street Journal*. Exchange rate data are also collected for the same trading day as the stock index observations, and are used to convert market return data to United States dollar equivalent returns.

While the data used in this study were monthly data, the results have been converted to an annualized basis for readability.

FINDINGS

The geometric mean return and standard deviation of returns for each of the seven markets are presented in Table 1. As observed in the table, the U.S. index clearly dominates the other indexes in this table. The U.S. market enjoys the highest geometric mean rate of return, and is also the most stable (i.e., has the smallest standard deviation of returns) across this ten-year (121-month) period. The data show the Frankfurt DAX has the closest comparable dollar-adjusted rate of return, but this index has a standard deviation of returns that is over half again larger than that of the S&P 500. The standard deviation of returns for the Toronto 300 was the second smallest one in this period, but the dollar-adjusted rate of return in the Canadian market index was only slightly above one-third of that experienced by the S&P 500. The S&P 500 index also had the lowest coefficient of variation for this period of study. This indicates that it has the lowest amount of risk relative to return.

TABLE 1
Rates of return, standard deviations, and coefficients of variation
All values stated as percentages

Market	Annual Geometric Mean Return	Standard Deviation of Returns	Coefficient of Variation
S&P 500	14.79	12.10	0.818
Toronto	5.08	16.37	3.222
London	10.55	21.43	2.031
Paris	9.85	19.16	1.945
Frankfurt	12.36	18.45	1.493
Milan	5.72	28.93	5.058
Tokyo	-3.63	29.43	-8.107

Adjusted to U.S. dollars, the implications of investing $10,000 in each of these markets is illustrated in Figure 1. As is clear from this figure, an investor investing in either the S&P 500 or Frankfurt DAX would have more than tripled these invested funds across this ten-year (121-month) period. Investing in the London index would have produced nearly identical results with investing in the Paris index as the funds in each more than doubled during this period. At the lower extreme, almost a third of the funds invested in the Tokyo index would have been lost.

Figure 1

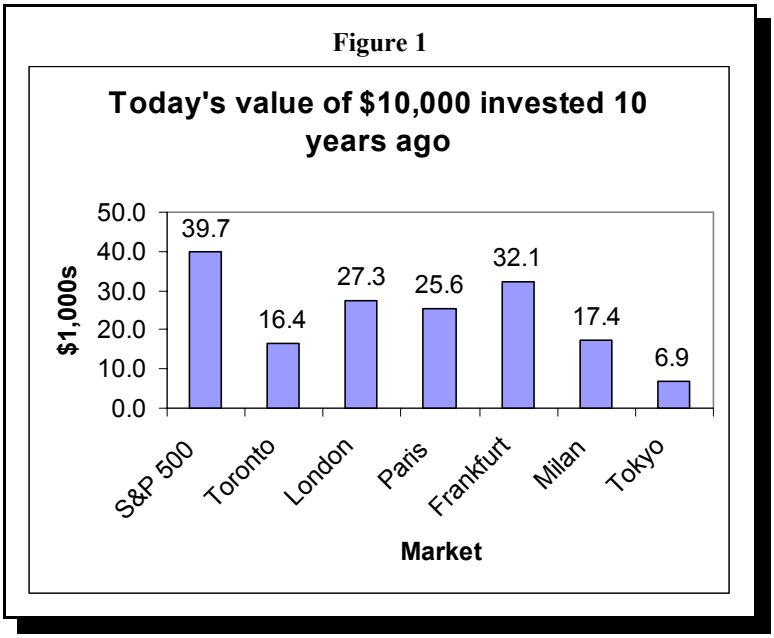


Table 2 reports the correlation coefficients between returns in each of the seven markets. All correlation coefficients are positive, indicating a clearly positive relationship between the returns over this period in the seven financial markets. Correlation to the United States market is highest with the Toronto exchange and lowest with the Tokyo and Milan indexes. All other things being equal, we would expect the low correlation coefficients to indicate that the Tokyo and Milan indexes would be the best indexes for diversification purposes for an U.S. investor.

TABLE 2
Correlation coefficients between indexes

	S&P 500	Toronto	London	Paris	Frank.	Milan	Tokyo
S&P 500	1						
Toronto	0.6866	1					
London	0.4023	0.3777	1				
Paris	0.5762	0.4524	0.4320	1			
Frank.	0.5274	0.4739	0.3632	0.7264	1		
Milan	0.2783	0.3311	0.3140	0.3580	0.3872	1	
Tokyo	0.3501	0.2983	0.2876	0.3674	0.2618	0.2526	1

Utilizing the data from these seven markets, potential minimum variance portfolios were developed for several possible rates of return. This was accomplished by including all seven indexes in the hypothetical portfolio, and then minimizing the standard deviation of the portfolio. Minimization of the standard deviation of the portfolio was performed subject to two constraints. First the portfolio must earn the highest rate of return. Second the weighting of the indexes must sum to one and no index could be allowed to have negative weighting.

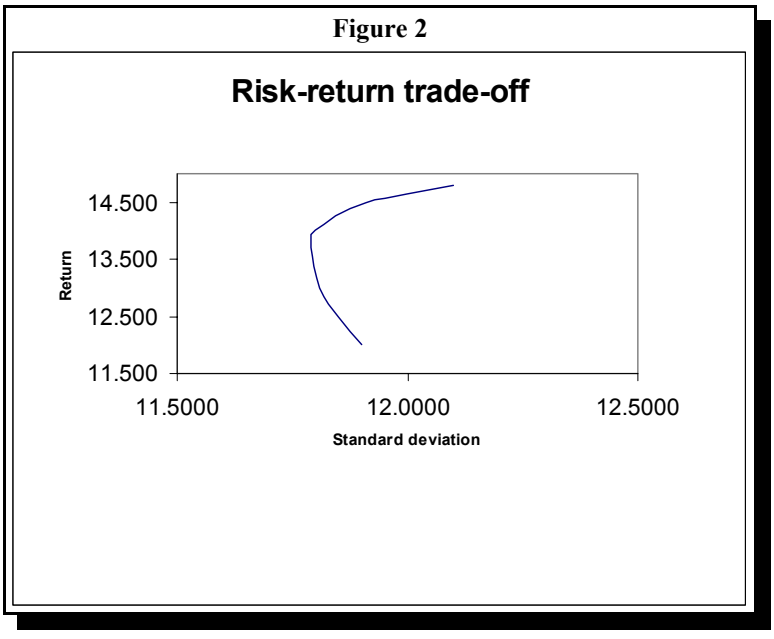
In modern portfolio theory one ascertains the desired rate of return and utilizes it as one of the constraints in seeking the optimum portfolio. Therefore the choice of a desired rate of return becomes a key component in optimizing the portfolio. As one moves down the relevant portion of the efficient frontier, there is an expected trade-off between return and risk. Each successive portfolio on the frontier represents both lower returns and lower levels of risk.

Table 3 presents the returns, standard deviations, and coefficients of variation for several possible combinations of the United States S&P 500 and other market indexes. Figure 2 is a graphical representation of this table. These portfolios are the minimum volatility portfolios for each rate of return listed in the table. The weight of the United States component varies in each portfolio from a 100 percent United States component to only 63 percent, with the weight of each of the other indexes also being varied as required.

TABLE 3
Efficient Frontier Portfolios
All values stated as percentages

Portfolios			Weight of each index in frontier portfolios						
Annual Return	Annual Standard Deviation	Coefficient of Variation	S&P 500	Toronto	London	Paris	Frankfurt	Milan	Tokyo
14.79	12.10	0.818	100.0	0	0	0	0	0	0
14.5	11.91	0.821	87.3	0	6.1	0	6.6	0	0
14.0	11.80	0.843	80.4	0.9	7.9	0	7.2	3.3	0.4
13.7	11.79	0.861	79.6	1.1	8.0	0	7.2	3.4	0.8
13.5	11.80	0.874	76.2	4.0	7.9	0	6.9	3.4	1.6
13.0	11.81	0.908	71.9	7.3	7.8	0	6.6	3.6	2.8
12.5	11.85	0.948	67.8	10.6	7.7	0	6.1	3.9	3.9
12.0	11.90	1.071	63.4	13.9	7.6	0	6.1	4.0	5.1

Figure 2



While there is an efficient frontier present in Figure 2, it is quite short. The portfolio with the highest return consisted of only the S&P 500 Index and had an average rate of return of 14.79 percent and a standard deviation of 12.10 percent. The minimum variance portfolio had an average

rate of return of 13.70 percent and a standard deviation of 11.79 percent. Thus, the range of returns was only 1.07 percent and the range of standard deviations was only 0.31 percent. This historical efficient frontier was indeed very short.

In this study the U.S. market index had the highest return, so the inclusion of any other index lowers the overall portfolio return. The high return on the S&P 500 combined with its low volatility during this period are major reasons why the minimum variance portfolio has an 80 percent weighting in the U.S. market index (See Table 3).

Using the coefficient of variation to compare the risk-return trade-off between the U.S.-only portfolio and the minimum risk portfolio, one observes that the U.S.-only portfolio has a coefficient of variation of 0.818 while the minimum variance portfolio has a coefficient of variation of 0.861. This indicates that the U.S.-only portfolio represented a better risk-return trade-off versus the minimum variance portfolio. Contrary to what is normally expected, investing in the minimum risk portfolio gave the investor very little reduction in risk and did so at a relatively large reduction in return. Furthermore, international diversification would entail greater investment and management costs. The U.S. investor had almost nothing to gain across the decade of the nineties through diversification by investing in the major market indexes.

CONCLUSIONS

In theory an investor's portfolio may benefit by being invested in the U.S. market and another market that is less than perfectly correlated with the U.S. market. Diversification typically reduces risk significantly at the cost of a small reduction in return. However, during the decade of the 1990s, U.S. investors were not rewarded for international diversification. They would have experienced small reductions in risk coupled with large reductions in return. Data across this time period using the market indexes for the United States and its G-7 partners fail to support the usefulness of international diversification.

If the goal of the investor’s investment strategy is risk minimization and offsetting domestic market losses, then the investor facing an asset allocation decision must consider the historical market patterns discussed here. The cases which are examined in this study show international diversification (based on major market indexes) over these ten years (121 months) would not have been as potent a tool for U.S. investors as has been suggested in much of the academic research and by many investment advisors. The risk reduction benefits of diversification were simply not evident. Given this recent historical experience, the investor must ask if there is sufficient reason (in terms of risk reduction) to pursue international diversification. Going forward there is clearly little in the data from the 1990s to argue for using the indexes from other industrialized countries to diversify an U.S.-based portfolio. It may be that inclusion of the indexes can only be done if subjective judgment tells the investor that things will be different in the future.

The results of this study might be sample specific. The complete data set of the decade from 1990 through 2000 is used in describing the relationship between the United States and the remaining G-7 markets. However, it may be difficult to extrapolate the findings of this research to any other markets, specific stocks in these markets, or to other time periods. Nevertheless, investors typically obtain reasonable expectations of the potential benefits of international diversification by

studying historical relationships and the results in this study should provide input that allows investors to make a more informed investment decision.

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THE EFFECTS OF MANAGEMENT CHANGES ON EARNINGS FORECASTS

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ABSTRACT

Prior studies in the area of management forecasts contain one common characteristic, they assess voluntary earnings disclosures during normal operating periods, when the incentive structure is generally routine and ongoing. This research tests whether voluntary earnings disclosures released during non-normal operating periods (specifically management changes) differ from disclosures released during normal operating periods in terms of credibility. In terms of bias and information content, findings suggest that forecasts tend to significantly differ during normal versus non-normal operating periods. With increasing management changes taking place today, these findings have practical implications on users of forecast information.

INTRODUCTION

Prior research in the study of voluntary earnings disclosures finds that managers release information that is unbiased relative to subsequently revealed earnings and that tends to contain more bad news than good news (Baginski et al.,1994; Frankel, 1995). Such releases are also found to contain information content (Patell, 1976; Waymire, 1984; Pownell & Waymire, 1989). Although forecast release is costly, credible disclosure will occur if sufficient incentives exist. These incentives include bringing investor/manager expectations in line (Ajinkya & Gift, 1984), removing the need for expensive sources of additional information (Diamond, 1985), reducing the cost of capital to the firm (Diamond & Verrechia, 1987), and reducing potential lawsuits (Lees, 1981).

All of the aforementioned empirical studies have one common characteristic, they assess voluntary earnings disclosures during normal operating periods, when the incentive structure is generally routine and ongoing. The research question addressed in this study is: Do voluntary earnings disclosures released during non-normal operating periods (specifically management changes) differ from disclosures released during normal operating periods in terms of credibility? This question links earnings management to voluntary disclosures of earnings. For several years researchers have found that some degree of earnings management may exist in mandatory disclosures. I argue that incentives leading to earnings management may manifest in voluntary disclosures. If the potential exists for voluntary disclosures to be managed, then to what extent do investors rely upon the forecast information?

In addressing this research question, I rely upon literature that indicates different incentive structures during non-normal operating periods that may lead to earnings management. DeAngelo

(1986) shows that managers have incentives during management buyouts to manage earnings downward in attempts to reduce buyout compensation. Collins and DeAngelo (1990) show that earnings management occurs during proxy contests, and market reaction to earnings during these contests is different than during normal operating periods. DeAngelo (1990) finds that managers have incentives during merger activities to manage earnings upward so as to convey to current stockholders that the potential merger will not adversely affect their investment. Perry and Williams (1994) find that management of accounting earnings occurs in the year preceding "going private" buyouts. Stunda (1996) finds that managers exert greater upward earnings management during mergers and acquisitions.

This study assesses the effect that management changes (i.e., CEO and/or accompanying top staff) have on management forecast credibility. In accomplishing this, the presence of earnings forecast management is tested by using bias measures along with the market reaction to the forecast during the management change (non-normal operating periods). The study focus is on firms involving management changes during the period 1983-1999. Results are compared to forecasts released in periods for which no management changes take place (normal operating periods). Based upon statistical analysis, conclusions are drawn that identify whether management changes become a factor that influenced management earnings forecasts more during non-normal operating periods than during normal operating periods. This would have implications for voluntary disclosures in general (since current literature finds voluntary disclosures to be unbiased). There would be potential implications for managers of firms that undergo management changes, along with investors in these firms.

HYPOTHESIS DEVELOPMENT

Hypotheses About Bias of Management Forecast

As previously noted, recent studies of management earnings forecasts do not find evidence of bias in voluntary management disclosures. These studies of management forecasts must be considered along with the earnings management literature. For instance, voluntary disclosures facilitate additional information to the investor at a lower acquisition cost. However, if only partial communication flows from management to investors and acquiring full information is costly, there exists asymmetric information and the potential for earnings management in the earnings forecast.

If the same degree of earnings management (whether positive or negative) exists in both the forecast of earnings and actual earnings, the expectation is that there would be no difference in forecast error. If, however, the ability to perform earnings management is anticipated but not realized, some difference of forecast error would be present. If greater upward earnings management of the forecast occurs (or less actual earnings management), a negative forecast error should exist. If greater downward earnings management of the forecast occurs (or less actual earnings management), a positive forecast error should exist. Thus, the first hypothesis tests for the existence of forecast error. The null hypothesis tested is:

H1: Average management forecast error (actual EPS – management forecast of EPS) equals zero for firms engaged in management changes.

Introducing a firm-specific control (i.e., a forecast for the same firm in a normal operating period) allows a test of the relative forecast error in the normal versus non-normal operating periods. If firms display the same degree of earnings management in normal versus non-normal periods, the expectation is that there will be no difference in forecast error. If, however, there exists different incentives to manage earnings (either upward or downward) during non-normal periods, as suggested by current literature, then a positive or negative forecast error would result. Stated in the null form:

H2: The average forecast error for the firm undergoing management changes equals the average forecast error for the same firms during normal operating periods.

Hypothesis About Information Content of Accounting Earnings and Management Forecasts

If mandatory disclosures of earnings contain some degree of earnings management, then voluntary disclosures may possess the potential for such earnings management as well. Investors may react to managed earnings in one of two ways; they may discount the information as additional noise, or they may view this information as enhancing the properties of the signal (i.e., in terms of amount or variance). Research during the past two decades has shown that accounting earnings posses information content, however, current literature finds that the information content of earnings announcements is different during non-normal operating periods. For instance, Collins and DeAngelo (1990) find a greater market reaction to earnings during proxy contests, and Stunda (1996) finds a greater reaction during mergers and acquisitions.

If investors interpret managed earnings forecasts as just additional noise, the market would discount this information. If, however, investors view the managed earnings forecast as a positive (or negative) signal from management, the market would not discount the information. The expectation for information content of management forecasts in non-normal operating periods would revolve around these two notions. These alternative notions suggest the following null hypothesis:

H3: The information content of management forecasts during management changes is equal to the information content of management forecasts during normal operating periods.

RESEARCH DESIGN

The sample consists of management forecast point estimates made during the period 1983-1999 meeting the following criteria: 1) The management earnings forecast was recorded by the Dow Jones News Retrieval Service (DJNRS). 2) Management change information was obtained from the Wall Street Journal (WSJ). 3) Security price data was obtained from the Center for Research on

Security Prices (CRSP). 4) Earnings data was obtained from Compustat. The overall sample consists of firms which made at least one management earnings forecast during the period 1983-1999. This large sample is divided into sub-samples; one sub-sample consists of firms during "normal" operating periods, while the other sub-sample consists of firms during "non-normal" (i.e., undergoing management changes) operating periods. For sensitivity analysis, the non-normal firms are further classified into two groups; one group consists of firms with forecasts made within ninety days either side of a management change announcement, the other group consists of firms with forecasts made within ninety days after a management change announcement. The reason for the existence of these latter two groups is because it is unclear at what point during a management change firms may begin to manage earnings (i.e., before the announcement or after the announcement). Analysis of this issue is facilitated by the group separation. Table 1 provides the summary of the sample used in the study.

Table 1
Study Sample Summary

	Number of Forecasts
Original sample	8,082
Forecasts removed due to insufficient Compustat data	621
Forecasts removed due to insufficient CRSP data	318
Final overall sample	7,143
Forecasts 90 days after management change announcement	358
Forecasts 90 days before/after management change announcement	419
Common normal/non-normal forecasts 90 days after announcement	135
Common normal/non-normal forecasts 90 days before/after announcement	197

TEST OF HYPOTHESIS 1

The management forecasts of earnings must be related to actual earnings in order to determine if bias exists. McNichols (1989) analyzes bias through the determination of forecast error. Stated in statistical form the hypothesis is represented as follows:

$$Sum\ fe_i / n = 0$$

Where: fe_i = forecast error of firm i (forecast error = actual eps – management forecast of eps), deflated by the firm's stock price 180 days prior to the forecast.

In order to test hypothesis 1, firms engaged in non-normal operations are analyzed. Statistical analysis is performed on the sample in order to determine if the average forecast error is zero. McNichols (1989) and DeAngelo (1988) conduct a t-test on their respective samples in

addition to a Wilcoxon signed rank test. Lehmann (1975) reports that the Wilcoxon test has an efficiency of about 95% relative to a t-test for data that are normally distributed, and that the Wilcoxon test can be more efficient than the t-test for non-normal distributions. Therefore, this analysis consists of performing a t-test and a Wilcoxon signed rank test on the average cross-sectional differences between actual earnings per share and the management forecast of earnings per share.

TEST OF HYPOTHESIS 2

Introducing a firm-specific control for firms that forecast in both normal and non-normal operating periods allows a test of the relative forecast error in these two respective periods. Stated in statistical form the hypothesis is represented as follows:

$$Sum\ fe_i / n_{non\text{-}normal} = Sum\ fe_i / n_{normal}$$

In order to test hypothesis 2, the same firms are studied in both non-normal and normal operating periods. Forecast error during non-normal operations is compared to forecast error for these same firms during normal operations. Required criteria for this test is that these firms have more than one forecast during the study period, and that at least one forecast be contained in a normal operating period and at least one forecast be contained in a non-normal operating period. Similar statistical tests to those conducted in hypothesis 1 are employed for hypothesis 2.

TEST OF HYPOTHESIS 3

The purpose of this test is to assess the relative information content of management earnings forecasts during normal and non-normal operating periods. The following model is used to evaluate information content:

$$CAR_{it} = a + b_1 UE_{it} + b_2 D1_{it} UE_{it} + b_3 MB_{it} + b_4 B_{it} + b_5 MV_{it} + b_6 H_{it} UE_{it} + e_{it}$$

Where:	CAR_{it}	=	*Cumulative abnormal return forecast i, time t*
	a	=	*Intercept term*
	Ue_{it}	=	*Unexpected earnings for forecast i, time t*
	$D1_{it}$	=	*Dummy variable, 0 for normal, 1 for non-normal operating period*
	Mb_{it}	=	*Market to book value of equity as proxy for growth and persistence*
	B_{it}	=	*Market model slope coefficient as proxy for systematic risk*
	Mv_{it}	=	*Market value of equity as proxy for firm size*
	H_{it}	=	*Horizon of forecast, measured as days into year before forecast*
	e_{it}	=	*Error term for forecast i, time t*

Normal firms represented by the dummy variable will consist of management forecasts made during normal operating periods. Non-normal firms represented by this variable will consist of firms engaged in management changes (either 90 days before and after the change announcement or 90 days after the change announcement).

The coefficient "a" measures the intercept. The coefficient b_1 is the earnings response coefficient (ERC) for all firms in the sample (during both normal and non-normal operating periods). The coefficient b_2 represents the incremental ERC for non-normal periods. Therefore, b_2 captures the difference in the information content for firms during normal and non-normal operating periods. The coefficients b_3, b_4, b_5, and b_6 are contributions to the ERC for all firms in the sample. To investigate the effects of the information content of management forecasts on ERC, there must be some control for variables shown by prior studies to be determinants of ERC. For this reason, the variables represented by coefficients b_3 through b_6 are included in the study.

Unexpected earnings (UE_i) is measured as the difference between the management earnings forecast (MF_i) and security market participants' expectations for earnings proxied by consensus analyst following as per Investment Brokers Estimate Service (IBES) (EX_i). The unexpected earnings are scaled by the firm's stock price (P_i) 180 days prior to the forecast:

$$Ue_i = (Mf_i - Ex_i) / P_i$$

For each disclosure sample, an abnormal return (AR_{it}) is generated for event days –1, 0, and +1, where day 0 is defined as the date of the forecast disclosure identified by the DJNRS. The market model is utilized along with the CRSP equally-weighted market index and regression parameters are estimated between –290 and –91. Abnormal returns are then summed to calculate a cumulative abnormal return (CAR_{it}). Hypothesis 3 is tested by examining the coefficient associated with the unexpected earnings of forecasts, b_2, during non-normal operating periods. There are two possible conclusions; the forecast may be noisy, which in this event, $b_2<0$, or it will possess an information-enhancing signal to the investor, which will result in $b_2>0$.

RESULTS

Tests of hypothesis 1 are conducted on two samples; one sample consists of a total of 358 firms in which the management forecast was made within a window extending to 90 days after a management change announcement. The second sample consists of 419 firms in which the management forecast was made within a window 90 days before to 90 days after the management change announcement.

Table 2 contains the results of this test. Panel A of Table 2 indicates results for the first sample of 358 firm forecasts. Mean forecast error for these firms is -.08 with a p-value of .05. Using the distribution-free rank test, significance is observed at the .01 level. Panel B of Table 2 indicates results for the second sample of 419 firms. Mean forecast error for these firms is -.19 with a p-value of .01. Using the distribution-free rank test, significance is observed at the .01 level. The results associated with these statistics are consistent with the notion of greater upward earnings

management of the forecast. Results, therefore, lead to a rejection of hypothesis 1 that average management forecast error equals zero.

Table 2
Test of Hypothesis One

Table Entry is Average Management Forecast Error Deflated by Firm's Stock Price
180 Days Prior to Forecast
Model: $Sum\ fe_i / n = 0$

Panel A-management forecast error 90 days after management change announcement

n^1	Mean (t-statistic)	Median	Minimum	Maximum	Standard Deviation
358	-.08 (-2.23)[a]	-.01[b]	-.005	.287	.0014

Panel B-management forecast error 90 days after management change announcement

n^2	Mean (t-statistic)	Median	Minimum	Maximum	Standard Deviation
419	-.19 (-2.35)[a]	-.01[b]	-.002	.348	.0011

[a] Significant at the .01 level (two-sided test).
[b] Significant at the .01 level using the non-parametric sign rank test.
fe_i forecast error of firm i (actual eps – management forecast of eps).
n^1 sample of 358 firm forecasts for the period 1983-1999.
n^2 sample of 419 firm forecasts for the period 1983-1999.

Hypothesis 2 examines whether the introduction of firm-specific control has a bearing on the average forecast error. This test is developed by comparing forecasts of the same firms in both a normal and non-normal operating period. This allows for a test of the relative forecast error in the two different operating periods. Panel A of Table 3 indicates results for the sample of 135 common firms that forecast in both operating periods with forecasts occurring within 90 days after the change announcement. Results show that the mean forecast error derived from the average differences between normal/non-normal operating periods is .06 with a p-value of .02. Using the distribution-free sign rank test, significance is observed at the .01 level. Panel B of Table 3 indicates results for the sample of 197 common firms that forecast in both operating periods with forecasts occurring with 90 days before and after the change announcement. Results show that a mean forecast error is .11 with a p-value at .01. The sign rank test indicates significance at the .01 level. The results suggest rejection of the hypothesis that the average forecast errors during these two periods are the same. In addition, the forecast error during non-normal operating periods exceeds the forecast error during normal operating periods, on average. This again is consistent with the notion of greater upward earnings management of the forecast during non-normal operating periods, and that investors do not discount forecasts released during non-normal operating periods.

Table 3
Test of Hypothesis Two

Model: $Sum\ fe_i / n_{non\text{-}normal} = Sum\ fe_i / n_{normal}$

Panel A-Table entry is average management forecast error difference between normal and non-normal forecasts 90 days after the management change announcement

n^1	Mean (t-statistic)	Median	Minimum	Maximum	Standard Deviation
358	.06 (2.29)[a]	.01[b]	.003	.429	.0020

Panel B-Table entry is average management forecast error difference between normal and non-normal forecasts 90 days before/after the management change announcement

n^2	Mean (t-statistic)	Median	Minimum	Maximum	Standard Deviation
197	.11 (2.41)[a]	.01[b]	-.003	.448	.0010

[a] Significant at the .01 level (two-sided test).
[b] Significant at the .01 level using the non-parametric sign rank test.
fe_i forecast error of firm i (actual eps – management forecast of eps).
n^1 sample of 358 firm forecasts for the period 1983-1999.
n^2 sample of 197 firm forecasts for the period 1983-1999.

Hypothesis 3 tests information content of management forecasts during non-normal operating periods relative to the information content of management forecasts during normal operations. Panel A of Table 4 reports results of using the sample of 358 firms making a management forecast within 90 days following a management change announcement. As indicated in Panel A, the coefficient representing the variable which is the incremental ERC for non-normal operating periods (b_2), has a value of .10 with a p-value of .05. The coefficient representing the overall ERC for all firms (b_1), has a value of .14 with a p-value of .04. All other control variables are not significant at conventional levels. Panel B of Table 4 reports results of using the sample of 419 firms making a management forecast 90 days before or after the management change announcement. Panel B indicates a value of .18 for the b_2 coefficient with a p-value of .02. Coefficient b_1 has a value of .12 with a p-value of .01, while other control variable coefficients, are again, not significant at conventional levels. These findings indicate that not only do forecasts contain information content, there is a difference in the information content of management forecasts during normal and non-normal operating periods. Results, therefore, suggest rejection of the hypothesis that information content of management forecasts during normal operating periods is equal to information content of management forecasts during non-normal operating periods.

Table 4
Test of Hypothesis Three

Model: $CAR_{it} = a+b_1UE_{it}+b_2D1_{it}UE_{it}+b_3MB_{it}+b_4B_{it}+b_5MV_{it}+b_6H_{it}UE_{it}+e_{it}$

Panel A-Table represents data for 358 firms 90 days after the management change announcement

	Coefficients (t-statistics)							
n^1	a	b_1	b_2	b_3	b_4	b_5	b_6	Adjusted R^2
358	.23 (.88)	.14 (2.10)[c]	.10 (1.96)[d]	.12 (.11)	-.06 (-.32)	.02 (.28)	.18 (.50)	.082

Panel B-Table represents data for 419 firms 90 days before/after the management change announcement

	Coefficients (t-statistics)							
n^2	a	b_1	b_2	b_3	b_4	b_5	b_6	Adjusted R^2
419	.40 (.76)	.12 (2.42)[a]	.18 (2.08)[b]	.08 (.18)	-.02 (-.27)	.09 (.52)	.21 (.33)	.069

[a] Significant at the .01 level (one-sided test).
[b] Significant at the .02 level (one-sided test).
[c] Significant at the .04 level (one-sided test).
[d] Significant at the .05 level (one-sided test).
n^1 sample of 358 firm forecasts for the period 1983-1999.
n^2 sample of 419 firm forecasts for the period 1983-1999.

CAR_{it} = *Cumulative abnormal return forecast i, time t*
a = *Intercept term*
Ue_{it} = *Unexpected earnings for forecast i, time t*
$D1_{it}$ = *Dummy variable, 0 for normal, 1 for non-normal operating period*
Mb_{it} = *Market to book value of equity as proxy for growth and persistence*
B_{it} = *Market model slope coefficient as proxy for systematic risk*
Mv_{it} = *Market value of equity as proxy for firm size*
H_{it} = *Horizon of forecast, measured as days into year before forecast*
e_{it} = *Error term for forecast i, time t*

CONCLUSIONS

This study provides empirical evidence regarding the credibility of management forecasts during management changes. Bias results indicate that managers exert greater upward earnings management on the forecast during non-normal operating periods. Information content results indicate the presence of incremental information content in management forecasts during management changes relative to normal operating periods.

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THE USEFULNESS OF ACCOUNTING INFORMATION IN ASSESSING SYSTEMATIC RISK: A RE-EXAMINATION

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ABSTRACT

This study documents the potential statistical problems in using accounting risk measures in assessing a firm's systematic risk. It is found that all three problems: measurement error, omission of variables and multicollinearity exist in this area of research. To underscore the serious nature of the problems, two most important empirical studies in this area of research are replicated with new data: the Beaver, Kettler and Scholes' study and the Eskew's study. In both cases, the results are inconsistent with their findings. An alternative model, LISREL, is recommended for this area of research.

INTRODUCTION

The objectives of this paper are 1) to reiterate the common problems in the application of the conventional regression model in empirical accounting research and provide some evidence that these problems do exist in accounting data and 2) to underscore these problems, two of the oft-cited earlier studies of the usefulness of accounting information in assessing systematic risk are partially replicated based on a new data set to see whether their results may be cross-validated and if not, why. But, first, some justification is given here as to why research in this area is important.

Portfolio theory tells us that systematic risk is the only risk for which investors, holding diversified portfolios, need to be concerned about (e.g., Sharpe 1964). Thus, rational risk-averse investors will hold well-diversified portfolios. Systematic risk is an important economic decision variable for most investors because it is well known that most people are risk-averse. The accounting literature also stresses the importance of risk assessment. It is stated in ASOBAT (AAA 1966, 4 and 19) that one of the objectives of accounting is to provide information for "making decisions concerning the use of limited resources" and it continues, "accounting information is the chief means of reducing uncertainty under which external users act". AICPA's Trueblood Report (1973, 13) states that, "the basic objective of financial statements is to provide information useful for making economic decisions". Also, the FASB (1983, par. 34) states that the objective of financial reporting is "to provide information that is useful to present and potential investors and creditors and other users in making rational investment, credit, and similar decisions". Hence, investigation into the usefulness of accounting information is an important area of research and is consistent with the pronouncements and viewpoints expressed by the above groups concerned with financial reporting.

Capital market-based accounting research has been widely accepted for this purpose, as is evidenced by the voluminous publications in prestigious accounting and finance journals. In fact, the article by Ball and Brown (1968), which served to introduce the capital market-based methodology in the accounting literature, was recently named the recipient of the American Accounting Association's newly established 'Seminal Contribution to Accounting Literature Awards.' This noteworthy designation underscores the important contribution that capital market-based research has provided to the body of knowledge in accounting.

Since systematic risk is theoretically an important decision variable for investors, creditors and managers, the ability of accounting information to assess systematic risk is of particular importance. Since the publication of Ball and Brown (1969) numerous research studies in this area have been conducted and published (e.g., Ang et al. 1984; Beaver et al. 1970; Bildersee 1975; Ben-Zion and Shalit 1975; Bowman 1979; Breen and Lerner 1973; Brenener and Smidt 1978; Elgers 1980; Elgers and Murray 1982; Eskew 1979; Hill and Stone 1980; Lev 1974; Lev and Kunitzky 1974; Logue and Merville 1972; Mandelker and Rhee 1984; Melicher 1974; Melicher and Rush 1974; Rosenberg and Mckibben 1973; Thompson 1976; White 1972). The results have been mixed and inconsistent.

The remainder of this paper is divided into four sections. Section I discusses some potential problems facing empirical researchers in this area of study. Section II describes the sample selection criteria and the resulting sample. Section III presents the results of partial replications and some extensions of the oft-cited studies by BKS and Eskew. Section IV presents the concluding remark.

SOME PROBLEMS RELATED TO THE STUDIES OF THE ASSOCIATION BETWEEN THE SYSTEMATIC RISK AND ACCOUNTING RISK MEASURES

The FASB recognizes the limitations of accounting information. In particular, it acknowledges that "the information often results from approximate, rather than exact, measures." and thus, "despite the aura of precision that may seem to surround financial reporting in general and financial statements in particular, with few exceptions the measures are approximations, which may be based on rules and conventions, rather than exact amounts" (FASB 1983, par. 20). That is to say, it acknowledges potential measurement errors in accounting information.

The potential determinants of systematic risk are not accounting data per se. Rather, the determinants are the financial constructs, such as growth, operating leverage, profitability, liquidity, efficiency, etc., resulting from the management's operating, investing and financial decisions, which accounting data attempt to measure. These constructs are widely accepted risk measures about a firm and their surrogates have been somewhat successfully used in default predictions (Altman et al. 1977; Deakin 1972) and bond ratings (Copeland and Ingram 1982; Pinches et al. 1977; Watson et al. 1983). These surrogates are usually obtained from publicly available accounting data. Consequently, identification of the determinants of systematic risk from commonly accepted accounting risk measures has been actively studied in both the finance and accounting literature. Unfortunately, the results have so far been inconclusive, and mostly conflicting. Sound guidance in 1) the selection of variables to be incorporated (omitted variables), 2) dealing with measurement errors, and 3) coping with multicollinearity has been lacking and has contributed to the inability to

reach consistent conclusions in previous studies. A brief summary of the major consequences of these problems is given below (e.g., Jensen 1967; Judge, Griffithhs, Hill, Lutkepohl and Lee 1985):

1	*Omitting variables that are correlated with the independent variables in a regression equation will cause biased estimates of the error variance and the regression coefficients of the remaining variables. In the case of two correlated independent variables, for instance, the bias caused by leaving out one variable will be equal to the product of the partial regression coefficient of the omitted variable had it been in the equation and the simple regression coefficient of the omitted variable on the remaining independent variable.*
2	*Measurement errors in variables have much more complicated consequences in regression than either omitted variables or multicollinearity problems. In the simple case of a pair of variables, it is well known that measurement errors will attenuate the correlation between the two variables. But, in multiple regression where there is more than one independent variable involved, measurement errors in the independent variables have a much more complicated impact on the partial regression coefficients. The biases may be upward or downward depending on the interrelationship among the observed variables, measurement errors, and the true scores. Wickens (1972) showed that it is better to include variables with measurement errors than omit them in a multiple regression model.*
3	*The well-known multicollinearity problem in regression tends to cause unstable parameter estimates. The estimates are generally highly correlated with large variances making it very difficult to isolate the effects attributable to the individual variables. Furthermore, it can cause serious numerical inaccuracies in the parameter estimates, as demonstrated in Wampler (1970). However, estimates remain unbiased provided the model is not misspecified and numerical accuracy is not sacrificed.*
4	*Finally, all three problems could result in estimates having signs opposite to the true ones. Hence, the result from regression or correlation analysis could be sample-sensitive and hard to interpret.*

From the discussion above, one can see that any application of regression techniques demands careful thought on the part of the analyst. This is especially true in the study of the relationship between market determined risk measures and accounting data-based risk measures since the relevant measures are of the ex ante type, which are difficult to obtain. Furthermore, the risk measures in accounting applications are generally abstract concepts, which have no unique well-defined measures. Various ex post proxies have generally been employed in empirical research. Measurement errors and multicollinearity have thus become thorny issues. Most of the variables chosen to be included in the models examined generally lack theoretical support (see, e.g., the discussion given in BKS article). Furthermore, important variables were omitted in many of the studies. For example, operating leverage and financial leverage, which can theoretically be linked to systematic risk (Galon 1981; Galon and Gentry 1982; Subramanyan and Thomadakis 1980; Hamada 1972), were either excluded or omitted from BKS and Eskew's studies. This perhaps helps to explain the inconsistent findings. So far, none of the previous studies seem to have been replicated to cross-validate earlier findings. Each research study uses a different, even though sometimes overlapping set of accounting risk measures. Most of the researchers were somewhat aware of measurement error, omitted variables and multicollinearity problems. But, none has faced the problem seriously, let alone come up with a reasonable solution. In fact, most researchers seemed to have been content with casually mentioning these problems and went on to report their findings as if these problems did not interfere with their results. If such studies cannot be cross-validated by

a new set of data, they will be of little or dubious value. Cross-validation will lend some credence to empirical studies and thus, help theoretical development. So, it seems to be reasonable to undertake a replication of earlier works. In the following section, the findings from partial replications of the BKS and Eskew studies will be reported.

DESCRIPTION OF SAMPLE

The Standard and Poor's Industrial Compustat 1985 tape was used to obtain the necessary financial data, and the University of Chicago Center for Research on Security Prices (CRSP) 1985 tape was consulted for the relevant market determined systematic risk. The CRSP monthly security return tape was used to estimate each firm's market determined systematic risk measure. Of the 3,211 firms listed on the tape, only 574 firms had a complete twenty-year database (January 1966 - December 1985) of monthly returns. The Compustat tape has a total of 2,322 firms listed, of which 875 firms use the calendar year as the fiscal year. Of these 875, firms 395 firms are also listed on the CRSP tape. Therefore, 395 firms constitute the basic sample used in this study.

REPLICATIONS

In this section, the essential portions of the studies by BKS and Eskew, two of the most oft-cited studies, are replicated using the new data set described in the previous section.

BEAVER, KETTLER AND SCHOLES' STUDY

355 of the 395 firms in the basic sample have complete twenty years data on the Compustat tape for all the variables examined by BKS. This twenty-year period is broken down into two sub-periods with ten years each. The summary statistics of the two periods' systematic risks are presented in Table 1. Compared to the BKS sample (BKS 1970, Tables 1 and 2, 665) it can be seen that the means of the systematic risks using the same equally weighted market index as employed by BKS are smaller than those reported by BKS (.805 and 0.810 vs. .991 and .987). Also, the product moment correlation for the two time periods is .69, which is about 16 percent higher than the .59 reported by BKS. Together with the mean of the logarithm of the size variable, as presented in Table 2, one can see that, compared to the BKS sample (BKS 1970, Table 3, 667), the current sample consists of larger, less risky firms. These firms exhibit a higher growth rate in assets, much less liquidity and higher leverage. Also, the second period has much greater earnings variability and dividend payout; the accounting betas for both periods are much larger with somewhat larger cross-sectional standard deviations than the BKS sample. These findings are not surprising, since the second period covers the recessional period of the late seventies and early eighties. Due to the oft-mentioned reluctance on the part of management to reduce dividends, the mean payout ratio could be larger simply because the earnings are smaller as a result of recession. Inspection of Table 3 reveals that all but two of the inter-period correlations for the accounting risk measures are similar in magnitude to those reported by BKS (BKS 1970, Table 4, 668). The two notable differences are dividend-payout, which has a much lower inter-correlation, and accounting beta, which has a much

higher inter-correlation than those reported by BKS. The lower inter-period correlation for the payout is probably due to the recession affecting the business in a non-homogeneous way, whereas the higher inter-period correlation for the accounting beta supports the claim that the current sample consists of more stable firms. The non-homogeneous impact of recession on business earnings is also suggested by the larger average earnings variability for the second period. Of course, these results could also be due solely to sample variation.

Table 1
Summary Statistics for Distribution of Estimates of Systematic Risk (beta)

	Mean	Standard Deviation	Range
Period one (66-75)	.805	.299	.077 to 0.97
Period two (76-85)	.810	.346	.160 to 2.20
Correlation for the two period betas: .69108			

Table 2
Summary Statistics for Accounting Risk Measures

	Mean		Standard Deviation	
Period	one	two	one	two
Dividend payout	.485	.663	.198	1.587
Growth	.104	.085	.043	.048
Leverage	.480	.478	.155	.126
Liquidity	2.100	1.910	1.145	1.255
Size	6.250	7.200	1.324	1.352
Earnings variability	.060	.092	.066	.149
Accounting beta	1.043	.991	1.481	2.498

Results from the multiple regression analysis are presented in Table 4. The coefficients for all the variables except liquidity, accounting beta and, leverage have the correct signs as predicted by the theoretical and analytical results of Myers and Thurnbull (1977), Subramanyam and Thomadakis (1980), Ang, Peterson and Peterson (1984). The growth variable has a negative coefficient for both periods conforming to the results of Myers and Thurnbull. This negative relationship also holds for the simple correlation for both periods. This contradicts most, if not all empiricists' *ad hoc* arguments, which assert that, *ceteris paribus*, growth firms should be riskier (BKS 1970, 660). For period one, all variables are statistically significant (at .05 level of significance), whereas for period two, leverage, liquidity, and dividend payout are not significant. The coefficients for liquidity and accounting beta have the wrong sign for period one, and for period two, the coefficients for liquidity and leverage have the wrong sign even though they are not

statistically significant. Such inconsistent findings have also been reported in past empirical studies (e.g., Breen and Lerner 1973; Ang, Peterson and Peterson 1984).

Table 3
Inter-period Correlations for Accounting Risk Measures

Dividend payout	.059
Growth	.243
Leverage	.784
Liquidity	.811
Size	.963
Earnings variability	.480
Accounting beta	.299

Table 4
Multiple Regression Summary

	coefficients		t-statistics	
Period	one	two	one	two
Dividend payout	-.575	-.082	-8.477	-.810
Growth	-.779	-.692	-2.692	-1.990
Leverage	.393	-.286	3.526	-1.822
Liquidity	.056	.202	3.699	1.203
Size	-.040	-.052	-4.224	-3.920
Earnings variability	2.606	.674	12.479	5.032
Accounting beta	-.051	.023	-5.414	3.055
R-square: .499 F(7, 347)-statistics: 49.4 (period one) R-square: .286 F(7, 347)-statistics: 19.8 (period two)				

Simple correlations between the systematic risk and the accounting risk measures are presented in Table 5. Compared to the BKS result (BKS 1970, Table 5, 669) the accounting beta, size and liquidity have much higher correlation with systematic risk, and growth and leverage have much lower correlations with systematic risk. One must be careful to avoid potentially misleading inferences based solely on analyses of simple correlation coefficients. For example, financial leverage is negatively correlated with systematic risk for both periods while dividend payout is positively correlated with the systematic risk for period two. These results appear, on the surface, to be counterintuitive. One possible source of this apparent inconsistency is the violation of the

ceteris paribus assumption made in theoretical and analytical arguments. In multiple regression analysis, the relationship between the dependent and the independent variables is dealt with in a partial fashion, i.e., the regression coefficient for an independent variable has the same sign as the partial correlation coefficient between the independent variable in question and the dependent variable with all the other independent variables held constant. Thus, as long as there are no interactive effects among the independent variables, multiple regression analysis is more in line with theoretical and analytical assumptions. Of course, the model must be free of misspecifications for proper interpretation.

The results of the BKS model, i.e. using accounting risk measures to reduce measurement error of period one's beta, are provided in Table 6. The multiple correlation (.63) is only slightly less than the .67 reported by BKS (BKS 1970, 672). Also, growth has a negative coefficient as opposed to the positive one reported by BKS. Another interesting similarity between the two results is that the magnitude of the coefficients (ignoring the sign difference for the growth variable) is very similar.

Table 5
Contemporaneous Correlation between Accounting Risk measures and Systematic Risk

Period	one	two
Dividend payout	-.329	.024
Growth	-.095	-.226
Leverage	-.001	-.119
Liquidity	.232	.241
Size	-.305	-.301
Earnings variability	.535	.388
Accounting beta	.190	.361

Table 6
BKS Model with New Data Set

	Coefficients	t-statistics
Dividend payout	-.511	-7.744
Growth	-.833	-2.704
Earnings variability	2.275	11.843
R-square: .391 F(3, 351)-statistics: 74.97		

Table 7 provides the forecasting results of various models. The naive forecasting model, which uses period one betas as forecasts of their corresponding period two counterparts, produces forecasts with mean square error of .07 and mean absolute error of .202. The respective values given by BKS are .093 and .239 (BKS 1970, Table 7, 677). The BKS model produces forecasts having

mean square error of .081 and mean absolute error of .233; the corresponding results given by BKS are .089 and .23 (BKS 1970, Table 7, 677). From these results, it can be seen that the instrumental variables approach actually increases forecast errors for the current sample. This is in direct contrast to the results provided by BKS. One possible explanation is that the current sample consists of more stable firms as mentioned before, and the inter-period correlation for the systematic risk is much higher. Of course, besides the possible impact of sampling variation, measurement errors and omitted variable problems are other possible causes of this contradictory finding. Notice that the improvement of mean square error from .093 to .089 and of mean absolute error from 0.239 to 0.230 as reported by BKS was not impressive and it might have occurred simply by chance.

Table 7
Analysis of Forecast Errors

	Mean Square Error	Mean Absolute Error
Naive Model	.070	.202
BKS Model	.081	.233

ESKEW STUDY

Eskew used the CRSP value weighted index as a surrogate for the market portfolio return. By using this index, the un-weighted arithmetic mean of the firm's betas is no longer one, as Eskew seemed to have implied in his article (1979, 108 and 117). Table 8 provides the summary statistics for the systematic risk. The mean of the betas is 1.07 and .96 for periods one and two respectively. They are slightly smaller than those given by Eskew (Eskew 1979, Table 3, 115). Note that Eskew broke his sample into three six-year sub-periods.

The multiple regression result is presented in Table 9. Some interesting points are worth noting when Table 9 is compared to Table 4. The only difference between the two tables is the market determined systematic risk. In Table 4, the dependent variable is estimated from the market model by using the CRSP equally weighted market index, whereas, in the current table the market index used is the value weighted index. There are differences in the significant variables as well as some of the signs of the coefficients. For period one, the significant variables are dividends payout, earnings variability, accounting beta and liquidity, and for period two, the significant variables are earnings variability, leverage and accounting beta. The coefficients for accounting beta, liquidity and growth have the wrong signs for period one; only the coefficients for leverage and liquidity have the wrong signs for period two. Again, this is consistent with the inconclusive results reported in the literature. Table 10 presents the contemporaneous correlation between the accounting risk measures and the systematic risk estimated from the CRSP value weighted market index. Again, care must be exercised in interpreting the simple correlation coefficients as discussed above.

Table 8
Summary Statistics for Distribution of Estimates of Systematic Risk (beta)

	Mean	Standard Deviation	Range
Period one	1.067	.331	.180 to 2.23
Period two	.963	.384	.230 to 2.28
Correlation for the two period betas: .62389			

Table 9
Multiple Regression Summary

	Coefficients		t-statistics	
Period	one	two	one	two
Dividend payout	-.749	-.009	-9.369	-.748
Growth	.387	-.567	1.136	-1.385
Leverage	.180	-.507	1.367	-2.741
Liquidity	.052	.023	2.866	1.147
Size	-.015	-.017	-1.334	-1.077
Earnings variability	2.761	.649	11.225	4.116
Accounting beta	-.074	.026	-6.712	2.933
R-square: .434 F(7, 347)-statistics: 38.0 (period one) R-square: .200 F(7, 347)-statistics: 12.4 (period two)				

Using the SPSS stepwise regression procedure with F set to enter and to remove at 3.5 and tolerance level set at .9, Eskew selected growth, size, and earning's variability as the three significant independent variables. Notice that dividends payout, which was used by BKS was no longer significant and was replaced by a size variable. The results of the Eskew's model are presented in Table 11. The signs of the coefficients are identical to those reported by Eskew (1979, Table 2, 113). But, the current R-square (.23) is slightly less than that reported by Eskew (.27). Notice that this is much smaller than the squared inter-period correlation (.39) of the systematic risks. The model is also fitted to the systematic risk estimated from the equally weighted market index. The R-square is .36 and growth has an insignificant, though negative coefficient. From this, it appears that the usefulness of accounting information is sensitive to the choice of market index. Elgers and Murray (1982) reached a similar conclusion.

Table 10 Contemporaneous Correlation between Accounting Risk Measures and Systematic Risk		
Period	one	two
Dividend payout	-.417	.021
Growth	-.091	-.175
Leverage	-.076	-.157
Liquidity	.227	.208
Size	-.196	-.169
Earnings variability	.415	.323
Accounting beta	.093	.323

Table 11 Eskew Model with New Data Set		
	Coefficient	t-statistics
Size	-.044	-3.716
Growth	1.269	3.452
Earnings variability	2.144	8.966
R-square: .226 F(3, 351)-statistics: 34.23		

The results of various forecasting models are presented in Table 12. The naive model produces forecasts having mean square error of .109 and mean absolute error of .266; the corresponding values given by Eskew are .145 and .2995 (Eskew 1979, Table 4, 115). Using the three variables selected by Eskew as instrumental variables to reduce the measurement error for period one's betas, the resulting forecasts have a mean square error of .141 and mean absolute error of .311; the corresponding values given by Eskew are 0.0952 and 0.2315 respectively (Eskew 1979, Table 5, 115). As in the case of the replication of BKS, using accounting variables as instrumental variables actually increases the mean square error and mean absolute error of the forecasts. This is in direct contrast to the results given in Eskew's article, where he showed that accounting variables improved the forecast.

Table 12 Analysis of Forecast Errors		
	Mean Square Error	Mean Absolute Error
Naive Model	.109	.266
Eskew Model	.140	.311

When Eskew's stepwise regression approach was employed, it selected three accounting risk measures: dividend payout, earnings variability, and liquidity as the three significant variables for betas estimated from CRSP value weighted market index. These three variables were then used as instrumental variables for period one's beta. This model produces forecast errors having mean square error of .106 and mean absolute error of 0.265. This is a negligible improvement over the naive forecast. On the other hand, the same method applied to the betas estimated from CRSP equally weighted index, selects earnings variability, dividend payout, size, accounting beta and growth as the significant variables. However, the resulting model produces forecast errors having mean square error of .096 and mean absolute error of .249, which are worse than those produced by a naive model.

CONCLUDING REMARKS

Portions of the results of the two replications are inconsistent with those reported by BKS and Eskew. The instrumental variables approach used to reduce measurement error of the period one's betas for forecasting the second period's betas not only fails to improve forecasting accuracy, it actually increases the mean square error and mean absolute error for the current sample. Apparently, the usefulness of the accounting risk measures in improving forecast accuracy depends on the market index as well as the sample and time period studied. Also, by the nature of the instrumental variables approach, bias is not affected. This disturbing finding could potentially arise from measurement errors, multicollinearity and omitted variables problems. Users of accounting information should be cautioned against using the research results of a particular study. Without sound theoretical guidance, any empirical study must be replicated to cross-validate the results. There are some preliminary piecewise theoretical advances in this area of research (Galai and Masulis 1976; Goldenberg and Chiang 1983; Hamada 1972; Myers and Thurnbull 1977; Senbet and Thompson 1982; Subramanyam and Thomadakis 1980). To cope with measurement error and multicollinearity problems, the linear structural equation model (LISREL) suggested by Joreskog and Sorbom (1982) or the partial least squares model developed by Wold (1982) may be viable alternatives to the problem-ridden linear regression model as is commonly employed.

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