Determinants of Cross Sectional Stock Returns Variation

Part 2 – Systematic and Idiosyncratic Risks

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Abstract

This is the second part of a two-part study on the factors that influence cross variability in stock returns, with particular attention to the role of macroeconomic fluctuations and idiosyncratic risks. The study covered the listed firms represented in the Phisix for the period 1988-2000 and 1994-2000.

The first part of the study focuses on the role of macroeconomic fluctuations as systematic risk factors. It uses a multifactor asset pricing framework with seven macroeconomic factors identified as potential sources of significant risks to individual firms. Regression results indicate that fluctuations in all of these macroeconomic factors have significant influence on individual stock returns. However, it is also found that systematic risks due to macroeconomic factors may not by themselves be able to fully explain observed variation in stock returns. Thus, the role of idiosyncratic risks, relative to systematic risks, warrants further investigation.

The second part of the study confirms the conjecture that both systematic and idiosyncratic risks matter. Using the model developed in the first part of the study, total risk is decomposed into its systematic and idiosyncratic components. Statistical analysis confirms that both risk components, together with a measure of the stock's market liquidity, are the main determinants of cross sectional variation in stock returns.

Looking deeper into what factors generate both types of risks, the individual firm's sensitivity to systematic risk appears to be determined by its dividend history and certain other firm-level fundamentals, especially growth history. Dividend history, because of its signaling function, is also found to be a major indicator of idiosyncratic risk. Except for this, idiosyncratic risk appears to be driven by factors very specific to the firm which may not be directly related to firm fundamentals. More research is indicated on the factors that generate firm-specific or idiosyncratic risk.

These results have important implications. Systematic risk, which constitutes a large proportion of total risk, can be managed at the macro level by regulating macroeconomic fluctuations. The firm can also choose its level of systematic risk exposure by appropriate operating decisions and internal diversification. In a similar vein, the investor can choose his/her level of systematic risk by appropriate analysis of firm fundamentals and stock selection.

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1. Introduction

This is the second part of a two-part article, the main purpose of which is to determine the factors that influence cross sectional variation in stock returns, with particular attention to the role of macroeconomic fluctuations and idiosyncratic risks. The focus of the first part of the study is on macroeconomic fluctuations as determinants of systematic risks. The focus in this second part is on the role of idiosyncratic risks.

In the context of asset pricing, risk is defined to be the volatility of stock returns measured by the standard deviation or variance. Systematic risk represents that portion of volatility induced by unanticipated macroeconomic fluctuations and cannot be diversified away. Idiosyncratic risk is the difference between total volatility or risk and systematic risk. Based on standard investment theory, given enough assets in an investor's portfolio, idiosyncratic risks can be diversified away and can be ignored for pricing purposes. Thus, only systematic risk should matter in asset pricing.

The results of the first part of the study indicate, however, that after systematic risks are considered, idiosyncratic risks still constitute a significant portion of total risk and may therefore be priced by the market. It was conjectured that this is probably due to incomplete arbitrage and the lack of investor diversification. If idiosyncratic risks matter, it is important for investors and analysts to understand the risk factors that generate returns and their underlying characteristics for purposes of portfolio formation and stock selection. To the extent that the stock market is considered important to the economy, it is also important for policy-makers to gain some insights as to the factors that affect stock returns and the role of idiosyncratic risk in asset pricing.. Based on these considerations, the second part of this study focuses on idiosyncratic risks and has the following specific objectives:

- To decompose total risk into its systematic and idiosyncratic components and determine their relative contributions to asset prices/stock returns.
- To determine the firm factors that affect the degree of the stock's exposure to systematic risk and the level of idiosyncratic risks.

This paper is organized as follows. The next section (Section 2) discusses certain theoretical and empirical issues related to systematic and idiosyncratic risks. Section 3discusses the data and methodology used in the study. In Section 4, total risk is decomposed into its systematic and firm-specific idiosyncratic components and their effects on stock returns investigated. Section 5 studies the firm-level factors that influence the aggregated systematic risk and the residual idiosyncratic risk. A system of equations integrating the previous findings on the return and risk generating process is formulated. Section 6 summarizes and concludes the study.

2. Theoretical and Empirical Issues

As discussed in the first part of the study, both the Arbitrage Pricing Theory (APT) introduced by Ross (1976) and the Intertemporal Capital Asset Pricing Model (ICAPM) introduced by Merton (1973) yield a multifactor asset pricing model that allows for factors other than market returns to explain cross sectional variation in individual asset returns. The main difference between APT and ICAPM is that the factors in APT originally are traded portfolios and the factors in ICAPM are state variables[1]. In current empirical practice, however, this distinction is often ignored. For an economy with N assets, the unconditional form of the model assumes that the asset return generating process can be expressed in matrix notation as

(1) $$R^{exc} = a + Bf + \varepsilon$$

(2) $$E[\varepsilon] = 0$$

[1] These refer to variables that describe the investment opportunity set such as macroeconomic variables.

(3) $$E[\varepsilon\varepsilon'] = \Sigma$$

where $R^{exc} = R - R_f$ is the (N x 1) vector of asset excess returns over the risk-free rate, a is the (N x 1) intercept vector, B is an (N x K) beta matrix, f is a (K x 1) vector of common factor realizations, and ε is the (N x 1) vector of disturbances. It is assumed that the common factors account for the common variation in returns such that the disturbance term for large well-diversified portfolios disappears. Thus, the disturbance terms must be sufficiently uncorrelated across assets.

Given this structure, Ross (1976) shows that the absence of arbitrage implies that the following relation can approximate the expected returns for the N assets

(4) $$E[R^{exc}] \approx B\lambda,$$

where $E[R^{exc}]$ is the (N x 1) vector of expected asset excess returns and λ is the (K x 1) vector of factor risk premia. The risk premium of an individual factor is the compensation or additional price demanded by an investor for an extra unit of that risk factor associated with the asset. The beta of the asset for that factor represents the asset's sensitivity to that factor. Thus, the expected return on an asset is equal to the return to a risk-free asset (or zero-beta asset) plus the sum of the individual factor premia weighted by the asset betas as shown in (4). In exact APT models, this relationship becomes an equality.

The difference between the left-hand-side and the right-hand-side in equation (4) for finite N is the vector of pricing errors $v = E[R^{exc}] - B\lambda$. Ingersoll (Chapter 7, 1987) showed that even in the presence of idiosyncratic risks, the APT would hold and the pricing errors tend to zero as N goes to infinity. However, Ingersoll also showed that for a finite number of assets the pricing errors would be larger as idiosyncratic risks were larger.

Like the basic single-factor CAPM, the multifactor model has been subjected to an entire literature of testing. The results of testing the multifactor models in the U. S. have been inconclusive (Huberman, 1987 and Goyal and Santa-Clara, 2001) although the performance of multifactor models has been better than the CAPM. A typical conclusion by reviewers of empirical results is that of Haugen (1997) who states that "empirical testing of the APT is at an early stage of development, and there is no conclusive evidence either supporting or contradicting the model." In the Philippines, mention has already been made of Mangaran's 1993 study where he tested the APT for the periods 1972-1981 and 1982-1991. His risk factors are four unobserved portfolios found significant in each period extracted using maximum likelihood factor analysis. The overall results are mixed with only a few of the extracted risk factors found significant or priced.

Research on the role of idiosyncratic risks in asset pricing is fairly recent. The empirical performance of multifactor models and the influential article of Campbell, Lettau, Malkiel, and Xu (2001) indicate that idiosyncratic risk may play a larger role in determining cross sectional variation in stock returns than traditional equilibrium-based or no-arbitrage-based models such as the CAPM, CCAPM, APT and ICAPM suggest. Using 1962-1997 U. S. stock data, Campbell et al decomposed volatility into its market, industry and idiosyncratic (residual) components. They noted a deterministic upward trend in idiosyncratic risk in terms of value and relative to total volatility. Furthermore, they found that the predictive ability of the single factor or market model of stock returns measured by R^2 has been declining over time and that the number of stocks required to attain a given level of portfolio diversification has increased. A recent study by Goyal and Santa-Clara (2001) studied the relationship between U. S. stock returns from 1926 to 1999 and found that a tradeoff exists between returns and total risk, not just systematic but including idiosyncratic risks. Their study was motivated by the general findings that portfolios held by individual investors and even by mutual funds were surprisingly undiversified. In their study, Goyal and Santa-Clara first estimated systematic risk using both the single factor or market model and the popular three-factor model due to Fama and French (1993). In addition to excess returns on the market portfolio used by the single factor model, the three-factor model used also the returns spread between small sized firms and large sized firms (SML) and the returns spread between firms with high book-to-market (value) ratio and firms with low book-to-market ratios (HML) as additional factors[2]. The idiosyncratic risk was then computed as the difference between total volatility less systematic risk. Their regression against total variance showed a significant t-statistic (p-value in parenthesis) of 2.42 (0.032) while the regression against idiosyncratic risk showed a t-statistic of 2.06 (0.053) using the market model and 2.53 (0.026) using the three-factor model. They concluded that idiosyncratic risk had an impact on stock returns and called for further research to understand how idiosyncratic risks are incorporated into stock prices. The significance of large idiosyncratic risks on pricing errors in an undiversified market could be one explanation for the poor results in tests of multifactor models in the local stock market such as those performed in the first part of this study. Furthermore, note that the basic foundation of multifactor models is the no-arbitrage condition, i.e., no one can make excess profits by riskless arbitrage in the market. As Dybvig and Ross (1989) suggested, an inefficient market is not consistent with the no-arbitrage condition since excess profits can be made in an inefficient market to an arbitrageur by trading on available information.

3 Data and Methodology

3.1 Sources of Data

In addition to stock returns data carried over from the first part of this study, firm financial data are obtained from published compilations of Business World, the Philippine Business Profiles & Perspectives, Inc., and the Philippine Stock Exchange.

3.2 Estimation and Testing Methodology

In estimating the systematic and idiosyncratic components of total risk, it is assumed that a fixed number of macroeconomic variables, with and without overall market risk, are the sources of systematic risks. Furthermore, market risk is proxied by the excess return on the market portfolio represented by the firms comprising the Philippine Stock Exchange index or the Phisix. The methodology for selecting the macroeconomic risk factors and estimating the factor sensitivity or factor loading matrix B in equation (1) is discussed in the first part of the study.

The total volatility (expressed in terms of the variance of excess returns) of each stock covered in this study is decomposed into its systematic and idiosyncratic components. From equation (1) and given the k macroeconomic risk factors with the estimate of the factor loading matrix B, the covariance matrix of excess returns can be expressed as the sum of the variation due to the common factors and the residual variation, as follows:

(5) $$\Omega = B\Omega_k B' + \Sigma,$$

where $\Omega_k = E[ff']$ is the covariance matrix of the macroeconomic risk factors and Σ is the residual covariance matrix. The ith stock's systematic risk is given as the ith item in the diagonal of the first term on the right-hand-side of equation (5) and also as:

(6) $$\sigma_{si}^2 = B_i^{'}\Omega_k B_i,$$

where B_i is the vector of beta coefficients for the ith stock. The ith stock's idiosyncratic risk is

[2] SML stands for small-minus-large and HML stands for high-minus-low. Because of the popularity of the Fama and French three-factor model in the U. S., these acronyms are standard in the literature.

given as the ith item in the diagonal of Σ and also as:

(7) $$\sigma_{di}^2 = \sigma_i^2 - \sigma_{si}^2$$

where σ_i^2 is the ith stock's excess returns variance.

To study the effects of the two components of risk, average excess returns of the firms included in the study are then regressed against the firms' computed systematic and idiosyncratic risks. At a deeper level, firm level factors are studied as possible determinants of systematic and idiosyncratic risks using OLS analysis. Dividend history, defined here as a binary variable with values depending on whether the firm has been declaring dividends consistently during the period covered in the study, is identified as a significant explanatory variable for both systematic and idiosyncratic risks. Finally, putting it all together, a system of equation relating excess returns to the risk factors and the risk factors to firm level variables is developed and the parameters estimated using seemingly unrelated regression (SUR) estimation. SUR is a technique for estimating the parameters of a system of equations when the error terms in the equations are suspected to be related to each other (Kennedy, 1992). Estimating the parameters simultaneously serves to improve the precision of the estimates.

4. Systematic and Idiosyncratic Risks

This section looks at the impact of idiosyncratic risks on stock returns. On the premise that stock returns are impacted by both systematic and idiosyncratic risks, the aggregate systematic risk attributable to macroeconomic factors and the residual idiosyncratic risk are computed for each stock covered in this study. . To study the effects of the two components of risk, average excess returns of the firms included in the study are then regressed against the firms' computed systematic and idiosyncratic risks.

4.1 Significance of Idiosyncratic Risks

One of the findings in the first part of this study is that macroeconomic variables have significant influence on the behavior of returns on individual stock over time. However, the evidence that macroeconomic variables are priced in the marketplace as systematic risks is not supported. This suggests that idiosyncratic risks not fully diversified have a significant impact on stock returns.

As a first approximation, idiosyncratic risk is proxied by the stock's own return volatility. Including volatility as one of the factors in equation (1), the excess return equation for the ith stock is expressed as:

(8) $$R_{it}^{exc} = \sum_{k=1}^{K} \beta_{ik} \tilde{f}_{kt} + \beta_{i\sigma} \sigma_{it}^2 .$$

Here σ_{it}^2 is the conditional variance of the excess return on the ith stock in period t estimated using GARCH regression procedures.[3] Table 1 shows the results of the regression on equation (8). The results for the explanatory variables, except the variance, change somewhat from those in Table 10 in the first part of this study. The hypothesis that $\beta_{i\sigma} = 0$ for all i and $\beta_{i\sigma} = \beta_{j\sigma}$ for all $i \neq j$ now is rejected only for the change in the monthly end-of-month nominal exchange rate and the market return. The variance coefficient is statistically significant for only six of the eighteen stocks. However, the hypothesis that the variance $\beta_{i\sigma} = 0$ for all i and $\beta_{i\sigma} = \beta_{j\sigma}$ for all $i \neq j$ is rejected. Furthermore, an examination of Tables 10 in the first part of this study and Table 1 below reveals that the R^2 for individual stocks increased slightly. This analysis shows that the

[3] In all cases, the applicable model is an ARCH (1) or GARCH (1, 1).

stock's own volatility (represented by the conditional variance of stock returns) appears to be a significant explanatory variable for the behavior of excess returns of individual stocks over time. Since volatility includes both systematic and idiosyncratic risks, the increase in R^2 can be attributed to the effect of idiosyncratic risks.

4.2 Pricing Impact of Systematic and Idiosyncratic Risks

Regression of the average cross sectional monthly excess returns of each stock for the period 1994-2000 against volatility measures such as the variance and standard deviation of monthly excess returns results in positive coefficients that are statistically significant. The regression against the variance shows a p-value of 0.0000 and R^2 of 0.8121 while that against standard deviation shows a p-value 0.0002 and R^2 of 0.4794. This validates the time series result that volatility does contribute significantly toward explaining cross sectional variation in excess returns. Recall that the variance of excess returns for each stock can be decomposed into systematic risk (σ_{si}^2) and diversifiable risk (σ_{di}^2). Systematic risk refers to that which an investor cannot diversify away by holding a sufficient large number of stocks in his/her portfolio. The residual, diversifiable risk goes rather quickly to zero as the number of stocks in an investor's portfolio grows sufficiently large. Restating equation (6) above, systematic risk is given as:

$$(9) \qquad \sigma_{si}^2 = B_i^{'}\Omega_k B_i,$$

where B_i is the vector of beta coefficients for the ith stock and Ω_k is the correlation matrix of the k factors[4]. For the sample stocks, the variance of excess returns is decomposed into its systematic and diversifiable components using the relationship in (9) and the estimated beta coefficients and sample correlation matrix. The results are shown in Table 2 with and without the aggregate market return as a risk factor. There is no identifiable pattern in this decomposition. For some stocks, the percentage of systematic risk to total variance is significant. For others, idiosyncratic risks dominate. Furthermore, the portion of systematic risk attributable to the identified macroeconomic variables is significant in all stocks but the range is quite wide. To get an appreciation of the relative significance of both risk components, the simple average idiosyncratic risk accounts for 58.24% of total risk. Using market capitalization as weighting factor, idiosyncratic risk accounts for 52.95 of total risk. This confirms that idiosyncratic risk is a significant component of total risk and it is only reasonable to expect that investors price this risk. For comparison, Goyal and Santa-Clara (2001) found that for the U. S. stock market from 1926-

[4] Since the correlation matrix is positive definite, systematic risk is zero if and only if the beta coefficients are uniformly zero.

Table 1 – Regression of Stock Returns Against Macroeconomic Risk Factors with Volatility: 1994-2000

Stock	Δe_t	$\Delta \pi_t^e$	Δo_t	Δop_t	Δrm_t	rs_t^d	rs_t^f	Market Return	Volatility	R^2
ABS	-0.01019	-0.00744	0.00021	0.01203	-0.00125	-0.02131	0.00281	0.62297	0.00015	0.38588
	0.2255	0.1059	0.4846	**0.0771**	0.9126	**0.0952**	0.4466	**0.0000**	**0.0300**	
AC	-0.01823	-0.00216	-0.00043	-0.00579	0.00109	0.01843	0.00263	1.82767	0.00000	0.66508
	0.1339	0.7456	0.3210	0.5572	0.9473	0.3162	0.6229	**0.0000**	0.7140	
ALI	-0.01996	-0.00257	-0.00020	-0.00362	-0.00249	0.01822	-0.00211	1.58175	-0.00001	0.71661
	0.0340	0.6170	0.5527	0.6352	0.8459	0.1995	0.6098	**0.0000**	**0.0140**	
BPC	-0.01913	-0.00461	-0.00048	0.00271	-0.01246	-0.01846	0.00325	1.04521	0.00002	0.61924
	0.0252	0.3240	0.1169	0.6949	0.2869	0.1534	0.3864	**0.0000**	**0.0598**	
FLI	-0.14349	-0.00227	-0.00071	-0.00286	-0.06121	0.13811	-0.02303	2.29100	0.00004	0.37918
	0.0003	0.9174	0.6184	0.9295	0.2596	**0.0224**	0.1895	**0.0000**	**0.0552**	
ICT	-0.04682	0.00430	0.00018	0.01135	-0.00166	0.01387	-0.00954	1.40551	0.00000	0.50740
	0.0033	0.6103	0.7506	0.3644	0.9372	0.5541	0.1641	**0.0000**	0.87190	
JFC	-0.00076	-0.00834	-0.00011	-0.00064	-0.00094	0.00966	-0.00031	1.12262	-0.00002	0.53622
	0.9342	**0.0986**	0.7362	0.9317	0.9404	0.4897	0.9382	**0.0000**	0.36610	
JGS	-0.02370	-0.00093	-0.00009	0.00615	-0.02112	0.00837	0.00244	1.44978	0.00004	0.55373
	0.0820	0.9009	0.8438	0.5764	0.2538	0.6823	0.6841	**0.0000**	**0.0015**	
LC	-0.01012	-0.00625	0.00065	-0.00233	-0.01822	-0.00992	0.00226	0.42308	0.00002	0.09567
	0.4930	0.4416	0.2170	0.8473	0.3656	0.6666	0.7298	**0.0324**	**0.4573**	
LCB	-0.01796	-0.00946	0.00056	-0.01416	-0.02175	-0.03522	0.00300	0.36520	0.00001	0.09928
	0.3172	0.3407	0.3884	0.3360	0.3721	0.1987	0.7051	0.1261	0.5284	
MBT	-0.02974	0.01418	-0.00008	0.00751	-0.01107	0.00647	-0.00781	0.57170	0.00004	0.36276
	0.0091	**0.0228**	0.8456	0.4150	0.4742	0.7076	0.1318	**0.0002**	0.1697	
MER	0.00288	-0.00081	-0.00008	0.00330	0.00353	-0.00746	-0.00467	0.51774	-0.00010	0.40131
	0.6312	0.8065	0.6917	0.4984	0.6657	0.4121	**0.0777**	**0.0000**	0.26980	
MERB	-0.00199	0.00242	0.00009	0.00144	0.00797	-0.00411	-0.00522	0.87522	-0.00005	0.64204
	0.7494	0.4784	0.6811	0.7756	0.3475	0.6634	**0.0570**	**0.0000**	0.2664	
MPC	-0.07850	-0.01403	-0.00018	-0.01651	-0.06378	0.04996	0.00382	2.13896	0.00003	0.62459
	0.0000	0.1529	0.7843	0.2551	**0.0090**	**0.0660**	0.6278	**0.0000**	0.2162	
PNB	-0.03119	0.01327	-0.00166	0.03128	-0.04055	-0.02187	0.00006	1.37614	0.00003	0.48514
	0.0678	0.1561	**0.0066**	**0.0238**	0.0814	0.3984	0.9935	**0.0000**	0.3948	
SMC	0.00216	-0.00115	-0.00011	0.00350	0.01475	-0.01308	-0.00491	0.26260	-0.00003	0.17629
	0.7704	0.7760	0.6890	0.5594	0.1429	0.2432	0.1323	**0.0077**	0.7737	
SMCB	-0.00419	0.00394	0.00017	0.00694	0.01479	0.01477	-0.00752	0.48935	-0.00001	0.24017
	0.6652	0.4552	0.6248	0.3735	0.2599	0.3121	**0.0796**	**0.0002**	0.9033	
TEL	0.01867	0.00512	0.00066	0.01115	0.00270	-0.00404	-0.00121	0.61468	0.00009	0.38549
	0.0101	0.1978	**0.0110**	**0.0578**	0.7847	0.7137	0.7096	**0.0000**	0.1715	
H0:$\beta_{ik}=0$	76.0570	20.5848	21.7814	18.3276	20.3505	23.1636	20.6656	971.663	38.6582	
	0.0000	0.3009	0.2418	0.4343	0.3134	0.1844	0.2966	**0.0000**	**0.0032**	
H0:$\beta_{ik}=\beta_{jk}$	64.7170	20.4558	21.7814	13.9697	20.2700	22.7860	15.2783	221.790	38.6346	
	0.0000	0.2516	0.1933	0.6692	0.2607	0.1563	0.5754	**0.0000**	**0.0020**	

Table 2 – Systematic and Idiosyncratic Risks

	Excluding Market Return			Including Market Return			Systematic
Code	Systematic Risk	Idiosyncratic Risk	σ_s^2 as % of Total	Systematic Risk	Idiosyncratic Risk	σ_s^2 as % of Total	Risk Due to Macro Factors
ABS	0.00200	0.01264	13.67	0.00533	0.00931	36.42	37.54
ACA	0.00895	0.04706	15.98	0.03750	0.01851	66.95	23.87
ALI	0.00644	0.03303	16.32	0.02731	0.01216	69.20	23.58
BPC	0.00496	0.01932	20.45	0.01451	0.00977	59.74	34.22
FLI	0.07592	0.25072	23.24	0.12090	0.20574	37.01	62.80
ICT	0.01392	0.04748	22.67	0.03082	0.03058	50.20	45.15
JFC	0.00174	0.02155	7.49	0.01238	0.01092	53.14	14.10
JGS	0.00818	0.04381	15.73	0.02571	0.02628	49.46	31.81
LC	0.00144	0.02933	4.68	0.00288	0.02789	9.36	50.04
LCB	0.00349	0.04188	7.70	0.00460	0.04077	10.15	75.89
MBT	0.00646	0.01936	25.02	0.00901	0.01682	34.87	71.74
MER	0.00085	0.00681	11.10	0.00306	0.00461	39.88	27.84
MERB	0.00235	0.01147	16.98	0.00871	0.00511	63.04	26.93
MPC	0.02831	0.08076	25.95	0.06725	0.04182	61.66	42.09
PNB	0.01855	0.05373	25.66	0.03459	0.03770	47.85	53.63
SMC	0.00087	0.00758	10.32	0.00147	0.00699	17.34	59.54
SMCB	0.00169	0.01389	10.87	0.00371	0.01188	23.79	45.69
TEL	0.00101	0.00990	9.24	0.00401	0.00690	36.75	25.15

1999, idiosyncratic risk accounted for 85% (using the market model of systematic risk) or 80% (using the Fama and French three-factor model) of total volatility. The smaller results for the Philippines are an indication of the greater sensitivity of the local stock market to macroeconomic fluctuations.

Regressing the cross sectional average excess returns of stocks against its own systematic risk yields a p-value of 0.0000 and R^2 of 0.6731 while that against residual idiosyncratic or diversifiable risk yields a p-value of 0.0000 and a higher R^2 of 0.8420. Both the coefficients for the systematic risk and idiosyncratic risk are highly significant. In particular, the result corresponding to systematic risk is consistent with standard investment theory. However, regressing excess returns against both variables simultaneously yields the following relationship:

(10) $$R_i^{exc} = -0.0031 + 0.06142\sigma_{si}^2 + 0.35273\sigma_{di}^2 .$$

(0.1962) (0.6441) (0.0009)

The figures in the parenthesis are the p-values. R^2 is 0.8592 and the F-statistic is highly significant with a p-value of 0.00000. However, it is apparent that systematic and idiosyncratic risks are highly correlated with each other (with correlation coefficient of 0.7730) and that idiosyncratic risk dominates in the multiple regression. The highly significant and positive coefficient corresponding to idiosyncratic risk indicates that this risk is not fully diversified in typical investor portfolios. Chart 1 shows actual average expected excess returns for the sample stocks plotted against the predicted excess returns using pricing equation (10). The variation of the sample points from the drawn 45^o line represents the pricing errors from the pricing equation.

5. Integrated Multifactor Pricing Model

5.1 Determinants of Systematic and Idiosyncratic Risks

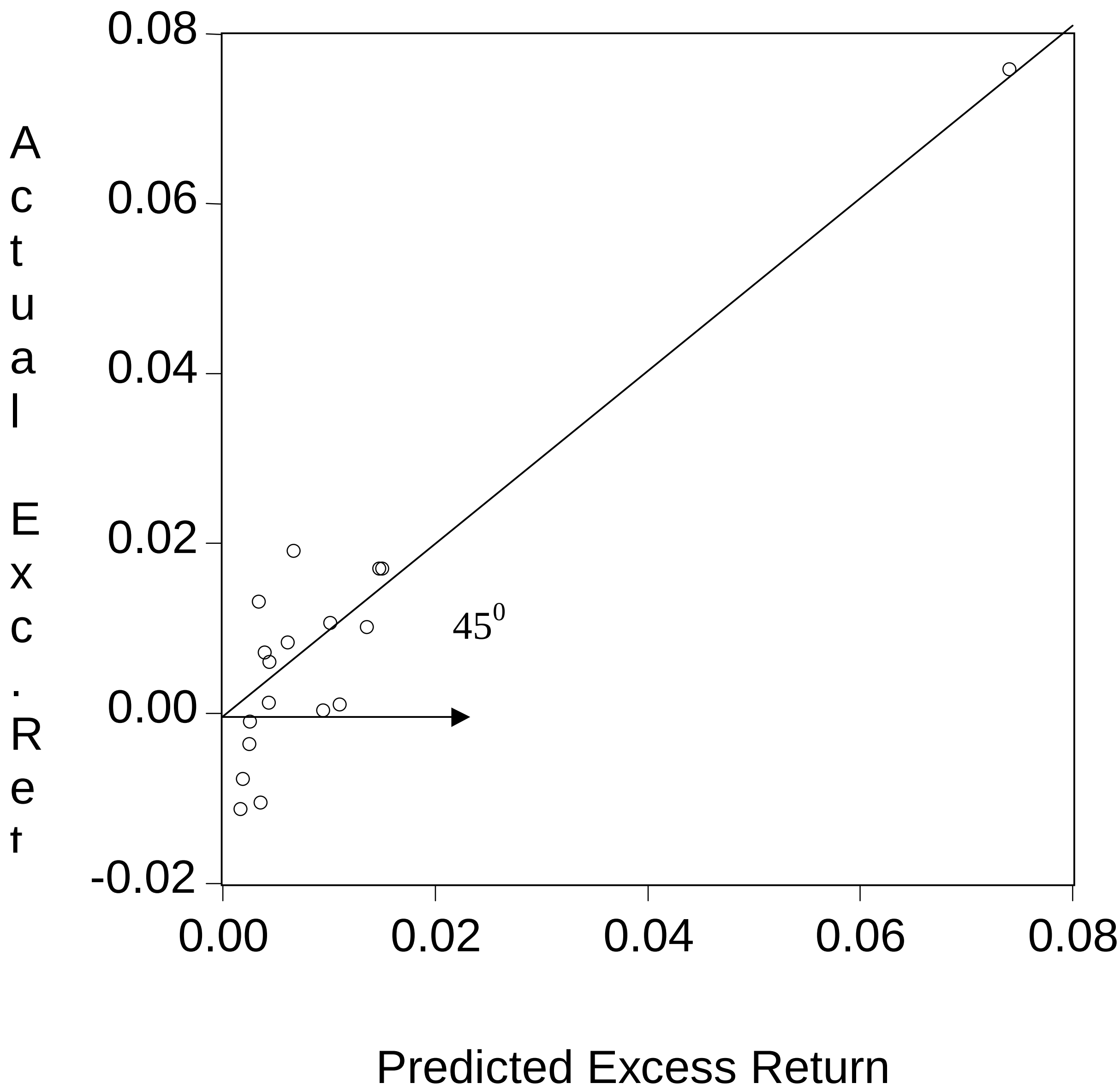
In the last section, it was concluded that the main determinants of cross sectional variation in stock returns are the stock’s sensitivity to fluctuations in macroeconomic variables (measured by the betas and aggregated into the individual stock’s systematic risk) and its own residual return volatility or idiosyncratic risk. This section looks at what characteristics of the firm (and its stock) drive systematic and idiosyncratic risks. For example, from *a priori* grounds, it should be expected that the systematic risks emanating from fluctuations in macro variables related to national output or aggregate demand are closely correlated with measures of exposure of income and cash flows to fluctuations in these macro factors. However, there are no guides in theory or past research to determine what factors generate idiosyncratic risks. Measures of firm fundamentals based on the existing literature are also used to gauge the robustness and comprehensive nature of systematic and idiosyncratic risks in explaining cross sectional variation in excess returns. If these measures are robust and comprehensive enough, then no other factors should contribute additional explanatory power for cross sectional returns that cannot be related to these factors. The measures are:

Income and Cash Flow Measures

- Net Income Growth (1993-2000)
- Revenue Growth (1993-1999)
- Cash Flow Growth (1993-2000)
- Revenue to Total Assets (1993-1999)

Chart 1 – Expected Excess Returns: Actual vs. Predicted

Equation (4.15)



- Cash Flow to Total Assets (1993-1999)
- Net Income to Stockholders Equity (1993-2000)
- Net Income to Market Capitalization (1993-2000)

Measures of Risk

- Average Debt-Equity Ratio (1993-1999)
- Dividend history (1993-2000)
- Net Income Coefficient of Variation (1993-2000)
- Revenue Coefficient of Variation (1993-1999)
- Cash Flow Coefficient of Variation (1993-2000)

Measures of Liquidity

- Trading Value to Market Capitalization (2000)
- Trading Volume (2000)

Measures of Cheapness[5]

- Book Value to Market Capitalization (1993-1999)
- Average q (1993-1999)

Measure of Size

- Market Capitalization (2000)
- Growth in Total Assets (1993-1999)
- Revenue Turnover (1993-2000)

In addition, dummy variables corresponding to the factor analysis done in the first part of this study are used to include industry or sectoral factors. Three identifiable factors are indicated in that analysis, labeled as the blue chip factor, the mining factor, and a catchall commercial-industrial-financial factor. The blue chip factor dummy variable is coded one if the stock is loaded heavily with that factor and the mining factor dummy variable is coded one if the stock is loaded heavily in that factor. The default is the commercial-industrial-financial sector.

Many of the measures listed are self-evident. Some, however, require additional explanation. Growth in net income and other variables is measured by fitting a log-linear curve through the annual data. In the absence of cash flow data, these are estimated by adding to reported net income 5% of total fixed assets to represent depreciation. This is consistent with the methodology used to estimate Tobin's q. The debt-equity ratio is traditionally considered a measure of financial risk because a high ratio exposes the firm to default risk in case cash flow is lower than expected. Dividend history, simply measured here by a qualitative variable with value one if the stock has consistently paid dividends during the 1993-2000 period and zero otherwise, is considered a measure of risk because of VAR decomposition studies (see, for example, Campbell et al., 1997) indicating that dividend variability generates less price volatility than other factors. Elton and Gruber (1994) also argued that dividend payments are less risky than capital

[5] This term is due to Haugen (1999), a leading exponent of the view that the U. S. stock market is inefficient.

gains. Thus, stocks that pay regular dividends are less risky than stocks that do not. The measures of liquidity used trading volume and the ratio of trading value to market capitalization. The rationale is that the higher this ratio is the less liquidity premium over the most liquid financial asset, e.g., 91-day treasury bill, will be required by the investor to hold the stock. This is also consistent with the finding earlier that the term premium, measured by the spread between the 364-day and 91-day treasury bill rates is a statistically significant risk factor. The measures of cheapness used are the ratio of the book value of stockholders' equity to market capitalization and average q as estimated in Aquino (2002).

Table 3 shows the results of regressing systematic risk against firm fundamental variables. Variables relating to revenue growth, total asset growth, a measure of revenue variability, and the ratio of revenue and cash flow to total assets are found statistically related to systematic risk. This sounds reasonable as these variables are arguably related to fluctuations in national output. The coefficient for market turnover is also found statistically significant. As noted previously, this variable is a measure of market liquidity and can be related to the term premium measured by the spread between the 364-day and 91-day treasury bill rates, one of the macro factors used in measuring systematic risk. The coefficients for dividend history and the blue chip factor are also found to be statistically significant. These variables are more likely to be related to aggregate market return than the seven macroeconomic variables. To determine if there are other significant variables that are missed in single regression, a step-wise multiple regression procedure (with F = 0.05 and 0.10 as entering criteria) is run with all the candidate firm fundamental variables. Only total asset growth and cash flow to total assets ratio are found significant in this regression. Thus, no other variables other than those in the list of statistically significant variables found in single regression are likely to influence the level of systematic risk.

Table 4 shows the results of regressing idiosyncratic risk as measured in the previous section against firm fundamentals. Only the variable corresponding to regular dividend payment history is found statistically significant. To determine if there are other significant variables that are missed in single regression, a step-wise multiple regression procedure (with F = 0.05 and 0.10 as entering criteria) is run with all the candidate firm fundamental variables. Again, only dividend history is found significant. This finding supports the earlier conjecture that stocks that pay regular dividends have less price and return volatility than those that do not. Equivalently, the market demands a premium return from stocks that do not pay dividends regularly. In addition, the results that the coefficients for measures of risks are not found statistically significant indicate that these risks are already subsumed under systematic risk and are not indications of idiosyncratic risks. This finding means that only issues related to specific firm developments, which may not be directly related to firm fundamentals, are relevant determinants of idiosyncratic risks.

The concept that a consistent dividend payout policy has a positive effect on stock prices is not new. To provide a brief background, under the celebrated Miller-Modigliani (1961) dividend irrelevance proposition, the value of a firm is not affected by its dividend policy in a world without taxes or transaction costs. However, in the presence of personal taxes where dividends and capital gains are taxed differently, Miller and Modigliani themselves stated that their proposition may not hold. Specifically, when dividend are taxes effectively higher than capital gains, as in the Philippines, payment of dividends will only serve to lower the value of the firm and its stocks (aside from the asset reduction effect of the cash payout). This is one plausible explanation why local corporations, as noted earlier in the informational efficiency

Table 3 – Regression of Systematic Risk Against Firm Fundamentals

	Coefficient	s.e.	t-statistic	p-values	R^2
Net Income Growth	0.0485	0.0375	1.2961	0.2133	0.0950
Revenue Growth	0.1450	0.0699	2.0760	**0.0544**	0.2122
Cash Flow Growth	0.0564	0.0496	1.1391	0.2714	0.0750
Revenue to Total Assets	-0.0320	0.0173	-1.8439	**0.0838**	0.1753
Cash Flow to Total Assets	-0.2659	0.1511	-1.7605	**0.0974**	0.1623
Net Income to St. Equity	-0.1509	0.1176	-1.2831	0.2177	0.0933
Net Inc. to Market Cap.	-0.0930	0.1590	-0.5849	0.5668	0.0209
Debt-Equity Ratio	0.0010	0.0422	0.0240	0.9812	0.0000
Dividend History	-0.0268	0.0133	-2.0128	**0.0613**	0.2020
Net Inc. Coeff. of Variation	0.0007	0.0004	1.6521	0.1180	0.1457
Revenue Coeff. of Variation	0.0612	0.0268	2.2831	**0.0364**	0.2457
Cash Flow Coeff. of Variation	0.0052	0.0035	1.4775	0.1589	0.1201
Trading Value to Market Cap.	0.0274	0.0347	0.7894	0.4414	0.0375
Book Value to Market Cap.	0.0304	0.0206	1.4741	0.1599	0.1196
Average q	0.0014	0.0093	0.1453	0.8863	0.0013
Market Capitalization	0.0000	0.0000	-1.4406	0.1690	0.1148
Total Asset Growth	0.1385	0.0542	2.5544	**0.0212**	0.2897
Market Turnover	-0.0320	0.0173	-1.8439	**0.0838**	0.1753
Blue Chip Factor	-0.0260	0.0149	-1.7510	**0.0991**	0.1608
Mining Factor	-0.0216	0.0225	-0.9630	0.3499	0.0548

Table 4 – Regression of Idiosyncratic Risk Against Firm Fundamentals

	Coefficient	s.e.	t-statistic	p-values	R^2
Net Income Growth	0.0611	0.0583	1.0468	0.3108	0.0641
Revenue Growth	0.1147	0.1171	0.9797	0.3418	0.0566
Cash Flow Growth	0.0942	0.0753	1.2501	0.2292	0.0890
Revenue to Total Assets	-0.0371	0.0277	-1.3364	0.2001	0.1004
Cash Flow to Total Assets	-0.2912	0.2421	-1.2026	0.2466	0.0829
Net Income to St. Equity	-0.1644	0.1847	-0.8902	0.3866	0.0472
Net Inc. to Market Cap.	-0.0177	0.2460	-0.0718	0.9436	0.0003
Debt-Equity Ratio	-0.0180	0.0645	-0.2783	0.7843	0.0048
Dividend History	-0.0446	0.0199	-2.2352	**0.0400**	0.2380
Net Inc. Coeff. of Variation	0.0002	0.0007	0.2994	0.7685	0.0056
Revenue Coeff. of Variation	0.0456	0.0459	0.9934	0.3353	0.0581
Cash Flow Coeff. of Variation	0.0024	0.0057	0.4190	0.6808	0.0109
Trading Value to Market Cap.	0.0240	0.0538	0.4466	0.6612	0.0123
Book Value to Market Cap.	0.0294	0.0329	0.8962	0.3834	0.0478
Average q	-0.0040	0.0142	-0.2822	0.7814	0.0050
Market Capitalization	0.0000	0.0000	-1.5048	0.1519	0.1240
Total Asset Growth	0.1061	0.0949	1.1179	0.2801	0.0724
Revenue Turnover	-0.0371	0.0277	-1.3364	0.2001	0.1004
Blue Chip Factor	-0.0305	0.0237	-1.2877	0.2162	0.0939
Mining Factor	0.0059	0.0354	0.1664	0.8699	0.0017

essay, hardly pay any dividends.[6] In terms of the effect on prices, however, the empirical evidence just cited for the Philippines is consistent with the experience in the U. S. and elsewhere (see Lease et al, 2000). The general belief seems to be that consistent dividend payments have a positive impact on prices despite tax disadvantages. One strand in the financial economics literature, pioneered by Bhattacharya (1979), explains this in terms of the informational or signaling content of dividends. In a world of imperfect information, insiders (managers and controlling stockholders) know more about the firm prospects than outsiders (potential investors and minority or non-controlling stockholders). Insiders would like to communicate to outsiders the good prospects of the company. However, costless communication will not be credible as every firm, regardless of prospects, will want to communicate costless optimistic messages to potential investors. Thus, for the signal to be credible, it must have a cost. In the case of dividends, this consists of the need for the to access outside sources of finance when required in place of retained earnings and the tax disadvantage of dividend payments to stockholders as against capital gains.

Miller and Rock (1985) developed a model in similar vein to that of Bhattacharya which appears to provide a plausible explanation for the empirical result. This model predicts that the disclosure of earnings provide the same information as disclosure of net dividends. The effect of dividend payments is the additional need for external funding to finance projects. Following the free cash flow hypothesis of Jensen (1986) whereby stockholders would prefer that the firm maintain low levels of cash (by declaring them as dividends) and a high level of debt. In this way, the stockholders will lower their cost of monitoring firm management (which function is largely taken over by creditors). Pursuing the argument further, monitoring by creditors and the fear of default will then lead firm management to choose less risky projects thereby reducing the riskiness of the firm's stocks.

The finding that dividend policy has an impact on stock prices is consistent with the belief of executives of listed Philippine firms surveyed in Kester at al (1995-96). These executives were of the opinion that the market used dividend announcements in assessing market values. Furthermore, they believed that dividend payments provided a signaling device of company prospects. However, they expressed no strong views regarding the question whether returns from capital gains were more risky than returns from dividends. Kester et al concluded from this last result that there was no support for what they referred to as the traditional view that stockholders preferred dividends to capital gains. This conclusion is contradicted by the empirical results just presented in this present study. As mentioned, the effect of dividend history on stock prices appears to be through the perceived lower operating risk (systematic and idiosyncratic) signaled by firms who pay dividends consistently.

To summarize the results in this section, certain firm-level fundamentals seem to be the main determinants of a stock's exposure to systematic risk. These include operating fundamentals such as growth in revenue and assets, ratios of revenue and cash flow to total assets, and revenue variability. Also included are stock-specific measures such as market turnover and dividend history. On the other hand, idiosyncratic risk seems to be generated by factors not directly related to firm fundamentals. Although dividend history has significant explanatory power for idiosyncratic and systematic risks, the decision to declare dividends consistently is as much related to firm fundamentals as it is a discretionary act of management. Two firms with the same fundamentals may elect different dividend policies. Thus, as mentioned, idiosyncratic risks seem to be generated by factors very specific to the firm. From perusal of business newspapers, these factors could include rumors and fads, public relation campaigns, announcements of new

[6] This is in contrast with the U. S. experience first cited by Black (1976). The U. S. has a similarly placed tax structure as the Philippines. However, U. S. firms generally pay consistently significant proportions of their earnings as dividends. Black referred to this phenomenon as 'the dividend puzzle."

projects, merger talks, take-over bids, and trading by parties with private information. It may even include external factors like random events, political connections, or the business group of the controlling shareholders of the firm. Much research still has to be done of the factors determining firm-specific or idiosyncratic risk.

5.2 Model Results

This section develops a multifactor model integrating systematic and idiosyncratic risks and relevant firm level variables that can explain cross sectional variation in excess returns. The model also includes a simultaneous determination of the factors that affect both components of risk. The model formulation also addresses the earlier problem of multicollinearity between systematic and idiosyncratic risks which serves to blur the relative contribution of these two composite factors in explaining excess returns.

First, the question of whether the measures of systematic and idiosyncratic risks already explain adequately cross section return variation is addressed. Table 5 shows the results of regressing the residuals from the regression equation. It is seen that net income and cash flow growth and market liquidity are statistically significant, indicating that these firm fundamental factors significantly add explanatory power for cross sectional return differences but are not captured in the joint regression involving the measures of systematic and idiosyncratic risks used. Regression of the residuals from a one-variable regression of excess returns against systematic risk alone, however, indicates that these factors are already subsumed under systematic risk. The same is true for the statistically significant blue chip factor. Based on these considerations, instead of equation (10), alternative models where the explanatory variables are systematic risk, idiosyncratic risk, market liquidity, net income and cash flow growth, and the blue chip factor need to be tested. In addition, it is seen that while dividend history shows up as the main explanatory factor for idiosyncratic risk, it also has a significant influence on systematic risk along with other firm-level variables. This may be the reason for the multicollinearity problem just cited. To disentangle these effects, a system of equation is formulated relating excess returns, idiosyncratic risk, systematic risk, the other variables just mentioned, and the variables earlier found to have significant influence on systematic risk. Seemingly related regression (SUR) is used because the error terms in the system of equation is suspected to interact with each other. The resulting best fitting system of equations with the variables found significant is:

$$\begin{aligned} R_i^{exc} &= \underset{(0.5039)}{0.00130} + \underset{(0.0451)}{0.19919}\sigma_{si}^2 + \underset{(0.0002)}{0.25384}\sigma_{di}^2 - \underset{(0.0038)}{0.019781}liq_i \\ \sigma_{si}^2 &= \underset{(0.0003)}{0.05636} - \underset{(0.0313)}{0.02401}div_i + \underset{(0.0003)}{0.08361}gta_i \\ \sigma_{di}^2 &= \underset{(0.0749)}{0.01833} - \underset{(0.0189)}{0.04461}div_i \end{aligned} \tag{11}$$

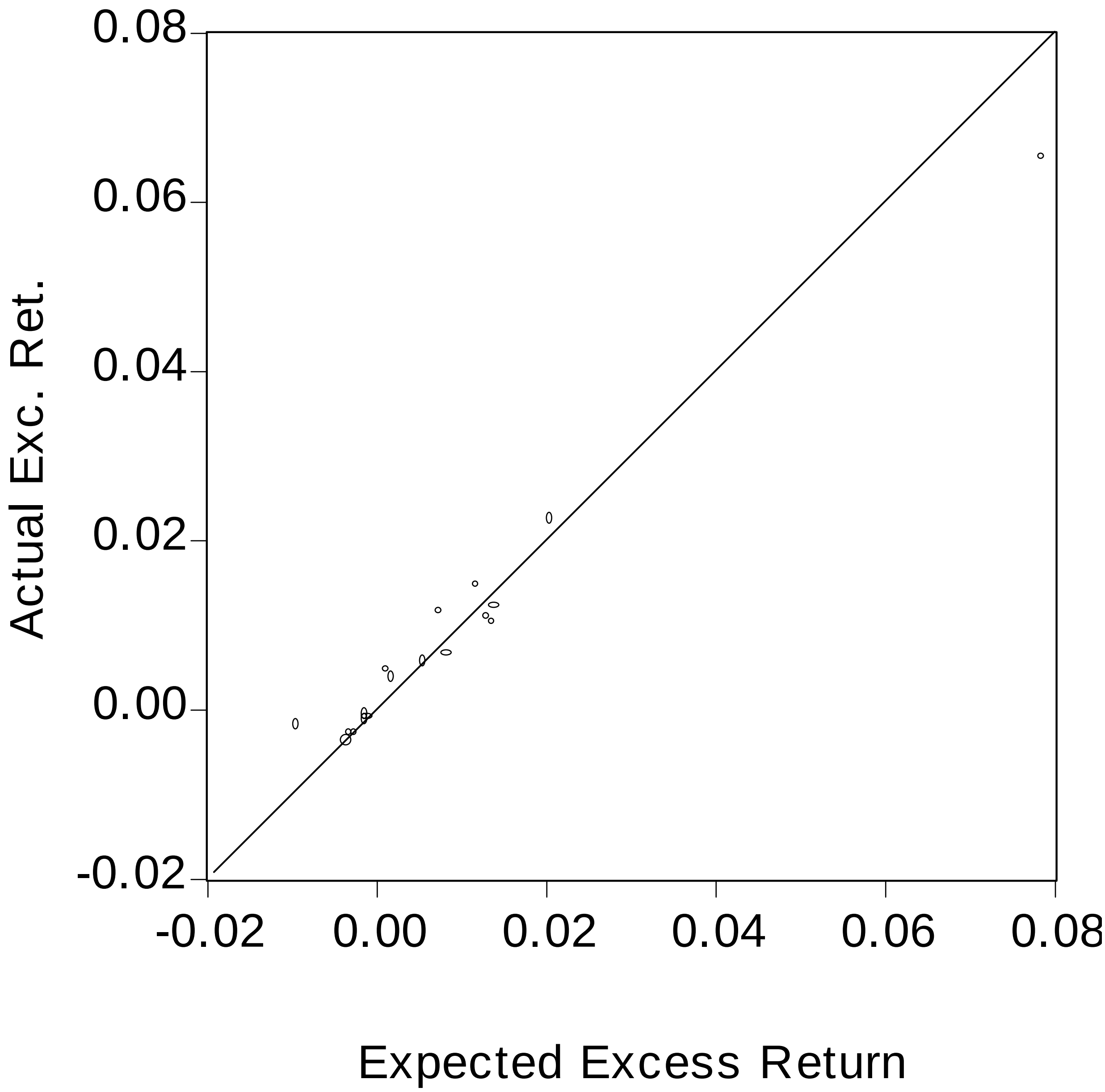
where liq_i if the ratio of trading volume to market capitalization for stock i and gta_i is the growth rate in total assets of the firm behind stock i. This regression has an R^2 of 0.9010 which is a better fit than equation (10). The intercept is statistically not different from zero, thus providing further support to the model. Chart 2 shows actual average expected excess returns for the sample stocks plotted against the predicted excess returns using pricing equation (11). The variation of the sample points from the drawn 45^o line represents the pricing errors from the pricing equation.

Table 5 – Regression of Macro Residuals Against Firm Fundamentals

	Coefficient	s.e.	t-statistic	p-values	R^2
Net Income Growth	0.0179	0.0086	2.0831	**0.0536**	0.2133
Revenue Growth	0.0325	0.0176	1.8461	0.0835	0.1756
Cash Flow Growth	0.0265	0.0108	2.4408	**0.0267**	0.2713
Revenue to Total Assets	-0.0017	0.0047	-0.3625	0.7217	0.0081
Cash Flow to Total Assets	0.0186	0.0404	0.4614	0.6507	0.0131
Net Income to St. Equity	0.0092	0.0304	0.3032	0.7657	0.0057
Net Inc. to Market Cap.	-0.0324	0.0388	-0.8351	0.4160	0.0418
Debt-Equity Ratio	-0.0107	0.0101	-1.0633	0.3034	0.0660
Dividend History	0.0016	0.0037	0.4357	0.6689	0.0117
Net Inc. Coeff. of Variation	0.0000	0.0001	0.4260	0.6758	0.0112
Revenue Coeff. of Variation	-0.0007	0.0076	-0.0912	0.9284	0.0005
Cash Flow Coeff. of Variation	0.0000	0.0009	-0.0091	0.9928	0.0000
Trading Value to Market Cap.	-0.0183	0.0074	-2.4707	**0.0251**	0.2762
Book Value to Market Cap.	-0.0019	0.0054	-0.3440	0.7353	0.0073
Average q	0.0044	0.0020	2.1653	0.0458	0.2266
Market Capitalization	0.0000	0.0000	0.3301	0.7456	0.0068
Total Asset Growth	0.0159	0.0154	1.0355	0.3159	0.0628
Revenue Turnover	0.0000	0.0000	-0.9848	0.3394	0.0572
Blue Chip Factor	-0.0070	0.0036	-1.9593	**0.0677**	0.1935
Mining Factor	0.0038	0.0056	0.6804	0.5060	0.0281

Chart 2 – Expected Excess Returns: Actual vs. Predicted

Equation (4.16)



Note that the effect of multicollinearity between systematic and idiosyncratic risks is lessened and both their coefficients in the first equation explaining excess returns are statistically significant with positive signs. As mentioned earlier, the observed multicollinearity appears to be due to the common influence of dividend history on both systematic and idiosyncratic risks. When this is isolated in the last two equations explaining both types of risks, the multicollinearity problem disappears. The negative coefficient for market liquidity indicates a positive term or liquidity premium required by the market for less-traded issues. This is consistent with the apparent risk premium found in Table 10 in the first part of this study with respect to the spread between the 364-day and 91-day treasury bill rates.

6 Concluding Remarks

This study set out to examine the various factors that may explain cross sectional variation in individual stock returns in the context of a multifactor asset pricing model. The results of the two-part study can now be summarized as follows:

- Seven macroeconomic factors are identified as potential sources of risks to individual firms. Regression results indicate that fluctuations in all of these macroeconomic factors have significant influence on individual stock returns. In fact, macroeconomics fluctuations account for 42-47% of total risk as compared say, with the U.S. where they contribute only 15-20% of total risk.
- However, an exact formulation of a multifactor asset pricing model fails to price these risk factors. The possible explanations for the poor results are incomplete arbitrage and lack of diversification on the part of investors resulting in significant idiosyncratic risks. Systematic risk, while significant, cannot by itself fully explain observed variation in stock returns. Idiosyncratic risk also matters.
- Systematic and idiosyncratic risks, together with a measure of the stock's market liquidity, appear to be the main determinants of cross sectional variation in stock returns.
- The firm's sensitivity to systematic risk in turn is determined by its dividend history and certain other firm-level fundamentals, especially growth history.
- Dividend history, because of its signaling function, is found to be a determinant of idiosyncratic risk. Except for this, idiosyncratic risk appears to be driven by factors very specific to the firm which may not be directly related to firm fundamentals. More research is indicated on what factors generate firm-specific or idiosyncratic risk.

These results have important implications. Systematic risk, which constitutes a large proportion of total risk, can be managed at the macro level by regulating macroeconomic fluctuations. The firm can also choose its level of systematic risk exposure by appropriate operating decisions and internal diversification. In a similar vein, the investor can choose his/her level of systematic risk by appropriate analysis of firm fundamentals and stock selection. However, except for choosing firms with consistent dividend history, the only way for a rational investor to minimize idiosyncratic risk is by portfolio diversification.

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other risk factors related to firm-scale and firm value. The result showed that bond and stock returns variations and the cross-sectional average returns is explained by all factors explains with value-based risk being most important factor. Fama and French [24] applied the three factor model on three different stock markets (NYSE, AMEX and NASDAQ) and found the returns are explained by market factor and size factor. Meanwhile the value factor could not describe the variations in expected returns of stocks. Over the years Fama and French model have contributed to create the a large body ofnew For instance, while crossing the road, there is always a risk of getting hit by a vehicle if precautionary measures are not undertaken. Similarly, in the area of investment and finance, various risks exist since the hard-earned money of individuals and firms are involved in the cycle. In this article, we shall be focussing on the differences between Systematic and Unsystematic Risk. These risks are inevitable in any financial decision, and accordingly, one should be equipped to handle them in case they occur. Systematic Risk does not have a specific definition but is an inherent risk existing FU, Fangjian. Idiosyncratic Risk and the Cross-Section of Expected Stock Returns. (2009). Journal of Financial Economics. 91, (1), 24-37.Â As a result, only systematic risk is priced in equilibrium and idiosyncratic risk is not. For various reasons, investors in reality however may not hold perfectly diversified portfolios. For instance, Goetzmann and Kumar (2004) show that, based on a sample of more than 62,000 household investors in the period of 1991 to 1996, more than 25 percent of the investor portfolios contain only one stock, over a half of the investor portfolios contain no more than three stocks and less than ten percent of the investor portfolios contain more than. We estimate the determinants of the rate of return on bank stocks using a standard equity pricing framework that decomposes share price risk into a systematic and an idiosyncratic component. The systematic component cannot be diversified away, and it is priced in the market in the sense of commanding higher expected returns. The opposite holds for the idiosyncratic component, which can be diversified away in sufficiently large portfolios and hence is not priced in the market.Â It can explain the cross-sectional variations in stock returns quite well. Thus, we do not construe our additional drivers as additional dimensions of systematic risk.6 Instead, we assume that they help describe the way individual bank stocks relate to these factors by affecting the risk loadings. Section 6 is broken into two parts: first, variation in the earnings/returns relation over time and its association with long-term risk-free interest rates are documented; second, cross-sectional variation in the earnings/returns relation and its association with risk, earnings persistence and/or growth are documented. Section 7 summarizes our findings and discusses some of the implications of our results for past and future research.Â then discuss the cross-sectional and temporal determinants of the ERCs which provide the basis for our empirical investigation. Finally, we compare the determinants of the ERCs identified in this study with those in the related literature.Â Previous studies identify persistence and systematic risk as the determinants. of ERCs.