# THE CONDITIONAL CAPM AND THE CROSS SECTION OF EXPECTED RETURNS: EVIDENCE FOR THE CANADIAN MARKET

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# ABSTRACT

## THE CONDITIONAL CAPM AND THE CROSS SECTION OF EXPECTED RETURNS: EVIDENCE FOR THE CANADIAN MARKET

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In this study we test a conditional version of the CAPM, proposed by Jagannathan and Wang (1996), that allows betas $(\beta)$ to vary over time as proxied by the yield spread between three-month Prime Corporate Paper and the three-month T-Bill rate $(\beta_p^{prem})$. The model also includes a measure of the sensitivity of human capital to the market $\beta$ as proxied by the lagged return on Total Labor Income $(\beta_p^{labor})$, and *SIZE* (log of share price times number of shares outstanding) as explanatory variables. Our objective is twofold: (a) to test this model's ability to better explain the cross-sectional variation of monthly returns on 25 *SIZE*- and *beta*-sorted portfolios of Canadian common stocks over the period from June 1965 to December 1992 (330 months); and (b) to compare the performance of this conditional CAPM with the unconditional CAPM (*SLB* model). For portfolio formation, we use a methodology similar to Fama and French (1992). For the estimation procedure, we use the two-step approach of Fama and MacBeth (1973) as well as the more powerful GLS time-series cross-sectional estimation approach.

Our results indicate that the conditional CAPM using all the variables does fairly well in explaining returns ($R^2$ of 38.99%). As in Jagannathan and Wang (1996) for US stocks, we find that the unconditional CAPM is not as powerful for Canadian stocks, and that most of its explanatory power comes from the constant factor or the zero-$\beta$ portfolio. As in Fama and French (1992) for US stocks, we find that Canadian stock data yield a significant and negative relationship between return and *SIZE*. We also find that the premiums for the sensitivity of the term-structure variable that allows for $\beta$ time-variation is significant. Unlike Jagannathan and Wang (1996), the premium for the sensitivity factor for the return on human capital is not significant. Our results suggest that three factors alone, the zero-$\beta$ factor, $\beta_p^{prem}$ and *SIZE*, explain fairly well the cross-sectional variation of Canadian stock returns for the time period studied herein.

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## 1. Introduction

One of the most important models developed in finance is the Sharpe-Lintner-Black CAPM model.[1] It describes the relationship between the return on any risky asset and its risk. It assumes a linear relationship between the return of a risky asset and beta ($\beta$), a measure of risk relative to that for a portfolio of all the assets in the economy. The CAPM is couched in a mean-variance efficient framework, is generally formulated as a single-period model, and assumes that $\beta$ is sufficient to explain the systematic part of returns.

Because of its importance in investment decision making, many researchers have tested the validity of the CAPM over the past 25 years. Fama and MacBeth (1973) and Black, Jensen and Scholes (1972) did some tests of the unconditional CAPM and find that the relationship between returns and $\beta$ is significant and positive. In contrast, Reinganum (1981) finds no significant relationship between $\beta$ s and returns, when daily returns are used. Fama and French (1992, 1993 and 1996) find that two variables *SIZE* (stock price times number of shares outstanding) and BE/ME (book-to-market equity ratio), and not $\beta$, explain the variation in the cross-section of portfolio returns. Many other variables are tested in the literature in order to identify other risk factors that can better explain cross-sectional returns systematically.

[1] Sharpe (1964), Lintner(1965), and Black (1972).

The proxy generally used for the return on the market portfolio (return on the stock market index) is found to be not sufficient. Mayers (1972) suggests that human capital needs to be included. Many studies attempt to test the CAPM using a number of macro-factors such as term-structure proxies or default-risk factors. They find that these factors add to the explanatory power of the model [e.g. Chen, Roll and Ross (1986)].

Tests also evaluate the conditional CAPM, where investors use the information available in one period to make decisions for the next. Tests of the conditional CAPM are successful in explaining variations in the cross-sectional returns of portfolios of stocks [Pettengil, Sundaram and Mahur (1995)]. Jagannathan and Wang (1996) find that a conditional CAPM that allows for $\beta$ to vary over time and with human capital included in the market return does well in explaining the cross-section of US stock returns. For Canadian stocks, Kryzanowski, Lalancette and To (1994) use a conditional model and apply non-linear estimation techniques to investigate the performance of mutual funds. Their model explains much of the cross-sectional variation in expected returns.

The purpose of our study is to test a conditional CAPM against the unconditional CAPM, and to test the ability of the conditional CAPM to explain the cross-sectional variation of returns for portfolios formed from Canadian stocks over the period 1965-1992. This is similar to the study of Jagannathan and Wang (1996) based on the US stock market. The model is used to address three issues: (a) the ability of a broader proxy for the market, one enriched with the return on human capital proxied by the return on Total Labor Income, to better explain the variation in returns; (b) the ability of a measure of beta-instability over the business cycle proxied by the lagged (one month) yield differential between three-month prime corporate paper and three-month T-Bills, to add explanatory power to the traditional CAPM; and (c) the significance of *SIZE* as an explanatory variable.

In the next section we present an overview of the most important studies on testing the CAPM and their findings. In Section 3, we introduce the variables to be used in our empirical tests and we present the portfolio formation process. Section 4 includes both the main model to be tested and a detailed explanation of the methodology followed. In Section 5, we present the empirical results as well as their interpretation. Our concluding remarks and direction for future research are presented in Section 6.

## 2. Review of the Literature

### 2.1. The Unconditional CAPM

The unconditional CAPM presented in the literature by Sharpe (1964), Lintner (1965) and Black (1972) (*SLB*) sets the theoretical framework for explaining the variations of expected returns on risky assets as well as their relation with risk. The *SLB* model takes the form:

$$E(R_i) = \gamma_o + \gamma_1 * \beta_i \qquad [1]$$

where $E(R_i)$ is the expected return on the risky asset *i*; $\gamma_0$ is the return on the zero-beta asset; $\gamma_1$ is the return on the portfolio of all assets in the economy ($R_m$); and $\beta_i$ is the measure of systematic risk. Beta is defined as:

$$\beta_i = COV(R_i, R_m)/VAR(R_m) \qquad [2]$$

The *SLB* model assumes that: (a) the expected return on a risky asset is linearly related to its $\beta$ and $R_m$; and (b) $\beta$ is a relevant and sufficient measure of risk that captures the variation in expected returns. The unconditional CAPM is a static or one-period model. Since it assumes that markets are perfect, information is discounted instantly as soon as it is available to every investor. If we assume that the lending rate is equal to the borrowing rate, we form the same model with excess returns. Thus: $R_i^* = R_i - R_f$ and $R_m^* = R_m - R_f$, where $R_f$ is the rate of return on the riskless asset.

Many studies attempt to test the CAPM because it is the most important model in finance due to its intuitive nature and its economic rationale. Black, Jensen and Scholes (1972) test the model using a number of time series OLS regressions and find a positive relation between return and $\beta$ for portfolios of US stocks for the period prior to 1970. Fama and MacBeth (1973) use a two-step approach over similar periods, and also find that $\beta$ s explain well the cross-sectional variation of returns of US stock portfolios.

In contrast, a number of studies during the past 25 years find that the relationship between $\beta$ s and returns is not strong.[2] The focus of most of these studies is to examine and test a number of issues relating to the validity of the CAPM such as: (a) $\beta$ may not be the only measure of risk; (b) other variables may directly explain variations in returns; (c) $\beta$ may not be stable over time or under different economic conditions or under various microstructure effects; (d) the CAPM may not hold for different time periods or

[2] For examples see: Reinganum (1981), Banz (1981), Chan, Chen, and Hsieh (1985), Lakonishok and Shapiro (1986), Bhandari (1988), Fama and French (1992), and Jegadeesh (1992).

in a multi-period context; (e) testing methods are not sufficient or accurate enough to test the CAPM's validity; (f) the relationship between $R_i$, $R_m$, $R_f$ and β may not be linear; (g) the proxies for $R_m$ may not be mean-variance efficient; (h) the use of portfolios instead of individual stocks as well as the method of formation of these portfolios may introduce some problems; (i) linear estimation techniques for the β s may not be accurate enough; and (j) the β s may not represent priced systematic risks.

In the next subsection we briefly present a number of studies that deal with some of the issues just discussed.

## 2.2. The Conditional and Other Multivariate Versions of the CAPM

Since the validity of the CAPM has been questioned, many researchers attempt to test other variables[3] that can better explain the cross-section of portfolio returns. Banz (1981) examines the role of the *SIZE* of a stock as proxied by the log of market equity (that is, the log of stock price times number of shares outstanding). He finds a strong and negative relation between returns on US stock portfolios and *SIZE*. Basu (1983) tests the effect of earnings-to-price (E/P) and cash flow-to-price (C/P) ratios as measures of profitability on the variation of returns of stocks. He finds a significant U-shape relation between returns and E/P even after controlling for *SIZE* and β. Keim (1988) identifies the dividend-to-price ratio and dividend yield (D/P) as having significant explanatory power for the cross-sectional variation of US stock returns. Rosenberg, Reid and Lanstein (1985) find a strong relationship between the ratio of book equity-to-market equity (BE/ME) and returns

[3] These variables are also referred to in the literarure as *anomalies* or *regularities*.

on portfolios of US stocks. Chan, Hamao and Lakonishok (1991) also find that high BE/ME is related with high returns on Japanese stocks. Amihud and Mendelson (1986) examine the relationship between liquidity proxied by the bid-ask spread and stock returns. They find that there is a strong positive relation between illiquidity (high bid-ask spread) and US stock returns. Bhandari (1988) tests the effect of leverage, proxied by the assets-to-market equity ratio (A/ME), in explaining the cross-sectional variation of stock returns. He finds a significant positive relation between these two variables. Lakonishok, Shleifer and Vishny (1994) examine the effect of past sales growth. Their findings suggest that past sales growth affects high-growth stocks more than low-growth stocks based on the effect of past returns on future returns and investment decisions. Jegadeesh and Titman (1993) examine the effect of short-term returns and medium-term returns on stock returns and identify a strong continuation behavior in ex-post returns. De Bondt and Thaler (1985) find a significant reversal behavior in long-term returns. Kryzanowski and Zhang (1992) find significant continuation behavior for ex-post short-term returns but insignificant reversal behavior for the ex-post long-term returns for portfolios of Canadian stocks.

Fama and French (1992) (F&F) test the unconditional CAPM and find that two variables, *SIZE* and BE/ME, can explain very well the cross-section of US stocks over the period 1963-1990. Given the absence of any correlation between $\beta$ s and either *SIZE* or BE/ME, these latter two variables successfully capture most of the systematic risk in returns. In contrast, Chan and Chen (1991) show that since high-BE/ME stocks and low-*SIZE* stocks are usually companies in bad financial condition, that a financial distress factor explains the evidence reported in F&F. Fama and French (1993) provided a three-factor model that includes $\beta$, and two so-called zero-cost factors, one related to BE/ME (the difference between high-BE/ME and low- BE/ME portfolios of stocks (HML)) and one related to *SIZE* (the difference between small-*SIZE* and big-*SIZE* portfolios of stocks (SMB)). They test their model using many other factors and conclude that this three-factor model explains very well the cross-section of returns and that in the presence of these three factors all other factors become insignificant.

The F&F findings are the source of criticism in many studies. Concentrating on the data source and the portfolio formation aspects of F&F, Khotari, Shanken and Sloan (1995) identify a significant selection-bias introduced for the *SIZE*-sorted and BE/ME-sorted portfolios since many high-BE/ME and low-*SIZE* stocks do not survive, and thus are removed from the CRSP and COMPUSTAT tapes. They find that if the portfolio formation is done differently the results change. Chan, Jegadeesh and Lakonishok (1995) conclude that this problem is not significant. Davis (1994) obtains results similar to those of F&F (1992) after controlling for the selection-bias. Lo and MacKinlay (1990) and MacKinlay (1995) argue that the F&F results may be due to data-snooping given the variable construction for the characteristic-based portfolios. Daniel and Titman (1997) find a seasonality problem. A strong January effect accounts for most of the ability of the F&F (1993) three-factor model in explaining the cross-sectional variation of stock returns.

From the view point of investor behavior, Lakonishok, Shleifer and Vishny (1994) suggest that small-*SIZE* stock and high BE/ME stock returns are too high and their covariance with the macro-factors too low to justify the conclusion that they have the ability to explain the cross-sectional variation in a CAPM framework. They find that value-stocks (low price) are outperformed by glamour-stocks (high price) simply because of their past performance. They also find that variables such as sales growth, E/P, C/P and BE/ME have strong explanatory power but not *SIZE*. Similarly, La Porta (1996) finds systematic errors in investor behavior based on an examination of under-priced value stocks versus over-priced glamour stocks. He concludes that *SIZE* lacks explanatory power because of this. Daniel and Titman (1997) use a conditional model and control for *SIZE* and BE/ME. They find that the returns of low- $\beta$ and high- $\beta$ portfolios are the same. They conclude that these two factors do not compensate for systematic risk and are not pervasive factors. The characteristics themselves of these factors give them explanatory power.

A number of studies examine the sensitivity of the CAPM to macro-economic factors and to the sensitivity of $\beta$ over time. Merton (1973) introduces an inter-temporal version of the CAPM with a number of macro-economic factors that are orthogonal to the returns on the market portfolio. A hedge-portfolio is included to allow for the different states of the economy. Chen, Roll and Ross (1986) use term-structure and business-cycle variables as well as default-risk proxies to test their explanatory power for the cross-section of returns and find a significant relationship. Chan, Chen and Hsieh (1985) use similar variables to those of Chen, Roll and Ross (1986) and find that they explain well the variation in the cross-section of returns. Black (1993) uses an event study methodology to test the relationship between $\beta$ s and returns, and finds that $\beta$ s as well as returns vary over-time. Chen (1991) provides evidence that $\beta$ s vary over the business cycle.

Pettengil, Sundaram and Mahur (1995) test a conditional version of the CAPM that accounts for the fact that the riskless rate of return may be higher than the market return.

They find a significant relation between $\beta$ s and returns on US portfolios of stocks for the period 1926-1990. Their results depend upon their use of expected rather than realized rates of return. Jagannathan and Wang (1996) use a conditional version of the CAPM that includes a measure that captures $\beta$ instability over time (normally the yield spread between low-grade and high-grade corporate bonds) and include the return on human capital in the market return. Their model explains well the cross-sectional variation of stock returns, and the relation between return and $\beta$, is not significant. Moreover, they find that *SIZE* does not add significantly to the explanatory power of the model

# 3. Data Sampling and Description of the Variables

## 3.1. Variable Definitions

At this point the main explanatory variables used in this study to test the conditional CAPM are introduced. The foundations for their use is presented in Section 4. The first variable is the return on the value-weighted stock market index ($R_t^{vw}$), as proxied by the return on the TSE/Western Total Return Index. It represents the value weighted index of the portfolio of all stocks traded on the Toronto Stock Exchange. The series is extracted from the TSE/Western Return Files.

The next variable is the return on human capital ($R_t^{labor}$) which allegedly captures the aggregate wealth in the economy. Since the underlying notion for the unconditional CAPM is that $R_t^{vw}$ should represent the basket of all traded assets in the economy, many studies show that the return on the stock market index is not sufficient to capture this variable [Stambaugh (1982)]. Our proxy for the variable *LABOR* is Total Labor Income as reported on the Statistics Canada Tapes (Matrix "D5640" - Total Wages and Salaries). The $R_t^{labor}$ is calculated as the two-month moving average, as suggested by Jagannathan and Wang (1996), in order to avoid any measurement errors, and to take into account the fact that these figures become available with a one month delay. Therefore: $R_t^{labor} = (Labor_{t-1} + Labor_{t-2})/(Labor_{t-2} + Labor_{t-3})$.

The third variable is the return on the market risk premium ( $R_{t-1}^{prem}$ ), which captures the changes in economic conditions (business cycle) that affect the investment decisions of investors at time "t". Some of the best forecastors for business cycles identified in the literature. are the yield spread between six-month commercial paper and the six-month T-Bill, between the ten-year Treasury Bond and the one-year Treasury Bond, and between the high-yield corporate bonds and low-yield corporate bonds [Stock and Watson (1989)]. Our proxy for the variable *PREM* is the yield spread between three-month Canadian Prime Corporate Paper and the three-month Government of Canada Treasury Bill.[4] The series are extracted from the Statistics Canada Tapes (matrices "B14017" and "B14060" – CDA Bond Yield & Other Int. R.).

The last variable used is *SIZE*, as proxied by the logarithm of market equity (*log(ME)*). We estimate *ME* for each stock as the share price times the number of shares outstanding (in million of dollars). As explained earlier in Section 2, *SIZE* plays a substan-

[4] We use this yield spread because these are the two series that are close to the proxies used in the literature, and they are the only series with sufficient monthly data for the entire period of July.

tial role in explaining the variation of the cross-section of expected returns according to previous research. We extract the series from the TSE/Western Stock Return files. All variables are measured at a monthly frequency.

### 3.2. Portfolio Formation

To test the conditional CAPM, we use all the common stocks that are traded on the Toronto Stock Exchange over the period from January 1960 to December 1992. The data for the monthly returns, prices and outstanding number of shares of stocks are taken from the TSE/Western Stock Return files. Following the Fama and French (1992) procedure, we form the portfolios at June of year "t" using a two-dimensional sorting method. A stock is included in a portfolio at June of year "t" if it has at least 24 and up to 60 quoted monthly returns before that June, and it has quoted prices for the following 12 months up to June of year "t+1". Using the logarithm of market equity, *log(ME)* (in million of dollars), we sort all stocks by their *SIZE* and we split them in quintiles (*SIZE*-quintile) for June of each year "t".

Within each *SIZE*-quintile we sort all stocks by their *pre-ranking* betas ($\beta$) starting at June of 1965. At June of year "t" a stock's $\beta$ is estimated from the time-series OLS regression of every stock's 24 to 60 past monthly returns on a constant and the returns on the TSE/Western Total Return Index. Within each *SIZE*-quintile, we split all stocks in quintiles based on their pre-ranking $\beta$ s (beta-quintile). At the end of June of year "t", we obtain 25 portfolios. We calculate the returns for each portfolio for the next 12 months, or from July of year "t" to June of year "t+1". A portfolio's return is estimated as the equally weighted returns of all the stocks in that portfolio. As noted in Chan and Chen (1988), the two-dimensional sorting procedure allows for a wide dispersion of returns. We repeat the procedure every year to allow for any delisting of stocks. Following Fama and MacBeth (1973), we estimate a portfolio's $\beta$ as the average of the *pre-ranking* $\beta$ s of all stocks in a portfolio. We also estimate a portfolio *SIZE* as the equally weighted *log(ME)* of all stocks in the portfolio.

Thus, we create 25 *SIZE*- and beta-sorted portfolios for which we calculate the monthly returns from June 1965 to December 1992 (330 months). As shown in appendix 1, the total number of stocks that is allocated equally to the 25 portfolios each year, increases dramatically from 280 in 1965 to 809 in 1992, or from 11 to 33 stocks per portfolio respectively.[5]

# 4. Model and Methodology

## 4.1. The Conditional Model and its Specifications

The model that we use to test the conditional CAPM and its ability to explain the cross-sectional variation of Canadian stock returns is the one suggested by Jagannathan and Wang (1996). Their model addresses two major issues.

First, the unconditional CAPM that is presented in Section 2 (equation [1]) assumes that the betas $(\beta)$ are constant over time. If we allow information to change over time and therefore investors decisions to change based on the information available at any given point in time, then the CAPM holds only in its conditional form. As shown in other studies [Keim and Stambaugh (1986), Fama and French (1989)], $\beta$ s vary over time. As economic conditions change and we move from unstable economic phases (such as recessions) to economic booms, $\beta$ s also change. For example, in bad economic times where firms tend to increase their leverage, $\beta$ s tend to be higher for stocks that are faced with poorer prospects for economic growth and earnings and higher probabilities of financial distress. Therefore, business cycles play an important role in the way $\beta$ s behave over-time [Ferson and Harvey (1991), Chen (1991)]. Jagannathan and Wang (1996) demonstrate that the $\beta$ of any risky asset can be decomposed in two parts: the unconditional $\beta$ ($\beta_i^{vw}$) which is related to the gross market return ($R_t^{vw}$), and a measure of $\beta$ -instability ($\beta_i^{prem}$) which is related to the return of the business cycle premium ($R_{t-1}^{prem}$). Earlier in Section 3.1., we presented some of the proxies for $R_{t-1}^{prem}$ that are used in the literature as well as the one that we use herein. The expected return of the risky asset, $E(R_i)$, is assumed to be linearly related to both $\beta_i^{vw}$ and $\beta_i^{prem}$.[6]

The second issue is the choice of the proxy used to estimate $R_t^{vw}$ as the return on the stock market index. As discussed in Section 3.1., this is supposed to capture the return on the portfolio of all assets in the economy. Hence a measure of aggregate wealth should theoretically explain better the variation in expected returns, since stocks are only a small part of the total investments available in an economy. Mayers (1972) uses human capital as

[5] The number of stocks originally extracted from the TSE/Western Return files is larger but some of the stocks did not meet our inclusion criteria.
[6] A mathematical proof of this is provided in Appendix A of Jagannathan and Wang (1996) paper.

a proxy for the return on aggregate wealth. Using the Fama and Schwert (1977) model, Jagannathan and Wang (1996) prove that, if the return on aggregate wealth is an exact linear relation of the growth rate of the per capita labor income, then the return on labor income ($R_t^{labor}$) is linearly related to the market return ($R_{mt}$), as described by the *SLB* model (equation [1] ). The reason is that the return on the stock market index is not sufficient to explain the cross-sectional variation of expected returns. Thus Jagannathan and Wang (1996) estimate $\beta_t^{labor}$ which is related linearly with $E(R_{it})$.

In Section 2, we presented a number of studies that use market equity (*ME*) as an additional explanatory variable in estimating the cross-sectional variation in expected returns. Many of these studies use US stocks, and find that *SIZE* (as defined in Section 3.1. above) does add significantly to the explanation of the cross-section of returns [Banz (1981), Reinganum (1981), Chan, Chen and Hsieh (1985), and Fama and French (1992)]. Therefore, we include *log(ME)* in our model to examine this variable's performance for portfolios of Canadian stocks.

Our model for testing the ability of the conditional CAPM to explain the cross-sectional variation of expected returns takes the following form:

$$E(R_{pt}) = \alpha_o + \alpha_{vw}\beta_p^{vw} + \alpha_{prem}\beta_p^{prem} + \alpha_{labor}\beta_p^{labor} + \alpha_{size}\log(ME) \qquad [3]$$

where: $\alpha_0$, $\alpha_{vw}$, $\alpha_{prem}$, $\alpha_{labor}$, $\alpha_{size}$ are constants, $p$ is the portfolio number (p=1...25), $t$ stands for month number (t=1...330),

$E(R_{pt})$= the expected return of portfolio $p$ at time $t$,

$$\beta_p^{vw} = COV(R_{pt}, R_t^{vw}) / VAR(R_t^{vw}), \quad [4]$$

$$\beta_p^{prem} = COV(R_{pt}, R_{t-1}^{prem}) / VAR(R_{t-1}^{prem}), \quad [5]$$

$$\beta_p^{labor} = COV(R_{pt}, R_t^{labor}) / VAR(R_t^{labor}), \text{ and} \quad [6]$$

$\log(ME)$ = logarithm of $ME$ ( share price times number of shares outstanding).

According to Jagannathan and Wang (1996), if the full model (equation [3]) prices returns correctly, the constant term (which is the return on the zero-$\beta$ portfolio) must be significantly different from zero. The coefficients of both $\beta_p^{vw}$ and $\beta_p^{labor}$ must be positive and significantly different from zero. Both these factors should be able to capture the expected risk premia on the basket of all traded assets in the economy. Also, the coefficient of $\beta_p^{prem}$ is expected to be positive and significantly different from zero. It is supposed to capture the sensitivity of betas to changes over the business cycles. According to Jagannathan and Wang (1996), *SIZE* should have no residual effect on this model (equation [3]), and thus we expect to find its coefficient to be insignificant.

Therefore, the null hypothesis therefore is that the coefficients $\alpha_0$, $\alpha_{vw}$, $\alpha_{prem}$, and $\alpha_{labor}$ in equation [3] are significantly different from zero. The two methods used to test their hypothesis are briefly described in the next sub-sections.

## 4.2. The Fama-MacBeth Estimation Procedure

The first method to test the main model (equation [3] ) was first suggested by Black, Jensen and Scholes (1972) and refined by Fama and MacBeth (1973). Fama and MacBeth (1973) test the unconditional CAPM (equation [1] ) on the cross-section of expected returns on US portfolios of stocks for the period between 1926-1968 using a two-step approach.

Based on their method, we first estimate the individual stock $\beta$ s (as we explained in Section 3.2.) at June of year "t", and assign the mean values of the estimated $\beta$ s of all stocks in a portfolio as the portfolio $\beta$ over the period from July of year "t" to June of year "t+1" (the next 12 months). This alleviates the error-in-variables problem that is created since we use estimated $\beta$ s instead of actual ones. The two-dimensional sorting procedure for the portfolio creation also should alleviate the sampling-error problem (Fama and French (1992)) by giving us a wider dispersion of realized returns. If we sort portfolios on $\beta$ s only, then the low-$\beta$ portfolios tend to have lower estimated values and the high-$\beta$ portfolios tend to have higher estimated values of their true $\beta$ s.

We estimate the individual stock *pre-ranking* $\beta$ s for the main model (equation [3]); namely $\beta_i^{vw}$, $\beta_i^{prem}$, and $\beta_i^{labor}$ from the time-series OLS regressions of $R_{it}$ on a constant and $R_t^{vw}$; $R_{it}$ on a constant and $R_{t-1}^{prem}$; and $R_{it}$ on a constant and $R_t^{labor}$, respectively. We then estimate the mean values of the individual $\beta$ s for the stocks in a portfolio, and assign these means as the portfolio $\beta$ s. Hence, we have a cross-section of 25 portfolios for each of the 330-months.

The second step is to simply run the cross-sectional OLS regressions for each of the 330 months to obtain the time-series estimates of each of the coefficients. We test the significance of the coefficients by estimating the time-series averages of the t-statistic[7] of all regressions. We also use the time-series averages of the R-Square estimates to examine the model's explanatory power of the variation in expected returns.

## 4.3. The GLS Time-Series Cross-Sectional Procedure

The second method that we use to estimate the parameters in equation [3] uses a more powerful method, which is a pooled time-series and cross-section regression method. Initially, we repeat the first step that we described in Section 4.2. in order to estimate the various $\beta$ specifications for the portfolios that are used to test the main model (equation [3]).

For the second step, a time-series and cross-section regression method is used, which estimates the parameters in equation [3] by simultaneously using both the cross-sectional data and the time-series data. This alleviates the error-in-variables problem which is created by the Fama and MacBeth two-step method. By using the Fuller-Batese method in estimating the variance in the error terms, this procedure alleviates any heteroscedasticity problems. The regression approach to estimate the parameters of the model is Generalized Least Squares (GLS). As in the previous method, we use the t-statistics to test the significance of the estimated coefficients. In the next section we report and analyze our empirical findings.

[7] All t-values are assessed at the 0.05 level of significance, unless noted otherwise.

## 5. Empirical Findings

### 5.1. Preliminary Characteristics of the Portfolios

Some of the basic characteristics of the 25 portfolios which are formed as described in Section 3, are presented in Table 1. In panel A, we report the mean values of the monthly returns of the 25 *SIZE*-sorted and beta-sorted portfolios over the entire period from July 1965 to December 1992 (330 months). For every month, a portfolio's return is calculated as the equally weighted returns of all the stocks in the portfolio. Based on panel A, the post-ranking returns vary from 0.7% to 3.67%. A slight negative relationship exists between returns and betas $\left(\beta_p^{vw}\right)$ as we move from the low-$\beta$ portfolios to the high-$\beta$ portfolios along each *SIZE* quintile, and a strong negative relationship between return and *SIZE* exists as we move from the small-*SIZE* portfolios to the big-*SIZE* portfolios. In panel B, we report the mean values for *SIZE* over the entire period. The post-ranking values for *SIZE* in a portfolio are calculated as the equally weighted average of the monthly values of the log of market equity (ME) (i.e. the share price times the outstanding number of shares) for the stocks in the portfolio. The post-ranking values for *SIZE* range from 1.422 to 6.4675 (these are logs of millions of dollars). The same kind of dispersion is observed in panel C, which reports the mean June values for *SIZE* over the entire period (June 1965 - June 1992). These pre-ranking values for *SIZE* range from 1.328 to 6.4406. Panel D reports the mean values of the betas $\left(\beta_p^{vw}\right)$ for the 25 portfolios over the entire period. As detailed in Section 3, a portfolio's $\beta_p^{vw}$ is calculated as the mean beta from the OLS regressions of the returns for every stock in the portfolio $(\beta_i^{vw})$ on a constant and the return $(R_t^{vw})$ on the TSE/Western Total Value Return Index (TSE/W). Their values range from 0.0878 to 2.0482.

In Table 2 we present some additional characteristics of the 25 portfolios for the different beta specifications described earlier in Section 4. The $\beta_p^{vw}$ reported in panel A are calculated using the time-series OLS regressions of each portfolio's returns on a constant and the returns on the TSE/W index over the 330-month period. The $\beta_p^{vw}$ range from 0.6796 to 1.406, and are significantly different from zero. Appendix 3 reports the estimates for the T-statistics, the standard errors, the P-values and the R-squares for the various time-series OLS regressions. The high R-square values (up to 0.8659) for the underlying beta regressions $(\beta_p^{vw})$ reported in panel A, denote a strong relationship between portfolio and the stock market index returns (appendix 3, panel A). The betas $(\beta_p^{size})$ reported in panel B of Table 2 are from the time-series OLS regressions of portfolio returns on a constant and each portfolio's log of market equity (ME). These betas range from -0.0099 to 0.0485, and almost one half of these betas are statistically significant. Even for the portfolios where the $\beta_p^{size}$ are statistically significant, the average $R^2$ values are low. The betas $(\beta_p^{prem})$ reported in panel C of Table 2 are from the time-series OLS regressions of the residuals (themselves obtained from the regression of a portfolio's return on a constant and the return on the TSE/W index) on a constant and the return on the yield spread between the three-month commercial paper rate and the three-month T-Bills $(R_t^{prem})$. The yield spread betas $(\beta_p^{prem})$ range from -0.4744 to 0.7097 and generally are statistically insignificant (see appendix 3, panel C). The betas $(\beta_p^{labor})$ reported in panel D of Table 2 are from the time-series

## TABLE 1
## Descriptive Characteristics of the 25 Portfolios

The time series averages for three descriptive measures of the 25 portfolios which are formed as in Fama and French (1992) are reported in this table. The procedure for portfolio formation is described in detail in section 3. All common stocks from the TSE/Western database are sorted in size-quintiles first and within each size-quintile they are sorted in beta-quintiles to form 25 equally weighted portfolios over the period from July 1965 to December 1992 (330 months). In *Panel A*, we report the time series averages of the *Returns*, which are the equally weighted returns of the stocks in each of the 25 portfolios for the 330-month period of study. In *Panel B*, we report the same values for *Size*, which are calculated as the equally weighted (in millions) of the logarithm of the Market Equity or *ME* (share price times the outstanding number of shares) for the 330-month period. *Panel C*, reports the pre-ranking averages for *Size*. In *Panel D*, we report the pre-ranking averages of the $\beta_p^{vw}$ values (p=1...25) which are calculated as the equally weighted average of the $\beta_i^{vw}$ ($i$ = stock in a portfolio) from the OLS regressions of the returns of each of the stocks in the portfolio on a constant and the returns on the TSE/Western Value Weighted Total Return Index.

| | Beta-Low | 2 | 3 | 4 | Beta-High |
|---|---|---|---|---|---|
| | **Panel A: Time Series Average Return (Post-Rank)** | | | | |
| **Size-Small** | 0.0367 | 0.0284 | 0.0249 | 0.0279 | 0.0291 |
| **2** | 0.0160 | 0.0159 | 0.0159 | 0.0137 | 0.0106 |
| **3** | 0.0126 | 0.0138 | 0.0115 | 0.0070 | 0.0076 |
| **4** | 0.0093 | 0.0108 | 0.0098 | 0.0089 | 0.0079 |
| **Size-Big** | 0.0092 | 0.0092 | 0.0095 | 0.0082 | 0.0084 |
| | **Panel B: Time Series Average Size (Post-Rank)** | | | | |
| **Size-Small** | 1.4506 | 1.4982 | 1.4222 | 1.4741 | 1.4524 |
| **2** | 2.7540 | 2.7728 | 2.7563 | 2.7437 | 2.7242 |
| **3** | 3.7408 | 3.7469 | 3.7601 | 3.7104 | 3.7185 |
| **4** | 4.7465 | 4.8289 | 4.7661 | 4.7780 | 4.7412 |
| **Size-Big** | 6.4675 | 6.4213 | 6.5134 | 6.4060 | 6.3342 |
| | **Panel C: Time Series Average Size (Pre-Rank)** | | | | |
| **Size-Small** | 1.3286 | 1.3991 | 1.3617 | 1.3852 | 1.3593 |
| **2** | 1.3280 | 1.4002 | 1.3629 | 1.3846 | 1.3595 |
| **3** | 3.7092 | 3.7157 | 3.7403 | 3.7136 | 3.7121 |
| **4** | 4.7226 | 4.8062 | 4.7548 | 4.7628 | 4.7303 |
| **Size-Big** | 6.4406 | 6.3946 | 6.4982 | 6.3994 | 6.3125 |
| | **Panel D: Time Series Average $\beta_p^{vw}$ s (Pre-Rank)** | | | | |
| **Size-Small** | 0.0878 | 0.6542 | 0.9913 | 1.3370 | 2.0482 |
| **2** | 0.2169 | 0.6754 | 0.9552 | 1.2742 | 1.8880 |
| **3** | 0.3236 | 0.7201 | 0.9637 | 1.2569 | 1.7897 |
| **4** | 0.3835 | 0.7069 | 0.9411 | 1.2067 | 1.7038 |
| **Size-Big** | 0.5021 | 0.7955 | 0.9636 | 1.1619 | 1.5753 |

**TABLE 2**

**Time Series Regression Parameter ( β s) Estimates for the Main Variables**

The $\beta_p^{vw}$, $\beta_p^{size}$, $\beta_p^{prem}$, and $\beta_p^{labor}$ estimates are reported in this table. The full model (we use various subsets of this to estimate the parameters) for the time-series OLS regressions is:

$$E[R_{pt}] = \beta_0 + \beta_p^{size} \log(ME_{pt}) + \beta_p^{vw} R_t^{vw} + \beta_p^{prem} R_{t-1}^{prem} + \beta_p^{labor} R_t^{labor}$$

The procedure for the portfolio formation is described in detail in section 3. All common stocks from the TSE/Western files are sorted in size-quintiles first and within each size-quintile they are sorted in beta-quintiles to form 25 equally weighted portfolios. The studied period is from July 1965 to December 1992 (330 months). The subscript $p$ denotes portfolio number ($p$ =1...25) and the subscript $t$ denotes month number ($t$ =1...330). All variable definitions are given in sections 3 and 4 of the text. In *Panel A*, we report the estimates for the $\beta_p^{vw}$ for the 25 portfolios from the OLS regressions of the portfolio returns on the TSE/Western Value Weighted Total Return Index over the whole period. In *Panel B*, we report the $\beta_p^{size}$ estimates for the 25 portfolios from the OLS regressions of the portfolio returns on the log of Market Equity or *ME* (share price times the outstanding number of shares) over the whole period. *Panel C*, reports the $\beta_p^{prem}$ estimates that are orthogonal to the $\beta_p^{vw}$. In *Panel D*, we report the $\beta_p^{labor}$ estimates that are orthogonal to the $\beta_p^{vw}$ and the $\beta_p^{prem}$ estimates. In section 5.1. of the text we report in detail the estimation process for the parameters reported in panels C and D herein. All T-Statistics, Standard Errors, P-Values and $R^2$ values are reported in Appendix 2, Panels A through D.

| | **Beta-Low** | **2** | **3** | **4** | **Beta-High** |
|---|---|---|---|---|---|
| | | | **Panel A: $\beta_p^{vw}$ Estimates** | | |
| **Size-Small** | 0.7538 | 1.0369 | 0.9761 | 1.3195 | 1.4060 |
| **2** | 0.6981 | 0.8706 | 1.0326 | 1.1212 | 1.4016 |
| **3** | 0.6796 | 0.8177 | 1.0209 | 1.0816 | 1.3535 |
| **4** | 0.7249 | 0.7838 | 0.9432 | 1.1314 | 1.3645 |
| **Size-Big** | 0.7318 | 0.9351 | 0.9306 | 1.0952 | 1.2789 |
| | | | **Panel B: $\beta_p^{size}$ Estimates** | | |
| **Size-Small** | -0.0099 | 0.0053 | 0.0005 | 0.0018 | 0.0065 |
| **2** | 0.0200 | 0.0248 | 0.0299 | 0.0252 | 0.0485 |
| **3** | 0.0020 | 0.0147 | 0.0237 | 0.0296 | 0.0410 |
| **4** | 0.0112 | 0.0103 | 0.0136 | 0.0142 | 0.0373 |
| **Size-Big** | 0.0072 | 0.0066 | 0.0046 | 0.0111 | 0.0134 |
| | | | **Panel C: $\beta_p^{prem}$ Estimates orthogonal to the $\beta_p^{vw}$s** | | |
| **Size-Small** | -0.4304 | -0.3892 | -0.0382 | -0.2519 | -0.4744 |
| **2** | -0.1596 | 0.3967 | 0.3938 | 0.7097 | 0.4577 |
| **3** | 0.1939 | 0.2951 | 0.0508 | 0.4529 | 0.3216 |
| **4** | -0.3729 | -0.0948 | 0.2051 | 0.4081 | 0.4087 |
| **Size-Big** | -0.1866 | 0.0611 | 0.1804 | 0.0860 | -0.0094 |
| | | | **Panel D: $\beta_p^{labor}$ Estimates orthogonal to the $\beta_p^{prem}$ & the $\beta_p^{vw}$** | | |
| **Size-Small** | -0.0562 | -0.7264 | -0.8170 | -0.4492 | -0.7833 |
| **2** | -0.3617 | -0.4563 | -0.4100 | -0.0571 | -0.2578 |
| **3** | -0.2391 | -0.1984 | -0.0897 | 0.0595 | 0.1629 |
| **4** | -0.1891 | -0.2812 | -0.2490 | -0.0260 | 0.1794 |
| **Size-Big** | 0.0002 | -0.1261 | -0.0732 | -0.1330 | 0.0483 |

regressions of the residuals (themselves obtained from the regression of a portfolio's return on a constant, $R_t^{vw}$ and $R_t^{prem}$) on a constant and the two-month moving average returns on Total Labor Income $\left(R_t^{labor}\right)$. These labor income betas $\left(\beta_p^{labor}\right)$ vary from -0.4563 to 0.1794. They are statistically significant for only ten of the portfolios. While this indicates some residual effect in the betas (appendix 3, panel D), the low $R^2$ values indicate that the effect is not strong.

## 5.2. Unconditional and Conditional CAPM Estimations

The results from implementing the two procedures described in Section 4 of the thesis for the unconditional CAPM and various versions of the conditional CAPM (the full model or subsets) are presented in Tables 3 and 4. Specifically, the parameter estimates from the Fama-MacBeth two-step cross-sectional regression procedure (FM) are reported in Table 3, and the parameter estimates from the GLS time-series cross-sectional regression method (GLS) are reported in Table 4. The parameter estimates reported in Table 3 are time-series averages from the month by month cross-sectional regressions. The *R-square* values are also time series averages. All *T-Statistics* are time series averages of the t-values for tests of the hypothesis that the coefficients are equal to zero. The *Std Dev* and the *P-Value* are the time series averages of the standard deviations of the coefficients and their respective P-values.

Model 1 is the Sharpe-Lintner-Black unconditional (static) CAPM. For the FM procedure (see Table 3), the mean beta premia $\left(a_{vw}\right)$ is -0.0036 with a standard deviation of 0.00392 and is not statistically different from zero. The mean constant $\left(a_0\right)$ of 0.0178 has a standard deviation of 0.0448 and is statistically significant. The mean R-square of 16.75% is higher than that obtained in similar studies for the US markets. The GLS procedure results reported in Table 4 yield similar results. When we add *SIZE* to the CAPM equation to get model 2, we find that the mean *SIZE* coefficient estimate $(a_{size})$ from the FM procedure is -0.0036, which is statistically significant (t-value of –6.1154). Moreover, the mean R-square value becomes 31.41% which is significantly improved over that for the unconditional CAPM. It appears that for our data, *SIZE* better explains the variation in expected returns. The results are again similar for the GLS procedure (see Table 4).

The conditional model 3 is the unconditional CAPM augmented with $\beta_p^{prem}$ to capture the instability of betas over time. For the FM procedure results reported in Table 3, the mean $\beta_p^{prem}$ parameter estimate $(a_{prem})$ is -0.0006, which is statistically insignificant (t-value of -0.9569). The mean R-square value of 22.71% is higher than that for the unconditional CAPM (model 1). However, the mean beta-prem GLS estimate $(a_{prem})$ is 0.0006 and statistically significant (standard error equal to 0.0002). When *SIZE* is included to get model 4, the mean FM $\beta_p^{size}$ and $\beta_p^{prem}$ parameter estimates ($\alpha_{size}$ and $\alpha_{prem}$) are statistically significant, and the mean R-square value increases to 35.4%. The results are similar for the GLS estimation.

Model 5 adds $\beta_p^{labor}$ to the conditional CAPM. The mean $\beta_p^{labor}$ FM parameter estimate $(a_{labor})$ of -0.0031 is not statistically significant. The mean $\beta_p^{prem}$ estimate $(a_{prem})$ becomes statistically insignificant, and the mean R-square is 28.42%. We get similar results using the GLS estimation procedure. When *SIZE* is added to model 5 to get model 6, only

## TABLE 3
## Fama-MacBeth Regression Estimates for the Unconditional and Conditional CAPM

The time series averages of the coefficients $\alpha_0$, $\alpha_{size}$, $\alpha_{vw}$, $\alpha$ $p_{rem}$ and $\alpha_{labor}$ from the two-step Fama and MacBeth type regressions for various models are reported in this table (N = 330). The full model for the cross-sectional regressions is:

$$E[R_{pt}] = \alpha_0 + \alpha_{vw}\beta_p^{vw} + \alpha_{size}\log(ME_p) + \alpha_{prem}\beta_p^{prem} + \alpha_{labor}\beta_p^{labor}$$

The procedure for portfolio formation is described in detail in section 3 of the text. All common stocks from the TSE/Western return file are sorted in size-quintiles first and then within each size-quintile they are sorted in beta-quintiles to form 25 equally weighted portfolios. The studied period is from July 1965 to December 1992 (330 months). All variable definitions are given in more detail in sections 3 and 4 of the text. The subscript $p$ denotes portfolio number ($p$ =1...25), and the subscript $t$ denotes month number ($t$ =1...330). The log($ME_p$) is the log of Market Equity or $ME$ (share price times the outstanding number of shares). The $\beta_p^{vw}$ are the equally weighted average coefficients from the OLS regressions of the returns of every stock in a portfolio on a constant and the TSE/Western Value Weighted Total Return. The $\beta_p^{prem}$ are the equally weighted average coefficients from the OLS regressions of the returns of every stock in a portfolio on a constant and the yield spreads between 3-month Commercial Paper and 3-month T-Bills. The $\beta_p^{labor}$ are the equally weighted average coefficients from the OLS regressions of the returns of every stock in a portfolio on a constant and the 2-month moving averages of Total Labor Income. All reported T-Statistics, Std Devs, P-Values and $R^2$ values are time-series averages. * and ** indicate significance at the 0.05 and 0.01 levels, respectively.

| **Model** | | $\alpha_0$ | $\alpha_{vw}$ | $\alpha_{size}$ | $\alpha$ $p_{rem}$ | $\alpha_{labor}$ | |
|---|---|---|---|---|---|---|---|
| **1** | Estimate | 0.0178** | -0.0036 | | | | |
| | T-Statistic | 7.2289 | -1.6641 | | | | |
| | Std Dev | 0.0448 | 0.0392 | | | | |
| | P-Value | 0.0001 | 0.0970 | | | | |
| | R-Square | | | | | | 0.1675 |
| **2** | Estimate | 0.0309** | -0.0033 | -0.0036** | | | |
| | T-Statistic | 8.0186 | -1.5616 | -6.1154 | | | |
| | Std Dev | 0.0699 | 0.0388 | 0.0106 | | | |
| | P-Value | 0.0001 | 0.1193 | 0.0001 | | | |
| | R-Square | | | | | | 0.3141 |
| **3** | Estimate | 0.0166** | -0.0020 | | -0.0006 | | |
| | T-Statistic | 6.7478 | -0.7257 | | -0.9569 | | |
| | Std Dev | 0.0447 | 0.0494 | | 0.0112 | | |
| | P-Value | 0.0001 | 0.4686 | | 0.3393 | | |
| | R-Square | | | | | | 0.2271 |
| **4** | Estimate | 0.0317** | -0.0034 | -0.0037** | -0.0012* | | |
| | T-Statistic | 8.2502 | -1.3625 | -6.3814 | -1.9470 | | |
| | Std Dev | 0.0697 | 0.0454 | 0.0105 | 0.0108 | | |
| | P-Value | 0.0001 | 0.1740 | 0.0001 | 0.0524 | | |
| | R-Square | | | | | | 0.3540 |
| **5** | Estimate | 0.0153** | -0.0023 | | 0.0000 | -0.0031 | |
| | T-Statistic | 6.0339 | -0.8049 | | -0.0285 | -1.8798 | |
| | Std Dev | 0.0459 | 0.0507 | | 0.0109 | 0.0298 | |
| | P-Value | 0.0001 | 0.4215 | | 0.9773 | 0.0610 | |
| | R-Square | | | | | | 0.2842 |

**TABLE 3 (Continued)**

| Model | | $\alpha_0$ | $\alpha_{vw}$ | $\alpha_{size}$ | $\alpha\, p_{prem}$ | $\alpha_{labor}$ | |
|---|---|---|---|---|---|---|---|
| **6** | Estimate | 0.0318** | -0.0035 | -0.0036** | -0.0010 | -0.0002 | |
| | T-Statistic | 8.1378 | -1.3520 | -5.9876 | -1.6914 | -0.1218 | |
| | Std Dev | 0.0711 | 0.0473 | 0.0109 | 0.0112 | 0.0263 | |
| | P-Value | 0.0001 | 0.1773 | 0.0001 | 0.0917 | 0.9031 | |
| | R-Square | | | | | | 0.3899 |
| **7** | Estimate | 0.0168** | -0.0050* | | | -0.0041** | |
| | T-Statistic | 6.5005 | -2.1725 | | | -2.3440 | |
| | Std Dev | 0.0470 | 0.0415 | | | 0.0314 | |
| | P-Value | 0.0001 | 0.0305 | | | 0.0197 | |
| | R-Square | | | | | | 0.2278 |
| **8** | Estimate | 0.0310** | -0.0039 | -0.0034** | | -0.0001 | |
| | T-Statistic | 7.9108 | -1.6974 | -5.8420 | | -0.0834 | |
| | Std Dev | 0.0712 | 0.0413 | 0.0107 | | 0.0269 | |
| | P-Value | 0.0001 | 0.0906 | 0.0001 | | 0.9336 | |
| | R-Square | | | | | | 0.3512 |

**TABLE 4**

**GLS Time-Series Cross-Sectional Regression Estimates for the Unconditional and Conditional CAPM**

The time series averages of the coefficients $\alpha_0, \alpha_{size}, \alpha_{vw}, \alpha_{prem}$ and $\alpha_{labor}$ from the GLS time-series cross-section regressions for various models are reported in this table (N = 8,250 or 25*330). The full model is:

$$E[R_{pt}] = \alpha_0 + \alpha_{vw}\beta_p^{vw} + \alpha_{size}\log(ME_p) + \alpha_{prem}\beta_p^{prem} + \alpha_{labor}\beta_p^{labor}$$

The procedure for portfolio formation is described in detail in section 3 of the text. All common stocks from the TSE/Western file are sorted in size-quintiles first and then within each size-quintile they are sorted in beta-quintiles to form 25 equally weighted portfolios. The studied time period is from July 1965 to December 1992 (330 months). All variable definitions are given in more detail in section 4 of the text. The subscript $p$ denotes portfolio number ($p$ =1...25), and the subscript $t$ denotes month number ($t$ =1...330). The $\log(ME_p)$ is the log of Market Equity or $ME$ (share price times the outstanding number of shares). The $\beta_p^{vw}$ are the equally weighted average coefficients from the OLS regressions of the returns of every stock in a portfolio on a constant and the TSE/Western Value Weighted Total Return. The $\beta_p^{prem}$ are the equally weighted average coefficients from the OLS regressions of the returns of every stock in a portfolio on a constant and the yield spreads between 3-month Commercial Paper and 3-month T-Bills. The $\beta_p^{labor}$ are the equally weighted average coefficients from the OLS regressions of the returns of every stock in a portfolio on a constant and the 2-month moving averages of Total Labor Income. All reported T-Statistics, Standard Errors, and P-Values are time-series averages. * and ** indicate significance at the 0.05 and 0.01 levels, respectively.

| Model | | $\alpha_0$ | $\alpha_{vw}$ | $\alpha_{size}$ | $\alpha_{prem}$ | $\alpha_{labor}$ |
|---|---|---|---|---|---|---|
| 1 | Estimate | 0.0165** | -0.0020 | | | |
| | T-Statistic | 3.9895 | -0.8235 | | | |
| | Std-Error | 0.0041 | 0.0024 | | | |
| | P-Value | 0.0001 | 0.4103 | | | |
| 2 | Estimate | 0.0349** | -0.0024 | -0.0047** | | |
| | T-Statistic | 8.2893 | -1.3587 | -8.1706 | | |
| | Std-Error | 0.0042 | 0.0018 | 0.0006 | | |
| | P-Value | 0.0001 | 0.1743 | 0.0001 | | |
| 3 | Estimate | 0.0157** | -0.0008 | | 0.0006** | |
| | T-Statistic | 3.8345 | -0.3560 | | 2.9085 | |
| | Std-Error | 0.0041 | 0.0024 | | 0.0002 | |
| | P-Value | 0.0001 | 0.7218 | | 0.0036 | |
| 4 | Estimate | 0.0337** | -0.0017 | -0.0045** | 0.0004* | |
| | T-Statistic | 8.0090 | -0.9270 | -7.9245 | 2.2480 | |
| | Std-Error | 0.0042 | 0.0018 | 0.0006 | 0.0002 | |
| | P-Value | 0.0001 | 0.3539 | 0.0001 | 0.0246 | |
| 5 | Estimate | 0.0403* | -0.0202 | | 0.0033 | -0.0323 |
| | T-Statistic | 2.3020 | -0.9170 | | 0.6610 | -1.1030 |
| | Std-Error | 0.0175 | 0.0220 | | 0.0050 | 0.0293 |
| | P-Value | 0.0317 | 0.3697 | | 0.5159 | 0.2827 |
| 6 | Estimate | 0.0338** | -0.0010 | -0.0046** | 0.0004* | 0.0019 |
| | T-Statistic | 7.9901 | -0.5395 | -7.9547 | 2.2720 | 1.6200 |
| | Std-Error | 0.0042 | 0.0019 | 0.0006 | 0.0002 | 0.0012 |
| | P-Value | 0.0001 | 0.5896 | 0.0001 | 0.0231 | 0.1053 |

**TABLE 4 (Continued)**

| Model | | $\alpha_0$ | $\alpha_{vw}$ | $\alpha_{size}$ | $\alpha\, p_{rem}$ | $\alpha_{labor}$ |
|---|---|---|---|---|---|---|
| **7** | Estimate | 0.0159** | -0.0009 | | | 0.0021 |
| | T-Statistic | 3.8416 | -0.3572 | | | 1.7667 |
| | Std-Error | 0.0041 | 0.0025 | | | 0.0012 |
| | P-Value | 0.0001 | 0.7210 | | | 0.0773 |
| **8** | Estimate | 0.0350** | -0.0018 | -0.0048** | | 0.0019 |
| | T-Statistic | 8.2716 | -0.9628 | -8.2034 | | 1.5914 |
| | Std-Error | 0.0042 | 0.0019 | 0.0006 | | 0.0012 |
| | P-Value | 0.0001 | 0.3357 | 0.0001 | | 0.1116 |

the mean $\beta_p^{size}$ and constant FM estimates ($\alpha_{size}$ and $\alpha_0$) are statistically significant. The mean R-square is highest for model 6 at 38.99%. When model 6 is estimated using the GLS procedure, the mean $\beta_p^{prem}$ estimate $(a_{prem})$ is statistically significant.

In model 7, the conditional CAPM includes only beta-labor $(\beta_p^{labor})$ and the market beta $(\beta_p^{vw})$. For the FM estimations, the mean beta-labor estimate $(a_{labor})$ is -0.0041 and statistically significant. The mean R-square is 22.78%. However, for the GLS estimations, the mean beta-labor estimate $(a_{labor})$ at 0.0021 is statistically insignificant. When we add *SIZE* to model 7 to get model 8, we again obtain similar results for both estimation procedures. Both the average *SIZE* and constant estimates ($\alpha_{size}$ and $\alpha_0$) are statistically significant.

## 5.3. Further Discussion of the Findings

The characteristics of the portfolios for the Canadian stocks summarized in Table 1 are similar to the ones found by Jagannathan and Wang (1996) for the US stock market. Also a strong negative relationship exists between returns and *SIZE*, as reported by Fama and French (1992 and 1993), Banz (1981), and Basu (1983). The results from the FM and GLS estimations suggest that *SIZE* plays a significant role in explaining the variation of Canadian stock returns. Our tests do not examine if the results are robust, since the literature reports that portfolio formation can affect the significance of any variable in explaining the cross-sectional variation of returns, and that *SIZE* does not capture systematic errors but rather its effect comes from the characteristics of the variables that affect the returns [Daniel and Titman (1997)]. Similarly, Kryzanowski and Zhang (1992) using an event-study methodology to test the winner-loser effect for portfolios formed between 1952-1988, find that the explanatory power of *SIZE* is not robust across markets.

Our results using both the FM and GLS estimation procedures indicate that our data reject the unconditional CAPM. The $\beta_p^{vw}$ are not significant for either the traditional or augmented CAPM models. This supports the findings of many other studies that find that the SLB model is rejected by their data. However, this conclusion may be fragile. If we compare the pre-ranking $\beta_p^{vw}$ estimates (Table 1, panel D) with the post-ranking $\beta_p^{vw}$ estimates (Table 2, panel A), we observe some deviation in their values. Thus, our methodology may not be assigning the correct betas to the portfolios. It might be useful to test for robustness by using the sum-$\beta$ approach of Dimson (1979), which was used by Fama and French (1992) to capture non-synchronous trading. Moreover, the post-ranking $\beta_p^{vw}$ estimates (Table 2, panel A) from the time-series OLS regressions of $R_{it}$ on $R_t^{vw}$ are all positive and statistically significant, and the $R^2$ values are very high. This indicates that $\beta_p^{vw}$ is a strong measure of contemporaneous sensitivity but is not a good predictor of the variation in subsequent expected returns.

Unlike Jagannathan and Wang (1996), we do not find a significant relation between the measure of beta instability over time $\left(\beta_p^{prem}\right)$ and returns, except for the full model 6 and only for the GLS estimation procedure (Table 4). As for the systematic risk measure of human capital $\left(\beta_p^{labor}\right)$, it is significant only in model 5 which includes $\beta_p^{vw}$, and only for the less powerful FM estimation procedure. If we examine the findings for model 5 in tables 3 and 4, we find that the risk premia for $\beta_p^{vw}$ become smaller than the ones for the unconditional model 1. This suggests that market and human capital returns are correlated since some of the explanatory power of $\beta_p^{vw}$ is absorbed by $\beta_p^{labor}$.

Overall, only the constant and *SIZE* appear to have explanatory power for the cross-section of expected returns. The constant should be significant because we are using gross (and not net) returns as in Jagannathan and Wang (1996). The constant should approximate the riskless rate of return. Further work includes further tests of the robustness of the model in explaining the cross-section of expected returns. For example, with regard to the data, it would be useful to determine the effect, if any, of selection bias [Chen, Jegadeesh and Lakonishok (1995), and Khotari, Shanken and Sloan (1995)], or of data snooping [MacKinlay (1995)], or of seasonality. However, Kryzanowski, Lalancette and To (1994) find no significant seasonality effect for their sample of Canadian stocks.

## 6. Conclusion

In this study we used a conditional version of the CAPM that allows $\beta$ s to vary over time $\left(\beta_p^{prem}\right)$. We also added a measure of the sensitivity of human capital $\left(\beta_p^{labor}\right)$ to the market $\beta$, and *SIZE* [*log(ME)*] as an explanatory variable. Our objective was to test this model's ability to better explain the cross-sectional variation of monthly returns on 25 *SIZE*- and beta-sorted portfolios of Canadian common stocks over the period from June 1965 to December 1992 (330 months). We also wanted to compare this conditional CAPM with the unconditional CAPM (*SLB* model). For portfolio formation, we used a methodology similar to Fama and French (1992). For the estimation procedure, we used the two-step approach of Fama and MacBeth (1973), and the more powerful GLS time-series cross-sectional estimation approach.

Our results indicate that the conditional CAPM using all the variables does fairly well in explaining returns ($R^2$ of 38.99%). As in Jagannathan and Wang (1996) for US stocks, we find that the unconditional CAPM is not as powerful for Canadian stocks and that most of its explanatory power comes from the constant factor or the zero-$\beta$ portfolio. As in Fama and French (1992) for US stocks, we find that Canadian stock data yield a significant and negative relationship between return and *SIZE*. We also find that the premia for the sensitivity of the term-structure variable that allows for $\beta$ time-variation is significant. Unlike Jagannathan and Wang (1996), the premia for the sensitivity factor for the return on human capital is not significant. Our results suggest that three factors alone, the zero-$\beta$

factor, $\beta_p^{prem}$ and *SIZE* explain fairly well the cross-sectional variation of Canadian stock returns.

However, our findings may be fragile without further robustness tests. We need to conduct further out-of-sample tests, construct different characteristic-based portfolios, and test for the explanatory power of the chosen models using different proxies for the sensitivity factors or with other explanatory variables. The literature strongly suggests that the ability of any such model to either theoretically or empirically survive depends on the use of many testing procedures to exhaustively examine its inferential sturdiness.

More research is still required in order to quantify the intangible factors that affect investors' decisions. As Fama and French [(1996), p. 81] note, if analysts are using the wrong estimates for the market portfolio and these estimates are not mean-variance efficient. and most researchers use these proxies, then the results may support a given model when in fact the true variable is unobservable. As La Porta [(1996), p. 1740] indicates, most fund managers and analysts are not being tested only on their ability to forecast accurately but also on the timeliness of the stocks that they recommend.

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## Appendix 1
## Portfolio Contents

The total number of stocks per period used in this study which are allocated equally in each of the 25 portfolios, as well as the number of stocks per portfolio, are reported in this appendix. Every period studied (i.e. 1965-66) represents 12 months and starts from July of one year to June of the following year. For each month of the study period, there are 25 *size*- and *beta*-sorted portfolios. There are two basic criteria that a stock has to meet to be included in one of the 25 monthly portfolios at a given period (i.e. July of year "t" to June of year "t+1") of our study namely: (a) it must have at least 24 consecutive quoted values for price, return, and number of shares outstanding prior to the June of year "t"; and (b) it must have quoted values for price, return, and number of shares outstanding for all of the 12 subsequent months (July of year "t" to June of year "t+1"). The portfolio formation method is that of Fama and French (1992). It is presented in section 3 of the text.

| Period | Total Number of Stocks Used | Number of Stocks Per Portfolio |
|---|---|---|
| 1965-66 | 280 | 11 |
| 1966-67 | 288 | 12 |
| 1967-68 | 290 | 12 |
| 1968-69 | 299 | 12 |
| 1969-70 | 329 | 14 |
| 1970-71 | 363 | 15 |
| 1971-72 | 373 | 15 |
| 1972-73 | 396 | 16 |
| 1973-74 | 367 | 15 |
| 1974-75 | 333 | 14 |
| 1975-76 | 360 | 14 |
| 1976-77 | 348 | 14 |
| 1977-78 | 323 | 13 |
| 1978-79 | 330 | 13 |
| 1979-80 | 405 | 16 |
| 1980-81 | 507 | 20 |
| 1981-82 | 595 | 24 |
| 1982-83 | 628 | 25 |
| 1983-84 | 653 | 27 |
| 1984-85 | 700 | 28 |
| 1985-86 | 725 | 29 |
| 1986-87 | 756 | 30 |
| 1987-88 | 873 | 35 |
| 1988-89 | 896 | 36 |
| 1989-90 | 873 | 35 |
| 1990-91 | 856 | 34 |
| 1991-92 | 828 | 33 |
| 1992-93 | 809 | 33 |

## Appendix 2
## Problems Encountered in Portfolio Construction

The portfolio formation process used in this study is the one suggested by Fama and French (1992). As explained in section 3.2. of the text, we form 25 equally weighted *SIZE*- and *beta*-sorted portfolios for each month over the period from July 1965 to December 1992 (330 months). The *SIZE* and *beta* variables are defined in sections 3.1. and 3.2. of the text. A study period is 12 months, and starts from July of year "t" to June of year "t+1". We repeat the procedure for each one of the 29 study periods to allow for any delisting of stocks. Hence, within a study period the stocks used in the month-by-month portfolios are the same, whereas in the following period some of them are dropped and new ones are used. In the process of forming the portfolios, we encountered a number of problems.

For a study period (July of year "t" to June of year "t+1"), we first sort all common stocks from the TSE/Western file in *SIZE* quintiles, based on their *SIZE* values at the end of June of year "t". We then sort all stocks in each *SIZE* quintile into *beta* quintiles, based on their pre-ranking *beta* estimates. This gives us 25 *SIZE*- and *beta*-sorted portfolios each month. Following the suggestion of Fama and MacBeth (1973) suggestion for *beta*-sorted portfolios, if the stocks within each *SIZE* quintile are not exactly divisible by 5, we allocate each of the remainder stocks to the highest-*beta* portfolio first, to the immediately lower-*beta* portfolio next, and so on. To estimate the pre-ranking *betas*, we select all stocks which, in June of year "t", have at least 24 (2 years) and up to 60 (5 years) of past monthly returns. We then estimate the pre-ranking *betas* by regressing the returns on the portfolios with the returns on the TSE/Western Value-Weighted Total Return Index.

Therefore, a stock is included in a portfolio for a given study period if it has: (a) at least 24 consecutive quoted values for price, return, and number of shares outstanding prior to the June of year "t"; and (b) quoted values for price, return, and number of shares outstanding for all of the 12 subsequent months (July of year "t" to June of year "t+1"). The total number of common stocks originally extracted from the TSE/Western file was approximately 2,840. We selected from these the ones that met both of our selection criteria for each study period. We were left with a final sample of 1,674 stocks.

In the process of selecting the portfolios, we encountered a number of problems. Some of the stocks that were extracted from the TSE/Western file had no reported values for either the price or the return or the number of shares outstanding. We were able to identify several of the reasons for these, and they are:

1. There was thin trading or no trading at all for these stocks.
2. There had been a stock-split, and there was no price adjustment.
3. There had been a significant stock buy-back, and no value was reported for the number of shares outstanding.

For a number of stocks, we also identified a significant number of months with no reported values on price, which we could not explain. However, for all the stocks that we have quoted values for price and number of shares outstanding but no return values, we calculated the missing values and added them to the data base. In addition to the two selection criteria mentioned earlier, a stock was included only if it had no more than 15% of its observations missing for the estimation period (24 to 60 months prior to the June of year "t"). Thus, we selected 1,674 stocks that met all our criteria. In appendix 1, we report the number of stocks that remained for each of the 29 study periods, as well as the number of stocks in each of the 25 portfolios.

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## Appendix 3
## Time Series Regression Parameter Estimates for the Main Variables

The $\beta_p^{vw}$, $\beta_p^{size}$, $\beta_p^{prem}$, and $\beta_p^{labor}$ estimates are reported in this table. The full model (we use various subsets of the full model to estimate the parameters) for the time-series OLS regressions is:

$$E[R_{pt}] = \beta_0 + \beta_p^{size}\log(ME_{pt}) + \beta_p^{vw}R_t^{vw} + \beta_p^{prem}R_{t-1}^{prem} + \beta_p^{labor}R_t^{labor}$$

The procedure for portfolio formation is described in detail in section 3 of the text. All common stocks from the TSE/Western file are sorted in size-quintiles first and then within each size-quintile they are sorted in beta-quintiles to form 25 equally weighted portfolios. The studied time period is from July 1965 to December 1992 (330 months). The subscript $p$ denotes portfolio number ($p$ =1...25) and the subscript $t$ denotes month number ($t$ =1...330). All variable definitions are given in section 4 of the text. In *Panel A*, we report the estimates for the $\beta_p^{vw}$ for the 25 portfolios from the OLS regressions of the portfolio returns on the TSE/Western Value Weighted Total Return Index over the whole period. In *Panel B*, we report the $\beta_p^{size}$ estimates for the 25 portfolios from the OLS regressions of the portfolio returns on the logs of Market Equity or *ME* (share price times the outstanding number of shares) over the whole period. *Panel C* reports the $\beta_p^{prem}$ that are orthogonal to the $\beta_p^{vw}$. In *Panel D*, we report the $\beta_p^{labor}$ estimates that are orthogonal to the $\beta_p^{vw}$ and the $\beta_p^{prem}$. In *Panel E*, we report the $\beta_p^{vw}$ and the $\beta_p^{size}$ estimates from the OLS regressions of the portfolio returns on the TSE/Western Value Weighted Total Return Index and the logs of ME over the whole period. *Panel F* reports the $\beta_p^{vw}$, $\beta_p^{size}$, $\beta_p^{prem}$, and $\beta_p^{labor}$ estimates from the OLS regressions of the portfolio returns on all variables. We also report all T-Statistics, Standard Errors, and P-Values for the parameter estimates as well as the $R^2$ values for the model.

| | | Beta-Low | 2 | 3 | 4 | Beta-High |
|---|---|---|---|---|---|---|
| | | **Panel A: The $\beta_p^{vw}$ Estimates** | | | | |
| **Size-Small** | $\beta_p^{vw}$ | 0.7543 | 1.0372 | 0.9719 | 1.3149 | 1.4041 |
| | T-stat | 5.5960 | 13.2167 | 11.6237 | 13.2953 | 12.9471 |
| | Std Error | 0.1348 | 0.0785 | 0.0836 | 0.0989 | 0.1085 |
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | R-square | 0.0872 | 0.3475 | 0.2917 | 0.3502 | 0.3382 |
| **2** | $\beta_p^{vw}$ | 0.6981 | 0.8706 | 1.0326 | 1.1212 | 1.4016 |
| | T-stat | 13.0521 | 19.8923 | 18.9466 | 19.1686 | 19.8456 |
| | Std Error | 0.0535 | 0.0438 | 0.0545 | 0.0585 | 0.0706 |
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | R-square | 0.3418 | 0.5468 | 0.5225 | 0.5284 | 0.5456 |
| **3** | $\beta_p^{vw}$ | 0.6796 | 0.8177 | 1.0209 | 1.0816 | 1.3535 |
| | T-stat | 19.0689 | 21.4523 | 26.9389 | 22.4985 | 22.7990 |
| | Std Error | 0.0356 | 0.0381 | 0.0379 | 0.0481 | 0.0594 |
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | R-square | 0.5258 | 0.5839 | 0.6887 | 0.6068 | 0.6131 |
| **4** | $\beta_p^{vw}$ | 0.7249 | 0.7838 | 0.9432 | 1.1314 | 1.3646 |
| | T-stat | 22.2080 | 24.7776 | 24.2113 | 31.2796 | 28.4609 |
| | Std Error | 0.0326 | 0.0316 | 0.0390 | 0.0362 | 0.0479 |
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | R-square | 0.6006 | 0.6518 | 0.6412 | 0.7489 | 0.7118 |
| **Size-Big** | $\beta_p^{vw}$ | 0.7318 | 0.9351 | 0.9306 | 1.0952 | 1.2789 |
| | T-stat | 29.5273 | 35.6075 | 41.2325 | 46.0275 | 34.3201 |
| | Std Error | 0.0248 | 0.0263 | 0.0226 | 0.0238 | 0.0373 |

**Appendix 3 (Continued)**

| | | Beta-Low | 2 | 3 | 4 | Beta-High |
|---|---|---|---|---|---|---|
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | R-square | 0.7266 | 0.7945 | 0.8383 | 0.8659 | 0.7822 |
| | | | **Panel B: The $\beta_p^{size}$ Estimates** | | | |
| **Size- Small** | $\beta_p^{size}$ | -0.0099 | 0.0053 | 0.0005 | 0.0018 | 0.0065 |
| | T-stat | -0.7389 | 0.6043 | 0.0556 | 0.1661 | 0.6507 |
| | Std Error | 0.0134 | 0.0087 | 0.0085 | 0.0108 | 0.0099 |
| | P-Value | 0.4605 | 0.5461 | 0.9557 | 0.8682 | 0.5157 |
| | R-square | 0.0017 | 0.0011 | 0.0000 | 0.0001 | 0.0013 |
| **2** | $\beta_p^{size}$ | 0.0200 | 0.0248 | 0.0299 | 0.0252 | 0.0485 |
| | T-stat | 2.2842 | 3.0944 | 2.6866 | 2.3204 | 3.5556 |
| | Std Error | 0.0088 | 0.0080 | 0.0111 | 0.0109 | 0.0137 |
| | P-Value | 0.0230 | 0.0021 | 0.0076 | 0.0209 | 0.0004 |
| | R-square | 0.0157 | 0.0284 | 0.0215 | 0.0162 | 0.0371 |
| **3** | $\beta_p^{size}$ | 0.0020 | 0.0147 | 0.0237 | 0.0296 | 0.0410 |
| | T-stat | 0.2626 | 1.7902 | 2.5312 | 2.6152 | 3.4483 |
| | Std Error | 0.0077 | 0.0082 | 0.0094 | 0.0113 | 0.0119 |
| | P-Value | 0.7931 | 0.0743 | 0.0118 | 0.0093 | 0.0006 |
| | R-square | 0.0002 | 0.0097 | 0.0192 | 0.0204 | 0.0350 |
| **4** | $\beta_p^{size}$ | 0.0112 | 0.0103 | 0.0136 | 0.0142 | 0.0373 |
| | T-stat | 1.5001 | 1.3886 | 1.6356 | 1.4472 | 3.1915 |
| | Std Error | 0.0075 | 0.0074 | 0.0083 | 0.0098 | 0.0117 |
| | P-Value | 0.1346 | 0.1659 | 0.1029 | 0.1488 | 0.0016 |
| | R-square | 0.0068 | 0.0058 | 0.0081 | 0.0063 | 0.0301 |
| **Size-Big** | $\beta_p^{size}$ | 0.0072 | 0.0066 | 0.0046 | 0.0111 | 0.0134 |
| | T-stat | 2.2059 | 1.2706 | 0.9262 | 2.0767 | 2.0912 |
| | Std Error | 0.0033 | 0.0052 | 0.0050 | 0.0053 | 0.0064 |
| | P-Value | 0.0281 | 0.2048 | 0.3550 | 0.0386 | 0.0373 |
| | R-square | 0.0146 | 0.0049 | 0.0026 | 0.0130 | 0.0132 |
| | | **Panel C: $\beta_p^{prem}$ Estimates that are orthogonal to the $\beta_p^{rm}$** | | | | |
| **Size- Small** | $\beta_p^{prem}$ | -0.4304 | -0.3892 | -0.0382 | -0.2519 | -0.4744 |
| | T-stat | -0.4765 | -0.7406 | -0.0681 | -0.3801 | -0.6531 |
| | Std Error | 0.9032 | 0.5255 | 0.5604 | 0.6627 | 0.7264 |
| | P-Value | 0.6340 | 0.4595 | 0.9457 | 0.7041 | 0.5142 |
| | R-square | 0.0007 | 0.0017 | 0.0000 | 0.0004 | 0.0013 |
| **2** | $\beta_p^{prem}$ | -0.1596 | 0.3967 | 0.3938 | 0.7097 | 0.4577 |
| | T-stat | -0.4454 | 1.3560 | 1.0801 | 1.8193 | 0.9683 |
| | Std Error | 0.3584 | 0.2925 | 0.3646 | 0.3901 | 0.4727 |
| | P-Value | 0.6564 | 0.1760 | 0.2809 | 0.0698 | 0.3336 |
| | R-square | 0.0006 | 0.0056 | 0.0035 | 0.0100 | 0.0029 |

**Appendix 3 (Continued)**

| | | Beta-Low | 2 | 3 | 4 | Beta-High |
|---|---|---|---|---|---|---|
| **3** | $\beta_p^{prem}$ | 0.1939 | 0.2951 | 0.0508 | 0.4529 | 0.3216 |
| | T-stat | 0.8124 | 1.1576 | 0.2001 | 1.4098 | 0.8090 |
| | Std Error | 0.2386 | 0.2550 | 0.2540 | 0.3213 | 0.3975 |
| | P-Value | 0.4171 | 0.2479 | 0.8416 | 0.1595 | 0.4191 |
| | R-square | 0.0020 | 0.0041 | 0.0001 | 0.0060 | 0.0020 |
| **4** | $\beta_p^{prem}$ | -0.3729 | -0.0948 | 0.2051 | 0.4081 | 0.4087 |
| | T-stat | -1.7121 | -0.4474 | 0.7863 | 1.6909 | 1.2750 |
| | Std Error | 0.2178 | 0.2119 | 0.2609 | 0.2414 | 0.3206 |
| | P-Value | 0.0878 | 0.6549 | 0.4323 | 0.0918 | 0.2032 |
| | R-square | 0.0089 | 0.0006 | 0.0019 | 0.0086 | 0.0049 |
| **Size-Big** | $\beta_p^{prem}$ | -0.1866 | 0.0611 | 0.1804 | 0.0860 | -0.0094 |
| | T-stat | -1.1253 | 0.3474 | 1.1952 | 0.5392 | -0.0375 |
| | Std Error | 0.1658 | 0.1760 | 0.1509 | 0.1594 | 0.2498 |
| | P-Value | 0.2613 | 0.7285 | 0.2329 | 0.5901 | 0.9701 |
| | R-square | 0.0038 | 0.0004 | 0.0043 | 0.0009 | 0.0000 |
| | | **Panel D: $\beta_p^{labor}$ Estimates orthogonal to the $\beta_p^{prem}$ & $\beta_p^{vw}$** | | | | |
| **Size- Small** | $\beta_p^{labor}$ | -0.0562 | -0.7264 | -0.8170 | -0.4492 | -0.7833 |
| | T-stat | -0.1226 | -2.7524 | -2.9068 | -1.3380 | -2.1374 |
| | Std Error | 0.4588 | 0.2639 | 0 2811 | 0.3357 | 0.3665 |
| | P-Value | 0.9025 | 0.0062 | 0.0039 | 0.1818 | 0.0333 |
| | R-square | 0.0000 | 0.0226 | 0.0251 | 0.0054 | 0.0137 |
| **2** | $\beta_p^{labor}$ | -0.3617 | -0.4563 | -0.4100 | -0.0571 | -0.2578 |
| | T-stat | -1.9992 | -3.1159 | -2.2300 | -0.2880 | -1.0756 |
| | Std Error | 0.1809 | 0.1464 | 0.1838 | 0.1981 | 0.2397 |
| | P-Value | 0.0464 | 0.0020 | 0.0264 | 0.7735 | 0.2829 |
| | R-square | 0.0120 | 0.0287 | 0.0149 | 0.0003 | 0.0035 |
| **3** | $\beta_p^{labor}$ | -0.2391 | -0.1984 | -0.0897 | 0.0595 | 0.1629 |
| | T-stat | -1.9841 | -1.5374 | -0.6956 | 0.3649 | 0.8077 |
| | Std Error | 0.1205 | 0.1291 | 0.1289 | 0.1632 | 0.2017 |
| | P-Value | 0.0481 | 0.1250 | 0.4872 | 0.7154 | 0.4199 |
| | R-square | 0.0119 | 0.0072 | 0.0015 | 0.0004 | 0.0020 |
| **4** | $\beta_p^{labor}$ | -0.1891 | -0.2812 | -0.2490 | -0.0260 | 0.1794 |
| | T-stat | -1.7169 | -2.6393 | -1.8890 | -0.2119 | 1.1039 |
| | Std Error | 0.1101 | 0.1065 | 0.1318 | 0.1226 | 0.1625 |
| | P-Value | 0.0870 | 0.0087 | 0.0598 | 0.8323 | 0.2704 |
| | R-square | 0.0089 | 0.0208 | 0.0108 | 0.0001 | 0.0037 |
| **Size-Big** | $\beta_p^{labor}$ | 0.0002 | -0.1261 | -0.0732 | -0.1330 | 0.0483 |
| | T-stat | 0.0025 | -1.4151 | -0.9559 | -1.6495 | 0.3807 |
| | Std Error | 0.0842 | 0.0891 | 0.0766 | 0.0806 | 0.1268 |

## Appendix 3 (Continued)

| | | Beta-Low | 2 | 3 | 4 | Beta-High |
|---|---|---|---|---|---|---|
| | P-Value | 0.9980 | 0.1580 | 0.3398 | 0.1000 | 0.7036 |
| | R-square | 0.0000 | 0.0061 | 0.0028 | 0.0082 | 0.0004 |
| | | **Panel E: The $\beta_p^{rw}$ and $\beta_p^{size}$ Estimates** | | | | |
| **Size- Small** | $\beta_p^{rw}$ | 0.7538 | 1.0369 | 0.9761 | 1.3195 | 1.4060 |
| | T-stat | 5.5883 | 13.2015 | 11.6385 | 13.3011 | 12.9055 |
| | Std Error | 0.1349 | 0.0785 | 0.0839 | 0.0992 | 0.1089 |
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | $\beta_p^{size}$ | -0.0096 | 0.0047 | -0.0053 | -0.0060 | -0.0018 |
| | T-stat | -0.7437 | 0.6712 | -0.7337 | -0.6912 | -0.2182 |
| | Std Error | 0.0128 | 0.0071 | 0.0072 | 0.0087 | 0.0081 |
| | P-Value | 0.4576 | 0.5026 | 0.4636 | 0.4899 | 0.8274 |
| | R-square | 0.0887 | 0.3484 | 0.2929 | 0.3511 | 0.3383 |
| **2** | $\beta_p^{rw}$ | 0.6938 | 0.8651 | 1.0223 | 1.1135 | 1.3781 |
| | T-stat | 13.0543 | 20.1964 | 18.8235 | 19.1135 | 19.3784 |
| | Std Error | 0.0531 | 0.0428 | 0.0543 | 0.0583 | 0.0711 |
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | $\beta_p^{size}$ | 0.0168 | 0.0213 | 0.0181 | 0.0166 | 0.0201 |
| | T-stat | 2.3637 | 3.9744 | 2.3368 | 2.2121 | 2.1267 |
| | Std Error | 0.0071 | 0.0054 | 0.0078 | 0.0075 | 0.0090 |
| | P-Value | 0.0187 | 0.0000 | 0.0201 | 0.0276 | 0.0340 |
| | R-square | 0.3529 | 0.5677 | 0.5304 | 0.5353 | 0.5518 |
| **3** | $\beta_p^{rw}$ | 0.6804 | 0.8143 | 1.0143 | 1.0760 | 1.3340 |
| | T-stat | 19.0500 | 21.3594 | 26.6865 | 22.1167 | 22.4564 |
| | Std Error | 0.0357 | 0.0381 | 0.0380 | 0.0487 | 0.0594 |
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | $\beta_p^{size}$ | -0.0027 | 0.0077 | 0.0088 | 0.0056 | 0.0189 |
| | T-stat | -0.5027 | 1.4536 | 1.6718 | 0.7746 | 2.5048 |
| | Std Error | 0.0053 | 0.0053 | 0.0053 | 0.0073 | 0.0075 |
| | P-Value | 0.6155 | 0.1470 | 0.0955 | 0.4392 | 0.0127 |
| | R-square | 0.5261 | 0.5865 | 0.6914 | 0.6075 | 0.6204 |
| **4** | $\beta_p^{rw}$ | 0.7231 | 0.7821 | 0.9411 | 1.1325 | 1.3511 |
| | T-stat | 22.0807 | 24.6721 | 24.0448 | 31.1045 | 28.0834 |
| | Std Error | 0.0327 | 0.0317 | 0.0391 | 0.0364 | 0.0480 |
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | $\beta_p^{size}$ | 0.0036 | 0.0038 | 0.0032 | -0.0014 | 0.0136 |
| | T-stat | 0.7619 | 0.8673 | 0.6376 | -0.2840 | 2.1323 |
| | Std Error | 0.0048 | 0.0044 | 0.0050 | 0.0050 | 0.0064 |
| | P-Value | 0.4466 | 0.3864 | 0.5242 | 0.7766 | 0.0337 |
| | R-square | 0.6013 | 0.6526 | 0.6417 | 0.7490 | 0.7157 |
| **Size-Big** | $\beta_p^{rw}$ | 0.7281 | 0.9342 | 0.9310 | 1.0948 | 1.2744 |
| | T-stat | 29.4544 | 35.4616 | 41.1123 | 45.6134 | 34.0987 |
| | Std Error | 0.0247 | 0.0263 | 0.0226 | 0.0240 | 0.0374 |

**Appendix 3 (Continued)**

| | | Beta-Low | 2 | 3 | 4 | Beta-High |
|---|---|---|---|---|---|---|
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | $\beta_p^{size}$ | 0.0036 | 0.0012 | -0.0006 | 0.0003 | 0.0041 |
| | T-stat | 2.0968 | 0.5167 | -0.3022 | 0.1482 | 1.3452 |
| | Std Error | 0.0017 | 0.0024 | 0.0020 | 0.0020 | 0.0030 |
| | P-Value | 0.0368 | 0.6057 | 0.7627 | 0.8822 | 0.1795 |
| | R-square | 0.7303 | 0.7946 | 0.8383 | 0.8659 | 0.7834 |
| | | **Panel F: The $\beta_p^{vw}$, $\beta_p^{size}$, $\beta_p^{prem}$, and $\beta_p^{labor}$ Estimates** | | | | |
| **Size- Small** | $\beta_p^{vw}$ | 0.7527 | 1.0334 | 0.9766 | 1.3182 | 1.4017 |
| | T-stat | 5.5572 | 13.2802 | 11.7240 | 13.2423 | 12.8980 |
| | Std Error | 0.1355 | 0.0778 | 0.0833 | 0.0995 | 0.1087 |
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | $\beta_p^{size}$ | -0.0084 | 0.0080 | -0.0045 | -0.0048 | -0.0002 |
| | T-stat | -0.5920 | 1.0886 | -0.5923 | -0.5095 | -0.0264 |
| | Std Error | 0.0142 | 0.0073 | 0.0076 | 0.0095 | 0.0083 |
| | P-Value | 0.5542 | 0.2772 | 0.5541 | 0.6107 | 0.9790 |
| | $\beta_p^{labor}$ | -0.0458 | -0.7510 | -0.8165 | -0.4441 | -0.7922 |
| | T-stat | -0.0989 | -2.8174 | -2.8716 | -1.3073 | -2.1391 |
| | Std Error | 0.4637 | 0.2666 | 0.2843 | 0.3397 | 0.3703 |
| | P-Value | 0.9213 | 0.0051 | 0.0044 | 0.1920 | 0.0332 |
| | $\beta_p^{prem}$ | -0.1704 | -0.4022 | 0.2582 | -0.0135 | -0.3035 |
| | T-stat | -0.1695 | -0.7359 | 0.4333 | -0.0186 | -0.4053 |
| | Std Error | 1.0051 | 0.5466 | 0.5959 | 0.7247 | 0.7489 |
| | P-Value | 0.8655 | 0.4623 | 0.6651 | 0.9852 | 0.6855 |
| | R-square | 0.0888 | 0.3658 | 0.3105 | 0.3546 | 0.3483 |
| | | | | | | |
| **2** | $\beta_p^{vw}$ | 0.6919 | 0.8674 | 1.0249 | 1.1182 | 1.3809 |
| | T-stat | 13.0570 | 20.5077 | 18.9725 | 19.1556 | 19.3583 |
| | Std Error | 0.0530 | 0.0423 | 0.0540 | 0.0584 | 0.0713 |
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | $\beta_p^{size}$ | 0.0176 | 0.0208 | 0.0182 | 0.0141 | 0.0195 |
| | T-stat | 2.4633 | 3.9078 | 2.3608 | 1.8323 | 2.0277 |
| | Std Error | 0.0072 | 0.0053 | 0.0077 | 0.0077 | 0.0096 |
| | P-Value | 0.0143 | 0.0001 | 0.0188 | 0.0678 | 0.0434 |
| | $\beta_p^{labor}$ | -0.3664 | -0.4632 | -0.4259 | -0.0628 | -0.2790 |
| | T-stat | -2.0229 | -3.2032 | -2.3118 | -0.3153 | -1.1587 |
| | Std Error | 0.1811 | 0.1446 | 0.1842 | 0.1992 | 0.2408 |
| | P-Value | 0.0439 | 0.0015 | 0.0214 | 0.7528 | 0.2474 |
| | $\beta_p^{prem}$ | -0.2065 | 0.3727 | 0.4436 | 0.5478 | 0.3468 |
| | T-stat | -0.5729 | 1.3002 | 1.2212 | 1.3560 | 0.7206 |
| | Std Error | 0.3605 | 0.2866 | 0.3633 | 0.4040 | 0.4813 |
| | P-Value | 0.5671 | 0.1944 | 0.2229 | 0.1760 | 0.4717 |
| | R-square | 0.3622 | 0.5821 | 0.5393 | 0.5380 | 1.0740 |
| | | | | | | |
| **3** | $\beta_p^{vw}$ | 0.6815 | 0.8162 | 1.0147 | 1.0763 | 1.3341 |
| | T-stat | 19.1403 | 21.5066 | 26.6556 | 22.1552 | 22.5142 |
| | Std Error | 0.0356 | 0.0380 | 0.0381 | 0.0486 | 0.0593 |

**Appendix 3 (Continued)**

| | | Beta-Low | 2 | 3 | 4 | Beta-High |
|---|---|---|---|---|---|---|
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | $\beta_p^{size}$ | -0.0018 | 0.0106 | 0.0101 | 0.0587 | 0.0233 |
| | T-stat | -0.3399 | 1.9007 | 1.8150 | 0.3567 | 2.9327 |
| | Std Error | 0.0054 | 0.0056 | 0.0055 | 0.0075 | 0.0079 |
| | P-Value | 0.7341 | 0.0582 | 0.0704 | 0.2336 | 0.0036 |
| | $\beta_p^{labor}$ | -0.2424 | -0.1988 | -0.0932 | 0.0587 | 0.1678 |
| | T-stat | -1.9911 | -1.5331 | -0.7192 | 0.3567 | 0.8341 |
| | Std Error | 0.1217 | 0.1297 | 0.1296 | 0.1645 | 0.2012 |
| | P-Value | 0.0473 | 0.1262 | 0.4725 | 0.7215 | 0.4048 |
| | $\beta_p^{prem}$ | 0.2250 | 0.4942 | 0.2119 | 0.5483 | 0.6786 |
| | T-stat | 0.9100 | 1.8412 | 0.7934 | 1.6300 | 1.6224 |
| | Std Error | 0.2472 | 0.2684 | 0.2671 | 0.3364 | 0.4183 |
| | P-Value | 0.3635 | 0.0665 | 0.4281 | 0.1041 | 0.1057 |
| | R-square | 0.5326 | 0.5931 | 0.6923 | 0.6110 | 0.6246 |
| **4** | $\beta_p^{rm}$ | 0.7234 | 0.7826 | 0.9416 | 1.1309 | 1.3460 |
| | T-stat | 22.2072 | 24.8613 | 24.1674 | 31.1335 | 28.3173 |
| | Std Error | 0.0326 | 0.0315 | 0.0390 | 0.0363 | 0.0475 |
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | $\beta_p^{size}$ | -0.0027 | 0.0028 | 0.0065 | 0.0061 | 0.0261 |
| | T-stat | -0.4524 | 0.5440 | 1.0987 | 0.9619 | 3.4755 |
| | Std Error | 0.0060 | 0.0052 | 0.0059 | 0.0063 | 0.0075 |
| | P-Value | 0.6513 | 0.5868 | 0.2727 | 0.3368 | 0.0006 |
| | $\beta_p^{labor}$ | -0.1941 | -0.2799 | -0.2400 | -0.0182 | 0.2229 |
| | T-stat | -1.7417 | -2.5935 | -1.7999 | -0.1471 | 1.3783 |
| | Std Error | 0.1114 | 0.1079 | 0.1334 | 0.1240 | 0.1617 |
| | P-Value | 0.0825 | 0.0099 | 0.0728 | 0.8831 | 0.1690 |
| | $\beta_p^{prem}$ | -0.4090 | 0.0371 | 0.4356 | 0.5980 | 1.0626 |
| | T-stat | -1.4823 | 0.1485 | 1.4168 | 1.9319 | 2.8343 |
| | Std Error | 0.2759 | 0.2499 | 0.3074 | 0.3096 | 0.3749 |
| | P-Value | 0.1392 | 0.8820 | 0.1575 | 0.0542 | 0.0049 |
| | R-square | 0.6079 | 0.6596 | 0.6471 | 0.7518 | 0.7245 |
| **Size-Big** | $\beta_p^{rm}$ | 0.7281 | 0.9347 | 0.9317 | 1.0948 | 1.2742 |
| | T-stat | 29.3640 | 35.4915 | 41.1491 | 45.6862 | 34.0299 |
| | Std Error | 0.0248 | 0.0263 | 0.0226 | 0.0240 | 0.0374 |
| | P-Value | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | $\beta_p^{size}$ | 0.0037 | 0.0018 | 0.0003 | 0.0010 | 0.0055 |
| | T-stat | 1.7648 | 0.6647 | 0.1277 | 0.4188 | 1.5648 |
| | Std Error | 0.0021 | 0.0027 | 0.0022 | 0.0023 | 0.0035 |
| | P-Value | 0.0785 | 0.5067 | 0.8984 | 0.6757 | 0.1186 |
| | $\beta_p^{labor}$ | 0.0077 | -0.1233 | -0.0733 | -0.1333 | 0.0633 |
| | T-stat | 0.0913 | -1.3670 | -0.9455 | -1.6359 | 0.4947 |
| | Std Error | 0.0848 | 0.0902 | 0.0776 | 0.0815 | 0.1280 |
| | P-Value | 0.9273 | 0.1726 | 0.3451 | 0.1028 | 0.6211 |
| | $\beta_p^{prem}$ | 0.0139 | 0.1485 | 0.2048 | 0.1524 | 0.2070 |

**Appendix 3 (Continued)**

| | Beta-Low | 2 | 3 | 4 | Beta-High |
|---|---|---|---|---|---|
| T-stat | 0.0688 | 0.7455 | 1.2333 | 0.8273 | 0.7129 |
| Std Error | 0.2020 | 0.1992 | 0.1661 | 0.1841 | 0.2904 |
| P-Value | 0.9452 | 0.4565 | 0.2184 | 0.4086 | 0.4764 |
| R-square | 0.7303 | 0.7961 | 0.8394 | 0.8672 | 0.7839 |

# Appendix 4
## The Unconditional CAPM (Fama-MacBeth Procedure)

Univariate Procedure

Variable=BETA

**Moments**

| | | | |
|---|---|---|---|
| N | 330 | Sum Wgts | 330 |
| Mean | -0.00359 | Sum | -1.1847 |
| Std Dev | 0.03919 | Variance | 0.001536 |
| Skewness | -0.67033 | Kurtosis | 8.38917 |
| USS | 0.509549 | CSS | 0.505296 |
| CV | -1091.65 | Std Mean | 0.002157 |
| T:Mean=0 | -1.66408 | Pr>\|T\| | 0.0970 |
| Num ^= 0 | 330 | Num > 0 | 143 |
| M(Sign) | -22 | Pr>=\|M\| | 0.0178 |
| Sgn Rank | -3968.5 | Pr>=\|S\| | 0.0219 |

**Quantiles(Def=5)**

| | | | |
|---|---|---|---|
| 100% Max | 0.172371 | 99% | 0.095119 |
| 75% Q3 | 0.014279 | 95% | 0.059929 |
| 50% Med | -0.00564 | 90% | 0.037282 |
| 25% Q1 | -0.02167 | 10% | -0.04352 |
| 0% Min | -0.27947 | 5% | -0.06094 |
| | | 1% | -0.09183 |
| Range | 0.451838 | | |
| Q3-Q1 | 0.035948 | | |
| Mode | -0.27947 | | |

**Extremes**

| Lowest | Obs | Highest | Obs |
|---|---|---|---|
| -0.27947( | 276) | 0.087275( | 182) |
| -0.12403( | 188) | 0.095119( | 187) |
| -0.11318( | 171) | 0.09968( | 237) |
| -0.09183( | 86) | 0.112792( | 161) |
| -0.08999( | 307) | 0.172371( | 91) |

# Appendix 5

## The Unconditional CAPM (GLS TSCSREG Procedure)

Dependent Variable: PORTFOLIO RETURN

Model Description

| | |
|---|---|
| Estimation Method | RANTWO |
| Number of Cross Sections | 25 |
| Time Series Length | 330 |

Variance Component Estimates

| | | | |
|---|---|---|---|
| SSE | 18.57533 | DFE | 8248 |
| MSE | 0.002252 | Root MSE | 0.047456 |
| RSQ | 0.0001 | | |

| | |
|---|---|
| Variance Component for Cross Sections | 0.000061 |
| Variance Component for Time Series | 0.002839 |
| Variance Component for Error | 0.002252 |

Hausman Test for Random Effects

| | | | |
|---|---|---|---|
| | Degrees of Freedom: | | 1 |
| m value: | 0.0588 | Prob. > m: | 0.8084 |

Parameter Estimates

| Variable | DF | Parameter Estimate | Standard Error | T for H0: Parameter=0 | Prob > \|T\| | Variable Label |
|---|---|---|---|---|---|---|
| INTERCEP | 1 | 0.016483 | 0.004132 | 3.989530 | 0.0001 | Intercept |
| BIDX | 1 | -0.001965 | 0.002387 | -0.823478 | 0.4103 | |

# Appendix 6

## The unconditional CAPM With SIZE (Fama-MacBeth Procedure)

Univariate Procedure

Variable=BETA

Moments

| | | | |
|---|---|---|---|
| N | 330 | Sum Wgts | 330 |
| Mean | -0.00334 | Sum | -1.10183 |
| Std Dev | 0.03884 | Variance | 0.001509 |
| Skewness | -0.80045 | Kurtosis | 8.107929 |
| USS | 0.499982 | CSS | 0.496304 |
| CV | -1163.26 | Std Mean | 0.002138 |
| T:Mean=0 | -1.56164 | Pr>\|T\| | 0.1193 |
| Num ^= 0 | 330 | Num > 0 | 146 |
| M(Sign) | -19 | Pr>=\|M\| | 0.0415 |
| Sgn Rank | -3518.5 | Pr>=\|S\| | 0.0423 |

Quantiles(Def=5)

| | | | |
|---|---|---|---|
| 100% Max | 0.148215 | 99% | 0.091338 |
| 75% Q3 | 0.015868 | 95% | 0.062649 |
| 50% Med | -0.00351 | 90% | 0.041024 |
| 25% Q1 | -0.02308 | 10% | -0.04424 |
| 0% Min | -0.27983 | 5% | -0.0609 |
| | | 1% | -0.08827 |
| Range | 0.428043 | | |
| Q3-Q1 | 0.038952 | | |
| Mode | -0.27983 | | |

Extremes

| Lowest | Obs | Highest | Obs |
|---|---|---|---|
| -0.27983( | 276) | 0.08535( | 137) |
| -0.11722( | 188) | 0.091338( | 182) |
| -0.11297( | 171) | 0.095441( | 237) |
| -0.08827( | 86) | 0.113832( | 161) |
| -0.0852( | 208) | 0.148215( | 91) |

Univariate Procedure

Variable=SIZE

Moments

| | | | |
|---|---|---|---|
| N | 330 | Sum Wgts | 330 |
| Mean | -0.00358 | Sum | -1.18038 |
| Std Dev | 0.010625 | Variance | 0.000113 |
| Skewness | -0.88453 | Kurtosis | 2.266891 |
| USS | 0.041365 | CSS | 0.037143 |
| CV | -297.052 | Std Mean | 0.000585 |
| T:Mean=0 | -6.1154 | Pr>\|T\| | 0.0001 |
| Num ^= 0 | 330 | Num > 0 | 120 |
| M(Sign) | -45 | Pr>=\|M\| | 0.0001 |
| Sgn Rank | -9578.5 | Pr>=\|S\| | 0.0001 |

Quantiles(Def=5)

| | | | |
|---|---|---|---|
| 100% Max | 0.02796 | 99% | 0.015507 |
| 75% Q3 | 0.003565 | 95% | 0.011635 |
| 50% Med | -0.00269 | 90% | 0.008578 |
| 25% Q1 | -0.00898 | 10% | -0.01616 |
| 0% Min | -0.04894 | 5% | -0.02197 |
| | | 1% | -0.03595 |
| Range | 0.076896 | | |
| Q3-Q1 | 0.012548 | | |
| Mode | -0.04894 | | |

Extremes

| Lowest | Obs | Highest | Obs |
|---|---|---|---|
| -0.04894( | 306) | 0.015085( | 248) |
| -0.04398( | 276) | 0.015507( | 90) |
| -0.04376( | 187) | 0.019563( | 197) |
| -0.03595( | 79) | 0.02175( | 168) |
| -0.03589( | 307) | 0.02796( | 173) |

# Appendix 7

## The Unconditional CAPM with SIZE (GLS TSCSREG Procedure)

Dependent Variable: PORTFOLIO RETURN

### Model Description

| | |
|---|---|
| Estimation Method | RANTWO |
| Number of Cross Sections | 25 |
| Time Series Length | 330 |

### Variance Component Estimates

| | | | |
|---|---|---|---|
| SSE | 18.50557 | DFE | 8247 |
| MSE | 0.002244 | Root MSE | 0.04737 |
| RSQ | 0.0082 | | |

| | |
|---|---|
| Variance Component for Cross Sections | 0.000022 |
| Variance Component for Time Series | 0.002793 |
| Variance Component for Error | 0.002240 |

### Hausman Test for Random Effects

| | | | |
|---|---|---|---|
| | Degrees of Freedom: | | 2 |
| m value: | 15.5482 | Prob. > m: | 0.0004 |

### Parameter Estimates

| Variable | DF | Parameter Estimate | Standard Error | T for H0: Parameter=0 | Prob > \|T\| | Variable Label |
|---|---|---|---|---|---|---|
| INTERCEP | 1 | 0.034940 | 0.004215 | 8.289300 | 0.0001 | Intercept |
| BETA | 1 | -0.002434 | 0.001792 | -1.358692 | 0.1743 | |
| SIZE | 1 | -0.004729 | 0.000579 | -8.170574 | 0.0001 | |

# Appendix 8

## The Full Conditional Model (Fama-MacBeth Procedure)

Univariate Procedure

Variable=INTERCEPT

Moments

| | | | |
|---|---|---|---|
| N | 330 | Sum Wgts | 330 |
| Mean | 0.031829 | Sum | 10.50366 |
| Std Dev | 0.071052 | Variance | 0.005048 |
| Skewness | 0.897678 | Kurtosis | 5.664411 |
| USS | 1.995264 | CSS | 1.660941 |
| CV | 223.23 | Std Mean | 0.003911 |
| T:Mean=0 | 8.137753 | Pr>\|T\| | 0.0001 |
| Num ^= 0 | 330 | Num > 0 | 234 |
| M(Sign) | 69 | Pr>=\|M\| | 0.0001 |
| Sgn Rank | 14317.5 | Pr>=\|S\| | 0.0001 |

Quantiles(Def=5)

| | | | |
|---|---|---|---|
| 100% Max | 0.471143 | 99% | 0.236854 |
| 75% Q3 | 0.069413 | 95% | 0.139094 |
| 50% Med | 0.0285 | 90% | 0.112196 |
| 25% Q1 | -0.00682 | 10% | -0.04121 |
| 0% Min | -0.24461 | 5% | -0.07255 |
| | | 1% | -0.13197 |
| Range | 0.715751 | | |
| Q3-Q1 | 0.07623 | | |
| Mode | -0.24461 | | |

Extremes

| Lowest | Obs | Highest | Obs |
|---|---|---|---|
| -0.24461( | 244) | 0.227997( | 187) |
| -0.16624( | 153) | 0.236854( | 306) |
| -0.15756( | 148) | 0.281711( | 282) |
| -0.13197( | 168) | 0.306237( | 91) |
| -0.11238( | 24) | 0.471143( | 276) |

Univariate Procedure

Variable=BETA (MARKET INDEX)

Moments

| | | | |
|---|---|---|---|
| N | 330 | Sum Wgts | 330 |
| Mean | -0.00352 | Sum | -1.16158 |
| Std Dev | 0.047296 | Variance | 0.002237 |
| Skewness | -2.17509 | Kurtosis | 21.83484 |
| USS | 0.740025 | CSS | 0.735936 |
| CV | -1343.66 | Std Mean | 0.002604 |
| T:Mean=0 | -1.35197 | Pr>\|T\| | 0.1773 |
| Num ^= 0 | 330 | Num > 0 | 148 |
| M(Sign) | -17 | Pr>=\|M\| | 0.0691 |
| Sgn Rank | -2756.5 | Pr>=\|S\| | 0.1121 |

Quantiles(Def=5)

| | | | |
|---|---|---|---|
| 100% Max | 0.152493 | 99% | 0.104775 |
| 75% Q3 | 0.018556 | 95% | 0.069388 |
| 50% Med | -0.00442 | 90% | 0.049708 |
| 25% Q1 | -0.02573 | 10% | -0.05202 |
| 0% Min | -0.44159 | 5% | -0.06886 |
| | | 1% | -0.10482 |
| Range | 0.594088 | | |
| Q3-Q1 | 0.04429 | | |
| Mode | -0.44159 | | |

Extremes

| Lowest | Obs | Highest | Obs |
|---|---|---|---|
| -0.44159( | 276) | 0.099289( | 182) |
| -0.11378( | 176) | 0.104775( | 76) |
| -0.10927( | 171) | 0.111336( | 237) |
| -0.10482( | 188) | 0.121427( | 295) |
| -0.09078( | 180) | 0.152493( | 91) |

Univariate Procedure

Variable=SIZE

Moments

| | | | |
|---|---|---|---|
| N | 330 | Sum Wgts | 330 |
| Mean | -0.00358 | Sum | -1.18291 |
| Std Dev | 0.010875 | Variance | 0.000118 |
| Skewness | -0.99631 | Kurtosis | 3.171427 |

Quantiles(Def=5)

| | | | |
|---|---|---|---|
| 100% Max | 0.028245 | 99% | 0.017618 |
| 75% Q3 | 0.003495 | 95% | 0.011217 |
| 50% Med | -0.00294 | 90% | 0.008538 |
| 25% Q1 | -0.00908 | 10% | -0.01686 |

Extremes

| Lowest | Obs | Highest | Obs |
|---|---|---|---|
| -0.05917( | 282) | 0.016248( | 32) |
| -0.04822( | 306) | 0.017618( | 90) |
| -0.04424( | 187) | 0.018977( | 197) |

# Appendix 8 (Cont'd)

```
USS          0.043152  CSS         0.038912       0% Min  -0.05917       5%  -0.02198       -0.04156(      91) 0.023683(     168)
CV           -303.392  Std Mean    0.000599                              1%  -0.04156       -0.03379(      79) 0.028245(     173)
T:Mean=0      -5.9876  Pr>|T|        0.0001    Range       0.087418
Num ^= 0          330  Num > 0          131    Q3-Q1       0.012573
M(Sign)           -34  Pr>=|M|       0.0002    Mode        -0.05917
Sgn Rank      -9277.5  Pr>=|S|       0.0001
```

Univariate Procedure

Variable=BETA (PREM)

```
                Moments                                 Quantiles(Def=5)                                   Extremes

N                 330  Sum Wgts         330    100% Max   0.045454     99%   0.029689       Lowest     Obs     Highest      Obs
Mean         -0.00104  Sum         -0.34448     75% Q3    0.002746     95%   0.016252      -0.05223(    133) 0.028456(      91)
Std Dev      0.011212  Variance    0.000126     50% Med   -0.00059     90%   0.009071      -0.05057(    113) 0.029689(      97)
Skewness     -0.69268  Kurtosis    5.741272     25% Q1    -0.00427     10%    -0.0106      -0.04963(    126) 0.034308(     146)
USS          0.041715  CSS         0.041355      0% Min   -0.05223      5%   -0.02162       -0.0452(     92) 0.035107(     144)
CV           -1074.02  Std Mean    0.000617                             1%    -0.0452      -0.03997(    161) 0.045454(     145)
T:Mean=0     -1.69139  Pr>|T|        0.0917    Range      0.097689
Num ^= 0          330  Num > 0          144    Q3-Q1      0.007021
M(Sign)           -21  Pr>=|M|       0.0239    Mode       -0.05223
Sgn Rank      -3751.5  Pr>=|S|       0.0303
```

Univariate Procedure

Variable=BETA (LABOR)

```
                Moments                                 Quantiles(Def=5)                                   Extremes

N                 330  Sum Wgts         330    100% Max   0.180579     99%   0.080633       Lowest     Obs     Highest      Obs
Mean         -0.00018  Sum         -0.05813     75% Q3    0.012779     95%   0.035842      -0.08021(    103) 0.078749(      31)
Std Dev      0.026267  Variance     0.00069     50% Med   -0.00062     90%   0.025227      -0.07011(    152) 0.080633(       7)
Skewness     1.188646  Kurtosis     7.66914     25% Q1    -0.01353     10%     -0.026      -0.06554(    234) 0.086397(      23)
USS          0.227008  CSS         0.226998      0% Min   -0.08021      5%   -0.04173      -0.06525(    151) 0.093399(     113)
CV           -14912.2  Std Mean    0.001446                             1%   -0.06525      -0.06412(    228) 0.180579(     276)
T:Mean=0     -0.12182  Pr>|T|        0.9031    Range      0.260791
Num ^= 0          330  Num > 0          160    Q3-Q1      0.026308
M(Sign)            -5  Pr>=|M|       0.6204    Mode       -0.08021
Sgn Rank      -1337.5  Pr>=|S|       0.4415
```

# Appendix 9

## The Full Conditional Model (GLS TSCSREG Proedure)

Dependent Variable: PORTFOLIO RETURN

### Model Description

| | |
|---|---|
| Estimation Method | RANTWO |
| Number of Cross Sections | 25 |
| Time Series Length | 330 |

### Variance Component Estimates

| | | | |
|---|---|---|---|
| SSE | 18.55182 | DFE | 8246 |
| MSE | 0.00225 | Root MSE | 0.047432 |
| RSQ | 0.0015 | | |

| | |
|---|---|
| Variance Component for Cross Sections | 0.000057 |
| Variance Component for Time Series | 0.002837 |
| Variance Component for Error | 0.002249 |

### Hausman Test for Random Effects

| | | | |
|---|---|---|---|
| | Degrees of Freedom: | | 3 |
| m value: | 5.8052 | Prob. > m: | 0.1215 |

### Parameter Estimates

| Variable | DF | Parameter Estimate | Standard Error | T for H0: Parameter=0 | Prob > \|T\| | Variable Label |
|---|---|---|---|---|---|---|
| INTERCEPT | 1 | 0.015145 | 0.004109 | 3.685957 | 0.0002 | Intercept |
| BETA (INDEX) | 1 | 0.000243 | 0.002454 | 0.099088 | 0.9211 | |
| BETA (PREM) | 1 | 0.000572 | 0.000194 | 2.943203 | 0.0033 | |
| BETA (LABOR) | 1 | 0.002168 | 0.001208 | 1.794740 | 0.0727 | |