January 2016

Operating Profitability, Investment And Finding Alpha In Diverse Economic Conditions

Eric Parks

OPERATING PROFITABILITY, INVESTMENT AND FINDING ALPHA IN DIVERSE ECONOMIC CONDITIONS

by

Eric Larsen Parks
Bachelor of Science, United States Air Force Academy, 2011

A Thesis

Submitted to the Graduate Faculty

of the

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Master of Science

Grand Forks, North Dakota

December
2016

This thesis, submitted by Eric Parks in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

Dr. Prodosh Simlai

Dr. Dan Biederman

Dr. Wei Yang

This thesis is being submitted by the appointed advisory committee as having met all of the requirements of the School of Graduate Studies at the University of North Dakota and is hereby approved.

Dr. Grant McGimpsey
Dean of the School of Graduate Studies

December 1, 2016
Date

PERMISSION

Title	Operating Profitability, Investment and Finding Alpha in Diverse Economic Conditions
Department	Economics
Degree	Master of Science in Applied Economics

In presenting this thesis in partial fulfillment of the requirements for a graduate degree from the University of North Dakota, I agree that the library of this University shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by the professor who supervised my thesis work or, in his absence, by the Chairperson of the department or the dean of the School of Graduate Studies. It is understood that any copying or publication or other use of this thesis or part thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University of North Dakota in any scholarly use which may be made of any material in my thesis.

Eric Parks
17 November 2016

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Table Page

ACKNOWLEDGMENTS

I wish to express my sincere appreciation to the members of my Advisory Committee for their guidance and support during my time in the master's program at the University of North Dakota.

ABSTRACT

This thesis examines how a firm's level of operating profitability and investment impact expected stock returns in diverse economic environments. Using time-series regressions in conjunction with dummy variables to represent different economic environments, the analysis measures the impact of specified market conditions on expected stock returns. The results confirm findings from existing literature that stock returns from profitable firms with lower levels of investment outperform those from less profitable firms with higher levels of investment. In an economic environment analysis, this thesis finds investment typically behaves as a traditional risk factor, but profitability occasionally provides an investor a valuable hedge during adverse market conditions. Lastly, portfolios are constructed that employ the findings in the analysis to illustrate the advantage an investor has by using an investment strategy consistent with this analysis.

CHAPTER I

INTRODUCTION

Financial markets are the cornerstones of any developed economy. They enable a codependent relationship between industries and investors. Industries seek capital required to develop new technology, purchase inventory, or to acquire other businesses and investors seek to generate investment income by assuming some of the risk. The markets connect people to industries and enable them to easily invest in risky cutting-edge technology or more reliable blue-chip giants. Ever since the market's inception investors have been looking for ways to better manage risk while increasing returns. As a result, many financial metrics and ratios have been developed to help an investor understand the financial condition of a company prior to investing. Furthermore, a large body of research has materialized, much of it focused on market predictability and making informed investment decisions. In this thesis, I investigate the performance of twenty-five portfolios of common stock returns with respect to the firm level characteristics: operating profitability and investment. This thesis contributes to the existing body of work by examining the relationship between operating profitability, investment and common risk factors. Specifically, I examine how the expected returns of stock portfolios sorted by operating profitability and investment change during different economic conditions.

To examine the relationship between operating profitability, investment and common risk factors, this analysis uses data compiled by Dr. Kenneth French. The data utilizes the Center for Research in Security Prices (CRSP) database and is composed of

unique portfolios based on specific security characteristics. My testing assets are twenty-five unique portfolios forged by differing levels of operating profitability and investment.

I employ the Market Model and the Fama-French three-factor model to dissect each of the portfolio's performance to determine which portfolio, and therefore, combination of operating profitability and investment have the highest expected excess returns. First, I show how the average returns on common stock are related to operating profitability and investment. Then, I investigate whether these patterns in average returns are explained by the Market Model or a multi-factor model such as the Fama-French three-factor model (1993). After this is established, I evaluate the performance of each of the portfolios during different economic conditions. Specifically, the portfolios are analyzed in up and down markets, recessionary and expansionary periods and finally during periods of restrictive and expansionary monetary policy. The goal of my analysis is to identify whether operating profitability or investment offer investors an opportunity to earn a premium in varying economic environments.

CHAPTER II

EXISTING LITERATURE

Over the last several years a large repository of research investigating the role of market risk in determining excess stock returns has materialized. Fama and French (2006) in their series of research have uncovered the impacts of value, investment and profitability on stock returns. Using valuation theory, Fama and French (2006) show that irrational pricing is not the only explanation to future stock returns, rather they can be explained by a firm's book-to-market, expected profitability and expected investment. Fama and French (2006) use cross-section regressions to predict levels of profitability and investment and link those predictions to market returns. Most important to my analysis, Fama and French (2006) establish three general conclusions: value stocks outperform growth stocks, more profitable firms have higher expected returns and firms with higher investment expect lower stock returns.

Another piece of existing literature that aligns closely with my analysis is *The value, size, and momentum spread during distressed economic periods* by Arshanapalli, Fabozzi and Nelson (2006). In their work, Arshanapalli et al. (2006) focus on revealing the behavior of the three common risk factors value, size and momentum, and how they perform in different economic environments. They identify portfolios to serve as proxies for each potential risk factor. They use 'small minus big' (SMB), 'high value minus low value' (HML) and 'winners minus losers' (WML) portfolios to measure the size, value and momentum premiums, respectively. Their analysis focuses on the risk factor

performance during four different economic environments. They analyze returns in up and down markets, recessionary and non-recessionary periods, restrictive and expansionary monetary policy and high and low credit spread environments. Using this methodology, Arshanapalli et al. (2006) are able to show which premiums prevail during different market conditions. In their analysis, SMB produced the highest premium among all three portfolios during the up market scenario, but produced statistically significant negative premiums during down market and recessionary periods. Contrary to SMB's performance, HML and WML both produced significant premiums during the down market and recessionary periods; however, the value portfolio produced a negative premium in up markets and the momentum portfolio produced a slightly better premium than in the down market. Their findings indicate SMB acts like a traditional risk factor, but HML and WML offer a valuable hedging opportunity to investors since they perform as well or better during adverse economic conditions (Arshanapalli et al. 2006).

In this thesis I contribute to the existing literature by examining the premiums produced by operating profitability and investment during different economic environments. I examine portfolios sorted by operating profitability and investment and confirm the findings of Fama and French (2006) that highly profitable firms with low levels of investment yield greater returns. Then, using similar regression techniques as Arshanapalli et al. (2006), I identify premiums to the market that are attributed to a firm's level of operating profitability or investment during different economic environments.

CHAPTER III

DATA

I obtained the portfolio level data from the Kenneth French Data Library[1], which uses data from the CRSP[2] database to create portfolios based on variables specific to security characteristics. My analysis uses returns data from twenty-five portfolios formed by the intersections of different levels of operating profitability and investment. Operating profitability is a company's annual revenue less expenses. Specifically, French defines operating profitability as "annual revenues minus cost of goods sold, interest expense, and selling, general, and administrative expenses divided by book equity for the last fiscal year" (French 2015). Investment is measured in the dataset as the change in total assets over the course of the prior year within each portfolio (French 2015). The levels of operating profitability and investment are divided into quintiles based on the NYSE breakpoints and then combined to form twenty-five unique portfolios. The portfolios contain data from 1963-2015 and are rebalanced annually to maintain the integrity of the dataset's specified categories over time.

To provide benchmarks for comparison, my analysis also uses portfolios that capture the value (HML) and size (SMB) premiums and the excess returns of the overall market. The HML portfolio represents the difference in returns produced by portfolios with high book-to-market ratios to those with low book-to-market ratios (or High minus Low). The SMB portfolio represents the difference in returns produced by portfolios with small market capitalizations to those with large market capitalizations (or Small

[1] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html
[2] http://www.crsp.com/

minus Big). The market portfolio captures the returns of all of the NYSE, AMEX and NASDAQ stocks.

Before my central question can be examined, some alterations to the dataset need to be made. The dataset contains the average monthly returns for each of the twenty-five portfolios, HML, SMB and the overall market. Since I am seeking to find a portfolio that can produce a premium to other investing options, essentially the portfolio that best manages risk, the data needs to be normalized to remove the risk-free rate from all of the portfolio and market returns. The risk-free rate in this analysis is defined as the expected return of a one-month U.S. treasury bill over the same period portfolio returns are measured. To normalize the returns data for analysis I removed the risk-free rate from both the reported market returns and also the returns of each portfolio. By removing the risk-free rate, I isolate the risk premium of the market and of each of the twenty-five portfolios. The excess returns of each portfolio will serve as the dependent variables in both the Market Model and Fama-French three-factor model. Table 1 shows the monthly

Table 1: Portfolio average excess returns

Portfolio Average Excess Returns (1963-2015)

Operating Profitability Quintile	Investment Quintile 1	2	3	4	5	Average
1	0.720	0.488	0.583	0.487	0.129	0.482
2	0.638	0.616	0.409	0.539	0.397	0.520
3	0.721	0.659	0.447	0.626	0.228	0.536
4	0.924	0.782	0.545	0.542	0.422	0.643
5	0.902	0.613	0.660	0.588	0.696	0.692
Average	0.781	0.632	0.529	0.557	0.374	

average excess returns of each of the twenty-five portfolios between 1963 and 2015. From this cursory look at the data, a trend is apparent that shows average excess returns

increase with the level of operating profitability and decrease in relation to the level of investment present in each portfolio, consistent with Fama and French's (2006) findings.

Additional data was also collected from the National Bureau of Economic Research[3] (NBER) and the St. Louis Federal Reserve's Federal Reserve Economic Data[4] (FRED) database to define different economic environments. The NBER publishes dates that define expansions and contractions of the U.S. economy. Using data for the gross domestic product, income, employment, industrial production and sales, the NBER determines whether the economy is in a recessionary or expansionary period. If the data shows a relative decline or rise over a period lasting more than a few months, the NBER declares the economy in a recessionary or expansionary period, respectfully. Table 2 lists the periods NBER determined to be recessionary periods between 1963 and 2015, all other periods are expansionary. This data is captured by a dummy variable and regressed as an independent variable against the excess returns of the twenty-five portfolios to measure portfolio performance during recessionary and expansionary periods. The FRED database was used to provide insight into and define the economic environments

Table 2: NBER recession dates

NBER Recession Dates (1963 - 2015)

Start	End	Duration (months)
Dec-1969	Nov-1970	11
Nov-1973	Mar-1975	16
Jan-1980	Jul-1980	6
Jul-1981	Nov-1982	16
Jul-1990	Mar-1991	8
Mar-2001	Nov-2001	8
Dec-2007	Jun-2009	18

[3] http://www.nber.org/
[4] https://research.stlouisfed.org/fred2/

caused by differing monetary policy, characterized in this analysis by the monthly interest rate for the United States. Figure 1 illustrates the variation in the monthly interest rate between 1963 and 2015. The interest rate, also known as the discount rate, is the premium charged to banks and other creditors for loans they receive from the Federal Reserve. The interest rate data is used in conjunction with a dummy variable to analyze how varying levels of investment influence a firm's excess stock returns due to the changing cost of borrowing money.

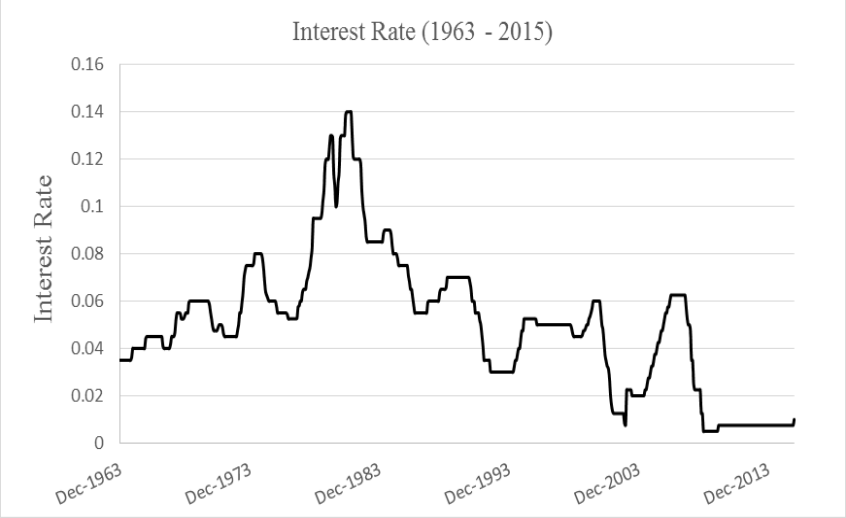

Figure 1: Interest rates

CHAPTER IV

METHODOLOGY

To evaluate the performance of my testing portfolios in comparison to the overall market I use two regression strategies, the Market Model and the Fama-French three-factor model. The Market Model regression relates the performance of a portfolio to the overall market and produces coefficients for the portfolio's alpha and beta. The Fama-French three-factor model similarly measures a portfolio's performance in relation to the overall market producing alpha and beta coefficients, but also provides sensitivities for the size and value factors in each portfolio. The Market Model is defined by the following regression equation

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + u_{i,t} \qquad (1)$$

where $r_{i,t}$ is the ith portfolio return, $r_{f,t}$ is the risk-free rate and $r_{m,t}$ is the overall market return for time period t. In this framework, alpha (α) represents abnormal or excess portfolio returns and beta (β) is a measure of risk with respect to the overall market. The Fama-French three-factor model is defined by the following regression equation

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + s_i * SMB_t + h_i * HML_t + u_{i,t} \qquad (2)$$

where β_i again measures risk with respect to the overall market and s_i and h_i represent the sensitivity of the size and value factors, respectfully. Both models are used to analyze the returns of the twenty-five portfolios from 1963-2015 and provide a baseline for comparison for the economic environment analysis.

After modeling the data using the Market Model and Fama-French three-factor model, dummy variables are introduced to analyze portfolio performance in four different economic environments. Portfolio performance is analyzed during up and down markets, recessionary and expansionary periods and over the course of differing monetary policy conditions. Monetary policy effects are explored through two different uses of the interest rate data. First, portfolios are tested during high and low interest rate periods and then during periods of increasing and decreasing interest rates. The dummy variable for up and down markets equals one when excess market returns are positive and is defined by

$$d_{i,t} = 1 \; if \; r_{m,t} - r_{f,t} > 0 \text{ and} \qquad (3)$$

$$d_{i,t} = 0 \; if \; r_{m,t} - r_{f,t} \leq 1.$$

The coefficient that results on this dummy variable when regressed with excess portfolio returns measures the impact of up and down markets on the expected excess returns of the twenty-five portfolios. To assess the impact of recessionary and expansionary periods, a dummy variable is set to one for the dates that fall within a recessionary period (Table 2) and zero for all other periods. To measure the impact of different monetary policy conditions on portfolio returns interest rates were considered to be high anytime the interest rate was above the sample average. Therefore, the dummy variable measuring the impact of high and low interest rate environments on expected returns equals one whenever the rate is less than 0.0505 and is defined by

$$d_{i,t} = 1 \; if \; Rate_{i,t} < 0.0505 \text{ and} \qquad (4)$$

$$d_{i} = 0 \; if \; Rate_{i,t} \geq 0.0505.$$

Lastly, I test portfolio performance during periods where interest rates are increasing or decreasing. The dummy variable equals one any time interest rates are increasing and for every period in-between until the next time interest rates are lowered and vice versa.

The coefficients on the dummy variables when regressed with excess portfolio returns differentiate how each portfolio performs under the specified market condition. By identifying the trends in portfolio performance in each economic environment I am able to determine how a firm's profitability and level of investment impact their expected stock returns under the economic conditions tested. The underlying goal of the analysis is to determine how to best posture an investor's portfolio, maximizing expected returns given the risk associated with current economic conditions.

To substantiate my findings, I use the regression results to select the portfolio with the highest expected return in each economic environment, resulting in four smart portfolios. For example, the actual returns from the portfolio that the model predicts to perform best in the up market are combined with the actual returns from the portfolio the model estimates to perform best in the down market. This results in a portfolio with returns from the selected up market portfolio for periods where $(r_m - r_f) > 0$ and returns from the selected down market portfolio for periods where $(r_m - r_f) < 0$. This process was repeated for each of the economic environments tested resulting in the four smart portfolios. If the resulting smart portfolios outperform, it substantiates my findings and suggests an investor would be better postured to earn excess returns by following a strategy consistent with this analysis.

Using these smart portfolios as a robustness check has limitations and is subject to criticism; however, this process does help illustrate some new findings. Since the economic environment analysis is conducted using all of the data from 1963-2015 the smart portfolios are assembled using data within the original sample. This robustness check does not provide any evidence as to how the smart portfolios or investment strategies perform outside of the sample. Furthermore, the smart portfolios assume investors have perfect information for the period in which they are investing. For example, the up and down market smart portfolio assumes that on day one of a time period, an investor knows if the market will have an up or down month or if the economy is currently in a recessionary or expansionary period. For the monetary policy smart portfolios this is less of a concern since interest rates are published by the Federal Reserve and less volatile than the other economic environment indicators.

In theory there are several ways to expand on this analysis. With the vast amount of securities data readily available, my methods could be applied to datasets sorted by different firm characteristics and performance measured across many different economic environments. However, as with the smart portfolio analysis, limitations arise regarding the practical application of the results. Important elements that consistently inhibit the application of this or similar analyses are investor information and unreliability of future performance. For an investor to implement a strategy based on the current state of an economic environment, the environment needs to be well defined and transparent to the investor at the time they make their investment, such as an interest rate environment. Further, although statistical trends in prior returns data are identified, this analysis provides no evidence or guarantee of future results. Afforded with more time, an

investment strategy could be developed from my findings and its performance measured against out of sample data points to provide higher confidence in future returns.

CHAPTER V

ANALYSIS

To set the baseline for my analysis, I regress the excess returns from all twenty-five portfolios on excess market returns using the Market Model and the Fama-French three-factor model. The Market Model provides initial insight into how the portfolios perform with respect to the overall market from 1963 to 2015. Table 3 shows the results

Table 3: Market model

Market Model (1963-2015)

Operating Profitability Quintile		Investment Quintile 1	2	3	4	5
1	Alpha	0.101	-0.0243	0.0688	-0.0803	-0.519***
	Beta	1.241***	1.027***	1.030***	1.137***	1.298***
	Adj R^2	0.768	0.769	0.706	0.762	0.796
2	Alpha	0.159	0.179*	-0.0362	0.0507	-0.184
	Beta	0.960***	0.875***	0.891***	0.978***	1.165***
	Adj R^2	0.738	0.766	0.781	0.777	0.775
3	Alpha	0.226*	0.241**	-0.00536	0.118	-0.372***
	Beta	0.992***	0.837***	0.906***	1.017***	1.202***
	Adj R^2	0.738	0.72	0.785	0.85	0.833
4	Alpha	0.451***	0.364***	0.0844	0.0507	-0.168
	Beta	0.948***	0.837***	0.923***	0.985***	1.182***
	Adj R^2	0.691	0.764	0.841	0.855	0.829
5	Alpha	0.429***	0.164	0.221**	0.115	0.103
	Beta	0.948***	0.899***	0.879***	0.948***	1.188***
	Adj R^2	0.702	0.746	0.8	0.816	0.805

* p<0.05 | **p<0.01 | ***p<0.001

from the Market Model regression (1) and reveals a concentration of significant positive alpha values for portfolios with high operating profitability and low investment. The alpha values for portfolios with the highest level of investment are almost all negative, with two of the values having a strong statistical significance. These statistics indicate

excess returns are present in firms with high levels of operating profitability and low investment whereas the same premium is not observed in firms with low levels of operating profitability and high levels of investment. These observations provide further evidence in support of Fama and French's (2006) findings that more profitable firms and those with lower levels of investment produce higher returns. Furthermore, the beta values in the table generally increase with the level of investment and decrease with the level of operating profitability. The adjusted-R^2 on average for all twenty-five portfolios is 0.78, indicating the model is able to explain 78% of the variation in the portfolio returns data. This cursory look at the alpha estimate is consistent with the average returns data from Table 1 and supports the existing literature which also finds that average returns increase with operating profitability and decrease with investment.

In addition to the Market Model, I use the Fama-French three-factor model to estimate portfolio returns. Table 4 reports estimates from the Fama-French three-factor time-series regression (2). The three-factor model suggests that an asset's expected return depends on its sensitivity to the overall market (β_i) and the influence of size (s_i) and value (h_i) factors. As discussed in Chapter IV, the Fama-French three-factor model is similar to the Market Model; however, provides a more robust explanation of performance by including proxies for the size and value factors present in a portfolio. Comparing the results in Table 4 to the Market Model results, the beta and alpha values decrease in absolute value in most instances. The Fama-French three-factor model captures the variation in portfolio returns caused by the size and value factors within each portfolio, in turn contributing to the net change in the alpha and beta values observed between the two different models. Although the alpha values decrease in magnitude in

the three-factor model, the results produce similar trends as the Market Model. The

Table 4: Fama-French three-factor model

Fama-French Three-Factor Model (1963-2015)

Operating Profitability Quintile		Investment Quintile 1	2	3	4	5
1	Alpha	-0.0256	-0.148	-0.0935	-0.227*	-0.458***
	Beta	1.166***	1.044***	1.029***	1.128***	1.166***
	SMB	0.498***	0.140***	0.275***	0.280***	0.397***
	HML	0.106**	0.233***	0.272***	0.234***	-0.289***
	Adj R^2	0.823	0.789	0.745	0.793	0.845
2	Alpha	-0.0526	0.00855	-0.139	-0.0408	-0.164
	Beta	1.010***	0.935***	0.926***	0.986***	1.053***
	SMB	0.166***	0.0583*	0.0391	0.125***	0.390***
	HML	0.427***	0.373***	0.223***	0.165***	-0.194***
	Adj R^2	0.801	0.819	0.799	0.79	0.822
3	Alpha	0.0961	0.138	-0.121	0.0701	-0.336***
	Beta	1.032***	0.876***	0.972***	1.047***	1.167***
	SMB	0.0671*	0.026	-0.0561*	-0.0322	0.0725*
	HML	0.274***	0.229***	0.288***	0.123***	-0.109**
	Adj R^2	0.76	0.74	0.816	0.854	0.837
4	Alpha	0.253*	0.285***	0.0626	0.0582	-0.0577
	Beta	1.014***	0.886***	0.980***	1.010***	1.140***
	SMB	0.0842*	-0.0532*	-0.178***	-0.109***	-0.0246
	HML	0.426***	0.202***	0.117***	0.0236	-0.247***
	Adj R^2	0.744	0.782	0.86	0.86	0.843
5	Alpha	0.275**	0.135	0.191*	0.207**	0.264**
	Beta	0.994***	0.962***	0.919***	0.947***	1.105***
	SMB	0.0814*	-0.191***	-0.1000***	-0.149***	0.0469
	HML	0.324***	0.138***	0.107***	-0.157***	-0.388***
	Adj R^2	0.734	0.767	0.808	0.832	0.837

* p<0.05 | **p<0.01 | ***p<0.001

portfolios comprised of highly profitable firms with low levels of investment yield the highest abnormal returns (alpha), once again confirming the findings of existing literature. On average the adjusted-R^2 for the Fama-French three-factor model is 0.80, marking a two-point improvement when compared to the Market Model. Therefore, I use the Fama-French three-factor model for the economic environment dummy variable analysis.

Taking a closer look at the size and value factors from the Fama-French three-

Table 5: Size premium beta (s_i)

Size Premium Beta

Operating Profitability Quintile	Investment Quintile 1	2	3	4	5	Average
1	0.498	0.140	0.275	0.280	0.397	0.318
2	0.166	0.058	0.039	0.125	0.390	0.156
3	0.067	0.026	-0.056	-0.032	0.073	0.015
4	0.084	-0.053	-0.178	-0.109	-0.025	-0.056
5	0.081	-0.191	-0.100	-0.149	0.047	-0.062
Average	0.179	-0.004	-0.004	0.023	0.176	

factor model reveals some notable trends in the regression output. As seen in Table 5, the size factor (s_i) from equation 2 decreases as the level of operating profitability in a portfolio increases; however, there does not appear to be a relationship between the size factor beta and the level of investment in a portfolio. This trend indicates that portfolios

Table 6: Value premium beta (h_i)

Value Premium Beta

Operating Profitability Quintile	Investment Quintile 1	2	3	4	5	Average
1	0.106	0.233	0.272	0.234	-0.289	0.111
2	0.427	0.373	0.223	0.165	-0.194	0.199
3	0.274	0.229	0.288	0.123	-0.109	0.161
4	0.426	0.202	0.117	0.024	-0.247	0.104
5	0.324	0.138	0.107	-0.157	-0.388	0.005
Average	0.311	0.235	0.201	0.078	-0.245	

with lower levels of operating profitability are made up of smaller firms than those with higher levels of operating profitability. Table 6 depicts the value factor beta (h_i) from equation 2 and illustrates a trend in the data between the value beta and the level of investment in a portfolio. As the level of investment increases, the value factor sensitivity in a portfolio decreases on average. This trend indicates that portfolios with lower (higher) levels of investment tend to have a greater concentration of value (growth)

firms. There is not an apparent trend in the data between profitability and the value factor sensitivity.

The Market Model and Fama-French three-factor model are both time series models and produce strong statistically significant coefficients on beta. To further investigate the relationship between beta and excess market returns I compared their relationship in the cross-section. Using an ordinary least squares (OLS) regression in conjunction with the betas returned from the Market Model (Appendix A) and the Fama-French three-factor model (Appendix B) I model the relationship between beta and portfolio returns. After running a simple OLS regression for each model and finding no relationship between beta and excess returns, the regression was ran a second time while forcing the intercept through zero. The statistics are improved when the intercept is set to zero, but the regression still fails to produce a p-value that is significant. Furthermore, all of the regressions have extremely low adjusted-R^2 values. Therefore, in the cross-section, there is not a statistically significant relationship between beta and average portfolio returns.

Economic Environment Analysis

To evaluate portfolio performance in different economic environments, I use dummy variables to capture the risk-adjusted returns of each portfolio under specified market conditions. To quantify the impact of up and down markets on excess portfolio returns I include a dummy variable for the up and down market state in the Fama-French three-factor model. The regression equation for this economic environment is defined by

$$r_{i,t} - r_{f,t} = \alpha_i + d_i * Up\ Market_i + \beta_i(r_{m,t} - r_{f,t}) + s_i * SMB_t + h_i * HML_t + u_{i,t}. \quad (5)$$

The results from this regression are tabulated in Table 7 and indicate only four of the coefficients on the dummy variable and five alphas are statistically significant. There are two positive alphas with strong statistical significance; however, each is accompanied by a large negative coefficient on the up market dummy variable. This indicates that these two portfolios may offer abnormal returns during the down market condition. The beta along with the size and value factors reported in Table 7 are very similar to the regression results from equation 2 (Table 4). This should be expected since the allocation of firms within the twenty-five portfolios remains the same during the economic environment analysis. The average adjusted-R^2 value for all twenty-five regressions is 0.80 indicating that on average the model explains 80% of the variation in the portfolio returns data. Table 8 displays the average expected returns from each of the twenty-five portfolios in up market and down market environments. In the up market environment, average expected returns are highest for highly profitable firms with low levels of investment. The highest expected returns in the up market environment are from the portfolio in the fourth quintile of profitability and first quintile of investment. This result is consistent

with the observed excess portfolio returns displayed in Table 1. In the down market

Table 7: Up/Down market dummy variable analysis

Fama-French Three-Factor Model (1963-2015)
Dummy Variable: Up/Down Market

Operating Profitability Quintile		Investment Quintile 1	2	3	4	5
1	Alpha	-0.226	-0.191	-0.313	-0.534*	-0.487*
	Up Market	0.37	0.0789	0.405	0.567	0.0536
	Beta	1.134***	1.038***	0.995***	1.080***	1.162***
	SMB	0.496***	0.139***	0.273***	0.277***	0.396***
	HML	0.106**	0.233***	0.272***	0.234***	-0.289***
	Adj R^2	0.823	0.789	0.745	0.794	0.845
2	Alpha	-0.261	0.0454	-0.2	-0.135	-0.292
	Up Market	0.386	-0.0681	0.113	0.173	0.238
	Beta	0.977***	0.941***	0.917***	0.971***	1.033***
	SMB	0.164***	0.0587*	0.0385	0.125***	0.389***
	HML	0.427***	0.373***	0.223***	0.165***	-0.193***
	Adj R^2	0.801	0.818	0.799	0.79	0.822
3	Alpha	0.0395	0.0718	0.191	0.450**	-0.498**
	Up Market	0.105	0.122	-0.577*	-0.702**	0.299
	Beta	1.023***	0.866***	1.020***	1.106***	1.142***
	SMB	0.0666	0.0254	-0.0534*	-0.0289	0.0711*
	HML	0.275***	0.229***	0.287***	0.122***	-0.109**
	Adj R^2	0.76	0.74	0.818	0.856	0.837
4	Alpha	0.0711	0.281	-0.205	0.128	-0.085
	Up Market	0.336	0.0081	0.495*	-0.129	0.0505
	Beta	0.986***	0.885***	0.938***	1.021***	1.136***
	SMB	0.0826*	-0.0532*	-0.180***	-0.108***	-0.0248
	HML	0.427***	0.202***	0.118***	0.0235	-0.247***
	Adj R^2	0.744	0.782	0.861	0.86	0.842
5	Alpha	0.233	-0.116	0.505***	0.181	0.204
	Up Market	0.0784	0.465	-0.581*	0.0483	0.11
	Beta	0.988***	0.923***	0.968***	0.943***	1.095***
	SMB	0.0810*	-0.193***	-0.0972***	-0.149***	0.0463
	HML	0.324***	0.138***	0.106***	-0.157***	-0.388***
	Adj R^2	0.733	0.768	0.81	0.832	0.837

* p<0.05 | **p<0.01 | ***p<0.001

environment, the expected returns still trend down with the level of investment; however, the two portfolios with significant positive alphas are notable outliers. The highest expected portfolio return in the down market environment comes from the portfolio

representing the third quintile of operating profitability and the fourth quintile of investment.

Table 8: Up/Down Market Expected Portfolio Returns

Expected Portfolio Returns - Up Market

Operating Profitability Quintile	Investment Quintile 1	2	3	4	5	Average
1	0.874	0.442	0.659	0.644	0.249	0.573
2	0.655	0.462	0.381	0.555	0.562	0.523
3	0.672	0.633	0.109	0.293	0.389	0.419
4	0.921	0.717	0.712	0.481	0.526	0.671
5	0.825	0.760	0.382	0.662	0.872	0.700
Average	0.789	0.603	0.449	0.527	0.520	

Expected Portfolio Returns - Down Market

Operating Profitability Quintile	Investment Quintile 1	2	3	4	5	Average
1	0.504	0.442	0.346	0.155	0.098	0.309
2	0.413	0.656	0.343	0.438	0.259	0.422
3	0.660	0.588	0.783	1.036	0.054	0.624
4	0.729	0.777	0.257	0.618	0.392	0.554
5	0.856	0.341	0.999	0.560	0.632	0.678
Average	0.632	0.561	0.545	0.561	0.287	

There are also some notable trends to identify when comparing the average expected portfolio returns with the average excess portfolio returns depicted in Table 1. In up markets, the continual decreasing trend in excess returns with a firm's level of investment from Table 1 is not observed. However, in the down markets highly profitable firms with low levels of investment do much better than less profitable firms with high levels of profitability, with the exception of the outliers discussed above. Therefore, during harsh market conditions, the stock prices of highly profitable firms with low levels of investment are more resilient to the adverse market condition than those of firms that are less profitable with a high level of investment.

To quantify the impact of recessionary and expansionary periods on portfolio returns sorted by operating profitability and investment I use a dummy variable that is

equal to one where the NBER determines the economy is in a recessionary period (Table 2) and otherwise equal to zero. Using the Fama-French three-factor model in conjunction with the dummy variable the results in Table 9 are produced from the following regression equation

$$r_{i,t} - r_{f,t} = \alpha_i + d_i * Recession_i + \beta_i(r_{m,t} - r_{f,t}) + s_i * SMB_t + h_i * HML_t + u_{i,t}. \quad (6)$$

The results show that nine portfolios have a significant alpha and only one portfolio has a

Table 9: Recession/Expansion dummy variable analysis

Fama-French Three-Factor Model (1963-2015)
Dummy Variable: Recessionary/Expansionary Periods

Operating Profitability Quintile		Investment Quintile 1	2	3	4	5
1	Alpha	-0.0574	-0.235*	-0.0434	-0.142	-0.469***
	Recession	0.216	0.591*	-0.339	-0.574	0.0723
	Beta	1.168***	1.050***	1.026***	1.122***	1.167***
	SMB	0.498***	0.139***	0.276***	0.281***	0.396***
	HML	0.106**	0.234***	0.272***	0.233***	-0.289***
	Adj R^2	0.823	0.79	0.745	0.794	0.845
2	Alpha	-0.0441	0.000926	-0.0942	-0.00268	-0.105
	Recession	-0.0578	0.0516	-0.303	-0.258	-0.396
	Beta	1.009***	0.936***	0.923***	0.983***	1.049***
	SMB	0.166***	0.0583*	0.0396	0.126***	0.391***
	HML	0.427***	0.373***	0.223***	0.164***	-0.194***
	Adj R^2	0.8	0.818	0.799	0.79	0.822
3	Alpha	0.0863	0.178	-0.121	0.0901	-0.324**
	Recession	0.0664	-0.27	0.0000608	-0.135	-0.0828
	Beta	1.033***	0.873***	0.972***	1.045***	1.166***
	SMB	0.0670*	0.0264	-0.0561*	-0.032	0.0727*
	HML	0.274***	0.229***	0.288***	0.123***	-0.109**
	Adj R^2	0.76	0.74	0.816	0.854	0.837
4	Alpha	0.245*	0.262**	0.041	0.104	-0.08
	Recession	0.051	0.158	0.146	-0.313	0.151
	Beta	1.014***	0.888***	0.981***	1.007***	1.142***
	SMB	0.0841*	-0.0535*	-0.178***	-0.108***	-0.0248
	HML	0.426***	0.202***	0.117***	0.0234	-0.246***
	Adj R^2	0.744	0.782	0.86	0.86	0.842
5	Alpha	0.244*	0.0635	0.200*	0.217*	0.282**
	Recession	0.209	0.485	-0.059	-0.0638	-0.125
	Beta	0.996***	0.967***	0.919***	0.946***	1.103***
	SMB	0.0811*	-0.192***	-0.0999***	-0.149***	0.0471
	HML	0.324***	0.138***	0.107***	-0.157***	-0.388***
	Adj R^2	0.733	0.768	0.808	0.832	0.837

* p<0.05 | **p<0.01 | ***p<0.001

significant coefficient on the dummy variable. The alphas increase with a firm's profitability and decrease with investment, except in the top two quintiles of profitability. The adjusted-R^2 value of these regressions remains high and on average is 0.80 for the twenty-five portfolios.

Equation 6 combined with the average sample value for excess market returns, SMB and HML produce the expected portfolio returns shown in Table 10. During

Table 10: Recessionary/Expansionary Market Expected Portfolio Returns

Expected Portfolio Returns - Recessionary

Operating Profitability Quintile \ Investment Quintile	1	2	3	4	5	Average
1	0.906	0.995	0.293	-0.005	0.191	0.476
2	0.589	0.661	0.149	0.318	0.058	0.355
3	0.778	0.428	0.447	0.510	0.157	0.464
4	0.968	0.918	0.670	0.274	0.552	0.676
5	1.080	1.028	0.610	0.534	0.589	0.768
Average	0.864	0.806	0.434	0.326	0.309	

Expected Portfolio Returns - Expansionary

Operating Profitability Quintile \ Investment Quintile	1	2	3	4	5	Average
1	0.690	0.404	0.632	0.569	0.118	0.483
2	0.646	0.609	0.452	0.576	0.454	0.547
3	0.712	0.698	0.447	0.645	0.240	0.548
4	0.917	0.760	0.524	0.587	0.401	0.637
5	0.871	0.543	0.669	0.598	0.714	0.679
Average	0.767	0.603	0.545	0.595	0.385	

recessionary periods, average expected portfolio returns decrease with the level of a firm's investment and increase with profitability, with the exception of the first quintile. Comparing these results to expansionary periods, there is still a strong positive trend between expected portfolio returns and profitability, but the trend between expected returns and investment is weakened. Interestingly, the portfolios in the highest two quintiles of operating profitability and the lowest two quintiles of investment during recessionary periods are expected to outperform the same portfolios during expansionary

periods. Further, the portfolios that contain the least profitable firms and highest levels of investment perform significantly worse in recessionary periods than the same portfolios in expansionary periods. These results indicate that investment behaves like a traditional risk factor and profitability could serve as a valuable hedge during recessionary periods.

The third economic environment tested examines how stock returns are influenced by monetary policy. From 1963 to 2015 the average monthly U.S. interest rate is 0.0505 and is illustrated in Figure 1. I define the state of high and low interest rates in the economy as above and below the average value. The dummy variable to represent this condition is defined by equation 4 and is modeled in the following regression equation

$$r_{i,t} - r_{f,t} = \alpha_i + d_i * Low\ Rate_i + \beta_i(r_{m,t} - r_{f,t}) + s_i * SMB_t + h_i * HML_t + u_{i,t}. \quad (7)$$

This framework isolates the expected returns of the twenty-five portfolios during restrictive and expansionary monetary policy. Table 11 contains the output from equation 7. None of the coefficients on the dummy variable are significant, but six alpha values are significant, the positive alphas represented by highly profitable firms with low investment. The average adjusted-R^2 value is once again high and is 0.80 across all of the portfolios.

The results from equation 7 are combined with the average values of market excess returns, SMB and HML to estimate the average expected portfolio returns for economic environments with high and low interest rates (Table 12). In the low interest rate environment the highest expected stock returns are estimated in firm's that have high levels of operating profitability and low levels of investment. Average returns increase on average as profitability increases, but the trend is not well defined. Furthermore, the

level of investment shares a decreasing trend with average returns, but is also weak since the fourth quintile of investment outperforms the third quintile on average.

Table 11: High/Low interest rate dummy variable analysis

Fama-French Three-Factor Model (1963-2015)
Dummy Variable: High/Low Interest Rates

Operating Profitability Quintile		Investment Quintile 1	2	3	4	5
1	Alpha	0.0376	-0.196	-0.0854	-0.213	-0.473**
	Low Rate	-0.121	0.0923	-0.0157	-0.0265	0.0286
	Beta	1.166***	1.044***	1.029***	1.128***	1.166***
	SMB	0.498***	0.140***	0.275***	0.280***	0.396***
	HML	0.105**	0.234***	0.272***	0.234***	-0.289***
	Adj R^2	0.823	0.789	0.745	0.793	0.845
2	Alpha	-0.11	0.0466	-0.13	-0.0997	-0.186
	Low Rate	0.111	-0.073	-0.0164	0.113	0.0422
	Beta	1.010***	0.935***	0.926***	0.986***	1.053***
	SMB	0.166***	0.0584*	0.0391	0.125***	0.390***
	HML	0.428***	0.372***	0.223***	0.166***	-0.193***
	Adj R^2	0.801	0.818	0.799	0.79	0.822
3	Alpha	0.153	0.247	-0.0295	0.0695	-0.205
	Low Rate	-0.108	-0.209	-0.175	0.00115	-0.252
	Beta	1.032***	0.876***	0.972***	1.047***	1.167***
	SMB	0.0672*	0.0262	-0.0559*	-0.0322	0.0728*
	HML	0.273***	0.227***	0.286***	0.123***	-0.112**
	Adj R^2	0.76	0.74	0.816	0.854	0.837
4	Alpha	0.346*	0.379**	0.0303	-0.0552	-0.207
	Low Rate	-0.179	-0.179	0.0619	0.218	0.286
	Beta	1.014***	0.886***	0.979***	1.010***	1.140***
	SMB	0.0843*	-0.0530*	-0.178***	-0.109***	-0.0249
	HML	0.424***	0.200***	0.118***	0.0261	-0.243***
	Adj R^2	0.744	0.782	0.86	0.86	0.843
5	Alpha	0.473**	0.277*	0.274*	0.156	0.0883
	Low Rate	-0.379	-0.272	-0.16	0.0991	0.336
	Beta	0.994***	0.962***	0.919***	0.947***	1.105***
	SMB	0.0817*	-0.191***	-0.0998***	-0.149***	0.0465
	HML	0.319***	0.135***	0.105***	-0.156***	-0.384***
	Adj R^2	0.735	0.768	0.808	0.832	0.838

* p<0.05 | **p<0.01 | ***p<0.001

In the high interest rate environment, profitability shares a strong positive relationship with expected returns and investment shares a strong negative relationship with expected returns. Comparing the expected returns in the two environments, the level of a firm's investment has a greater impact on stock returns when interest rates are

high versus when they are low. To illustrate this point we can compare the delta in average expected returns between the lowest level of investment and the highest level of investment for the two environments. In the low rate environment the delta is 0.299

Table 12: Low/High Interest Rate Expected Portfolio Returns

Expected Portfolio Returns - Low Rates

Operating Profitability Quintile \ Investment Quintile	1	2	3	4	5	Average
1	0.663	0.532	0.575	0.475	0.142	0.477
2	0.692	0.581	0.401	0.594	0.417	0.537
3	0.670	0.559	0.363	0.626	0.106	0.465
4	0.838	0.696	0.575	0.648	0.560	0.663
5	0.719	0.481	0.582	0.637	0.858	0.656
Average	0.716	0.570	0.499	0.596	0.417	

Expected Portfolio Returns - High Rates

Operating Profitability Quintile \ Investment Quintile	1	2	3	4	5	Average
1	0.784	0.440	0.591	0.501	0.114	0.486
2	0.581	0.654	0.418	0.481	0.375	0.502
3	0.778	0.768	0.538	0.625	0.358	0.613
4	1.017	0.875	0.513	0.430	0.274	0.622
5	1.098	0.753	0.742	0.538	0.522	0.731
Average	0.851	0.698	0.560	0.515	0.329	

$(0.716 - 0.417)$ whereas, the high rate environment has a delta of 0.522 $(0.851 - 0.329)$. Since interest rates directly influence the cost of borrowing money, as rates increase firms with high levels of investment have an increased cost of doing business, which translates to a negative impact to their stock prices. Conversely, when interest rates are low the cost of borrowing money is less and a firm's stock price benefits. These trends are apparent in Table 12 and demonstrate that investment acts as a traditional risk factor and profitability offers investors a hedging opportunity in high interest rate environments.

The final economic environment in my analysis is a second look at monetary policy, this time examining how excess returns are impacted by an economic

state of increasing or decreasing interest rates. The increasing and decreasing rate environments are defined by the last interest rate change by the Federal Reserve. Regardless of the magnitude of the interest rate, if the last time interest rates were changed they were lowered, the economy is said to be in a state of decreasing rates. The dummy variable representing this condition equals one for economic periods with increasing interest rates and zero for periods of decreasing rates. Including the dummy variable in the Fama-French three-factor model yields the following regression equation

$$r_{i,t} - r_{f,t} = \alpha_i + d_i * Rates\ Increasing_i + \beta_i(r_{m,t} - r_{f,t}) + s_i * SMB_t + h_i * HML_t + u_{i,t}. \quad (8)$$

The output from equation 8 is shown in Table 13. Two of the coefficients on the dummy variable and ten of the alpha values are significant. As in the previous economic environments, alpha tends to increase with profitability and decrease with investment. Once again the average adjusted-R^2 across the twenty-five portfolios is 0.80 so the regressions are able to explain most of the variation in the returns data.

Using the same process as in the previous three economic environments, the regression coefficients in Table 13 are combined with average excess market returns, SMB and HML to estimate the average expected returns under expansionary and restrictive monetary policy (Table 14). Consistent with the other economic environments, the top performing portfolios contain highly profitable firms with low levels of investment. In the increasing rate environment, a firm's level of investment has a much greater impact on their stock returns than their profitability. On average, the difference in returns from the least profitable firms compared to the most profitable firms is 0.016 whereas the difference in returns for firms with the lowest level of investment compared to firms with the highest level of investment is 0.383. Similar to the low and

Table 13: Raising/Lowering interest rates dummy variable analysis

Fama-French Three-Factor Model (1963-2015)
Dummy Variable: Raising/Lowering Interest Rates

Operating Profitability Quintile		Investment Quintile 1	2	3	4	5
1	Alpha	-0.187	-0.127	-0.373*	-0.377*	-0.623***
	Rates Increasing	0.287	-0.0367	0.497*	0.267	0.293
	Beta	1.168***	1.044***	1.034***	1.131***	1.169***
	SMB	0.500***	0.139***	0.278***	0.281***	0.398***
	HML	0.109**	0.233***	0.277***	0.237***	-0.286***
	Adj R^2	0.823	0.789	0.747	0.793	0.845
2	Alpha	-0.184	0.031	-0.144	-0.0249	-0.344*
	Rates Increasing	0.234	-0.04	0.0089	-0.0283	0.321
	Beta	1.012***	0.935***	0.926***	0.986***	1.057***
	SMB	0.167***	0.0581*	0.0391	0.125***	0.392***
	HML	0.429***	0.372***	0.223***	0.164***	-0.190***
	Adj R^2	0.801	0.818	0.799	0.79	0.823
3	Alpha	-0.0047	-0.028	-0.109	-0.00594	-0.467**
	Rates Increasing	0.179	0.295	-0.0217	0.135	0.232
	Beta	1.034***	0.879***	0.972***	1.048***	1.169***
	SMB	0.0682*	0.0278	-0.0562*	-0.0314	0.0739*
	HML	0.276***	0.232***	0.288***	0.124***	-0.107**
	Adj R^2	0.76	0.741	0.816	0.854	0.837
4	Alpha	0.332*	0.221	0.103	0.0544	-0.0593
	Rates Increasing	-0.141	0.115	-0.0727	0.00672	0.00285
	Beta	1.012***	0.887***	0.979***	1.010***	1.140***
	SMB	0.0833*	-0.0525	-0.178***	-0.109***	-0.0246
	HML	0.425***	0.203***	0.116***	0.0237	-0.247***
	Adj R^2	0.744	0.782	0.86	0.86	0.842
5	Alpha	0.367*	0.189	0.365**	0.259*	0.371*
	Rates Increasing	-0.164	-0.0949	-0.310*	-0.0928	-0.191
	Beta	0.992***	0.961***	0.916***	0.946***	1.103***
	SMB	0.0804*	-0.192***	-0.102***	-0.149***	0.0457
	HML	0.322***	0.137***	0.103***	-0.158***	-0.390***
	Adj R^2	0.734	0.767	0.809	0.832	0.837

* p<0.05 | **p<0.01 | ***p<0.001

high interest rate analysis, this difference is attributed to the increased cost of investment as interest rates rise. In the decreasing rate environment, average expected portfolio returns increase with a firm's profitability and decrease with a firm's level of investment. However, unlike what was observed in the increasing rate environment, investment no longer has a greater impact on returns than profitability. The average delta in returns between the portfolios with the lowest level of investment and those with the highest

Table 14: Increasing/Decreasing Interest Rate Expected Portfolio Returns

Expected Portfolio Returns - Increasing Rates

Operating Profitability Quintile \ Investment Quintile	1	2	3	4	5	Average
1	0.849	0.472	0.805	0.607	0.260	0.599
2	0.743	0.598	0.412	0.527	0.542	0.564
3	0.801	0.791	0.437	0.686	0.331	0.609
4	0.861	0.834	0.512	0.545	0.423	0.635
5	0.828	0.570	0.521	0.547	0.611	0.615
Average	0.816	0.653	0.538	0.582	0.433	

Expected Portfolio Returns - Decreasing Rates

Operating Profitability Quintile \ Investment Quintile	1	2	3	4	5	Average
1	0.562	0.509	0.308	0.340	-0.033	0.337
2	0.509	0.638	0.404	0.555	0.221	0.465
3	0.622	0.496	0.459	0.551	0.099	0.445
4	1.002	0.719	0.585	0.538	0.420	0.653
5	0.992	0.665	0.831	0.639	0.802	0.786
Average	0.737	0.605	0.517	0.525	0.302	

level is 0.436 whereas the average delta between the most and least profitable firms is 0.449. Thus, in the decreasing rate environment, profitability has a slightly greater impact on expected returns than investment.

To illustrate the findings from the economic environment analysis I construct a smart portfolio for each of the economic environments tested. Each smart portfolio combines the observed returns from the portfolio with the highest expected returns in each economic environment tested. The smart portfolio for the up and down market environment is based off of the returns from the portfolio in the fourth quintile of operating profitability and first quintile of investment for up market periods and the returns from the portfolio in the third quintile of operating profitability and fourth quintile of investment in down market periods (Table 8). The smart portfolio for recessionary and expansionary environments is constructed from portfolio returns in the fifth quintile of operating profitability and first quintile of investment for recessionary periods and

portfolio returns from the fourth quintile of operating profitability and first quintile of investment for expansionary periods (Table 10). The smart portfolio for the high and low interest rate environment combines portfolio returns in the fifth quintiles of operating profitability and investment for periods with low interest rates and portfolio returns from the fifth quintile of operating profitability and first quintile of investment for periods with high interest rates (Table 12). Lastly, the smart portfolio for the increasing and decreasing interest rate environment combines portfolio returns in the fourth quintile of operating profitability and first quintile of investment for all periods (Table 14).

The performance of the smart portfolios is demonstrated by showing the growth of a $1,000 investment over the entire time period of the sample, shown in Figure 2. All

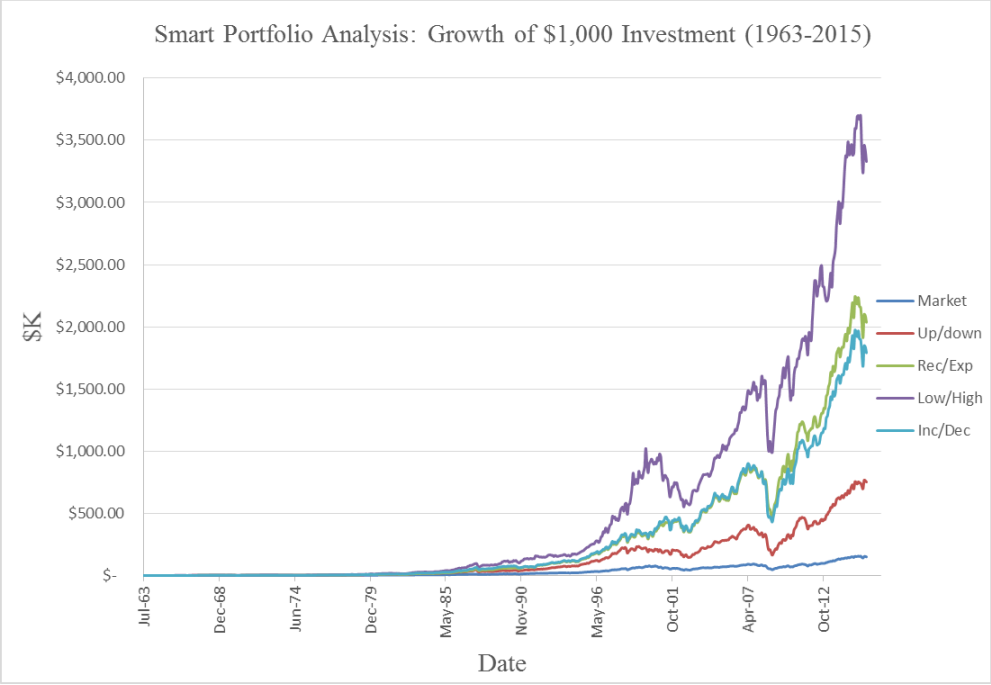

Figure 2: Smart portfolio returns

of the smart portfolios outperform the market, although as discussed in Chapter IV there are limitations to this analysis. In addition to the concerns already stated, these results do not account for any trading fees that would be incurred from frequently switching back

and forth between portfolios. In the economic environment analysis, the low and high interest rate environment produced the most notable trends. Furthermore, this environment is also the most transparent to investors since the Federal Reserve announces changes in the interest rate. These conditions allowed for the smart portfolio designed around the low and high interest rate to produce significantly higher returns than the alternatives. Despite the concerns mentioned, these results help substantiate that results of the economic environment analysis identify firm characteristics that thrive in specified economic environments, thus achieving higher stock returns.

CHAPTER VI

CONCLUSION

This thesis uses the Market Model and Fama-French three-factor model to replicate Fama and French's (2006) findings that more profitable firms with low levels of investment yield higher stock returns than less profitable firms with high levels of investment. Further, I expand on their research by using dummy variables to examine how a firm's profitability and level of investment translate to stock returns in different economic environments. The sensitivities on SMB and HML revealed that the more (less) profitable portfolios with lower (higher) levels of investment were comprised of large (small) value (growth) firms. In general, more profitable firms with lower levels of investment were consistently strong performers; however, there were a few other notable observations that came from the analysis. First, investment acts as a traditional risk factor, during good economic times firms with higher levels of investment perform better than those same firms during bad economic times. This effect was most noticeable during restrictive versus expansionary monetary policy, due to implications from the cost of investment. Profitability, however, did not always act as a traditional risk factor. In recessionary and high interest rate environments the most profitable portfolios had higher expected returns than the same portfolios during good economic conditions. This finding offers investors a valuable hedging opportunity in their portfolios. Lastly, I construct four smart portfolios that incorporate the findings in my analysis and measure their returns from 1963 to 2015. The smart portfolios, following a strategy consistent with my

analysis, outperform other alternatives and demonstrate how an investor could benefit from this analysis.

APPENDICES

Appendix A

Cross-sectional Regression Results (Market Model)

Variable	Coefficient	SE	P-value
Intercept	0.907	2.511	0.721
Beta	-1.244	2.461	0.618

Variable	Coefficient	SE	P-value
Intercept	0		
Beta	-0.362	0.311	0.256

Appendix B

Cross-sectional Regression Results (Fama-French three-factor model)

Variable	Coefficient	SE	P-value
Intercept	1.603	5.999	0.792
Beta	-1.729	5.866	0.771
SMB	-1.255	2.443	0.613
HML	-0.842	1.824	0.649

Variable	Coefficient	SE	P-value
Intercept	0		
Beta	-0.166	0.386	0.672
SMB	-1.660	1.875	0.385
HML	-0.554	1.443	0.704

REFERENCES

Ang, Andrew, and Geert Bekaert. "Stock Return Predictability: Is It There?" *The Review of Financial Studies* (2007): 651-707. Web.

Arshanapalli, Bala, Frank J. Fabozzi, and William Nelson. "The Value, Size, and Momentum Spread during Distressed Economic Periods." *Finance Research Letters* 3.4 (2006): 244-52. Web.

Fama, Eugene F., and Kenneth R. French. "Profitability, Investment and Average Returns." *Journal of Financial Economics* 82.3 (2006): 491-518. Web.

Fama, Eugene F., and Kenneth R. French. "Value versus Growth: The International Evidence." *The Journal of Finance* 53.6 (1998): 1975-999. Web.

French, Kenneth R. "Detail for 25 Portfolios Formed on Operating Profitability and Investment." Kenneth R. French Data Library. N.p., 2015. Web. 27 Mar. 2016. http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/tw_5_ports_op_inv.html.

Galagedera, Don U.A. "A Review of Capital Asset Pricing Models." Managerial Finance 33.10 (2007): 821-32. Web.

International Monetary Fund, Interest Rates, Discount Rate for United States© [INTDSRUSM193N], retrieved from FRED, Federal Reserve Bank of St. Louis. https://fred.stlouisfed.org/series/INTDSRUSM193N, October 27, 2016.

The National Bureau of Economic Research http://www.nber.org/cycles/cyclesmain.html, October 27, 2016. Web.