Abnormal Returns From Hedging, Firm Size, and the Fama and French Multifactor Models

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Received: February 3, 2023 Accepted: March 6, 2023 Online Published: March 26, 2023

doi:10.5430/ijfr.v14n2p71 URL: https://doi.org/10.5430/ijfr.v14n2p71

Abstract

I use the Fama and French (2015) five-factor model to reexamine the seemingly anomalous result of Nelson, Moffitt, and Affleck-Graves (2005), who document significant positive abnormal returns for firms that hedge. Contrary to their results, using the five-factor model on a new sample of U.S. firms from 2013 – 2021, I observe significant negative monthly abnormal returns of -0.190% (-2.26% annually) for firms using derivative securities (hedgers). My result is consistent with poorly diversified managers engaging in costly hedging behavior that benefits management at the cost of shareholders. When I divide the sample by size (total assets), I find that the significant negative abnormal returns are confined only to large firms, offering no support for the economies of scale or managerial sophistication hypotheses.

Keywords: hedging, derivatives, multifactor models, return anomalies

1. Introduction

Fama and French (2015) introduce a five-factor asset pricing model that is more robust in explaining stock returns than either the Fama and French (1993) three-factor or Carhart (1997) four-factor models. They contend that the value / growth factor in their original three-factor model is a noisy proxy for expected returns since the market value also responds to forecasts of earnings and investment. Their five-factor model adds factors based on the level of profitability (RMW) and investment (CMA) and they contend that these new factors capture the exposure of the value / growth factor, making the HML factor redundant. While they acknowledge their five-factor model has trouble capturing the returns on small stocks whose returns act like those of firms that invest a lot despite being unprofitable, overall, their five-factor model outperforms the three-factor model. Fama and French (2016) contend the five-factor model's success comes from its ability to capture the effects of profitable firms that invest conservatively and unprofitable firms that invest aggressively. Based on this ability, they show their five-factor model helps explain several important return anomalies (share repurchases, large share issuances, low/high beta stocks, low/high volatility stocks) that have avoided explanation by their three-factor model.

One such potential anomaly might be found in Nelson, Moffitt, and Affleck-Graves (2005), who find significant abnormal returns in a sample of U.S. firms that use derivative securities (hedge). Specifically, using the Fama and French (Carhart) four-factor model, they document significant monthly abnormal returns of 0.35% (4.3% annually) for all hedgers, 0.42% (5.1% annually) for currency hedgers, and 0.96% (12.2% annually) for firms that hedge only currencies and not interest rates or commodities. This result was shown to be robust across multiple asset pricing models and methodologies. Consistent with the economies of scale and managerial sophistication hypotheses (Nance, Smith, and Smithson 1993; Dolde 1993), the abnormal returns for currency hedgers were shown to be primarily driven by larger firms.

Fama (1998) suggests that "most long-term anomalies tend to disappear with reasonable changes in technique" and that "some anomalies do not stand up to out-of-sample replication." While the results of Nelson et al. are robust across multiple asset pricing models and methodologies, the Fama and French five-factor model was not an available methodology at the time of publication. Additionally, recent accounting standards updates require U.S. firms to disclose offsetting asset and liabilities positions in derivative securities. Beginning in September of 2013, these derivative data have been aggregated and reported the S&P Compustat database, which allows an out of sample test of Nelson et al.'s results on a new sample of U.S. firms using the five-factor methodology of Fama and French.

2. Sample

Nelson et al.'s sample was collected during the short window where the Financial Accounting Standard Board's (FASB) Statement of Financial Accounting Standard (SFAS) No. 119 – *Disclosure about Derivative Financial Instruments and Fair Value of Financial Instruments* was in force. SFAS No. 119 required firms to disclose the amount, nature, and terms of derivative financial instruments and to differentiate between derivatives held for trading purposes or purposes other than trading. SFAS No. 119 was superseded by SFAS 133 – *Accounting for Derivative Instruments and Hedging Activities* which, for firms with "qualified" hedging activities, eliminated the detailed disclosures required under SFAS No. 119 that were necessary to construct their hedging sample. Essentially these changes in accounting standards made an out of sample replication and test impossible, until FASB issued Accounting Standards Update (ASU) 2011-11 as revised and updated by ASU 2013-01, which, among other changes, required firms to disclose offsetting asset and liability positions in derivative securities. Beginning in September 2013, S&P Compustat began aggregating and reporting across derivative types for both current and long-term derivative assets and liabilities. While these variables allow me to identify "hedgers" and "non-hedgers," because of the aggregation used by S&P Compustat to construct these variables, I am unable to identify the exact types of hedging activity each firm is engaging in (currency, interest rate, commodity).

I make every effort to follow Nelson et al. in my sample construction process. I begin by selecting all U.S. incorporated firms from the Compustat Capital IQ North American Fundamentals Annual database with fiscal year ends from September 2013 through December 2020 having non-missing total assets. Utilities (Sic codes 4900-4999) and Financials (Sic codes 6000 – 6999) are removed. This sample is then matched with the Center for Research in Security Prices (CRSP) database where all securities other than common stocks (CRSP share codes 10 and 11) are removed. The resulting sample consists of 2,978 unique firms with 17,693 firm/year observations. Firms in the sample reporting nonzero values for the Compustat variables gains / losses on derivatives and hedging (DERHEDGL) or comprehensive income – derivative gains and losses (CIDERGL) are identified as using derivatives ("hedgers") for the current fiscal year. Firms reporting nonzero values for derivative assets – current (DERAC), derivative assets – long term (DERALT), derivative liabilities – current (DERLC), or derivative liabilities – long term (DERLLT) are identified as using derivatives ("hedgers") for both the current and next fiscal year.

I partitioned the sample by industry using the four-digit historical SIC code, placing them into the Fama and French 17 industry classifications. Since both utilities and financials were previously dropped from the sample, I am left with 15 unique industry groupings. Information of the mean and median market value of equity for both derivative and non-derivative users by industry grouping is reported in Table 1. The results presented in Table 1 consistently show, with the exception of the oil industry, that firms that hedge tend to be significantly larger than their non-hedging counterparts. These results are consistent with those reported in Table 1 of Nelson et al.

More detailed information on the percentages of firms using derivatives can be found in Table 2. While it appears that the percentage of firms using derivatives declines slightly over my sample period, comparison of my results with those of Nelson et al. shows that the percentage of firms hedging has increased overall since the time of their sample. For example, they report, 72.34%, 51.86%, and 33.18% of firms in the S&P 500, S&P mid-cap, and S&P small-cap indices using derivatives compared to 77.56%, 59.38%, and 47.41% for my sample respectively. Similar patterns can be observed for groups formed by industry and market value of equity quartiles. In general, my results are consistent with the overall level of consolidation and IPO trends in the U.S. equity markets over the past two decades.

3. Methodology

I carefully follow the methodology used by Nelson et al. in setting up my calendar time portfolios. When a firm has been identified as using derivatives during the firm's fiscal year, I classify that firm as a hedger for all 12 months of that fiscal year. I then use these classifications to construct monthly calendar-time portfolios that capture the value weighted return for a portfolio that invests in the stock of every company that engages in hedging activity, for every month of every fiscal year for which they are identified as having used derivatives. I compute the excess return on these monthly value-weighted hedging portfolios by subtracting risk-free rate, yielding $R_{P_t} - R_{f_t}$, which is then used as the dependent variables in the following regressions:

$$R_{P_t} - R_{f_t} = \alpha + \beta_{MKT}(R_{M_t} - R_{f_t}) + \beta_{SMB}SMB_t + \beta_{HML}HML_t + \varepsilon_t \quad (1)$$

$$R_{P_t} - R_{f_t} = \alpha + \beta_{MKT}(R_{M_t} - R_{f_t}) + \beta_{SMB}SMB_t + \beta_{HML}HML_t + \beta_{UMD}UMD_t + \varepsilon_t \quad (2)$$

$$R_{P_t} - R_{f_t} = \alpha + \beta_{MKT}(R_{M_t} - R_{f_t}) + \beta_{SMB}SMB_t + \beta_{HML}HML_t + \beta_{RMW}RMW_t + \beta_{CMA}CMA_t + \varepsilon_t \quad (3)$$

$$R_{P_t} - R_{f_t} = \alpha + \beta_{MKT}(R_{M_t} - R_{f_t}) + \beta_{SMB}SMB_t + \beta_{HML}HML_t + \beta_{RMW}RMW_t + \beta_{CMA}CMA_t + \beta_{UMD}UMD_t + \varepsilon_t \quad (4)$$

Table 1. Mean (median) market value of equity in millions USD from 2013 through 2020 by industry

Industry	Firms Using Derivatives	Firms Not Using Derivatives	P-Value on Test of Differences
	21,902.43	1,229.69	0.0001
Food	(7,361.51)	(418.85)	0.0001
	[317]	[233]	
	5,272.27	1,228.33	0.0001
Mines	(1,110.41)	(212.25)	0.0001
	[175]	[90]	
	10,489.26	17,185.95	0.0001
Oil	(1,708.33)	(231.50)	0.0001
	[537]	[190]	
	9,320.07	2,229.34	0.0001
Clothes	(2,741.20)	(398.66)	0.0001
	[169]	[108]	
	3,183.36	1,132.59	0.0001
Consumer Durables	(1,304.62)	(187.89)	0.0001
	[222]	[187]	
	5,975.03	1,146.83	0.0001
Chemicals	(2,698.52)	(408.92)	0.0001
	[332]	[129]	
	35,183.47	3,084.66	0.0001
Drugs, Soap, Tobacco	(1,599.74)	(252.74)	0.0001
	[387]	[604]	
	8,399.81	2,609.12	0.0001
Construction	(2,145.31)	(663.00)	0.0001
	[348]	[358]	
	2,936.01	706.83	0.0001
Steel Works	(1,685.52)	(395.37)	0.0001
	[125]	[78]	
	4,724.60	990.90	0.0001
Fabricated Products	(2,184.88)	(621.22)	0.0001
	[103]	[75]	
	11,151.82	3,018.49	0.0001
Machinery and Business Equipment	(2,817.99)	(228.33)	0.0001
	[1,266]	[1,190]	
	11,159.90	6,096.25	0.1120
Automotive	(2,870.85)	(851.42)	0.0001
	[233]	[125]	
	15,266.83	8,554.30	0.0006

Transportation	(3,136.85)	(1,243.94)	0.0001
	[339]	[379]	
	23,871.60	9,815.18	0.0008
Retail Stores	(3,556.55)	(636.84)	0.0001
	[317]	[676]	
	18,632.51	2,706.39	0.0001
Other	(1,687.64)	(458.32)	0.0001
	[2,975]	[5,289]	
	15,302.69	3,679.83	0.0001
All Firms	(2,196.13)	(426.68)	0.0001
	[7,845]	[9,711]	

Notes: Reported p-values are the result of T-test on the differences in Means and Wilcoxon two sample test on the medians. N in [].

Table 2. Percentage of sample firms that hedge by year, S&P index, size quartile, and industry

Sample Grouping	**N**	**Firms Using Derivatives (%)**	**Firms Not Using Derivatives (%)**	**Industry Grouping**	**N**	**Firms Using Derivatives (%)**	**Firms Not Using Derivatives (%)**
Year							
2013	1,394	49.21%	50.79%	Food	558	56.99%	43.01%
2014	1,935	46.72%	53.28%	Mines	265	66.04%	33.96%
2015	2,050	46.05%	53.95%	Oil	730	73.70%	26.30%
2016	2,144	44.87%	55.13%	Clothes	278	60.79%	39.21%
2017	2,276	44.46%	55.54%	Consumer Durables	413	54.00%	46.00%
2018	2,448	43.67%	56.33%	Chemicals	462	72.08%	27.92%
2019	2,606	41.63%	58.37%	Drugs, Soap, Tobacco	995	38.99%	61.01%
2020	2,840	42.85%	57.15%	Construction	709	49.22%	50.78%
Index				Steel Works	203	61.58%	38.42%
S&P 500	2,603	77.56%	22.44%	Fabricated Products	180	57.22%	42.78%
S&P Mid Cap	1,950	59.38%	40.62%	Machinery and Business Equipment	2,468	51.42%	48.58%
S&P Small Cap	3,012	47.41%	52.59%	Automotive	360	65.28%	34.72%
MVE Size Quartiles				Transportation	720	47.22%	52.78%
First (Largest)	4,421	70.26%	29.74%	Retail Stores	1,012	31.82%	68.18%
Second	4,425	49.06%	50.94%	Other	8,340	35.88%	64.12%
Third	4,422	32.25%	67.75%				
Fourth (Smallest)	4,425	26.58%	73.42%	All Firms	17,693	44.53%	55.47%

Notes: Following Nelson et al. (2005), firms are placed into the Fama-French 17 industry classifications (excluding utilities and financials). Size quartiles are calculated annually using data from the CRSP.

Where $R_{M_t} - R_{f_t}$ is the market excess return factor, SMB is a size factor calculated as the return on portfolios of **s**mall firms **m**inus **b**ig firms, HML is a value / growth factor calculated as the return on portfolios of **h**igh book-to-market firms **m**inus **l**ow book-to-market firms, RMW is a profitability factor calculated as the return on portfolios with **r**obust profitability **m**inus **w**eak profitability, CMA is an investment factor calculated as the return on portfolios of firms with **c**onservative levels of investment **m**inus **a**ggressive levels of investment, and UMD is a momentum factor calculated as the return on portfolios of firms with high prior returns (**u**p) **m**inus firms with low prior returns (**d**own). The intercept term (α) in each of these regressions is the primary variable of interest since it provides a measure of the monthly abnormal performance. All the factors used in this study were downloaded from Ken French's website. (Note 1)

4. Results

Results for the various Fama and French regressions are summarized in Table 3. In all cases the monthly regressions are run over the period from October 2012 through December 2021. For each month, the dependent variable is calculated as the excess return on a value weighed portfolio consisting of all firms identified as using derivative securities during that month. The intercept terms in these regressions, therefore, provides an estimate of the abnormal returns accruing to firms using derivatives.

Table 3. Results of Fama and French regressions on firms that hedge

Panel A - Fama and French (1993) three factor regressions with and without momentum factor

Intercept	Std Error	$R_m - R_f$	SMB	HML	UMD	Adj R^2
-0.00159	0.00096	1.01107	-0.06421	-0.06388		0.9454
(0.1010)		(0.0001)	(0.0933)	(0.0323)		
-0.00142	0.00096	0.99858	-0.06942	-0.08928	-0.04628	0.9460
(0.1419)		(0.0001)	(0.0698)	(0.0102)	(0.1501)	

Panel B - Fama and French (2015) five factor regressions with and without momentum factor

Intercept	Std Error	$R_m - R_f$	SMB	HML	RMW	CMA	UMD	Adj R^2
-0.00190	0.00093	1.00357	0.01103	-0.11365	0.15852	0.10082		0.9499
(0.0427)		(0.0001)	(0.7952)	(0.0023)	(0.0041)	(0.1175)		
-0.00178	0.00093	0.99604	0.00340	-0.12783	0.15047	0.09847	-0.03125	0.9499
(0.0594)		(0.0001)	(0.9371)	(0.0014)	(0.0069)	(0.1264)	(0.3188)	

Notes: The dependent variables in these regressions are the monthly value weighted excess portfolio returns from October 2012 through December 2021 for firms identified as using derivatives. P-values in ().

The results presented in Table 3 for the Fama and French four-factor model are surprisingly different from those reported in the original study. For all hedgers, they reported monthly abnormal returns of .352% (p-value 0.0954), while I document an insignificant -0.142% (p-value 0.1419). In examining the results using the Fama and French five-factor models, it is noteworthy that the profitability (RMW) factor loadings were significant in the both regressions (with and without momentum) while the investment (CMA) factor loadings were not. Despite the inclusion of both of these factors, the value / growth factor (HML) was not redundant in these regressions with the HML factor loadings being highly significant in both regressions. The most interesting result, however, when using the Fama and French five and six-factor models, is that firms using derivatives exhibit significant negative abnormal returns of -0.190% (p-value 0.0427) and -0.178% (p-value 0.0594) per month respectively. These compound to annual abnormal returns of -2.26% and -2.12% respectively for firms that hedge. These results stand in direct contrast to those of the prior study, and suggest that the hedges implemented by firms tend to be negative NPV in nature and result in a loss of value for the firms' shareholders. These significant negative abnormal returns are consistent with management whose individual human capital and wealth are so poorly diversified as to encourage them to hedge to protect their personal wealth even though this is costly to the firm and shareholders (Stulz (1984)). This result is also consistent with managers hedging based upon their inside debt holdings (Jensen and Meckling (1976), Edmans and Liu (2011), Belkhir and Boubaker (2013)).

As observed in Tables 1 and 2, larger firms are more likely to use derivatives (hedge) and consistent with the economies of scale and managerial sophistication hypotheses (Nance et al. and Dolde) Nelson et al. show that abnormal returns for currency hedgers were primarily driven by larger firms (as measured by total assets). To examine this relationship further, I divide derivative using firms into large and small hedgers using the annual median value of total assets for the sample of firms using derivatives. This process provides for an equal number of small and large hedgers for each year in the sample. I then run the various Fama and French regressions on the excess returns for both the large and small hedging samples, the results of which are presented in Table 4.

Table 4. Results of Fama and French regressions on large and small hedging firms

Panel A - Large Hedgers

Intercept	Std Error	R_m - R_f	SMB	HML	RMW	CMA	UMD	Adj R^2
-0.00157	0.00101	1.01875	-0.10028	-0.06195				0.9392
(0.1230)		(0.0001)	(0.0135)	(0.0483)				
-0.00138	0.00101	0.99681	-0.10619	-0.09075			-0.05248	0.9400
(0.1738)		(0.0001)	(0.0089)	(0.0129)			(0.1209)	
-0.00193	0.00097	1.00464	-0.01917	-0.11274	0.17017	0.11751		0.9446
(0.0497)		(0.0001)	(0.6673)	(0.0038)	(0.0033)	(0.0825)		
-0.00179	0.00098	0.99580	-0.02813	-0.12941	0.16070	0.11475	-0.03674	0.9447
(0.0705)		(0.0001)	(0.5344)	(0.0020)	(0.0059)	(0.0897)	(0.2637)	

Panel B - Small Hedgers

Intercept	Std Error	R_m - R_f	SMB	HML	RMW	CMA	UMD	Adj R^2
-0.00094	0.00129	1.00752	0.74444	-0.07942				0.9350
(0.4680)		(0.0001)	(0.0001)	(0.0482)				
-0.00127	0.00128	1.03260	0.75490	-0.02842			0.09293	0.9372
(0.3225)		(0.0001)	(0.0001)	(0.5336)			(0.0312)	
-0.00024	0.00128	0.98157	0.67908	-0.11818	-0.12644	-0.22080		0.9376
(0.8525)		(0.0001)	(0.0001)	(0.0202)	(0.0924)	(0.0137)		
-0.00059	0.00127	1.00356	0.70136	-0.07676	-0.10292	-0.21394	0.09128	0.9397
(0.6429)		(0.0001)	(0.0001)	(0.1497)	(0.1672)	(0.0152)	(0.0332)	

Notes: The dependent variables in these regressions are the monthly value weighted excess portfolio returns from October 2012 through December 2021 for firms identified as using derivatives. For the sample of firms identified as using derivatives, the median book value of assets is calculated for each year of the sample and firms falling above the median are classified as “large” hedgers with the remaining firms classified as “small” hedgers. P-values in ().

While the intercepts from the three and four-factor regressions reported in Table 4 are insignificant, the results from the five and six-factor regressions are inconsistent with the general results of Nelson et al, who found support for both the economies of scale and managerial sophistication hypotheses. For large hedgers, using both the five and six-factor models, I document statistically and economically significant negative monthly abnormal returns of -0.193% (p-value 0.0497) and -0.179% (p-value 0.0705). These compound to annual rates of -2.292% and -2.127% respectively. For small hedgers, using the same models, I document statistically and economically insignificant abnormal returns of -0.024% (.288% annually) and -0.059% (.706% annually). Having these significant negative abnormal returns for large hedgers but not small hedgers is inconsistent with both the economies of scale and managerial sophistication hypotheses that were supported by the results of Nelson et al.

5. Summary and Conclusions

Employing the latest five and six-factor asset pricing models from Fama and French on an entirely new sample of U.S. firms that use derivatives, I reexamine the hedging anomaly first documented by Nelson et al. and contrary to their results, document that firms using derivative securities (hedgers) exhibit significant negative monthly abnormal returns ranging from -0.178% (-2.12% annually) to -0.190% (-2.292% annually), indicating that the results of Nelson et al. do not hold up to out of sample testing. My results are consistent with managers whose individual human capital and wealth are so poorly diversified as to encourage them to engage in costly hedging activities that benefits them at the expense of shareholder wealth. When I divided the sample into large and small hedgers, I found significant abnormal returns only for large firms, a result that is inconsistent with the economies of scale and managerial sophistication hypotheses supported by Nelson et al.

While the evidence is clear that derivative users exhibit significant negative abnormal returns, because of Compustat's aggregation across derivative types (currency, interest rate, and commodity) in the calculation of their derivative asset and liability variables, I cannot determine which type(s) of derivatives are driving this result. A potential area for future research would be to determine if this this question could be addressed by hand collecting data about the specific types of derivatives used by firms from the text of the financial disclosures in the 10-K annual filings of the 7,845 firms identified as using derivatives. Another area for future research would be to apply additional asset pricing models and tests of long run abnormal returns to verify the robustness of the results presented in here. Finally, additional research could be done examining the relationship between inside debt and hedging activity and how this relationship impacts firm value.

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Note

Note 1. http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html Factors downloaded on February 24, 2022. The UMD factor is labeled MOM on French's site. Nelson et al. refer to it as UMD, as do I for comparison purposes.