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Operating Cost Flexibility and Implications for Stock Returns †

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† In memory of Simon Benninga.

Abstract: This study suggests a new measure for a firm's operating cost flexibility. Flexible firms are less risky and, therefore, require lower stock returns. This analysis of 126,202 firm-year observations from the U.S. cross-section of stock returns finds that the new measure explains a negative significant rate of return. The new measure's impact extends beyond that of operating leverage. In addition, the new measure's impact is both statistically and economically significant, and it is sustainable for a variety of in-sample and out-of-sample robustness tests. The new findings are beneficial to researchers and practitioners alike.

Keywords: operating cost; stock return; asset pricing; cross-section returns

JEL Classification: G11; G12; G13; G14; G17

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1. Introduction

Finance researchers and practitioners have long sought ways to predict and explain stock returns. The main focus and contribution of the current study is to propose a new risk measure that would explain the cross-section of U.S. stock returns. This new measure is based on the standard deviation of a firm's operating cost (*SDOC*). A *lower* standard deviation (or *lower SDOC*) implies *less* flexible operating costs, thus presenting a *higher* risk. On average, firms with a *lower SDOC* earn *higher* returns to compensate for this risk. While diversification may mitigate the risk, the latter cannot be eliminated entirely. When investing in portfolios of stocks, firms still bear a level of flexible or inflexible operating costs (unlike idiosyncratic risk, which can be canceled out entirely). El Ghoul et al. (2023) found a comparable link between firm inflexibility and cost of equity. Their findings complement the current study; however, they use different measures. In addition, Gu et al. (2018)'s findings also reinforce the driving force behind the current study. They discovered that, in the case of inflexible firms, risk increases along with operating leverage. However, in the current study, a low *SDOC* suggests inflexibility and, thus, indicates higher stock returns beyond the impact of the operating leverage. The new measure captures an explanatory power beyond that of operating leverage and its economic significance is even stronger than that of operating leverage. The importance of this study's findings and robustness tests (out-of-sample and GMM) is to highlight the new suggested measure and its impact. Investors (researchers and practitioners) may use the new measure to earn higher returns (despite the higher risk).

2. Literature Review

The most prevalent model used to explain firms' expected stock returns is the Capital Asset Pricing Model (CAPM; Sharpe 1964; Lintner 1965; Black 1972). This model elucidates the return on a stock by multiplying the coefficient of systematic risk (*beta*) for each stock by the market risk premium. The required return on a stock is the risk-free rate added to the former multiplication. Mestre (2023) employed a wavelet approach to analyze different frequencies of *betas* for the CAPM and emphasized the difference between short-run and long-run investment horizons. Other methods include, for example, Tokic and Jackson's

(2023) discretionary global macro approach and Avramov et al. (2022)'s study, which utilizes the regression regularization method. However, a number of anomalies to the CAPM have been discovered over the past few decades. Fama and French (1992) (hereinafter FF92) presented CAPM anomalies, including *size* or market capitalization (Banz 1981), along with *book-to-market* (Stattman 1980) (Rosenberg et al. 1985). According to FF92, a firm's *beta* becomes insignificant when market capitalization (i.e., *size*) is controlled for. Further anomalies include *momentum* and past performance, as in Jegadeesh and Titman (1993) and Novy-Marx (2011). Over the years, human life expectancy has increased. Taussig (2024) showed that, especially since the beginning of the current millennium, the average firm's pension expenses increased substantially. Higher firm pension expenses relative to their assets explain higher stock returns. Boado-Penas et al. (2020) showed that mixed-pension systems financed as pay-as-you-go with the addition of a compulsory funded pension scheme are more sustainable and require less adjustments. Batten et al. (2022) examined equity premium predictability with uncertainty and liquidity measures. They found that an uncertainty measure can surpass the historical average. Knowledge capital was found to be positively associated with stock returns during the COVID-19 pandemic in the U.S. manufacturing sector (Lee et al. 2024).

Ma et al. (2024) examined the influence of corporate environmental performance on stock returns for more than 3000 Chinese companies. They found evidence of green returns in the Chinese stock market. That is, companies with better environmental performance earned, on average, higher excess returns. Babar and Habib (2022) presented a positive link between product market competition and operating leverage, while Novy-Marx (2011) found that the outcome of a higher operating leverage was higher stock returns. Ali Qureshi (2024) analyzed the interaction between firms' CEO tweets and the consecutive day's stock return. The day after the tweet, stock returns and volume were found to be relatively higher. Referendums were also found to affect stock returns. A three-day window before and after a referendum in Switzerland showed a positive impact on returns and a negative impact on volatility (Morley 2023).

The current study analyzes the impact of *SDOC* on the cross-section of expected stock returns. The nomenclature is presented in Equations (1) and (2). Equation (1) clarifies the calculation of the operating cost's mean, while Equation (2) provides details about the calculation of the operating cost's variance or *VOC*. *SDOC* in Equation (2) is the square root of *VOC*. Operating cost is employed in the natural logarithm. Both calculations are based on rolling windows of five years.

$$Mean(Operating\ Cost)_{\mathrm{i\,t}} = \frac{1}{5}\sum_{t-4}^{t} Operating\ Cost_{i,t} \quad (1)$$

$$SDOC_{i,t} = \sqrt{VOC_{i,t}} = \sqrt{\frac{1}{4}\sum_{t-4}^{t}\left[Operating\ Cost_{i,t} - Mean(Operating\ Cost)\right]^2} \quad (2)$$

Section 3 includes the data and methodology, Section 4 covers the findings, and Section 5 concludes this paper.

3. Data and Methodology

SDOC is a company trait that is linked to company risk. Therefore, it must have explanatory power regarding the cross-section of stock returns. The hypothesis proposes that a lower *SDOC* will affect and provide an explanation for higher stock returns.

Extending the FF92 parsimonious model with the new firm trait, *SDOC* provides explanatory power that is not seized by *size*, *book-to-market*, and *past performance* effects.

3.1. Data

This article's premise relies on the methodology and data items used in FF92 and Novy-Marx (2011). The sample consists of all the companies in the NYSE, NASDAQ, and AMEX return files from the Center for Research in Securities Prices (CRSP) and the CRSP-COMPUSTAT Merged (CCM) database. These observations include the companies' financial reports. Utility and financial companies were not included, because these are regulated companies. Therefore, financial variables have different meanings for them. The sample period is 1967–2023. The monthly return of each company minus the risk-free rate (T-bills), i.e., the net return, serves as the explained variable in a cross-section regression. The monthly stock returns are from July 1967 to December 2023. For every year, the explained variable is the monthly net return, from July of one year to June of the consecutive year. The *SDOC* (standard deviation of operating cost) is the square root of the variance in the operating cost. The *operating cost* is the natural logarithm of COGS + XSGA (Novy-Marx 2011). The *SDOC* at the end of each year $t-1$ explains the monthly returns from July of year t to June of yeart + 1 (FF92). There is a gap of six months for the financial statements to be advertised (FF92).

For every firm and every year, the market capitalization or market equity (ME) (the number of outstanding shares multiplied by the price of a single share) is calculated in the month of June. The ME at the end of June of every year explains the monthly returns from July of the same year to June of the consecutive year. The ME is taken in the natural logarithm. Market equity or capitalization is also referred to as *size*. Book equity (BE) is the common ordinary equity from the CCM of each stock at the end of the fiscal year preceding the returns (CEQ + TXDB). Market equity (ME), or market capitalization for the book-to-market ratio is the number of outstanding shares multiplied by the price of a single share at the end of December of the year preceding the returns. Book-to-market (BE/ME) is the division of the former two taken in the natural logarithm. To mitigate the impact of outliers, observations above the 99.5% percentile are set to the 99.5% value. Similarly, observations below the bottom 0.5% percentile are set to the 0.5% value.

Calculation of *Past Performance*: (R(0,1)) calculates the return on a stock in the previous month, and (R(2,12)) calculates the return on a stock in the 12 months prior to the previous month. Table 1 depicts the descriptive statistics. Table 2 depicts the Pearson correlations of *the SDOC* and the FF92 parsimonious model variables, i.e., *book-to-market* and *size*. The Pearson correlation coefficients between the *SDOC* and *book-to-market* and between the *SDOC* and *size* are not high: −0.1280 and −0.0539, respectively. Meanwhile, the Pearson correlation coefficient between *book-to-market* and *size* is much higher, measuring −0.3632.

Table 1. Descriptive statistics from January 1966 to December 2022.

	Mean	**STD**	**MAX**	**MIN**
SDOC	0.2552	0.2161	1.4460	0.0269
Book-to-Market	−0.4636	0.8080	1.5678	−3.4091
Size	18.8943	2.0342	24.3604	14.5499

This table depicts the annual descriptive statistics of the *SDOC*, i.e., the standard deviation of the operating cost, where COGS + XSGA is employed in the natural logarithm. *Book-to-market* is the book equity at the end of a fiscal year (CEQ + TXDB), divided by the market equity at the end of December. The market equity at the end of December is the product of the number of shares outstanding and the price of a single share. This measure is taken in the natural logarithm. *Size* or market capitalization (also ME) is the number of shares outstanding multiplied by the price of a single share at the end of June of each year. This measure is taken in the natural logarithm. To mitigate the impact of outliers, observations above the 99.5% percentile are set to the 99.5% value. Similarly, observations below the bottom 0.5% percentile are set to the 0.5% value. There are 126,202 firm-year observations.

3.2. The New Model and Fama–Macbeth Regressions (FM)

The consequent model, which emerges from the hypothesis that the *SDOC* has explanatory power for cross-sectional stock returns, was tested:

$$R_{i\,t} = a + b_{1\,t}\ln(ME_{i\,t-1}) + b_{2\,t}\ln(BE/ME_{i\,t-1}) + b_{3\,t}\ln(SDOC_{i\,t-1}) + b_{4\,t}R(0,1) + b_{5\,t}R(2,12) + e_{i\,t} \quad (3)$$

The estimated coefficients from each cross-section regression are averaged and a t-statistic is calculated, in accordance with Fama and MacBeth (1973) (second stage of their model).

Table 2. Pearson correlation from January 1966 to December 2022.

	SDOC	**Book-to-Market**	**Size**
SDOC	1.00	-	-
Book-to-Market	−0.1280 ***	1.00	-
Size	−0.0539 ***	−0.3632 ***	1.00

This table depicts the Pearson correlation coefficients of stocks' *SDOC*, *book-to-market*, and *size.* The *SDOC* is the standard deviation of the operating cost, where COGS + XSGA is employed in the natural logarithm. *Book-to-market* is the book equity at the end of a fiscal year (CEQ + TXDB), divided by the market equity at the end of December. The market equity at the end of December is the product of the number of shares outstanding and the price of a single share. This measure is taken in the natural logarithm. *Size* or market capitalization (also ME) is the number of shares outstanding multiplied by the price of a single share at the end of June of each year. This measure is taken in the natural logarithm. To mitigate the impact of outliers, observations above the 99.5% percentile are set to the 99.5% value. Similarly, observations below the bottom 0.5% percentile are set to the 0.5% value. There are 126,202 firm-year observations. *** represents significance at the 1% level.

4. Main Findings of the Cross-Section Analysis

The main results of the cross-section FM regressions are depicted in Table 3. In a univariate regression, the *SDOC* is significant at the 1% level in explaining the returns. The t-statistic is (−4.45) (*p*-value < 1%). The *SDOC* remains significant at the 1% level in robustness tests for Newey–West (Newey and West 1987b) standard errors. These standard errors are corrected for heteroskedasticity and autocorrelation (Newey and West 1987a). Moreover, the *SDOC* remains significant at the 1% level, after controlling for the FF92 parsimonious model factors, *size,* and *book-to-market*. *Past performance* variables do not change the significance of the *SDOC*. The firm's age is insignificant even at the 10% level. As for the economic significance of the *SDOC*, a 1 standard deviation decrease in the *SDOC* explains an average increase of 2.0538% in annual returns. When controlling for the operating leverage (Novy-Marx 2011), both the *SDOC* and the operating leverage are significant at the 1% level. However, the economic significance and impact of the *SDOC* are much stronger (2.0538% vs. 1.6170%) (the Pearson correlation coefficient between the two is −0.1206). In addition to the rationale negative correlation, the mean of the operating leverage is 1.2842 for the first *SDOC* quartile and only 1.0241 for the fourth quartile (Table 4).

Table 3. Mean estimated coefficients (t-statistics) from July 1967 to December 2023.

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
SDOC	−0.7920 *** (−4.45)	−0.7512 *** (−4.45)	−0.5759 *** (−3.70)	−0.5809 *** (−4.08)	−0.5704 *** (−4.28)
Size		−0.1361 *** (−3.87)	−0.0969 *** (−2.64)	−0.1013 *** (−3.00)	−0.1031 *** (−3.10)
BM			0.2422 *** (4.50)	0.2581 *** (5.17)	0.2549 *** (5.20)
R(0,1)				−0.0500 *** (−14.30)	−0.0502 *** (−14.38)
R(2,12)				0.0032 ** (2.31)	0.0032 ** (2.30)
LN(Age)					0.0552 (0.39)
Adj R^2	0.0043	0.0170	0.0215	0.0373	0.0381

This table depicts the mean of the estimated coefficients (t-statistics) from the month-by-month regressions of returns on *size*, *book-to-market*, *SDOC*, and *past performance*. The *SDOC is the* standard deviation of the operating cost, where COGS + XSGA is employed in the natural logarithm. *Book-to-market* is the book equity at the end of a fiscal year (CEQ + TXDB), divided by the market equity at the end of December. The market equity at the end of December is the product of the number of shares outstanding and the price of a single share. This measure is taken in the natural logarithm. *Size* or market capitalization (also ME) is the number of shares outstanding multiplied by the price of a single share at the end of June of each year. This measure is taken in the natural logarithm. To mitigate the impact of outliers, observations above the 99.5% percentile are set to the 99.5% value. Similarly, observations below the bottom 0.5% percentile are set to the 0.5% value. *Past performance* is measured for the previous month and for the 12 months prior to the previous month. LN(Age) is the natural logarithm of the firm's age in years. ** and *** represent significance levels of 5% and 1%, respectively. For robustness, Newey–West standard errors are calculated. These errors correct for heteroskedasticity and autocorrelation. The *SDOC* remains significant at the 1% level. There are 1,456,050 firm-month observations. Relatively low Adj R^2 values are conventional for the cross-section of *individual* U.S. stock returns.

Table 4. SDOC 1st and 4th quartiles and operating leverage statistics from July 1967 to December 2023.

	SDOC 1st Quartile	SDOC 4th Quartile
Mean	1.2842	1.0241
STD	0.8510	0.8449
Skewness	2.3775	2.8864

This table depicts the descriptive statistics of the operating leverage (Novy-Marx 2011) for the 1st and 4th quartiles of the *SDOC*. The *SDOC is the* standard deviation of the operating cost, where COGS + XSGA is employed in the natural logarithm.

Robustness Tests: Out-of-Sample Tests and GMM

Regarding the issue of robustness, this study also analyzes the effect of the *SDOC* in an out-of-sample test. The full dataset of 1,456,050 firm-month observations is split randomly into two equal datasets of 728,025 in-sample observations and 728,025 out-of-sample observations. The random seed selected by the computer is 443,543,000. All the results remain significant at the 1% level for the in-sample dataset (Table 5). Then, the model from the in-sample regression is run on the out-of-sample dataset. The average difference between the predicted and actual returns is less than 3.21 basis points, and the difference and percentage change are both insignificant at the 5% level. The standard error is only 1.86 basis points. For further robustness, a generalized method of moments—GMM regression—is employed on the full dataset (Hansen 1982) (Jegadeesh et al. 2019). For over-identification, the previous two years' *SDOC* is added as an instrument. The results remain significant at the 1% significance level. (Table 6).

Table 5. In-sample results for out-of-sample testing: mean estimated coefficients (t-statistics) from July 1967 to December 2023.

SDOC	Size	BM	R(0,1)	R(2,12)	LN(Age)
−0.5851 ***	−0.1019 ***	0.2704 ***	−0.0503 ***	0.0038 ***	0.1080
(−3.90)	(−3.00)	(5.05)	(−13.36)	(2.63)	(0.92)

This table depicts the mean estimated coefficients (t-statistics) from month-by-month regressions of returns on *size*, *book-to-market*, *SDOC*, and past performance. The *SDOC is the* standard deviation of the operating cost, where COGS + XSGA is employed in the natural logarithm. *Book-to-market* is the book equity at the end of a fiscal year (CEQ + TXDB), divided by the market equity at the end of December. The market equity at the end of December is the product of the number of shares outstanding and the price of a single share. This measure is taken in the natural logarithm. *Size* or market capitalization (also ME) is the number of shares outstanding multiplied by the price of a single share at the end of June of each year. This measure is taken in the natural logarithm. To mitigate the impact of outliers, observations above the 99.5% percentile are set to the 99.5% value. Similarly, observations below the bottom 0.5% percentile are set to the 0.5% value. *Past performance* is measured for the previous month and for the 12 months prior to the previous month. LN(Age) is the natural logarithm of the firm's age in years. *** represents significance level of 1%. There are 728,025 firm-month observations in the in-sample dataset. The random seed selected by the computer is 443,543,000.

Table 6. GMM method: mean estimated coefficients (t-statistics) from July 1968 to December 2023.

SDOC	Size	BM	R(0,1)	R(2,12)	LN(Age)
−0.6289 ***	−0.0920 ***	0.2470 ***	−0.0501 ***	0.0031 **	0.1549
(−4.41)	(−2.81)	(5.01)	(−13.92)	(2.22)	(1.11)

This table depicts the mean estimated coefficients (t-statistics) from month-by-month regressions of returns on *size*, *book-to-market*, *SDOC*, and past performance. The GMM methodology was employed. For over-identification, the previous two years' *SDOC* is added as an instrument. The *SDOC is the* standard deviation of the operating cost, where COGS + XSGA is employed in the natural logarithm. *Book-to-market* is the book equity at the end of a fiscal year (CEQ + TXDB), divided by the market equity at the end of December. The market equity at the end of December is the product of the number of shares outstanding and the price of a single share. This measure is taken in the natural logarithm. *Size* or market capitalization (also ME) is the number of shares outstanding multiplied by the price of a single share at the end of June of each year. This measure is taken in the natural logarithm. To mitigate the impact of outliers, observations above the 99.5% percentile are set to the 99.5% value. Similarly, observations below the bottom 0.5% percentile are set to the 0.5% value. *Past performance* is measured for the previous month and for the 12 months prior to the previous month. LN(Age) is the natural logarithm of the firm's age in years. There are 1,330,161 firm-month observations. ** and *** represent significance levels of 5%, and 1%, respectively.

5. Conclusions

This study offers a new cause of risk, linked to the operating costs. The standard deviation of the operating cost (*SDOC*) is examined for the first time and is found to have a negative significant effect on the cross-section of U.S. stock returns. A lower *SDOC* implies inflexible operating costs that manifest a higher risk and, subsequently, higher expected stock returns. The effect is both statistically and economically significant. A 1 standard deviation decrease in the *SDOC* explains an average increase of 2.0538% in the annual returns. *SDOC*'s statistical and economic impacts on stock returns are uniquely stronger than those of the operating leverage, which clarifies the contribution of the new measure. Both out-of-sample tests and GMM estimation are performed. The findings are robust for both. This study is one step in the ongoing effort to explore different mechanisms that affect stock returns. The elusiveness of finding a way to explain stock returns will undoubtedly continue to intrigue researchers and practitioners alike.

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