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Is it risky to make the world a better place: A study on the association between Environmental, Social, and Governance (ESG) operational risk management and market derived volatilities

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by Kelly L. Johnson

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PUBLIC PRESENTATION

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Abstract

Investors and firms are increasingly concerned with their Environmental, Social and Governance (ESG) risk exposures. Awareness of firms' ESG policies by investors has grown substantially over the past five years. This growth led to the creation of company ratings for ESG operational risk exposure from third parties. We will analyze six years of ESG rankings, accounting and return data for S&P 500 firms and test whether ESG risk management ratings are associated with market derived measures of risk.

Purpose

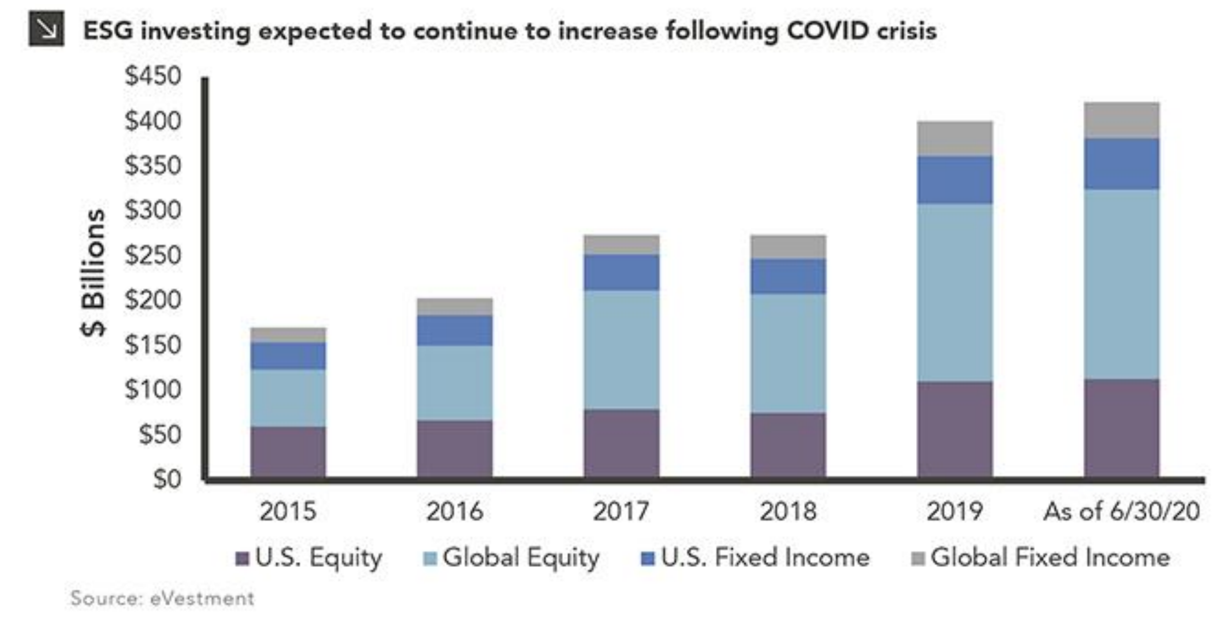
Environmental, social and governance (ESG) investing emerged from Socially Responsible Investing (SRI). Today, ESG investing is used synonymously with Sustainable Investing, Socially Responsible Investing, and Mission Related Investing. ESG investing is the consideration of both financial and ESG related factors when making an investment decision (MSCI, 2020). ESG related factors are a broad umbrella term used to describe a company's environmental, social, and/or governance risk exposure. Environmental factors relate to a company's resource use and the direct and indirect effect of their operations on the environment (S&P, 2019). Social factors that are considered in sustainable investments are how a company deals with social trends, labor, and politics (S&P, 2019). Governance factors refer to decision making policies and the distributions of rights and responsibilities among corporation participants (S&P, 2020). Some ESG focused risk concerns for a company are waste management, diversity efforts, board composition, and political contributions. Companies with good ESG initiatives are gaining popularity as people are continuing to align their investments with their values.

The alignment of investments with personal values is not a new development and can be traced back to religious groups. For example, Muslims developed investments that complied with Islamic laws and Quakers would not profit from the slave trade. The next development of SRI is the avoidance of investment in "sin industries", such as tobacco and liquor (Liu, 2020). SRI continued to expand with the emergence of activism, specifically during the Vietnam War. Individuals who were part of the anti-war movement were against investments supporting the production of Napalm (Liu, 2020). Thus, in the 1970's sustainable investing started to incorporate religious beliefs, ethics, and morals.

Figure 1:	*History of ESG investing up to 2011. Demonstrates how ESG investments are becoming more mainstream (Liu, 2020) and (Styrmoe, 2020)*						
1756	**1872**	**1968**	**1971**	**1984**	**2004**	**2006**	**2011**
Quakers forbade members from profiting on the slave trade	Sermon introduces idea of "sin stocks"	Vietnam War: Shareholders pressure companies to stop aiding production of Napalm	Pax World launches Pax Sustainable Allocation Fund (PAXWX)	U.S. Sustainable Investment Forum is founded	"Who Cares Wins" Report by Global Compact	United Nations' Principle of Responsible Investing is launched	Sustainability Accounting Standards Board formed
First time Socially Responsible is used in investing context	*Religious belief alignment with investment becomes more mainstream*	*First non-religious SRI instance*	*First sustainable mutual fund*	*US effort to shift of investments practices toward sustainability*	*First recommendation on incorporation of ESG issues into financial analysis*	*Global effort to encourage SRI development*	*Establish industry specific standards for corporate ESG issue reporting*

Figure 1 shows a timeline of important events that has aided in the expansion of ESG investing. In the past two decades, ESG investing has become more mainstreamed with mutual funds, global initiatives, and accounting reporting guidelines for investors and companies to utilize.

<u>*Figure 2:*</u>	*A chart from Marquette Associates, displaying ESG investment in billions by different security types from 2015 to June 2020 (Hernandez, 2020).*



ESG investing increased substantially over the past five years. "Since 2015, there has been a 147.5% increase in Assets Under Management (AUM) for ESG-mandated funds, specifically looking at U.S. Equity, U.S. Fixed Income, Global Equity, and Global Fixed Income" (Hernandez, 2020). *Figure 2* illustrates the global increase of investments in ESG focused securities. What is driving this recent increase in ESG related AUM? The demand for sustainable investments is driven, in part, by the millennial generation as stated in a 2019 report (Seelan, 2019). Millennials, individuals who are 24 to 39 years old in 2020, favor investments that align with their personal values. Morgan Stanley conducted a Sustainable Investing study in 2019 and found that 95% of millennial investors are interested in ESG investment options, a 9 percentage point increase from their 2017 study (Morgan, 2019). This shows that there has been an increased preference of ESG investments in recent years. Over the next several decades, there will be approximately a $30 trillion wealth transfer from the baby boomer generation (the wealthiest generation) to the children and grandchildren, which includes the millennial generation (Bank, 2017). This wealth transfer, in combination with the sustainable investing preference, is expanding the growth of ESG investing.

The expansion of ESG investing has brought forth research about the benefits and drawbacks of the consideration of ESG metrics in investments. Specifically, a focus on ESG operational risk management's impact on company performance. Operational risk is the risk of loss from inadequate internal processses, systems, people, or from external events (Basel, 2001). We investigate the association between ESG operational risk management and a company's stock performance, specifically market derived risks. The market derived risks we investigate are idiosyncratic volatility and systematic volatility. Idiosyncratic volatility, or firm specific risk, is the change in value of an asset due to company specific factors, such as an oil spill decreasing a stock's price (Corporate, 2020). Systematic volatility, or market risk, is the change in value of an asset due to an instance that has an effect on the entire market, such as COVID-19's impact on the stock market (Corporate, 2020). Intutition and previous studies imply that companies that manage their ESG risk exposure well tend to have less firm specific and market risk. It is logical to assume that a company's investment into carbon emissions management, diversity programs, and preventative corruption policies would be associated with a reduction in market derived volatilities. Additionally, previous studies have demonstrated that a company's favorable ESG policies tend to have lower market derived volatilities. For example, Becchetti (2015) shows that ESG investing reduces idiosyncratic risk exposure. Becchetti uses firms from 1992 to 2010 and explores the connection between corporate social responsibility and idiosyncratic risk exposure. Nofsinger and Varma (2014) find that ESG funds outperform conventional funds during crisis periods. In our study, we test how ESG operational risk management ratings are associated with market derived measures of risk, using a fixed effects regression for S&P 500 firms from 2015 to 2020.

Data

We use daily holding period returns, $R_{i,t}$, from CRSP for S&P 500 companies from 2015 to 2020. The S&P 500 stocks at the end of the last trading day of December in year *t-1* are used for year *t*, this data is gathered from Bloomberg. The update of S&P 500 stocks each year is done to provide a more holistic overview of the universe by combatting survivorship bias. The daily risk free rate ($R_{f,t}$), excess market return ($MKTRF_t$), SMB_t, HML_t, and UMB_t factors are gathered from CRSP. For each of these daily returns the excess returns, $Ret_{i,t}$, is calculated using *Eq1* .

Eq1
$$Ret_{i,t} = R_{i,t} - R_{f,t}$$

Additionally, we use an ESG risk ratings produced by Sustainalytics, pulled from Bloomberg. Sustainalytics is a major producer of ESG and Corporate Governance research and ratings. In 2020, they were honored as the Best Sustainable & ESG Research & Ratings Provider by Investment Week, a UK news and analysis service (Sustainalytics, 2021). Sustainalytics ESG risk ratings are calculated by analyzing a company’s unmanaged ESG operational risk exposure and their total ESG risk exposure. Specifically, Sustainalytics gains an understanding of a company's operational risk exposure by considering its corporate governance, material ESG, and idiosyncratic issues exposure. Sustainalytics defines corporate governance exposures as ESG risks that apply to all companies by industry. Material ESG issues, the core of its methodology, are exposures determined on the subindustry level. Idiosyncratic ESG issues capture the risk that are not directly related to the industry or subindustry (Sustainalytics, 2021). We use Sustainalytics rankings for stock *i* in year *t* that follow this methodology for ESG ($ESG_{i,t}$), Environmental ($ENV_{i,t}$), Social ($SOC_{i,t}$), and Governance ($GOV_{i,t}$). Collectively, we refer to these rankings for firm *i* in year *t* as $SUST\_M_{i,t} \in \{ESG_{i,t}\ , ENV_{i,t}\ , SOC_{i,t}\ , GOV_{i,t}\ \}$. These rankings indicate a company's $SUST\_M_{i,t}$ operational risk relative to its peers. The total percentile ranks assigned are on a scale from 0 to 100. For each company the lower the ranking the greater the unmanaged $SUST\_M_{i,t}$ risk exposure, and the higher the ranking the less unmanaged $SUST\_M_{i,t}$ risk exposure. The $SUST\_M_{i,t}$ rankings are typically updated annually. If a company has more than one ranking in a year the first available ranking, $SUST\_M_{i,t}$ is used .

Eq2 $$BE_{i,t} = BVPS_{i,t} * CSHO_{i,t}$$

Eq3 $$BEME_{i,t} = \frac{BE_{i,t}}{ME_{i,t}}$$

Eq4 $$LEV_{i,t} = 1 + \frac{LTDebt_{i,t}}{TA_{i,t}}$$

Additionally, yearly accounting data is gathered from CRSP/Compustat merged. These accounting metrics are Book Value per Share ($BVPS_{i,t}$), Common Shares Outstanding ($CSHO_{i,t}$), Market Equity ($ME_{i,t}$), Long Term Debt ($LTDebt_{i,t}$), and Total Assets ($TA_{i,t}$). This accounting data is used to calculate yearly; Book Equity ($BE_{i,t}$), *Eq2*, Book to Market Value

($BEME_{i,t}$), *Eq3*, and Leverage ($LEV_{i,t}$), *Eq4*. Also, Age ($AGE_{i,t}$) is calculated as the difference between the first month and year each stock has return data in CRSP and the observations month and year for each stock *i*. Following Fama and French (1993), for $TA_{i,t}$, $ME_{i,t}$, $BEME_{i,t}$, $LEV_{i,t}$, and $Age_{i,t}$ if these observations are after June of year *t,* they are used for year *t+1*. For observations before and in June in year *t*, they are used for year *t*. For our study, $TA_{i,t}$, $ME_{i,t}$, $BEME_{i,t}$, $LEV_{i,t}$, and $AGE_{i,t}$ are lagged. Therefore, the observations in June or before for year *t-2* are used for *t-1* and the observations after June of year *t-2* are used for year *t*.

Market and Idiosyncratic Volatility

For each stock, monthly idiosyncratic and systematic volatility is calculated using a four factor model, *Eq5*. This four factor model uses Fama and French (1992) factors ($MKTRF_t$,

Eq5 $$\widehat{Ret_{i,t}} = a_i + \beta_{i,1}(MKTRF_t) + \beta_{i,2}SMB_t + \beta_{i,3}HML_t + \beta_{i,4}UMD_t + \varepsilon_{it}$$

SMB_t, HML_t) augmented by a momentum factor (UMD_t), in the spirit of Carhart's (1997). The four factor model incorporates factor portfolios that proxy risk exposure to a given return characteristic. Specifically, the size, value, and momentum effect. SMB_t is the proxy for the size effect, which is low market capitalization stocks tend to outperform high capitalization stocks. HML_t, is the proxy for the value effect, which is high book to market valued stocks tend to outperform low book to market stocks (Fama, 1992). Lastly, UMD_t is the proxy for the momentum effect, which is stocks that tend to perform well in the past continue to perform well (Carhart, 1997). The addition of these factors allows us to appropriately distinguish between idiosyncratic and systematic components. Therefore, our four factor model adequately captures and effectively models the systematic factors that drive the returns.

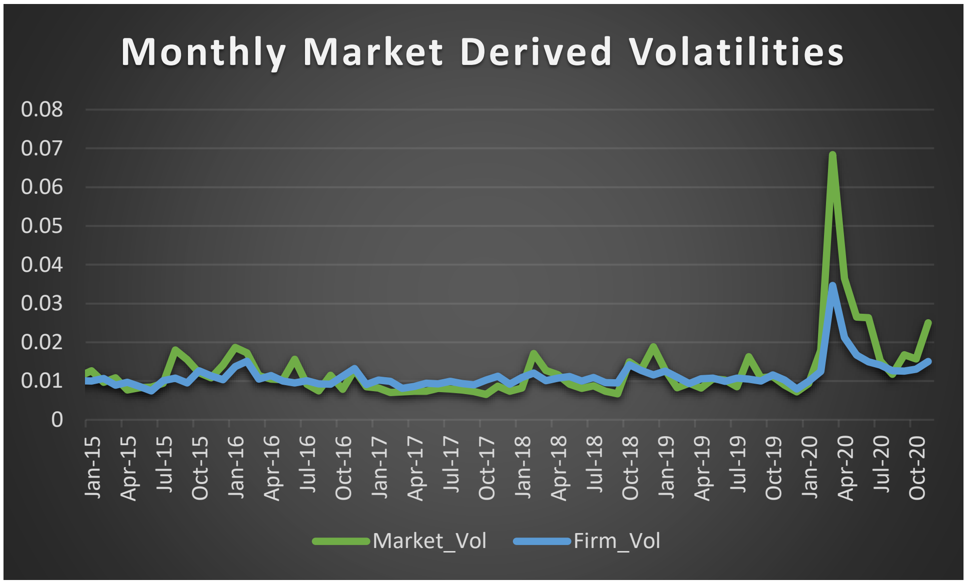
We calculate the monthly idiosyncratic volatility, $Firm\_Vol_{i,t}$, as the standard deviation of the residuals, ε_{it}. For systematic volatility, $Market\_Vol_{i,t}$, a variance decomposition, *Eq6,* is used. This is calculated by taking the standard deviation of the predicted values, $\sigma_{\widehat{Ret_{i,t}}}$.

Eq6 $$Market\_Vol_{i,t} = \sigma_{\widehat{Ret_{i,t}}} = \sqrt{\sum_{n=1}^{4} \beta_{i,n}{}^{2}\, \sigma_{i,n}^{2} + \sum_{m=1}^{4}\sum_{n=1}^{4} \beta_{i,n}\, \beta_{i,m}\, cov(n,m)}$$

Figure 3 provides descriptive statistics for the variables used in the fixed effects regressions. *Figure 4* is a graph of the monthly calculated idiosyncratic and systematic volatilities.

<u>*Figure 3:*</u>	*Descriptive statistic for systematic volatility, Market_Vol, idiosyncratic volatility Firm_Vol, Sustainalytics ESG ranking, Sust_Rank, Environmental ranking, Sust_Env, Social ranking, Sust_Soc, Governance ranking, Sust_Gov, natural log of total assets, lnTA, natural log of market equity, lnME, natural log of book to market value, lnBEME, natural log of leverage, lnLev and the companies Age, Age. The means, standard deviation, minimum value, maximum value, and count are reported.*				
	MEAN	***STD***	***MIN***	***MAX***	***N***
Market_Vol	0.0124	0.0106	0.0001	0.1436	27,702
Firm_Vol	0.0112	0.0074	0.0004	0.2214	27,702
Sust_Rank	52.3210	25.4339	0.893	100	27,702
Sust_Env	49.2216	27.8199	0.4425	100	27,702
Sust_Soc	50.3288	26.8052	0.3460	100	27,702
Sust_Gov	57.7694	24.2003	1.0870	100	27,702
lnTA	9.8941	1.3320	6.4080	14.7606	27,702
lnME	9.8775	1.0538	5.1568	13.1831	27,702
lnBEME	-1.1587	0.8612	-7.2254	1.8568	27,702
lnLev	0.2102	0.1197	0.0000	0.9306	27,702
Age	36.8559	24.4107	0.0833	93	27,702

Figure 4: *Calculated monthly idiosyncratic and systematic volatilities*



Fixed Effects Regressions

Next, we conduct fixed effects regressions to determine if *SUST_M* ratings have a significant impact on market derived volatilities. We know that each firm has unobservable characteristics that can be correlated with the regression residuals and can lead to biased parameter estimates. A fixed effects regression controls for these unobservable firm level characteristics, combatting omitted variable bias (Torres, 2007).

The fixed effects regressions we use are shown in *Eq7* and *Eq8*. Collectively, the volatility metrics are referred to as $VOL_{i,t} \in \{Market\_Vol_{i,t},\ Firm\_Vol_{i,t}\}$, where $VOL_{i,t}$ is the systematic or idiosyncratic volatility of stock *i* at month *t*.

Eq7 $$VOL_{i,t} = \alpha + \beta_{i,vol} VOL_{i,t-1} + \beta_{i,D} SUST\_MD_{i,t-1} + \varepsilon_{i,t}$$

Eq8 $$VOL_{i,t} = \alpha + \beta_{i,vol} VOL_{i,t-1} + \beta_{i,D} SUST\_MD_{i,t-1} + \Psi + \varepsilon_{i,t}$$

Eq9 $$\Psi = \beta_{i,1}\, ln(TA_{i,t-1}) + \beta_{i,2}\, ln(ME_{i,t-1}) + \beta_{i,3} ln(BEME_{i,t-1}) + \beta_{i,4} ln(LEV_{i,t-1}) + \beta_{i,3} ln(AGE_{i,t-1})$$

Dummy variables are made for $SUST\_M_{i,t}$ rankings each year. If the $SUST\_M_{i,t}$ ranking is greater than or equal to 50, good operational $SUST\_M_{i,t}$ management, then the dummy variable is set to 1. If the $SUST\_MD_{i,t}$ ranking is less than 50, poor operational $SUST\_M_{i,t}$ management, then the dummy variable is set to 0. Jointly the $SUST\_M_{i,t}$ rankings dummy variables are referred to as $SUST\_MD_{i,t} \in \{ESG\_D_{i,t},\ ENV\_D_{i,t},\ SOC\_D_{i,t},\ GOV\_D_{i,t}\}$, where $ESG\_D_{i,t}$, $ENV\_D_{i,t}$, $SOC\_D_{i,t}$, and $GOV\_D_{i,t}$ are the dummy variables for ESG (as a whole), environmental, social and governance rankings for stock *i* in year *t*. *Figure 5* shows a breakdown of the dummy variables for the sample.

Figure 5:	*Count of dummy variables and their percentage of total observation*			
	ESG	**ENV**	**SOC**	**GOV**
N	27,702	27,702	27,702	27,702
Good Operational Risk Management (1)	15,072	13,820	14,452	17,144
	54.41%	*49.89%*	*52.17%*	*61.89%*
Bad Operational Risk Management (0)	12,630	13,882	13,250	10,558
	45.59%	*50.11%*	*47.83%*	*38.11%*

The controls (Ψ) , *Eq9*, we use in our fixed effects regression are the natural logarithm of Total Assets ($ln(TA_{i,t-1})$), the natural logarithm of Market Equity ($ln(ME_{i,t-1})$), the natural logarithm of Book to Market Ratio ($ln(BEME_{i,t-1})$), the natural logarithm of Leverage, ($ln\left(LEV_{i,t-1}\right)$), and Age ($Age_{i,t-1}$). These controls were chosen to aid in the explanation of market derived volatility. Cooper (2007) found that stocks experience lower returns after a period with high asset growth. Fama and French (1992) conclude that market equity and book to market equity provide an explanation of average stock returns. Black (1976) notes that a negative return increases a firms leverage and thus leads to higher volatility. Fink (2010) demonstrates that the idiosyncratic risk during the internet boom is driven by age characteristics. Also, Total Assets and Market Equity can proxy the size of a firm and encompass the size effect. Additionally, Book to Market ratio can represent the value of the firm to proxy the value effect. Therefore, total assets, market equity, book to market value, leverage, and age were added as controls to aid in the explanation of idiosyncratic and systematic volatility.

Correlations

Fixed Effects regressions aid in omitted variable bias, for those variables correlated with our independent variable. Therefore, a correlation between *Market_Vol, Firm_Vol, Sust_Rank, Sust_Env*, *Sust_Soc*, *Sust_Gov*, *lnTA*, *lnME*, *lnBEME*, *lnLev*, and *Age*, is shown in *Figure 6*. The *SUST_M* rankings are not very highly correlated with the controls that we use to test the association of *SUST_M* operational risk management with market derived volatilities. Thus, it is logical to add these controls, under the fixed effects regression. If the controls were left out, this could lead to biased beta estimates.

Results

Figure 7 and *Figure 8* display the results from the systematic volatility and idiosyncratic volatiltiy uncontrolled and controlled fixed effects regressions.

Figure 6: *Correlations for systematic volatility, Market_Vol, idiosyncratic volatility Firm_Vol, Sustainalytics ESG ranking, Sust_Rank, Environmental ranking, Sust_Env, Social ranking, Sust_Soc, Governance ranking, Sust_Gov, natural log of total assets, lnTA, , natural log of market equity, lnME, , natural log of book to market value, lnBEME, , natural log of leverage, lnLev and the companies Age, Age are reported.*

	Market_Vol	***Firm_Vol***	***Sust_Rank***	***Sust_Env***	***Sust_Soc***	***Sust_Gov***	***lnTA***	***lnME***	***lnBEME***	***Leverage***	***Age***
Market_Vol	1										
Firm_Vol	0.5096	1									
Sust_Rank	-0.0411	-0.0732	1								
Sust_Env	-0.0538	-0.0984	0.8689	1							
Sust_Soc	-0.0106	-0.0327	0.8403	0.5914	1						
Sust_Gov	-0.0440	-0.0171	0.6229	0.4092	0.4406	1					
lnTA	-0.0409	-0.2040	0.2157	0.2213	0.1788	0.0655	1				
lnME	-0.1535	-0.2435	0.3238	0.3243	0.2864	0.1279	0.6604	1			
lnBEME	0.1451	0.0501	-0.0682	-0.0765	-0.0387	-0.0887	0.4401	-0.1837	1		
lnLev	-0.1159	0.0792	-0.0229	-0.0353	-0.0303	0.0836	-0.0994	-0.1028	-0.1828	1	
Age	-0.1058	-0.1052	0.1479	0.1260	0.1548	0.1015	0.1918	0.1358	0.0984	-0.0436	1

Figure 7:	*Fixed Effects regression results for the systematic volatility regressions. The italicized number are t-statistics.* ***Note:*** *SUST_MD estimates are multiplied by 10,000*							
	ESG		**ENV**		**SOC**		**GOV**	
N	27,702	27,702	27,702	27,702	27,702	27,702	27,702	27,702
R^2	0.3174	0.3266	0.3174	0.3265	0.3173	0.3266	0.3174	0.3265
Intercept	0.0056	0.0134	0.0056	0.0133	0.0055	0.0134	0.0056	0.0132
	54.0830	*23.5521*	*55.5961*	*23.4330*	*54.4485*	*23.6664*	*51.4610*	*23.5076*
Market_Vol	0.5778	0.5574	0.5777	0.5576	0.5781	0.5572	0.5778	0.5576
	113.3370	*107.7534*	*113.2902*	*107.7957*	*113.4293*	*107.6788*	*113.3313*	*107.8145*
SUST_MD	-2.7515	2.4307	-3.0708	1.7045	-1.3741	3.1221	-3.1227	-0.2064
	-2.5243	*2.1396*	*-2.8277*	*1.5121*	*-1.2647*	*2.7778*	*-2.7935*	*-0.1835*
lnTA		0.0004		0.0004		0.0004		0.0004
		4.3670		*4.3015*		*4.4393*		*4.3404*
lnME		-0.0010		-0.0010		-0.0010		-0.0010
		-10.0351		*-9.9355*		*-10.1481*		*-9.8119*
lnBEME		0.0003		0.0003		0.0003		0.0003
		3.2887		*3.3355*		*3.1754*		*3.2639*
lnLev		-0.0029		-0.0029		-0.0029		-0.0029
		-6.0982		*-6.0689*		*-6.1114*		*-6.0555*
Age		0.0000		0.0000		0.0000		0.0000
		-4.4268		*-4.2828*		*-4.4489*		*-4.1984*

Figure 8:	*Fixed Effects regression results for the idiosyncratic volatility regressions. The italicized number are t-statistics.* ***Note:*** *SUST_MD estimates are multiplied by 10,000*							
	ESG		**ENV**		**SOC**		**GOV**	
N	27,702	27,702	27,702	27,702	27,702	27,702	27,702	27,702
R^2	0.1649	0.1858	0.1656	0.1856	0.1644	0.1860	0.1643	0.1856
Intercept	0.0070	0.0167	0.0070	0.0165	0.0069	0.0167	0.0068	0.0165
	78.4192	*37.9357*	*80.6656*	*37.5739*	*78.8360*	*38.1648*	*74.3453*	*37.9919*
Firm_Vol	0.4074	0.3726	0.4062	0.3729	0.4083	0.3721	0.4085	0.3729
	73.4658	*66.1927*	*73.2103*	*66.2465*	*73.6713*	*66.0805*	*73.6956*	*66.2465*
SUST_MD	-4.0810	2.1722	-5.7366	0.3414	-2.3956	3.2452	-1.8625	0.1825
	-4.9239	*2.5313*	*-6.9447*	*0.4009*	*-2.9006*	*3.8223*	*-2.1925*	*0.2148*
lnTA		-0.0005		-0.0005		-0.0005		-0.0005
		-8.2411		*-8.2749*		*-8.1406*		*-8.2692*
lnME		-0.0004		-0.0004		-0.0004		-0.0004
		-5.3626		*-5.0477*		*-5.5962*		*-5.0413*
lnBEME		0.0007		0.0007		0.0007		0.0007
		8.9491		*8.9363*		*8.8007*		*8.9293*
lnLev		0.0023		0.0023		0.0023		0.0023
		6.2262		*6.2328*		*6.2179*		*6.1891*
Age		0.0000		0.0000		0.0000		0.0000
		-4.3235		*-4.0962*		*-4.3937*		*-4.0877*

Systematic Volatility

For systematic volatiltiy, in the uncontrolled model for ESG, ENV, SOC and GOV, the parameters for $SUST\_MD_{i,t}$ are significant at the 5% level, except $SOC\_D_{i,t}$. This means that there is a significant difference between the systematic volatilities of firms that have good and poor operational $ESG_{i,t}$, $ENV_{i,t}$, and $GOV_{i,t}$ risk management. What is interesting, is that the significant paramerter estimates are less than 0. This implies, that on average, firms with good $ESG_{i,t}$, $ENV_{i,t}$, or $GOV_{i,t}$, opretational risk management tend to have less systematic volatility than those with poor operational $ESG_{i,t}$, $ENV_{i,t}$, or $GOV_{i,t}$ risk management. For the uncontrolled model firms with good $ESG_{i,t}$, $ENV_{i,t}$, or $GOV_{i,t}$ operational risk management are associated with a -2.21% , -2.47%, and -2.51%, move in systematic volatility relative to the mean, respectively. When the controls were added, we can see all R^2 values increased. This means the addition of the controls allow a better explanation of systematic volatility. When we properly measure market risk we see different results. $ESG\_D_{i,t}$, $ENV\_D_{i,t}$, $SOC\_D_{i,t}$, and $GOV\_D_{i,t}$ have t-statistics of 2.139, 1.512, 2.777, and -.1835 respectively. Therefore, $ENV\_D_{i,t}$ and $GOV\_D_{i,t}$ are not significant at the 5% level. The controls that were added absorbed the relationship between systematic volatility $ENV_{i,t}$ or $GOV_{i,t}$ with market risk. On the other hand, $ESG\_D_{i,t}$ and $SOC\_D_{i,t}$ are significant at the 5% level. This means there is a significant difference in market risk for good and bad operational $ESG_{i,t}$ or $SOC_{i,t}$ risk management firms. Firms with good $ESG_{i,t}$ operational risk managemnet are associated with a 1.95% move in systematic volatility relative to the mean and tend to have more market risk then those with poor operational risk management. Firms with good $SOC_{i,t}$ operational risk management are associated to have a 2.508% move in systematic volaility realtive to mean.

Similarly to ESG, this is an increase in market risk. It is interesting that when we control for other known market volatility factors, that the relationship between $SUST\_M_{i,t}$ and market risk is either absorbed or associated with a small increase in volatility.

Idiosyncratic Volatility

For idiosyncratic volatility, in the uncontrolled model for ESG, ENV, SOC, and GOV the parameter for all dummy variables $SUST\_MD_{i,t}$ are significant at a 5% level. This means there is a significant difference between the idiosyncratic volatilities of firms that have good and poor operational $SUST\_M_{i,t}$ risk management. Also, all of the parameter estimates are negative, implying firms with good operational $SUST\_M_{i,t}$ risk management tend to have less idiosyncratic volatility than those with poor operational $SUST\_M_{i,t}$ risk management. For the uncontrolled model firms with good $ESG_{i,t}$, $ENV_{i,t}$, $SOC_{i,t}$, and $GOV_{i,t}$ operational risk management are associated with a -3.63% , -5.107%, -2.133%, and -1.658% move in firm specific risk, respectively. Additionally, when the controls were added we can see all R^2 values increased, creating a better explanation of idiosyncratic volatility. When we properly measure idiosyncratic volatility with controls, we see different results. $ESG\_D_{i,t}$, $ENV\_D_{i,t}$, $SOC\_D_{i,t}$, and $GOV\_D_{i,t}$ have t-statistics of 2.531, .400, 3.822, and .2148, respectively. Therefore, $ENV\_D_{i,t}$ and $GOV\_D_{i,t}$ are not significant at the 5% level. This is due to the absorption of the idiosyncratic volatility by the factors added. Additionally, $ESG\_D_{i,t}$ and $SOC\_D_{i,t}$ are significant at the 5% level. Therefore, there exists a significant difference in firm specific risk for firms with good and poor $ESG_{i,t}$ and $SOC_{i,t}$ operational risk management. Similarly to systematic volatility, both parameter estimates are positive. Therfore, $ESG_{i,t}$ and $SOC_{i,t}$ are associated with a 1.934% and 2.889% move in idiosyncratic volatility, respectively. When other known volatility factors are added, the relationship between $SUST\_M_{i,t}$ and idiosyncratic volatility is absorbed or associated with a small increase in volatility.

Analysis

We can see that for both properly modeled idiosyncratic and systematic volatility that firms with good operational $ESG_{i,t}$ or $SOC_{i,t}$ risk management are associated with higher market derived volatility. We do not know exactly the reason for this relation. However, one possible explanation is the implementation of beneficial ESG operational policies can be expensive and tends to lead to companies having less resources available to combat market and firm specific risks. Another option to consider is that the ESG scores can be biased. The American Council for Capital Formation found that companies with higher market capitalizations tend to have better ESG rating than lower market capitalization companies (Doyle, 2018). Our sample consists of S&P 500 companies, which are firms with the highest market capitalizations that are publicly traded in the United States (Corporate, 2020). Therefore, this bias, if true, would tend to lead to higher ratings for our sample. This misperception can lead to more volatility, which can be attributed to the misinformed investors realizing that the firm does not have the perceived ESG benefits. Lastly, the companies unaudited disclosures of ESG data can be associated with an increased market derived volatility. A component of ESG ratings is companies’ disclosure of their ESG data. However, there is no audit process for ESG disclosures, so investors and third party ESG raters rely on company transparency, and accurate statements of disclosures (Doyle, 2018). This creates a temptation for a company to understate their ESG risk which will produce a more favorable view by the public and a better ESG rating. Therefore, this misleads investors and can be associated with higher volatility. The association of higher idiosyncratic and systematic volatility with good $ESG_{i,t}$ or $SOC_{i,t}$ operational risk ratings can be due to cost to implement ESG policies, large market capitalization bias, and/or the unaudited ESG disclosures.

Conclusion

Environmental Social and Governance (ESG) investing has grown exponentially in recent years. These investments are projected to continue to grow as the wealth transfer to the millenial generation continues. Intuition and previous studies have implied that having good ESG operational risk management would lead to a reduction in market derived volatility. We conducted an uncontrolled and controlled fixed effects regressions for market derived volailities and $SUST\_M_{i,t}$ rankings. The controls added relate to a firms size, value, leverage, and age, which are known to affect market derived volaitilites. We found that when properly measuring $SUST\_M_{i,t}$ operational risk management, the reduction in systematic and idiosyncratic volatility is absorbed by the controls for envirornmental and governance operational risk mangement. Additionally, we found that there tends to be an increase in market derived volatility when there is good ESG or social operational risk mangement. Some possible explanations for this increase in volatility are the cost to implement ESG policies, large market capitalization bias, and/or the unaudited ESG disclosures. It would be interesting to investigate if size diversification or industry of firms impact the envirornmental, social and/or governance association with market derived volatilities. Futhermore, if this increase in volatility for good ESG and social operational risk management would be similar with international stocks.

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