

A CSR Asset Pricing Model

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Motivation

- We propose to study the Efficient Market Hypothesis (EMH) regarding extra-financial rating
- Our objective is to make a link between two well-documented fields in finance : Corporate Social Performance and Asset Pricing Models
- We explore a new issue related to the consideration of financial markets for extra-financial rating

Contribution

- We reveal a risk premium associated to extra-financial rating priced by the market : a new risk factor (BMG)
- We propose a parsimonious model including two factors that outperforms existing asset pricing models in the description of CSR rated european firms

Literature on Asset Pricing Models, Anomalies and Risk Factors

- Markowitz (1952) : mean-variance framework
- Sharpe (1964), Lintner (1965), Mossin (1966) and Black (1972)
CAPM :

$$E[r_i] = r_f + \beta_i(E[r_M] - r_f) \quad (1)$$

An abnormal return is a significant and positive return left unexplained by the CAPM:

$$r_{i_t} - r_{f_t} = (\alpha_i > 0) + \beta_i(r_{M_t} - r_{f_t}) + \epsilon_{i_t} \quad (2)$$

Literature on Asset Pricing Models, Anomalies and Risk Factors

- **The CAPM:** Sharpe (1964), Lintner (1965), Mossin (1966) and Black (1972)
- **The size effect:** Banz (1981), Schwert (1983), Hawawini and Keim (2000), Horowitz et al. (2001), Hou and Van Dijk (2010), Ghandi and Lustig (2015)
- **The value effect:** Basu (1977), Reinganum (1981), Rosenberg, Reid and Lanstein (1985)
- **Equity premium puzzle:** Mehra and Prescott (1985)
- **Fama-French 3-factor model** (1993)
- **The momentum effect:** Jegadeesh and Titman (1993)

Literature on Asset Pricing Models, Anomalies and Risk Factors

- **The 4-factor model:** Carhart (1997)
- **Global vs. regional models:** Fama and French (2012)
- **Quality minus Junk factor:** Asness *et al.* (2014)
- **The profitability effect:** Novy-Marx (2012), Hou *et al.* (2014)
- **The investment effect:** Baker and Wurgler (2002), Cooper *et al.* (2008), Watanabe *et al.* (2013)
- **The 5-factor model:** Fama and French (2015)

Literature on CSR and Financial Performance

• Positive relation

- Waddock and Graves (1997): lower implicit costs by socially irresponsible actions induce higher explicit costs for the firm
- Holme and Watts (2000): CSR contributes to the long-term growth and success of the company
- Jo and Harjoto (2012): Corporate governance increases firm value

• Negative relation

- Vance (1975): CSR expenses induce a competitive disadvantage that negatively impact stock returns
- Brammer et al. (2005) : composite CSR score is negatively related to stock returns in the UK
- Bauer et al. (2002) : German and US ethical funds underperform their benchmark

• Neutral relation

- Becchetti et al. (2012) : CSR contributes to make financial markets efficient

Research question

- Risk premia are almost always associated to an accounting criteria (B/M, E/P, market caps etc.). Is the quality of extra-financial ratings integrated in market price? Should an investor see CSR score as a risk premium for firms weakly responsible?

European Database

- Asset class : Equity
- Frequency : Monthly stock returns
- Period: 2002-2015
- Market : Euronext stock exchange : 18 European countries
- Data provider : DATASTREAM
- Initial sample size: 12 144 individual stocks

- Asset 4 extra-financial scores are the CSR implication proxy
- Only firms with available extra-financial rating are maintained
- Financial firms and stocks with negative book-to-market ratio are excluded

- Final sample Asset4 rated firms: 1 310 individuals stocks

Dependant variables - European market

Panel A *Book-to-Market*

		<i>Book-to-Market</i>			
		Low 25%	2 25%	3 25%	High 25%
CSR score ↑	30% Good	G,L	G,2	G,3	G,H
	40% Neutral	N,L	N,2	N,3	N,H
	30% Bad	B,L	B,2	B,3	B,H

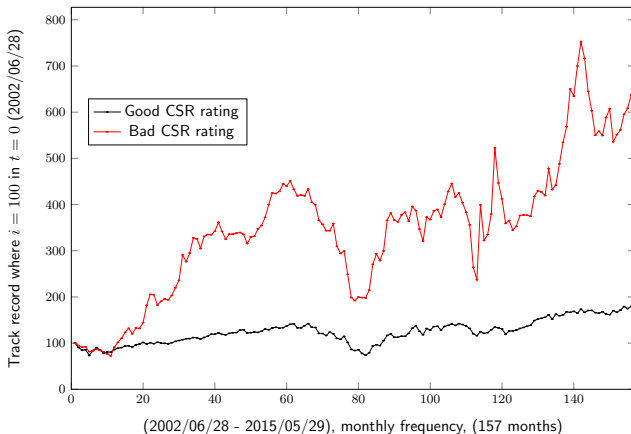
Panel B *Investment*

		<i>Investment</i>			
		Cons. 25%	2 25%	3 25%	Aggress. 25%
CSR score ↑	30% Good	G,C	G,2	G,3	G,A
	40% Neutral	N,C	N,2	N,3	N,A
	30% Bad	B,C	B,2	B,3	B,A

Panel C *Operating profitability*

		<i>Operating profitability</i>			
		Weak 25%	2 25%	3 25%	Robust 25%
CSR score ↑	30% Good	G,W	G,2	G,3	G,R
	40% Neutral	N,W	N,2	N,3	N,R
	30% Bad	B,W	B,2	B,3	B,R

Track record for portfolios with good and bad CSR stocks : June 2002 to May 2015



Explanatory variables

- Market premium ($R_M - R_f$)
- Small Minus Big (SMB) [Size]
- High Minus Low (HML) [Value]
- Winner Minus Loser (WML) [Momentum]
- Conservative Minus Aggressive (CMA) [Investment]
- Robust Minus Weak (RMW) [Op. profitability]
- Bad Minus Good (BMG) [Corporate Social Responsibility]

Except $r_M - r_f$, indep. var. are zero net investment portfolios.

Time series regressions: CAPM

		Panel A				Panel B				Panel C			
		Sharpe-Lintner-Black CAPM (1964)											
CSR score		<i>Book-to-market</i>				<i>Investment</i>				<i>Operating Profitability</i>			
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust			
Good		0,003	0,001	0,004	0,003	-0,002	0,000	-0,007	-0,002	0,002			
		1,45	0,31	0,75	1,05	-1,06	0,05	-1,25	-0,74	0,88			
Neutral		0,008 ***	-0,001	-0,006	0,006 **	0,001	-0,001	-0,008 *	0,001	0,005			
		3,18	-0,28	-1,24	2,00	0,17	-0,11	-1,69	0,35	1,44			
Bad		0,007	0,006	0,004	0,011 **	0,010 **	-0,004	0,002	0,005	0,007			
		1,31	1,16	0,38	2,20	2,42	-0,41	0,17	1,10	1,27			
		Market Premium											
CSR score		<i>Book-to-market</i>				<i>Investment</i>				<i>Operating Profitability</i>			
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust			
Good		0,476 ***	0,686 ***	0,811 ***	0,618 ***	0,658 ***	0,872 ***	1,030 ***	0,747 ***	0,520 ***			
		12,78	16,37	9,54	14,55	16,83	9,71	10,62	13,18	14,64			
Neutral		0,606 ***	0,882 ***	0,987 ***	0,762 ***	0,890 ***	0,923 ***	0,911 ***	0,754 ***	0,862 ***			
		13,89	16,61	11,18	13,92	15,29	11,52	11,52	16,02	14,27			
Bad		0,939 ***	0,833 ***	1,427 ***	0,784 ***	0,867 ***	1,516 ***	1,455 ***	0,821 ***	0,879 ***			
		9,45	9,02	7,74	9,35	12,38	8,08	7,42	9,45	9,67			

Student t test illustrated with stars (* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$)

Time series regressions: Lajili-Nasreddine-Desban model

		Panel A				Panel B				Panel C			
		<i>Book-to-market</i>				<i>Investment</i>				<i>Operating Profitability</i>			
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust	Neutral	Robust	
CSR score	Good	0,004 *	0,001	0,004	0,003	-0,002	0,001	-0,006	-0,002	0,002			
		1,87	0,54	0,77	1,18	-0,86	0,27	-1,01	-0,62	1,20			
	Neutral	0,008 ***	-0,001	-0,006	0,006 *	0,001	-0,001	-0,008 *	0,001	0,005			
	3,13	-0,30	-1,27	1,93	0,18	-0,23	-1,81	0,37	1,43				
	Bad	0,004	0,003	-0,005	0,007 *	0,008 **	-0,015 **	-0,008	0,002	0,004			
		0,72	0,60	-0,58	1,74	2,08	-2,11	-1,00	0,50	0,81			
Market Premium													
		<i>Book-to-market</i>				<i>Investment</i>				<i>Operating Profitability</i>			
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust	Neutral	Robust	
CSR score	Good	0,512 ***	0,711 ***	0,816 ***	0,633 ***	0,680 ***	0,925 ***	1,094 ***	0,765 ***	0,548 ***			
		13,69	16,47	9,18	14,35	16,86	10,00	11,00	12,98	15,16			
	Neutral	0,604 ***	0,879 ***	0,977 ***	0,755 ***	0,892 ***	0,896 ***	0,884 ***	0,758 ***	0,863 ***			
	13,26	15,86	10,60	13,22	14,66	10,76	10,76	15,41	13,68				
	Bad	0,755 ***	0,679 ***	1,015 ***	0,629 ***	0,788 ***	1,015 ***	0,979 ***	0,670 ***	0,756 ***			
		8,50	7,96	6,75	8,39	11,36	7,79	6,52	8,45	8,61			
Bad Minus Good													
		<i>Book-to-market</i>				<i>Investment</i>				<i>Operating Profitability</i>			
		Low	Neutral	High	Aggress.	Neutral	Cons.	Weak	Neutral	Robust	Neutral	Robust	
CSR score	Good	-0,088 ***	-0,060 **	-0,011	-0,037	-0,052 *	-0,128 **	-0,155 **	-0,044	-0,068 ***			
		-3,50	-2,07	-0,18	-1,25	-1,95	-2,07	-2,33	-1,11	-2,81			
	Neutral	0,005	0,008	0,023	0,017	-0,003	0,064	0,065	-0,008	-0,002			
	0,18	0,21	0,38	0,45	-0,09	1,15	1,18	-0,24	-0,05				
	Bad	0,442 ***	0,372 ***	0,994 ***	0,373 ***	0,191 ***	1,209 ***	1,148 ***	0,365 ***	0,296 ***			
		7,45	6,54	9,91	7,46	4,13	13,90	11,45	6,90	5,05			

Time Series Regression testing: GRS (1989)

- $r_t = (r_{1t}, \dots, r_{Nt})^\top : N \times 1$ is the vector of asset returns.
- $f_t = (f_{1t}, \dots, f_{Kt})^\top : K \times 1$ is the vector of common factor returns with $t = 1, \dots, T$
- We run TSR where $r_t = \alpha + \beta f_t + \epsilon_t$ with $\epsilon_t = (\epsilon_{1t}, \dots, \epsilon_{Nt})^\top \sim \text{i.i.d}$ $(0, \Sigma_\epsilon)$ is the zero-mean noise vector with $\Sigma_\epsilon : N \times N$ which is the positive definite error covariance matrix.
- $\Sigma_f : N \times N$ is the factor covariance matrix.
- We estimate OLS estimators $\hat{\alpha}, \hat{\beta}, \hat{\Sigma}_f, \hat{\Sigma}_\epsilon$ and make a null hypothesis where $H_0 : \alpha = 0$

$$GRS = \frac{T - N - K}{N} \times \left(1 + \widehat{\mu}_f^\top \widehat{\Omega}_f^{-1} \widehat{\mu}_f\right)^{-1} \times \left(\widehat{\alpha}^\top \widehat{\Sigma}_\epsilon^{-1} \widehat{\alpha}\right) \sim \mathcal{F}_{N, T-N-K} \quad (3)$$

- $\widehat{\mu}_f$ is the K -vector of sample mean of the explanatory variables.

GRS Results

	CAPM	FF3F	FFC4F	FF5F				LND2F		
$r_M - r_f$	X	X	X	X	X	X	X	X	X	X
<i>SMB</i>		X	X	X	X	X	X			
<i>HML</i>		X	X	X						X
<i>WML</i>			X			X			X	X
<i>RMW</i>				X	X					
<i>CMA</i>				X	X		X			
<i>BMG</i>						X	X	X	X	X
Panel A: CSR & B/M	2,091	2,656	2,124	2,99	2,542	1,628	2,439	1,984	1,559	1,886
Panel B: CSR & Invest.	1,986	1,824	2,256	2,199	2,108	2,189	1,624	1,881	2,176	2,072
Panel C: CSR & Op. prof.	1,391	1,64	1,839	2,058	1,67	1,596	1,695	1,191	1,621	1,844

Conclusions

- Firms socially less responsible can be assumed riskier but earn on avg. higher returns.
- Long-[short] strategies on socially non-responsible [responsible] securities have abnormal returns.
- The risk can be considered as multidimensional: extra-financial rating is priced by the market and constitutes a risk premium.
- A parsimonious model including 2 factors outperforms existing asset pricing models in the description of CSR rated firms on the European market.
- Risk premia do not have necessarily an accounting nature.

Extensions and futur research

- What about other extra-financial rating agencies ?
- What about firms without extra-financial rating ?
- What about US Market ?

**MANY THANKS
FOR YOUR
ATTENTION**

ANY QUESTIONS ?