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Factor Investing and ESG in the Corporate Bond Market Before and During the COVID-19 Crisis

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Factor Investing and ESG in the Corporate Bond Market Before and During the COVID-19 Crisis

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Abstract

The objective of this paper is to illustrate the factor investing space in corporate bonds before and during the COVID-19 crisis and is the natural extension of our prior analysis on both the new alternative credit factors and the ESG integration in credit.

We use monthly credit excess return in the EUR denominated Investment Grade bond universe for regression analysis and factor picking. ESG was making its way to becoming a mainstream factor within the Investment Grade universe and when the COVID-19 stress hit the financial markets, it displayed a "hedge-like" behavior. We had previously identified that better ESG and lower cost of capital were related, however the realization of this feature in a stress environment is worth investors' attention.

Keywords: Corporate bond, Factor investing , ESG, Covid-19

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Introduction

In our previous research - Ben Slimane *et al.* (2018) - we described the evolution of credit investing between traditional and new alternative factors. We have also identified subsequently in Ben Slimane et al. (2019) that ESG considerations had permeated from equities to credit and that ESG considerations were starting to impact the financing of corporates. In this context, we analyze how the traditional and new alternative factor mixed with ESG before the COVID-19 crisis. We then highlight the behavior of ESG during the COVID-19 crisis.

Pre Covid-19 mainstreaming of ESG

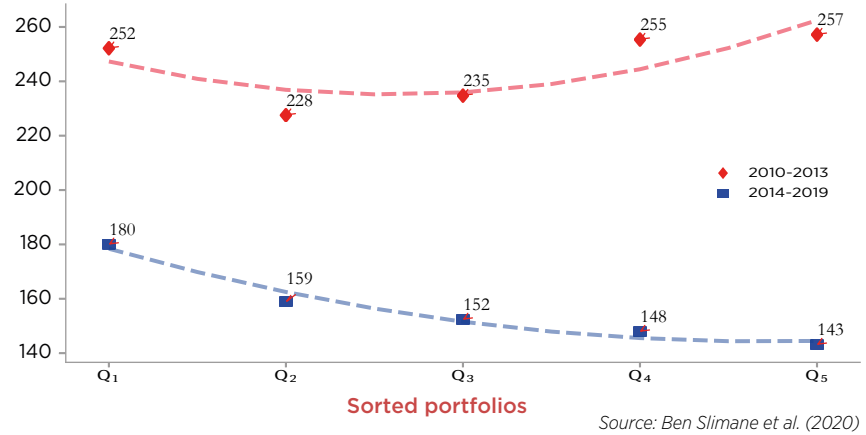
For Euro denominated investment grade bonds, we identified in Ben Slimane *et al.* (2018) that the market conditions changed after the 2008 financial crisis. In the period before the GFC from 2003 to 2008, the market is better explained with a set of traditional factors than with CAPM alone. The authors define their traditional bond risk factor model with duration-times-spread (DTS), duration and liquidity. In the period from 2009 to 2018 after the GFC, traditional factors in a multi-factor framework need to be augmented by new alternative factors to keep the multi-factor framework relevant against CAPM alone. Valuation, momentum, low risk and size were introduced. The payoffs of our implementations of valuation and momentum are also complementary which make these two factors attractive to on-board within a traditional and alternative multi-factor framework. Valuation in addition was already relevant in the USD denominated investment grade space before the GFC.

Separately, in Ben Slimane *et al.* (2019) we extend to corporate bonds the analysis of ESG in the asset pricing. ESG scores here refer to the proprietary scores generated by the ESG rating process of Amundi. The score combines multiple generalist and sector specific vendor data and is enhanced by internal sector reviews, engagement and thematic research by Amundi's ESG research desk. Owing to the commitment of Amundi to ESG since its foundation in 2010, the score has the point-in-time feature, which makes it representative of ESG status of issuers as it could be analyzed since 2010. Bennani *et al.* (2018) indicate that for Equities, sorted quintile portfolios[1] along ESG exposure displayed a U-shape in their returns before 2014 while transforming to a L-shape after 2014. This quantified improvement in ESG integration across regions at the exception of Japan is an indication that within the shareholder vs. stakeholder debate of Freidman and Freeman, the stakeholder theory is now better accepted by investors. On a mark-to-market basis as displayed in Figure 1, credit excess returns display after 2014 a positive relation to the ESG score of the issuers[2], while being indifferent between issuers with top ESG and bottom ESG scores before 2014.

[1] *The quintile portfolios are sector-neutral*

[2] *In the credit analysis, the quintile portfolios are also sector-neutral*

Chart # 1: Annualized credit return in bps of ESG sorted portfolios (EUR IG, 2010–2019)



Source: Ben Slimane et al. (2020)

We extend our prior regression analysis from Ben Slimane *et al.* (2018) to identify how ESG fits within a multi-factor framework. We start with all bonds denominated in EUR from the ICE[3] BofAML Large Cap (Investment Grade) Corporate Bond Index on a monthly basis. The duration, DTS and liquidity risk factor returns $R^I(t), R^S(t), R^L(t)$, are extracted thanks to the known factor loadings (modified duration, DTS, liquidity-time-price[4] respectively) and total return of bonds with a Fama-Macbeth procedure on the cross-section of the ICE BofAML Large Cap Investment Grade Corporate Bond index universe.

We then analyze the traditional risk factor model against the bond market credit excess return, which is our CAPM model. $R_i(t)$ is the credit excess return.

Equation 1: CAPM

$$R_i(t) = \alpha_i^C + \beta_i^{MKT} \cdot R^{MKT}(t) + \varepsilon_i^C(t)$$

For the traditional model, we use the previously extracted $R^I(t), R^S(t), R^L(t)$ risk factor returns.

[3] *Source ICE Data Indices, LLC ("ICE DATA"), is used with permission. ICE DATA, its affiliates and their respective third-party suppliers disclaim any and all warranties and representations, express and/or implied, including any warranties of merchantability or fitness for a particular purpose or use, including the indices, index data and any data included in, related to, or derived therefrom. Neither ICE DATA, its affiliates nor their respective third-party suppliers shall be subject to any damages or liability with respect to the adequacy, accuracy, timeliness or completeness of the indices or the index data or any component thereof, and the indices and index data and all components thereof are provided on an "as is" basis and your use is at your own risk. ICE DATA, its affiliates and their respective third-party suppliers do not sponsor, endorse, or recommend AMUNDI, or any of its products or services.*

[4] *Liquidity scores are described in Ben Slimane and De Jong (2017).*

Equation 2: Traditional factor model

$$R_i\ (t) = \alpha_i^T - \beta_i^{MD} \cdot R^I\ (t) - \beta_i^{DTS} \cdot R^S\ (t) + \beta_i^{LTP} \cdot R^L\ (t) + \varepsilon_i^T(t)$$

For the five-factor model, we introduce $F^{HML}(t), F^{WML}(t)$ which are the time-series of long short factor returns for the value and momentum factors as defined in Ben Slimane *et al.* (2018). In our value approach, we define the cheapness of bonds as the residual of the cross-sectional regression of option-adjusted spreads in logarithms over bond characteristics (in numerical values and dummy variables for similarity categories). Our momentum score is based on six-month trailing bond returns measured over the seven to first month prior to the calculation date, therefore excluding the eventual short-lived reversal effect. We add $F^{SMB}(t)$ for size in the six-factor model with the total debt value of the issuer.

Equation 3: Five-factor model

$$R_i\ (t) = \alpha_i^F - \beta_i^{MD} \cdot R^I\ (t) - \beta_i^{DTS} \cdot R^S\ (t) + \beta_i^{LTP} \cdot R^L\ (t) + \beta_i^{HML} \cdot F^{HML}(t) + \beta_i^{WML} \cdot F^{WML}(t) + \varepsilon_i^F(t)$$

We add $F^{SMB}(t)$ for size in the six-factor model .

Equation 4: Six-factor model

$$R_i\ (t) = \alpha_i^{SX} - \beta_i^{MD} \cdot R^I\ (t) - \beta_i^{DTS} \cdot R^S\ (t) + \beta_i^{LTP} \cdot R^L\ (t) + \beta_i^{SMB} \cdot F^{SMB}(t) + \beta_i^{HML} \cdot F^{HML}(t) + \beta_i^{WML} \cdot F^{WML}(t) + \varepsilon_i^F(t)$$

The $F^{ESG}(t)$ long short factor return for ESG is built from the ESG scores following the alternative factor approach described in Ben Slimane *et al.* (2018). We propose the "five-factor + ESG" and "six-factor + ESG" regression models.

Equation 5: Five-factor + ESG model

$$R_i\ (t) = \alpha_i^{F+ESG} - \beta_i^{MD} \cdot R^I\ (t) - \beta_i^{DTS} \cdot R^S\ (t) + \beta_i^{LTP} \cdot R^L\ (t) + \beta_i^{HML} \cdot F^{HML}(t) + \beta_i^{WML} \cdot F^{WML}(t) + \beta_i^{ESG} \cdot F^{ESG}(t) + \varepsilon_i^{F+ESG}(t)$$

Equation 6: Six-factor + ESG model

$$R_i\ (t) = \alpha_i^{SX+ESG} - \beta_i^{MD} \cdot R^I\ (t) - \beta_i^{DTS} \cdot R^S\ (t) + \beta_i^{LTP} \cdot R^L\ (t) + \beta_i^{SMB} \cdot F^{SMB}(t) + \beta_i^{HML} \cdot F^{HML}(t) + \beta_i^{WML} \cdot F^{WML}(t) + \beta_i^{ESG} \cdot F^{ESG}(t) + \varepsilon_i^{SX+ESG}(t)$$

With our regression results in Table 1 we confirm that in the periods 2010-2013 and 2014-2020 (end of February or end of June or end of July) the traditional factor model has less explanatory power than a simple CAPM. This validates our search for additional alternative factors. The VIF however indicates collinearity within exogenous variables (O'Brien, 2007). For the 2009-2018 period, we had accepted the five-factor model's VIF of 8.43 as reasonable for the collinearity within factors.

Table # 1: regression results for CAPM, traditional factors, traditional factors augmented by alternative factors and ESG								
	2010-2013		2014-2020/02		2014-2020/06		2014-2020/07	
Regression Model	Average R2 (%)	VIF	Average R2 (%)	VIF	Average R2 (%)	VIF	Average R2 (%)	VIF
CAPM	62.27		64.63		69.67		69.89	
TRAD	56.14	3.95	57.26	1.58	65.59	1.42	65.96	1.42
5F	67.07	17.44	62.28	12.58	72.16	14.50	72.35	14.41
6F	69.87	30.79	65.47	14.97	75.15	17.16	75.32	16.50
5F+ESG	68.78	22.47	64.16	14.71	73.55	18.85	73.74	17.58
6F+ESG	71.67	43.23	67.38	20.43	76.53	28.42	76.70	28.24

Source: ICE BoA Merrill Lynch Euro Large Cap Corporate Bond Index. Authors' calculations

After the COVID-19 related stress has started to recede in the credit market, we see that within the "five-factor + ESG" multi-factor model, collinearities have started to decreased (for the 2014-2020/07 period). As we are concerned by these collinearities within factors during the COVID-19 related market environment, we engage in a factor picking exercise. With a Least Absolute Shrinkage and Selection Operator (LASSO) analysis method introduced by Tibshirani (1996) which is a penalized regression approach, we seek the priority order in which we would choose factors to explain the market.

Table 2 shows that for the 2014 to 2020/02 period, the most relevant explanatory component is DTS, which often remain synonymous with "credit market beta" for practitioners. The alternative factor value is picked second and interestingly ESG is picked third. The period is of importance as we have identified that ESG integration in asset pricing has been increasing since 2014 both for equities and credit.

Table # 2: Factor-Picking order							
period	DTS	Dur.	Liq.	Value	Mom.	Size	ESG
2014 - 2020/01	1	5	4	2	7	6	3
2014 - 2020/02	1	5	4	2	7	6	3
2014 - 2020/03	2	4	3	1	5	6	7
2014 - 2020/04	2	5	4	1	6	3	7
2014 - 2020/05	2	5	4	1	6	3	7
2014 - 2020/06	2	5	4	1	6	3	7
2014 - 2020/07	2	5	4	1	6	3	7

Source: ICE BoA Merrill Lynch Euro Large Cap Corporate Bond Index. Authors' calculations

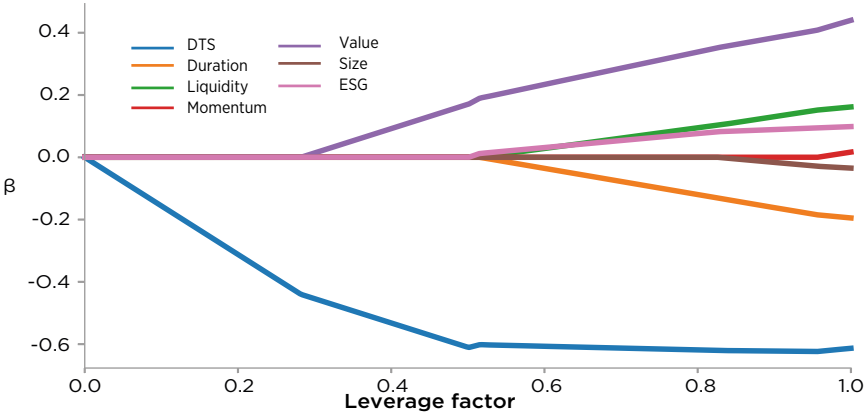
Table # 3: VIF evolution with the inclusion of the 2nd, 3rd, 5th, 6th and 7th variables							
period	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2014-2020/01		3.67	4.61	5.20	6.04	6.07	6.53
2014-2020/02		3.65	4.53	5.18	6.07	6.14	6.53
2014-2020/03		4.74	5.06	5.82	5.82	6.40	10.79
2014-2020/04		3.46	4.01	4.24	5.07	5.13	11.77
2014-2020/05		3.39	3.85	4.08	4.88	4.95	11.47
2014-2020/06		3.41	3.76	3.91	4.87	5.00	11.14
2014-2020/07		3.40	3.74	3.89	4.88	5.02	11.19

Source: ICE BoA Merrill Lynch Euro Large Cap Corporate Bond Index. Authors' calculations

Benefit of ESG during the Covid-19 period

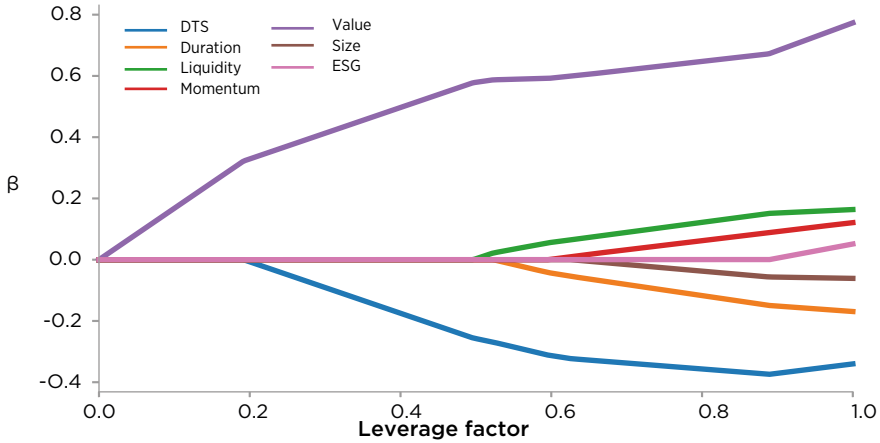
It is striking in Table 2 that with the addition of a single monthly data point, the factor picking exercise produces a significantly different ranking for ESG. This is a token of the magnitude of the march 2020 month in the World with the expansion of the COVID-19 pandemic and also in the credit market. Prior to march 2020, we could argue that ESG was pushing itself within the mix of the main factors explaining the credit market. Indeed, the "five-factor + ESG" regression model was better than a traditional model in terms of explanatory power. Relative to the previous 2010-2013 period, the VIF also in Table 2 signals a much-decreased collinearity within this model. As for factor picking, ESG was captured third after DTS and Value. This signaled to active managers who function in a low factor-intensity framework that ESG was getting close to DTS and value in significance for their investment process.

Chart # 2: LASSO regression analysis for 2014 - 2020/02



Source: ICE BoA Merrill Lynch Euro Large Cap Corporate Bond Index. Authors' calculations

Chart # 3: LASSO regression analysis for 2014 - 2020/03



Source: ICE BoA Merrill Lynch Euro Large Cap Corporate Bond Index. Authors' calculations

Figure 2 and 3 illustrate the change of ranking for ESG in the LASSO factor picking analysis before and after including March 2020 in the observation period. Looking closer to the monthly returns in Table 4, we can identify that the ESG long short return showed a solid positive return in the month where the credit market was hit the hardest by the global financial stress and the increase in expected unemployment rate related to the COVID-19 pandemic before central banks' intervention on the credit market.

Table # 4: Monthly factor long short returns and benchmark excess return

Date	Benchmark Excess Return	DTS	Dur.	Liq.	Value	Mom.	Size	ESG
2019/09	0,05	-0,06	0,27	0,03	0,48	-0,02	0,06	-0,14
2019/10	0,65	-0,03	0,10	0,04	0,27	-0,11	-0,14	0,01
2019/11	0,07	0,00	0,10	0,10	0,11	0,10	0,17	-0,02
2019/12	0,65	-0,13	0,22	0,01	0,47	0,33	-0,06	-0,11
2020/01	0,07	0,02	-0,36	-0,05	0,23	-0,03	0,20	-0,08
2020/02	*-1,05*	*0,17*	*-0,15*	*0,13*	*-0,44*	*0,17*	*0,37*	*0,13*
2020/03	*-5,95*	*0,56*	*-0,26*	*0,04*	*-4,16*	*0,06*	*0,30*	*1,27*
2020/04	3,24	-0,01	-0,70	0,04	2,05	-2,08	-2,10	-0,54
2020/05	0,90	-0,03	0,12	0,04	0,88	-0,71	0,15	-0,24
2020/06	1,04	-0,12	-0,07	-0,09	1,22	-1,60	0,44	-0,13
2020/07	1,22	-0,05	-0,18	0,02	0,65	-0,54	-0,22	-0,18

Source: ICE BoA Merrill Lynch Euro Large Cap Corporate Bond Index. Authors' calculations

Our interpretation is that in the highest market stress environment, investors chose to stick to their positively scored ESG issuers. We have previously demonstrated in Ben Slimane *et al.* (2019) that ESG has a positive impact on the cost of debt and

that this relation had strengthened after 2014. We estimated a 31bp difference in cost of capital between an ESG worst in class corporate and an ESG best-in-class corporate. In a stressed environment where the access to capital had become key to the going-concern of corporates, it is therefore rational that investors have favored higher scored ESG companies versus lower scored ESG companies. Amiraslani *et al.* (2017) have also showed the positive effects of high corporate social responsibility for better access to capital after the GFC shock.

As Figure 4 illustrates, the ESG factor has shown a "hedge" behavior in the stressed market environment of March 2020. Table 3 specifically illustrates the increase in collinearity when the seventh factor (ESG) is picked in the months following February 2020. The VIF is calculated by regressing each selected predictor on all others that are selected.

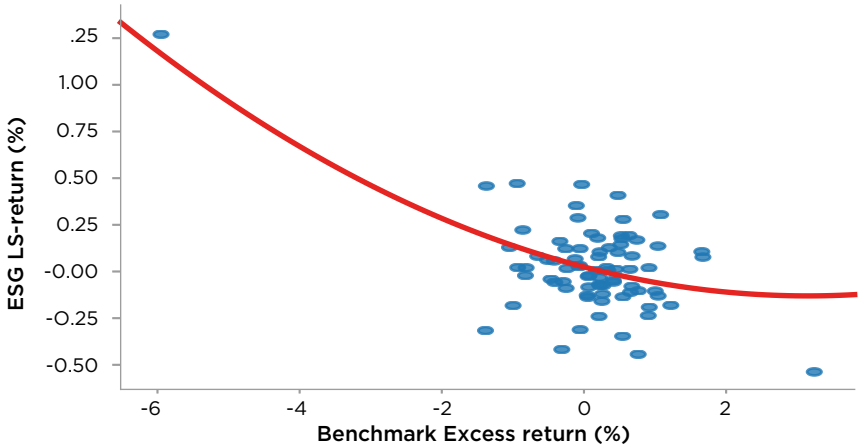
The ESG factor shows an interesting alternative pay-off pattern as illustrated in Figure 4. We must differentiate its behavior in a low volatile environment and during a deep crisis in the credit market as experienced after late February of 2020.

Then the ESG factor and the value factor set a good complementarity with a negative -69.6% correlation between their long short factor returns for the period 2014-2020-07. This feature is useful in a robust portfolio construction perspective based on alternative factors. See Ben Slimane *et al.* (2018) for the value factor pay-off analysis.

Further investigations could be performed to see the relative contributions of the three sub-components of the ESG score: Environment, Social & Governance. Particularly, the positioning of an issuer facing Environmental challenges could lead to significant discrepancies as the Euro denominated credit market has experienced a significant growth of the Green Bond market, which now constitutes for Investment Grade companies a relatively mature sub-segment. The Green Bonds will keep a strong visibility as the European Commission intends to use these instruments to "jumpstart a sustainable economic recovery"[5] and has launched in June 2020 a targeted consultation for an EU Green Bond Standard.

[5] *https://ec.europa.eu/commission/presscorner/detail/en/mex_20_1050*

Chart # 4: ESG long-short payoff function



Source: ICE BoA Merrill Lynch Euro Large Cap Corporate Bond Index. Authors' calculations

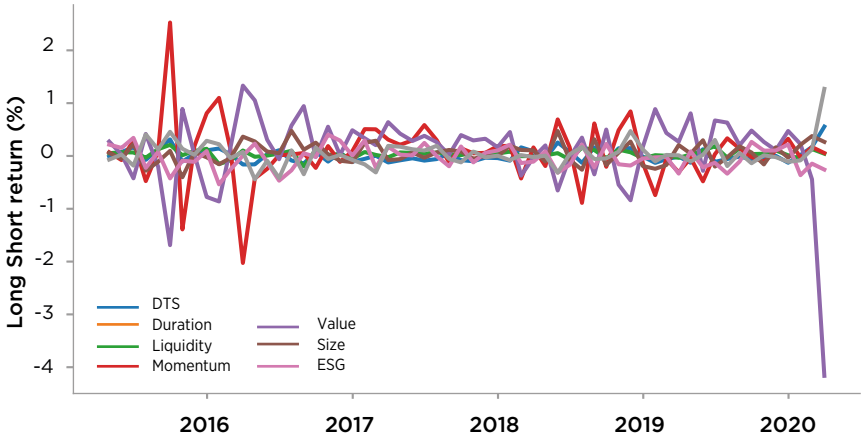
Conclusion

With our regression analysis on the credit excess returns in the Euro denominated Investment Grade space we identify that after 2014, ESG was mainstreaming itself within the main factors eligible for active management. When the COVID-19 crisis hit the credit market significantly in march of 2020, our factor-picking analysis indicate that ESG dipped in the ranking of factors explaining the market. However, ESG displayed a solid "hedge-like" feature, which is consistent with the concern of investors on corporates' capacity to access capital. We have previously demonstrated that the worse-to-better gap on the ESG score of issuers brought a difference in cost of capital. That concern became paramount between the moment when the financial market stress hit the credit market and central banks intervened to ease the default concerns. In addition to new alternative factors, the credit factor investment space needs to integrate ESG.

Going forward, we will study the green bond premium including its behavior during the COVID-19 crisis.

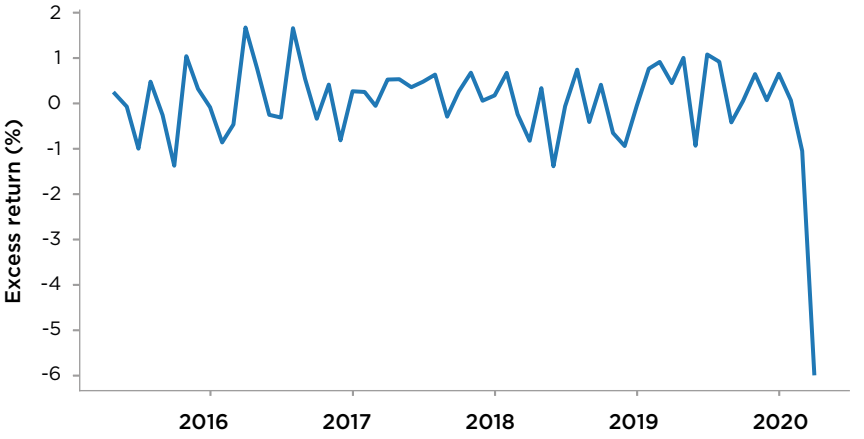
Appendix

Chart # 5: Monthly factor long short returns (5Y up to March 2020)



Source: ICE BoA Merrill Lynch Euro Large Cap Corporate Bond Index. Authors' calculations

Chart # 6: Monthly benchmark excess return (5Y up to March 2020)



Source: ICE BoA Merrill Lynch Euro Large Cap Corporate Bond Index. Authors' calculations

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