Chronicle of a Death Foretold: Does Higher Volatility Anticipate Corporate Default?

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Introduction

- **Motivation:** Academics and practitioners have developed several indicators in order to measure firms' financial fragility and forecast future corporate bankruptcies. However, many of these measures (such as Moody's widely used "Expected Default Frequencies" (EDFs)) are usually not easy to compute, partly because of their reliance on hard-to-obtain proprietary data underlying those variables.In this paper, we propose to use a simplified measure of default risk , called Distance to Insolvency (DI), to forecast corporate default and to gauge how the ECB's pandemic emergency purchase programme (PEPP) affected corporate defaults in the wake of the COVID-19 Pandemic.

- **Contributions:** At the granular level, the DI dominates the EDF when looking at two different forecasting horizons (3 and 12 monts) .This result is confirmed when looking at aggregate data, where the DI performs better than the EDF for predictive horizons beyond 3 months. Finally, we present a counterfactual exercise that considers the level at which corporate defaults in the euro area would have settled if the ECB had not implemented the pandemic emergency purchase programme (PEPP). We show that the ECB intervention reduced defaults during the crisis, relative to a counterfactual scenario of no policy intervention.

Data and Definitions

We proxy defaults through strongly negative equity returns (i.e. returns lower than minus 80%) over a 3 months horizon. Historically, such strong equity price declines have usually been associated with deep financial distress of the respective company, leading to a subsequent default. While this development does not necessarily imply that the firm has defaulted on its debt, it is a clear indication of the financial distress experienced around or ahead of a default event. We show 12 month trailing realised default rates and our default measures in Figure1 below. Figure 2 also shows that defaults tend to happen more frequently to firms that are smaller, less profitable, more leveraged and with lower Altman Z-scores.
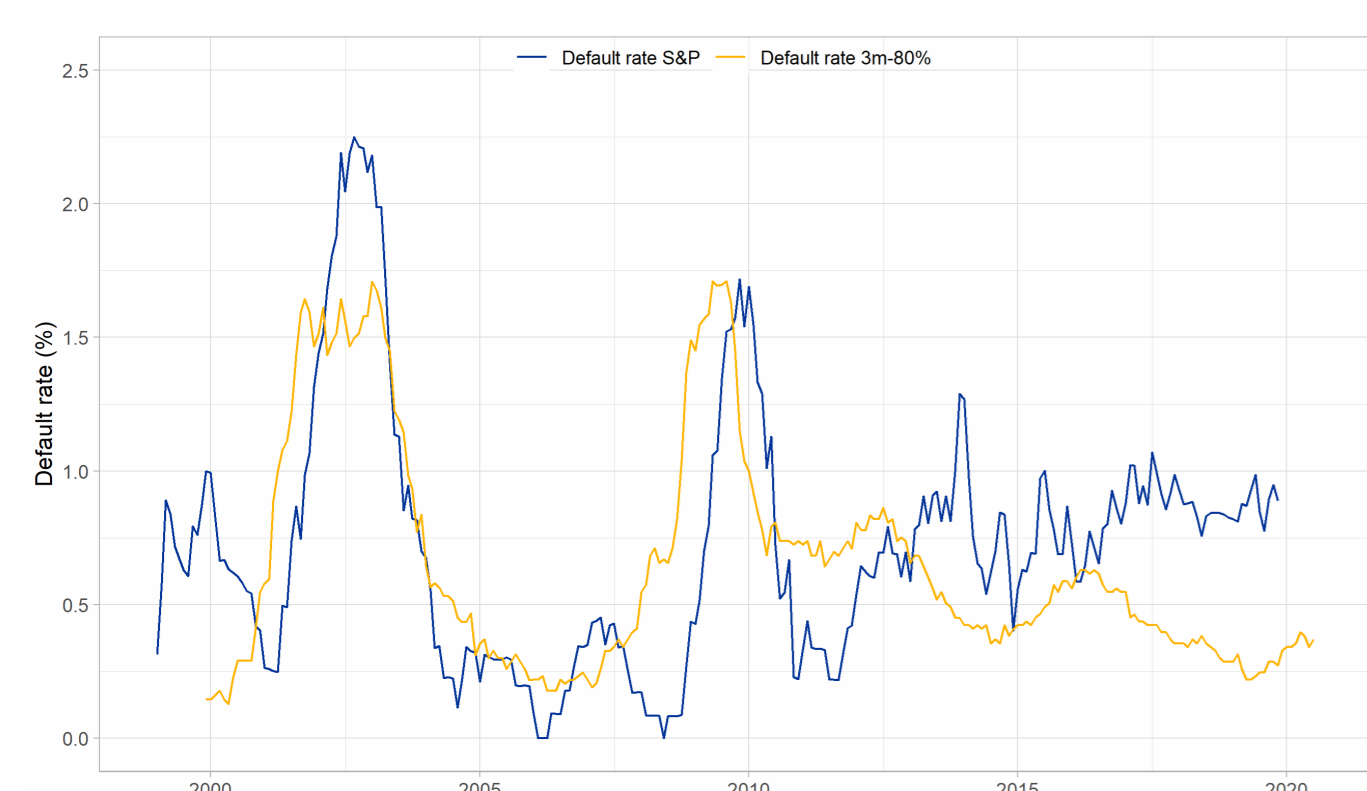

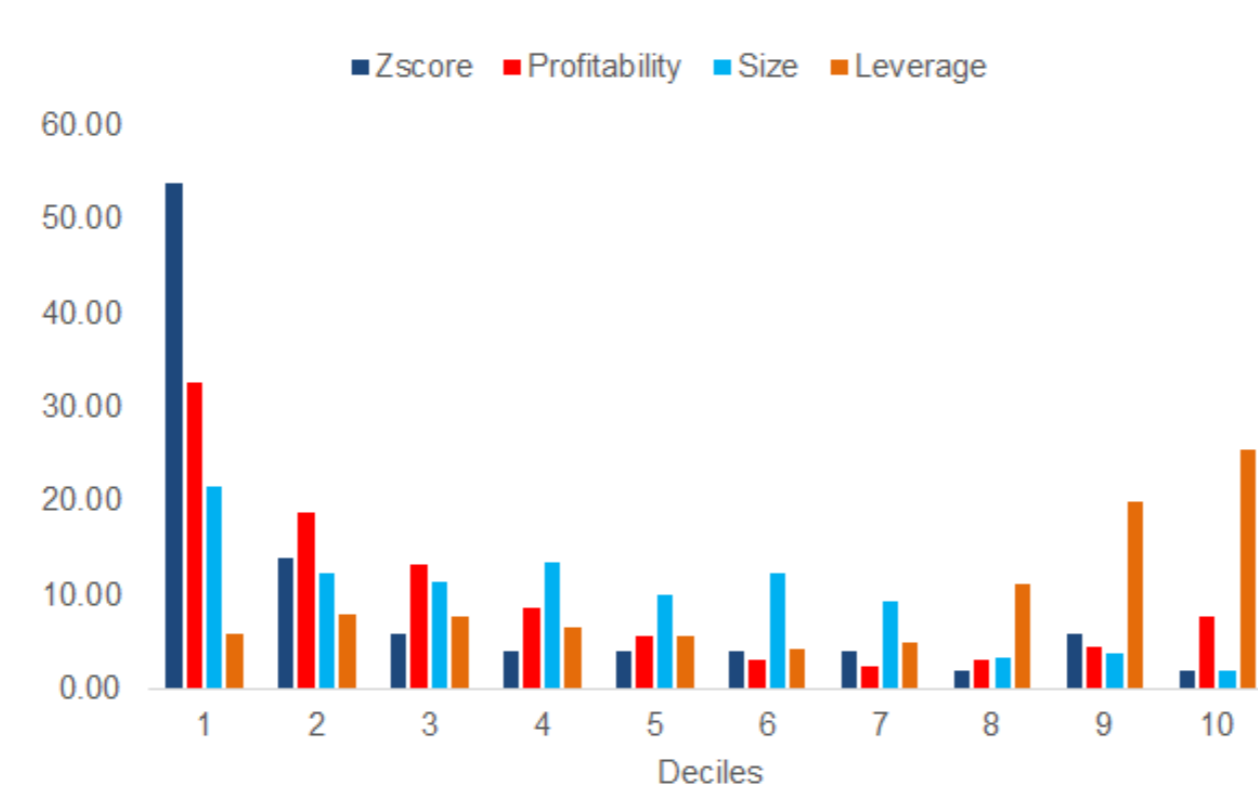**Figure 1:** Cumulative 12-month trailing default rates.

Figure 2: Observed defaults and firm characteristics.

Further, we construct the DI following [1], which shows that the inverse of equity volatility is an accurate measure of the DI if the DI is close to the Distance to Default. This provides a very simple measure of the DI, not subject to the inconsistencies of accounting data and independent of any ad-hoc assumptions. The sample period is 01-1999 to 06-2020 (monthly data). For ease of interpretation, we also transform the DI into a probability of default following the transformation applied in the Merton model.

Identification

We test the predictive ability of EDFs and DIs at two different horizons, 3 months and 12 months ahead. We employ two different models tol to assess if and to what extent EDFs and DIs are statistically relevant in explaining our proxy of corporate default. In this context, we will compare how the two predictors fare in relation to each other. At the granular level, we employ a Cox proportional hazard model, in line with the existing literature ([4], [3] and [2])

At the aggregate level, we include the median DI and EDF values for euro area firms into a monthly VAR together with the euro area industrial production index (IP), the VIX index, the corporate (BBB rating) bond spread for euro area NFCs and the default rate (DR) for euro area non-financial speculative grade corporations, as computed by Moody's. Our specification has six lags for the vector Y(t). We order the variables by the speed with which they react to the information flow, with the default rate being the slowest and the VIX being the fastest.

Results

At the granular level, we compare the performance of the EDF with our own DI measure in horse-race regressions, to check whether or not one of the measures dominates the other as a predictor of corporate defaults. The results are shown in Table1. Our simple DI measure dominates the EDF, both with and without controls. If we focus on the regressions where we do not employ any controls, an increase by 1 unit in the DI measure implies an increase in the probability of default by 15 and 14 percent at the 3- and 12-month horizon, respectively.

We also sort firms in EDF and DI deciles in Table 2. Then, we count the number of defaults that occur within each decile in the following 3 and 12 months, for each of the two indicators. the DI measure shows better results than the EDF at both horizons, which seems to confirm the in-sample results.

We also test the out-of-sample properties of our Cox model estimates in Table 2. We estimate the model recursively from December 2007 and then sort our firms into deciles according to their predicted hazard ratio. Next, we compute how many defaults happen at the 3 and 12-months horizon (outside our estimation window) for each decile of our predicted hazard ratio. Results show that the DI has a better out-of-sample predictive ability compared to the EDF.

Horse-Race Regressions

	DI	EDF	Mkt ret	3m yield	Corp. Spread	Vix	Size	Leverage	Mkt Cap
3M	**1.15**	1.006							
T-stat	[11.7]	[0.55]							
3M	**1.136**	0.97	**0.06**	**1.33**	1.006	0.98	0.87	1.83	1
T-stat	[5.71]	[-1.19]	[-2.0]	[2.79]	[1.10]	[-0.70]	[-1.48]	[0.88]	[-0.57]
12M	**1.14**	0.99							
T-stat	[10.03]	[-0.42]							
12M	**1.11**	1	**0.04**	**1.35**	1	0.99	**0.79**	2.2	0.99
T-stat	[3.90]	[0.13]	[-2.36]	[2.94]	[1.0]	[-0.22]	[-2.87]	[1.38]	[-0.56]

Figure 3: Horse-race Regressions of EDF and DI.

	3m		12m		3m		12m	
Decile	EDF	DI	EDF	DI	EDF model	DI model	EDF model	DI model
1	3.8	4.2	4.7	4.2	3.6	2.4	6.1	3.1
2	4.3	1.7	5.3	2.7	3.6	2.2	6.0	2.0
3	4.3	1.7	5.6	1.2	2.7	1.6	4.9	1.7
4	4.0	1.4	4.5	1.2	4.1	1.1	3.2	3.4
5	3.8	2.0	5.6	3.0	1.8	1.6	3.9	3.4
6	5.4	3.1	7.0	7.8	2.3	1.1	8.3	6.4
7	7.5	6.8	7.9	6.9	6.8	6.6	8.2	6.8
8	12.1	7.6	10.1	9.6	9.0	6.4	8.4	10.2
09-10	54.7	71.5	49.0	64.0	67.0	77.0	51.0	63.0

Figure 4: Defaults by EDF and DI decile and out-of-sample forecasts.

Focusing on the results from the VAR at the aggregate level, we show the response of the euro area default rates to the four financial shocks (i.e. a bond spread shock, DI, EDF and VIX shock) in Figure 3. The corporate bond spread and DI shocks have similar effects on the default rate. The resuls from the IRF confirm our findings at the granular level.

We use the VAR model described above to run a counterfactual exercise. We first translate the amount at disposal for PEPP purchases into a counterfactual 10-year interest rate and a counterfactual VIX value, and subsequently into a counterfactual DI value.The exercise is run up to July 2022 by computing counterfactual DI paths between August 2021 and July 2022 in the same way as was done before April 2020 and July 2021.

Figure 4 shows the actual default rate values up to July 2021 and its unconditional forecast from the VAR, alongside with the three counterfactual default rate paths. Overall, if PEPP-related purchases would have not been implemented at all, default rates would have peaked at around 7 percent instead of the realised 5 percent. The other two counterfactual paths lie between the no-PEPP case and the actual default rate and overall show that all decisions taken by the Eurosystem to step up the PEPP did contribute to alleviate the financial shock on euro area non-financial firms.
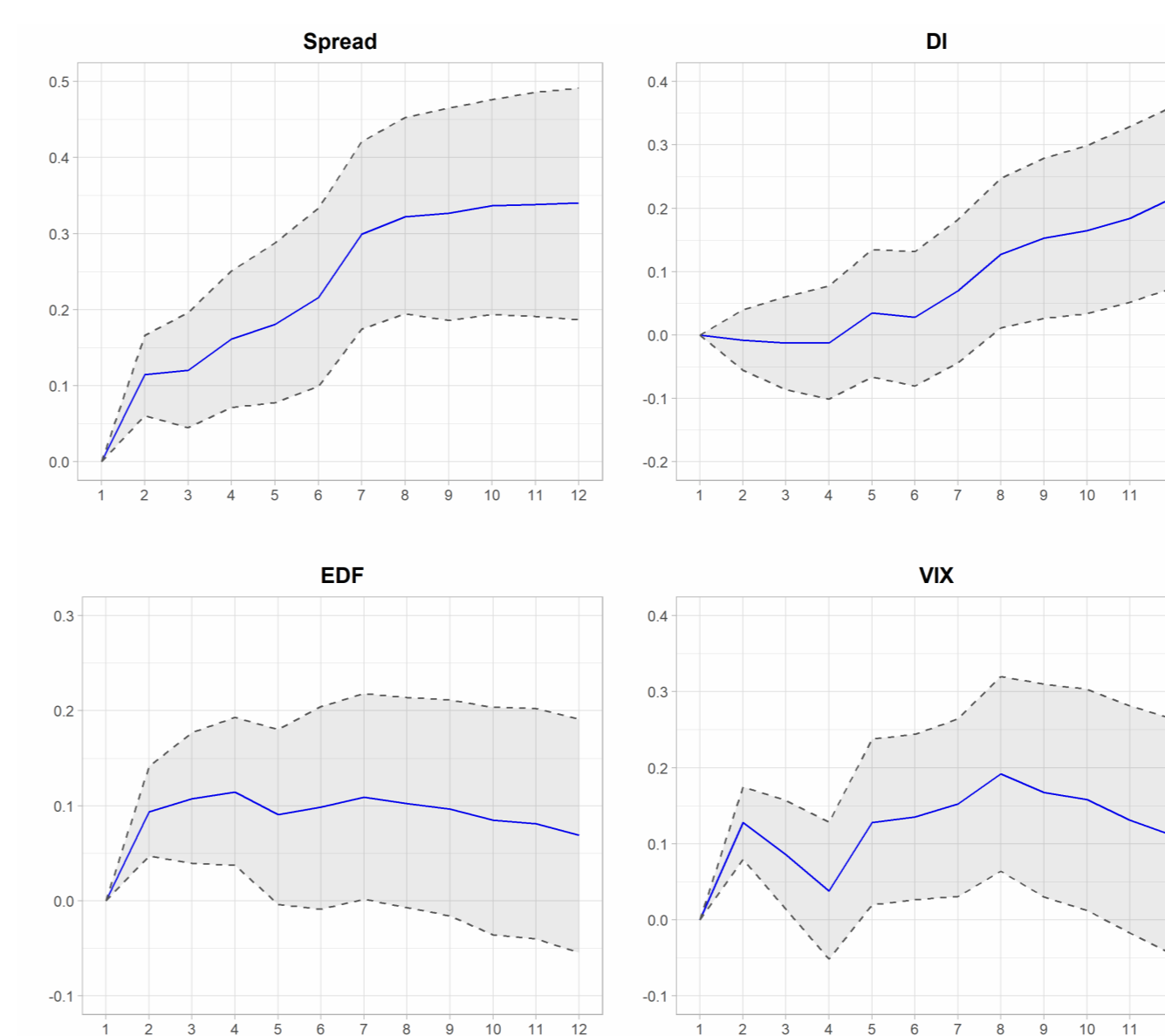

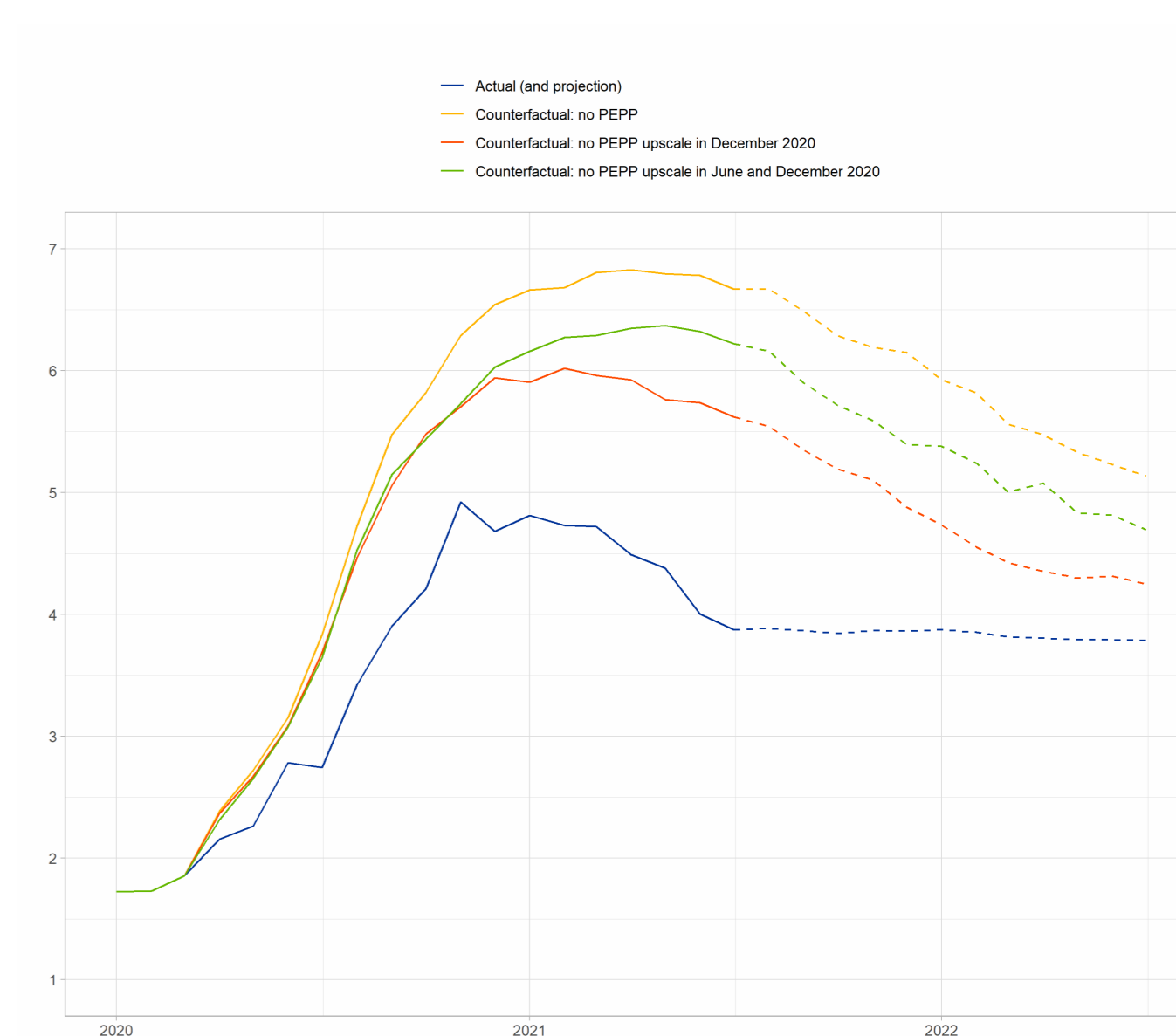**Figure 5:** Impulse Response Functions for Defaults.

Figure 6: The Effect of PEPP on Corporate Defaults.

Conclusions

- **A simple measure to forecast corporate defaults:** A simple measure of insolvency risk - called Distance to Insolvency (DI) can anticipate corporate defaults better than the commonly used Moody's EDF. Using Cox's Hazard rate regressions, The DI performs better than the EDF especially at longer horizons. This is confirmed out-of-sample. At the aggregate level, the DI shows once again superior forecasting power compared to the EDF in a VAR model.

- **Policy Implications:** We use the DI measure to simulate the evolution of corporate defaults during the COVID-19 crisis if the Eurosystem had not implemented the pandemic emergency purchase programme.

References

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