A sustainability transition on the move?
Evidence based on the disconnect from market fundamentals.*
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1. Is the European stock market overvalued and which market segments are affected?

► Since 2015 discussions whether stock markets might be inflated due to **unconventional monetary policy** (e.g. BIS, 2015 or Blanchard and Gagnon, 2016, Hudepohl et al., 2021).

► **EU Green Deal** and related **sustainable finance legislation intended to shift investor preferences towards sustainability** as reflected in **Environment, Social and Governance (ESG)** dimensions **to support the transition towards a sustainable economy.**

► **Policymakers** (e.g. BIS, 2021) **have expressed concerns that Green and ESG assets might have deviated too far from their fundamentals** ("too much, too quickly of a good thing").

Goals and Contributions:

Provide framework to measure and compare **non-fundamental** components in the European stock market to understand which market niches might be inflated.

2. Data

Using data from 1200 companies from Refinitiv Datastream, we construct DY and PI series and create portfolio variables for the European **Market** portfolio, as well as the subsets **ESG** (score>50), **Green** and **High-carbon** (see Alessi et al., 2022).

Number of companies in portfolio

	Market	ESG	Green	High-carbon
2005	678	71	26	474
2006	718	84	55	447
2007	777	124	90	435
2008	825	162	102	453
2009	837	175	104	456
2010	846	189	110	451
2011	859	206	115	453
2012	878	215	122	468
2013	891	221	129	468
2014	920	232	139	469
2015	961	249	151	488
2016	1016	267	154	536
2017	1048	306	157	557
2018	1100	364	162	605
2019	1154	405	162	657
2020	1193	447	162	696
2021	1191	431	162	694
2022	1192	431	162	695

3. Model

Log-linearised present-value model (see Campbell and Shiller, 1988) **estimated with Bayesian methods** (Choi et al., 2017, Chan and Santi, 2021). First order log-linear approximation of the log gross return:

$$r_{t+1} \simeq \kappa + \rho p d_{t+1} + \Delta d_{t+1} - p d_t$$

Observational equations:

$$pd_t = pdf_t + b_t \quad \text{(price-dividend)}$$
$$\Delta div_t = g_{t-1} + \epsilon^*_{dS_t} \quad \text{(dividend growth)}$$

Transition equations:

$$b_t = \frac{b_{t-1}}{\rho_{S_t}} + \epsilon^*_{bS_t} \begin{cases} 1/\rho_0 > 1 & surviving \\ 1/\rho_1 < 1 & collapsing \end{cases} \quad \text{(non-fundamental)}$$

$$pd_t^f = \frac{ln(1 + exp(\bar{pd})) - \rho_{S_t}\bar{pd} - \alpha^\mu_{S_t} + \alpha^g_{S_t}}{1 - \rho_{S_t}} - \frac{(\mu_t - \alpha^\mu_{S_t})}{1 - \rho\phi^\mu_{S_t}} + \frac{(g_t - \alpha^g_{S_t})}{1 - \rho\phi^g_{S_t}} \quad \text{(fundamental)}$$

$$g_t = \alpha^g_{S_t} + \phi^g_{S_t}(g_{t-1} - \alpha^g_{S_t}) + \epsilon^*_{gS_t} \quad \text{(expected dividend growth)}$$

$$\mu_t = \alpha^\mu_{S_t} + \phi^\mu_{S_t}(\mu_{t-1} - \alpha^\mu_{S_t}) + \epsilon^*_{\mu S_t} \quad \text{(expected gross returns)}$$

4. Bayesian estimation

► **Estimation of model parameters and unobservables with MCMC:** Samples from the joint posterior distribution are obtained using the factorisation:

$$f(\theta, \pi, \mathbf{S}, \xi | \mathbf{y}) = f(\xi | \theta, \pi, \mathbf{S}, \mathbf{y}) f(\theta, \pi, \mathbf{S} | \mathbf{y})$$

Posterior samples of the state vector ξ are **drawn off-line using the simulation smoother** proposed by Durbin and Koopman (2002). Samples from $f(\theta, \pi, \mathbf{S} | \mathbf{y})$ are obtained with the following Gibbs scheme:

$$f(\theta | \mathbf{S}, \pi, \mathbf{y}), \ Pr(\mathbf{S} | \theta, \pi, \mathbf{y}), \ f(\pi | \theta, \mathbf{S}, \mathbf{y})$$

By assumption the first full conditional verifies:

$$f(\theta | \mathbf{S}, \pi, \mathbf{y}) \propto f(\mathbf{y} | \mathbf{S}, \theta) \ f(\theta)$$

► **Bounds have to be imposed on some parameters:**
  ▷ on (ρ_0, ρ_1) to identify collapsing and surviving regimes.
  ▷ on (ϕ^x_0, ϕ^x_1) to enforce stationarity $x \in [\mu, g]$.
  ▷ on δ^y to ensure a larger variance for the collapsing regime to prevent label-switching.
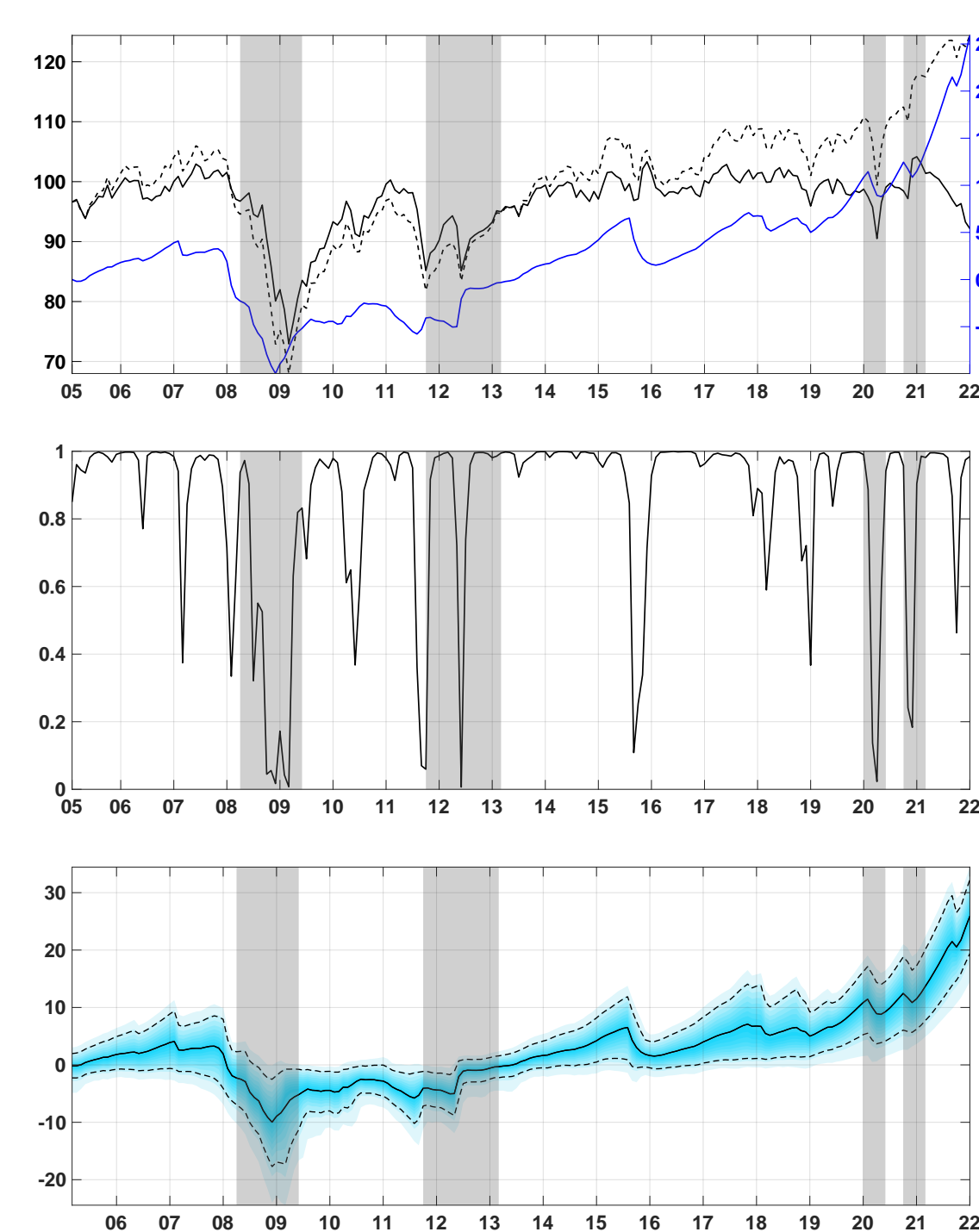
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5. Overvaluation in the European stock market

Top panel: Price-dividend ratio (dashed), fundamental and **non-fundamental** component.

► Both price components (fundamental and non-fundamental) show strong co-movement with economic activity.

**Mid panel:** Smoothed probability of the **non-fundamental** being in the surviving regime.

► Non-fundamental component collapses during periods of economic weakness (external validation).

**Bottom panel:** Posterior mean, 10 and 90 percentile of **non-fundamental** component.

► Gradual increase in non-fundamental component since 2016, possibly fueled by unconventional monetary policy.

► Strong increase in non-fundamental since January 2021 (12%), reaching almost 25% of total prices by January 2022.

6. Non-fundamental components across market segments

Posterior mean, 10-th and 90-th percentile (dashed) for respective portfolio and posterior mean of the market portfolio

Market

Green

ESG

High-carbon
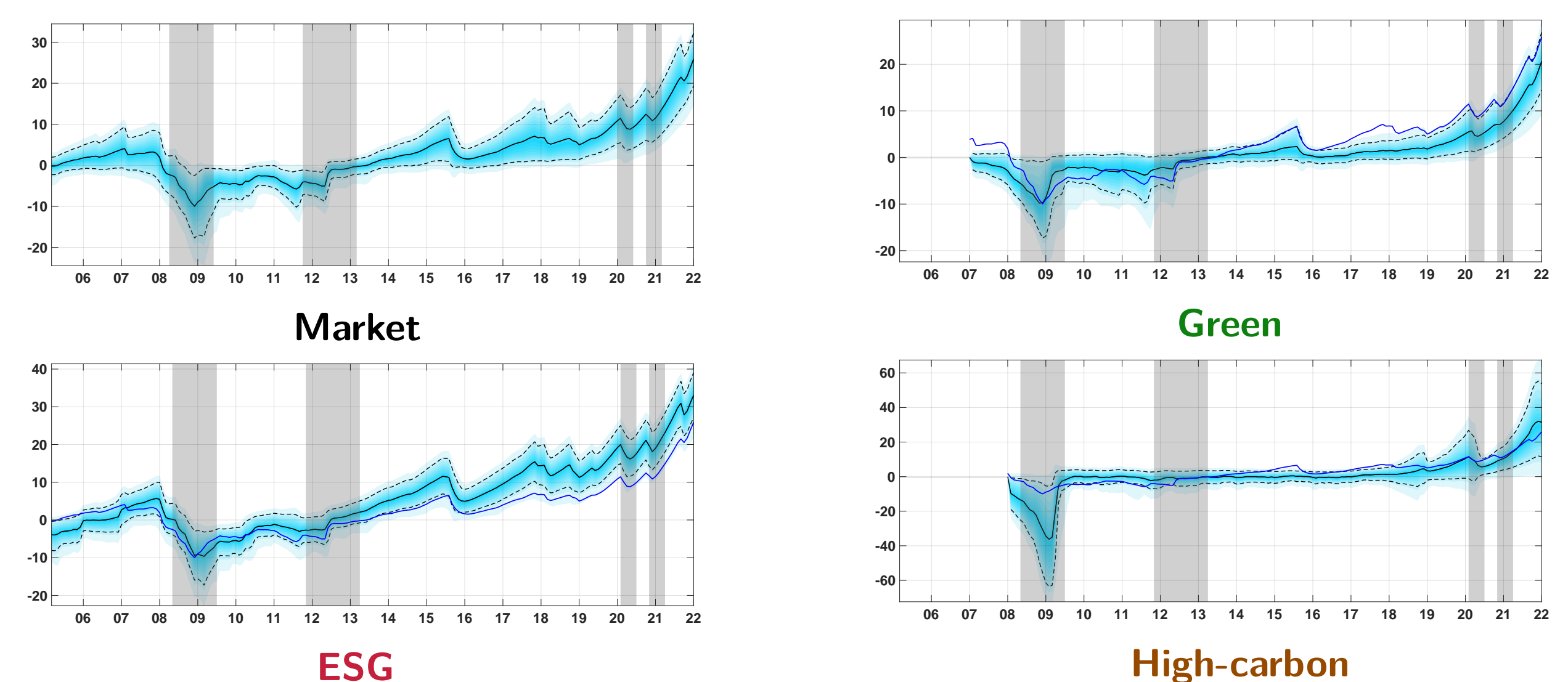
7. Contrasting non-fundamental components
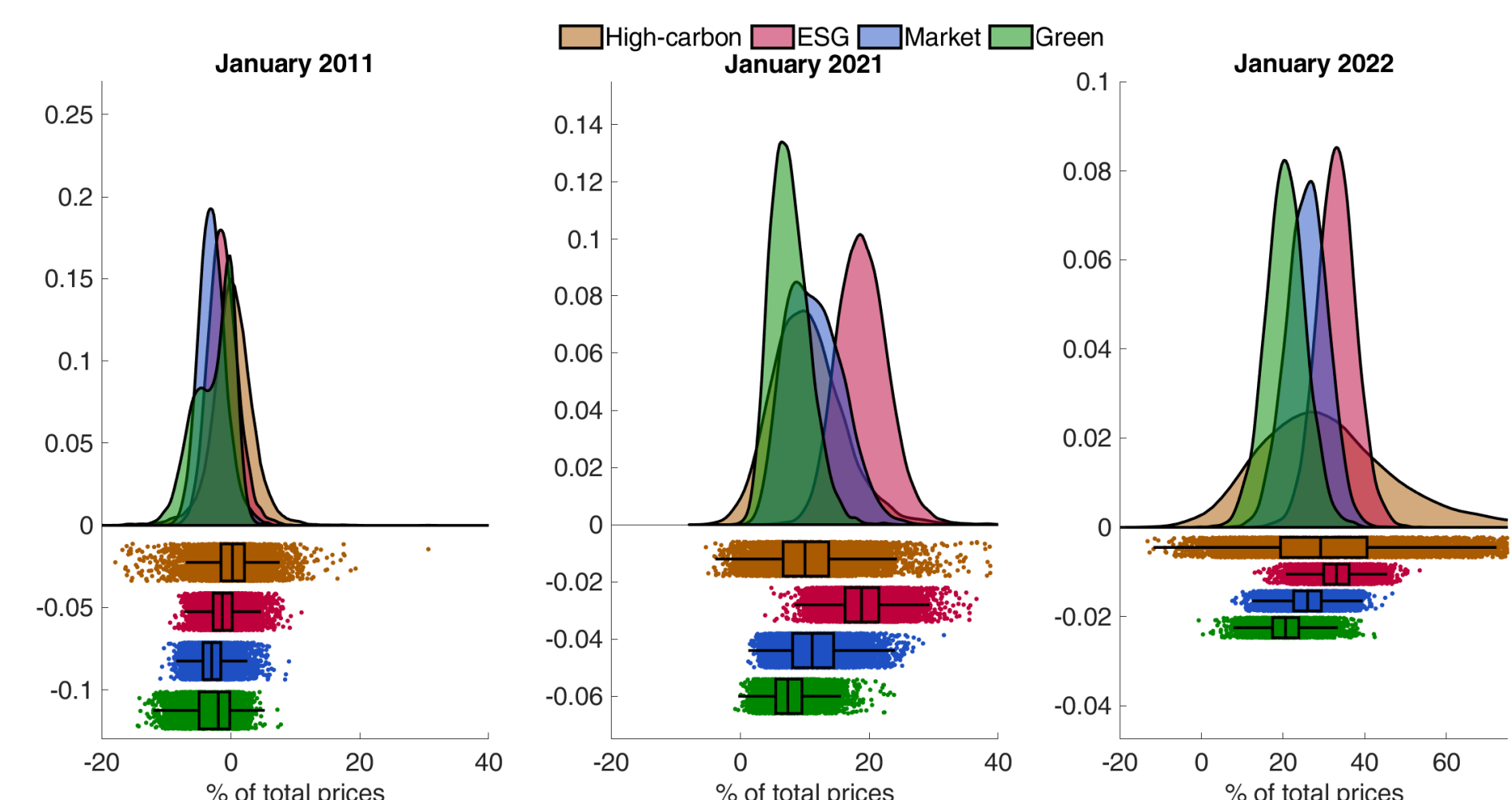
January 2011: Non-fundamental components across segments are aligned as investors didn't differentiate portfolios. Stock markets were fair price in between double-dip recession (non-inflated non-fundamental components).

January 2021: The non-fundamental component in the **Market** was elevated by about 12%. The non-fundamental components of the **Green** and **High-carbon** is in line with the market, while the **ESG** portfolio was already slightly, but significantly overvalued (20%).

January 2022: The non-fundamental in the European **Market** was inflated by 25% of total prices, while the non-fundamental component in the **ESG** portfolios was significantly but slightly inflated by about 35%.

8. Conclusions

European stock Market overvalued by 25% (January 2022):

► **Green** equities in line with the market.

► **ESG** portfolio significantly though little more overvalued than the market. Small disconnect from market in recent years.

► **High-carbon** portfolio has a large uncertainty around fundamental component estimate.

Interpretation:

► The findings point to a **"sustainability transition on the move"** in financial markets and proving the EU financial regulation working. Investors value sustainability aspects more. At the same time, there are higher uncertainties as regards the value of environmental unfriendly assets.

► While the slight overvaluation in **ESG** deserves careful monitoring, it is the entire **Market** that inflated during 2021 from 12% to about 25%, posing **risks to market stability.**

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