Monitoring systemic risk in the hedge fund sector
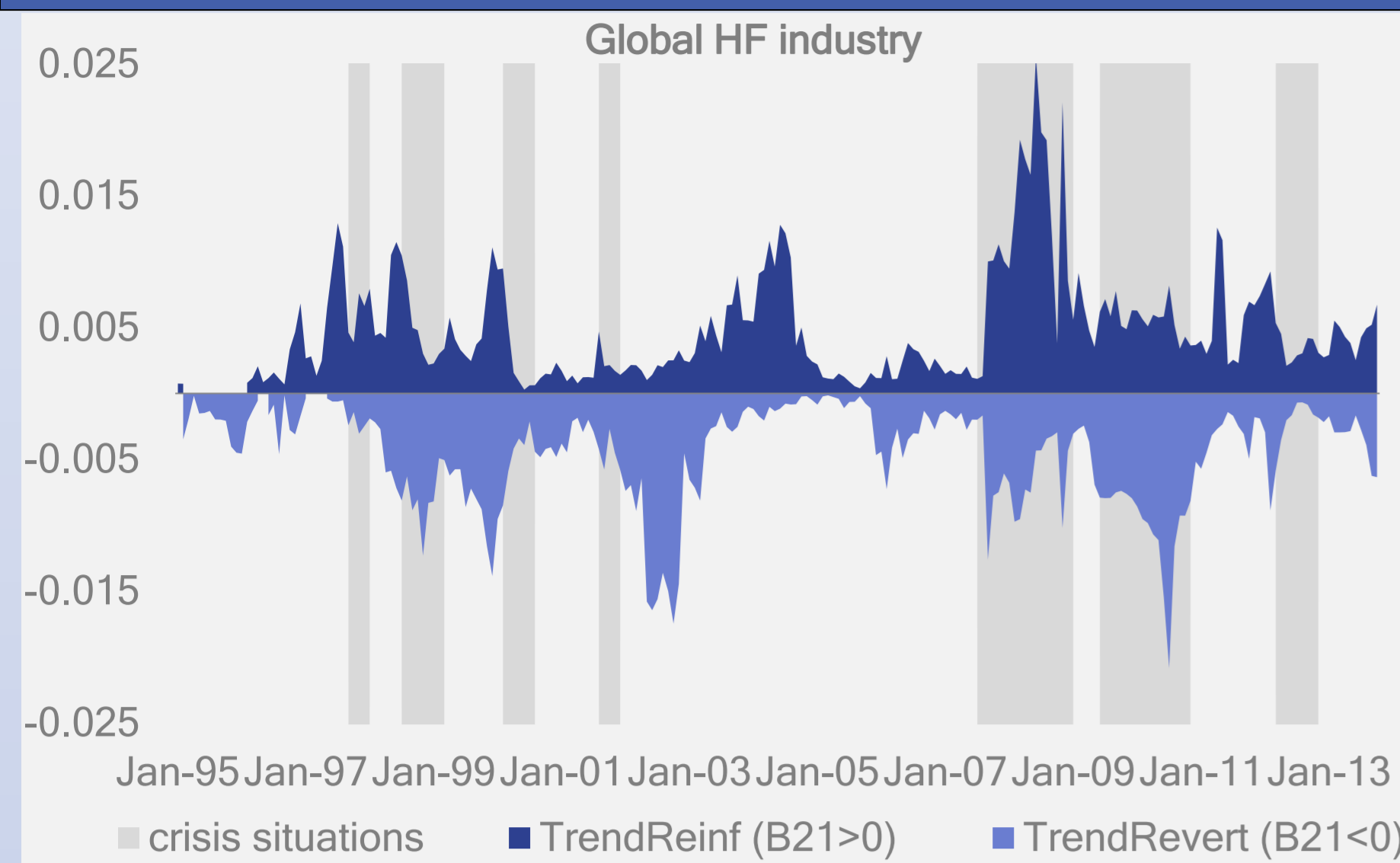
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European Securities and Markets Authority (ESMA)

Global HF industry

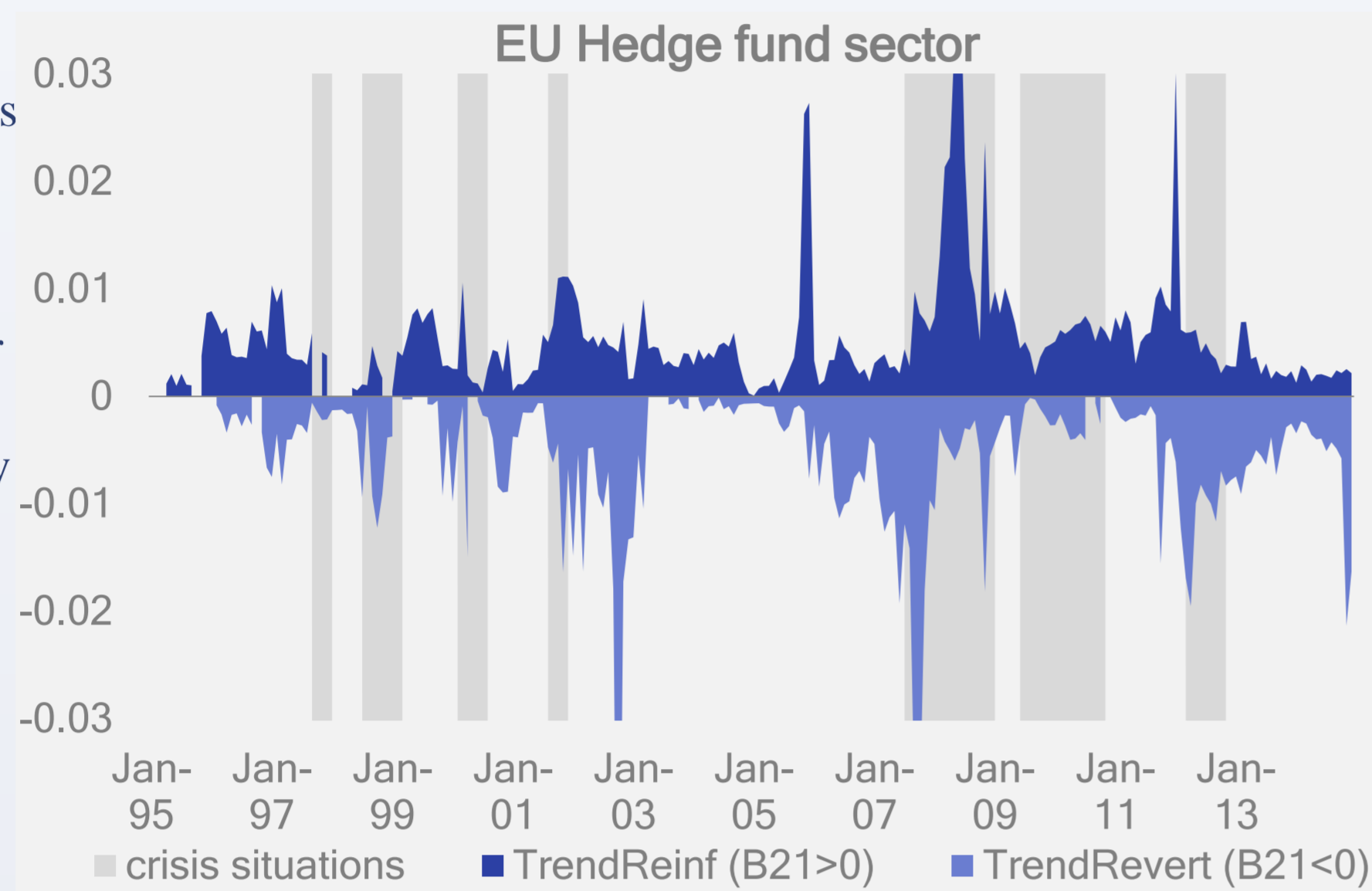crisis situations ■ TrendReinf (B21>0) ■ TrendRevert (B21<0)
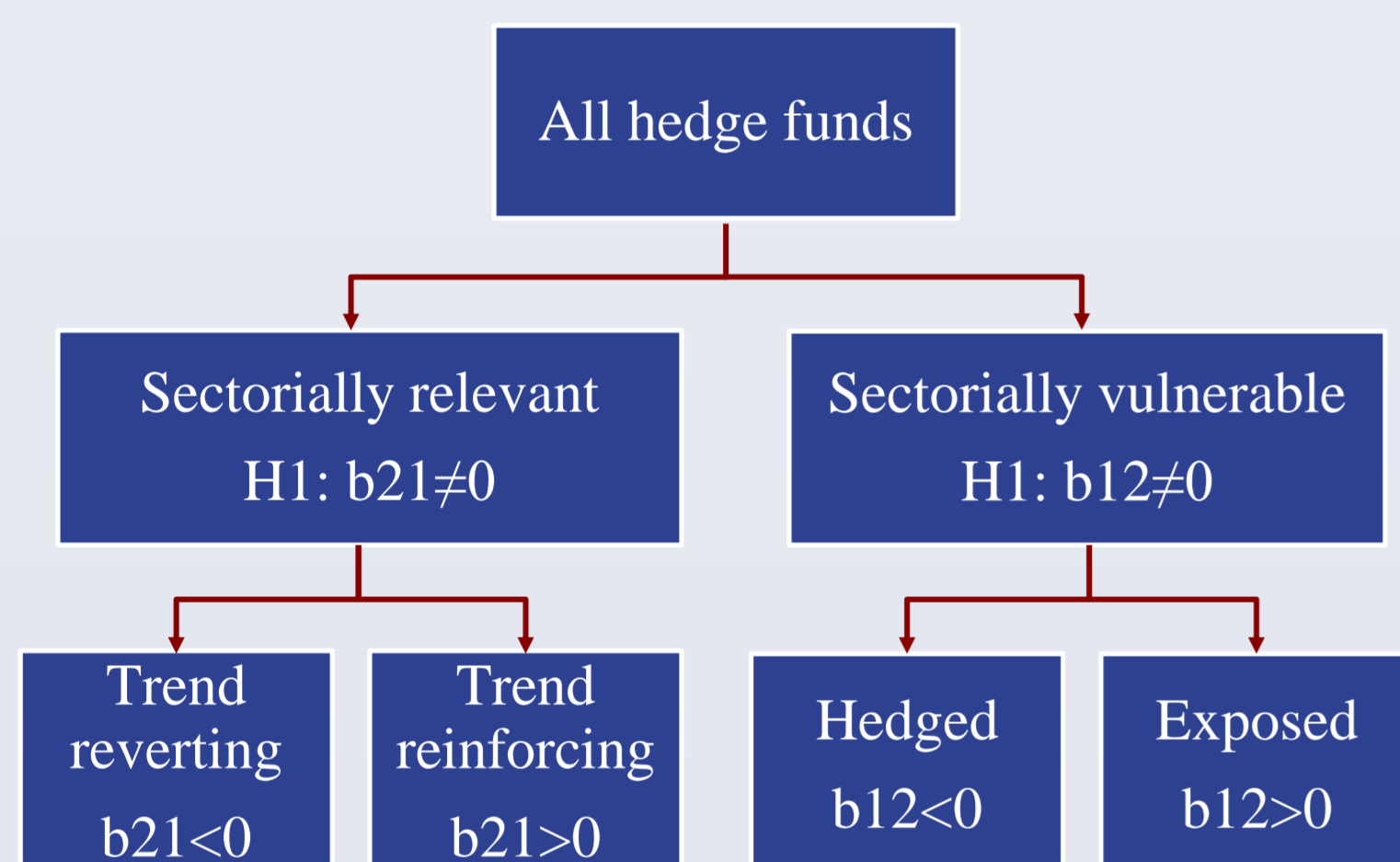
MAIN RESULTS /CONCLUSIONS

We propose **new indicators for systemic risk** generated through measuring intra-sectorial interdependencies **in the hedge fund sector**. In particular, we suggest to monitor the impact of two sets of funds on the sector's average performance: the set of funds reinforcing average performance and the set contributing to its mean reversion. Both measures display a high capability to identify periods of financial distress. They lend themselves to intuitive interpretation of the results obtained. The proposed measures prove to be robust to modifications in the underlying econometric model as well as changes in the data universe. The measures proposed are already used by ESMA in its ongoing efforts to monitor risks to financial stability. The methodology proposed may be employed in future for the construction of similar measures for other segments of the fund industry.

Interdependencies between individual fund returns and the sector's average return

The indicator **TRENDREINF** matches all financial crisis times observed with a sharp upward jump at their start or even slightly before. The indicator **TRENDREVERT** reacts either simultaneously or slightly delayed and displays marginally higher persistence. Trend reinforcing funds represent strategies which reconfirm the prevailing pattern of returns in the hedge fund industry. Thereby they tend to have a destabilising effect by

EU Hedge fund sector

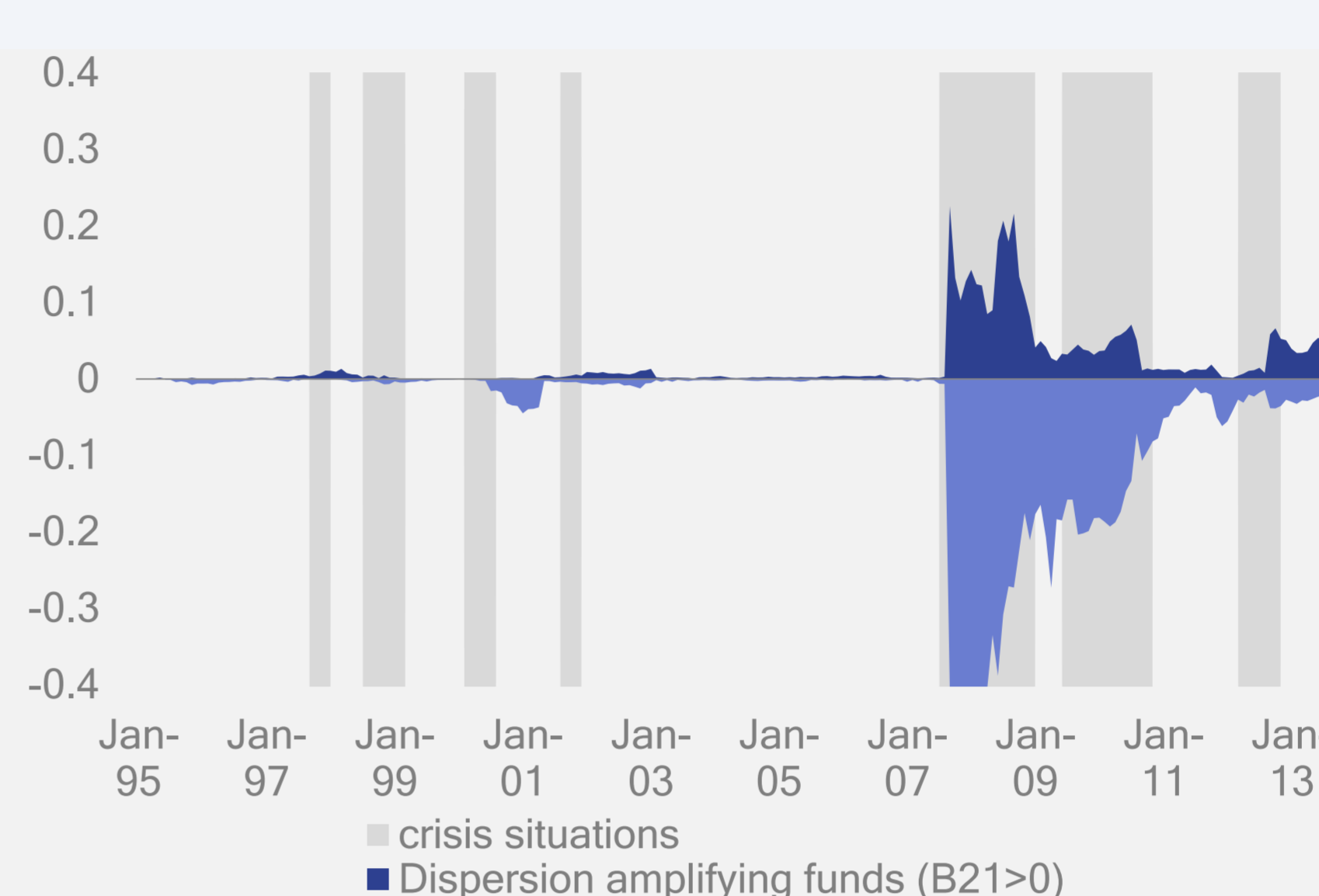crisis situations ■ TrendReinf (B21>0) ■ TrendRevert (B21<0)

corroborating potentially existing deviations from fundamentals. Trend reverting funds, on the other hand, form the complement with strategies performing contrary to the sector's average performance. In particular in times of market distress margin spirals, default chains and supply restrictions on liquidity probably reinforce the influence of trend reinforcing funds on the entire hedge fund sector. The mitigating influence of trend reverting funds is due to successful exploitation of strategies speculating synthetically against the market direction, which particularly go along with high leverage and dynamic trading strategies.

All hedge funds

- Sectorially relevant H1: b21≠0
  - Trend reverting b21<0
  - Trend reinforcing b21>0
- Sectorially vulnerable H1: b12≠0
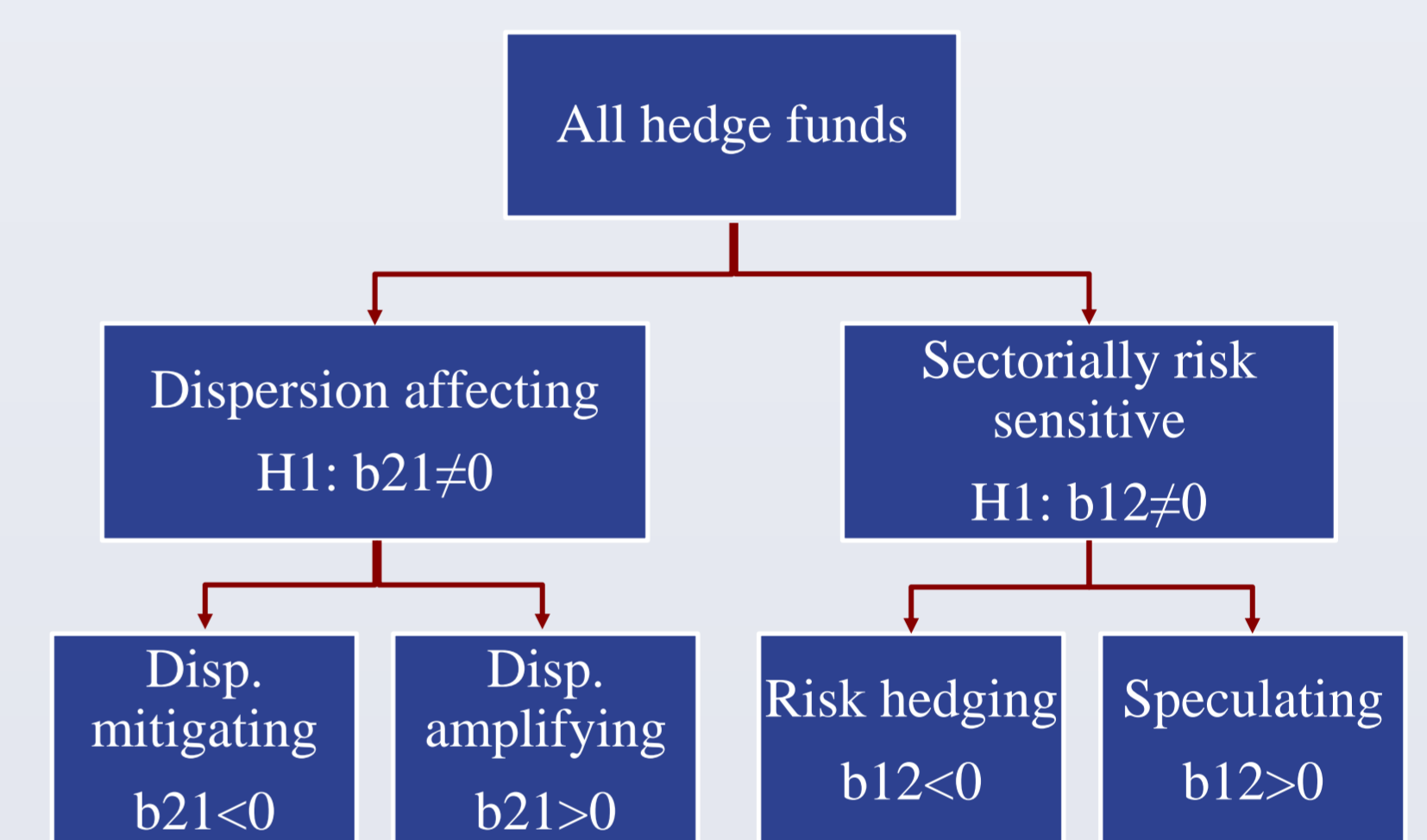 - Hedged b12<0
  - Exposed b12>0

Data

Our data on hedge fund returns include the HFR, TASS, Eurekahedge and Barclay Hedge databases. Each database covers some part of the hedge fund industry, possibly overlapping with the other databases. Hence our data need to be screened for duplicates to be removed. Deduplication is performed by using qualitative and quantitative data comparisons in order to identify potential duplicates and evaluating statistical criteria to test for their identity. Using the consolidated data, we extracted monthly returns for 21985 different funds ranging from M12 1956 to M12 2013. From this universe we chose all returns available for any sub-period in between M1 1990 and M12 2013 as the base sample for our analysis.
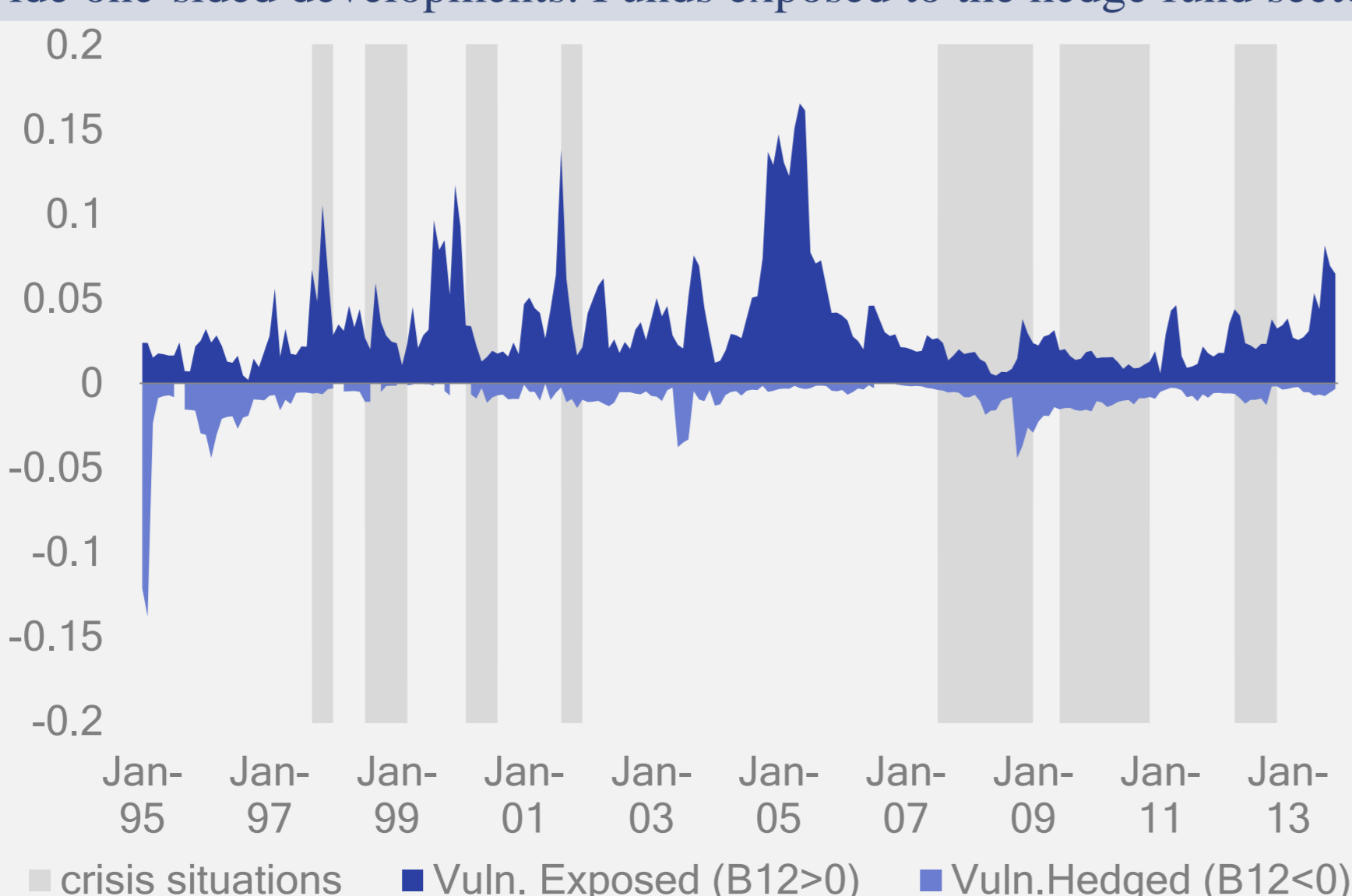
Model

In order to detect interdependencies between individual funds and the entire hedge fund industry, we employ the following VAR model:

$$\begin{pmatrix} IFR_t \\ SM_t \end{pmatrix} = \sum_{j=1}^{n} \begin{pmatrix} b_{11t-j} & b_{12t-j} \\ b_{21t-j} & b_{22t-j} \end{pmatrix} \begin{pmatrix} IFR_{t-j} \\ SM_{t-j} \end{pmatrix} + AX_t + \begin{pmatrix} e_{1t} \\ e_{2t} \end{pmatrix}.$$
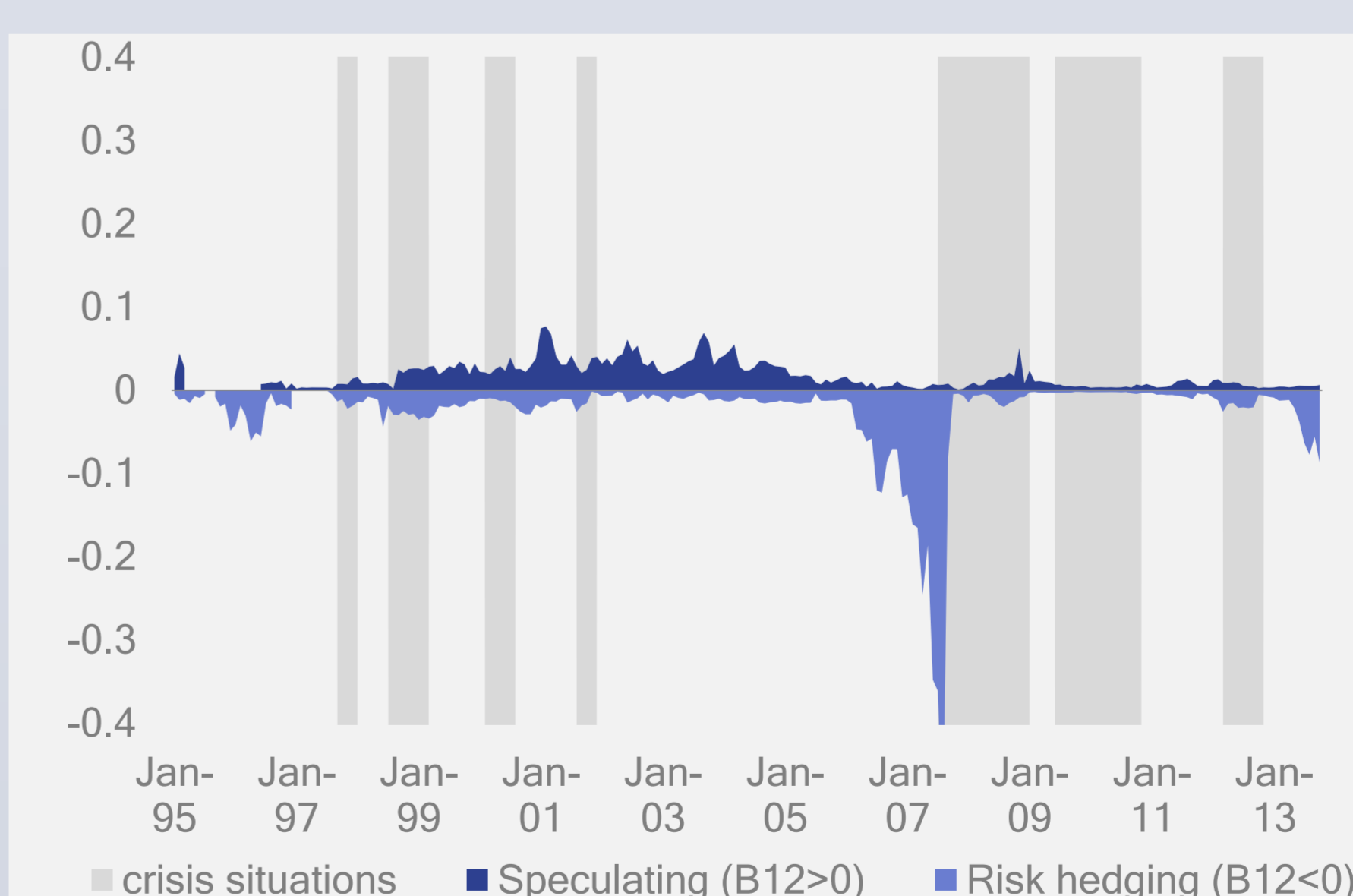
- IFR: Individual fund return
- SM: Sector moments measured by cross-section moments; i.e. the mean, standard deviation, skewness, kurtosis, or, alternatively, sets of percentiles.
- Control variables X, orthogonalised by PCA except for GARCH Residual:
  - Equity returns (Dow Jones);
  - Equity volatility (proxied by the residual of a GARCH(1,1) model of Dow Jones);
  - Liquidity risk (△ 3M_LIBOR-3M_TBILL);
  - Interest rate risk (△ 3M_TBILL);
  - Term structure risk (yield spread 10Y_TBOND-3M_TBILL);
  - Default risk (yield spread between 10Y-BAA corp. bond and 10Y-TBOND);
  - Real estate returns index (CS-home price index);
- Sample:
  - 1M1990 – 12M2013 global industry (Nmin=357, Nmax=9848)
  - 1M1990 – 12M2013 EU industry (Nmin=106, Nmax=2086)

The indicator **VULNHEDGED** based on funds hedged against market stress does not display any specific reaction to market stress, as its behaviour is hardly separable between crises and non-crises times. Related funds appear to react only weakly negative to the remaining sector, indicating their successful hedging against sector-wide one-sided developments. Funds exposed to the hedge fund sector, presented by **VULNEXPOSED**, are exhibiting spikes in their respective measure in the early stage, or shortly before, all crises times. Those funds may follow market directional strategies involving speculative leverage and/or high risk concentration, implicit benchmarks or similar quantitative investment models which render them quite reactive to market events.

crisis situations ■ Vuln. Exposed (B12>0) ■ Vuln.Hedged (B12<0)

Interdependencies between individual fund returns and the sector's standard deviation of returns

crisis situations ■ Dispersion amplifying funds (B21>0) ■ Dispersion mitigating funds (B21<0)

Abrupt level changes in indicators for **dispersion amplifying and mitigating funds** observed mainly in financial crises times after 2007 indicate that a subset of funds increased its influence on the tails of the hedge fund industry's performance dispersion. Three massive, but skittish peaks observed for the cross-sector dispersion of returns after 2007 are associated with fluctuations in a group of individual funds'

returns. A natural intuition for these results is that due to increased opportunities limited groups of funds started to speculate more heavily on volatility in asset markets and started to perform abnormally, thereby also stronger impacting the performance variation of the entire sector.

All hedge funds

- Dispersion affecting H1: b21≠0
  - Disp. mitigating b21<0
  - Disp. amplifying b21>0
- Sectorially risk sensitive H1: b12≠0
  - Risk hedging b12<0
  - Speculating b12>0

Indicator construction

- T-statistics for each individual parameter estimates are computed:

  $$t_{ij} = \frac{b_{ij}}{se_{ij}}$$

  where: - b = parameter estimate;
  - se = standard error of the estimate; i = 1, 2; j = 1, 2.
- Trends in systemic risk generation/transmission can be visualised as distribution of t-statistics derived from individual regressions.
  - **Sign**: Direction of the effect;
  - **Significance**: Statistical robustness of the effect.
- Aggregating across funds we compute, for each parameter:
  1. Fraction of fund (regressions) with a) significantly positive and b) significantly negative estimators (99% significance level used) ;
  2. Average size of estimators found to be a) positively and b) negatively significant;
  3. Product of fraction of significant estimators (1) and average size of estimators (2).
- Dynamic profiles reported for 1995-2013 using 36 M rolling windows.

crisis situations ■ Speculating (B12>0) ■ Risk hedging (B12<0)

In the build-up of the crisis unfolding after summer 2007, **funds vulnerable to risks** as reflected by a high performance dispersion in the hedge fund industry did play an important role as indicated by a pronounced spike in their reaction to the sector's low volatility observed in the years 2004-2006. A growing number of funds seem to have benefited either from the low level of cross-sectorial risk dispersion, by engaging in volatility selling or from the off-loading of increasing levels of hidden risks, not adequately priced in.

Robustness checks

- Model run with different set of endogenous variables for the HF sector (sets of statistical moments or percentiles of the distribution of funds' returns). Tests for serial correlation, heteroscedasticity and normality reconfirmed the robustness of the baseline model.
- Unit root tests for endogenous and exogenous variables repudiate non-stationarity issues.
- Model run with different lag lengths (1,2,3), rolling window lengths (36M, 48M, 60M), significance levels (90%, 95%, 99%) and maximum numbers for missing observations (0,5,10).
- Set of funds identified as relevant ones stable over time: On average 70 % of relevant funds remain in this set.
- Similar results hold for universe of EU hedge funds.