Supplementary Appendix

6.6 Number of Factors

Figure 30: Number of jump factors ($a = 4$)

Note: Perturbed eigenvalue ratio statistic for unbalanced panel of all jump returns ($a = 4$).
**Figure 31:** Number of jump factors \((a = 4.5)\)

Note: Perturbed eigenvalue ratio statistic for unbalanced panel of all jump returns \((a = 4.5)\).

**Figure 32:** Number of jump factors \((a = 5)\)

Note: Perturbed eigenvalue ratio statistic for unbalanced panel of all jump returns \((a = 5)\).
6.7 Composition of Factors

Figure 33: Portfolio weights of 4 overnight PCA factors.

Note: Portfolio weights of 4 overnight PCA factors over the whole time horizon 2004 to 2016. Stocks are sorted according to industry.
Figure 34: Portfolio weights of 4 daily PCA factors.

Note: Portfolio weights of 4 daily PCA factors over the whole time horizon 2004 to 2016. Stocks are sorted according to industry.
Figure 35: Portfolio weights of 4 weekly PCA factors.

Note: Portfolio weights of 4 weekly PCA factors over the whole time horizon 2004 to 2016. Stocks are sorted according to industry.
Figure 36: Generalized correlations of 4 continuous PCA factors with other factors.

Note: Generalized correlations of the first four statistical continuous PCA factors with the 4 PCA factors based on all HF data (continuous+jumps), the 4 continuous PCA proxy factors, different combinations of industry factors (market, oil, finance and electricity), the 4 Fama-French-Carhart factors, the 3 Fama-French factors and the market factor. Generalized correlations are based on continuous, intraday, overnight and daily returns, i.e. given the portfolio weights of a factor I calculate continuous, intraday, overnight and daily returns for this factor.
6.8 Asset Pricing Results

**Figure 37:** Cumulative factor returns for intraday, overnight and daily returns

![Graphs showing cumulative factor returns for intraday, overnight and daily returns.](image)

6.9 Time-Variation on Local 1-Months Window

**Figure 38:** Time-variation in the percentage of explained variation for different factors

![Graph showing time-variation in the percentage of explained variation.](image)

Note: The total variation (continuous + jump) is calculated on a moving window of one month (21 trading days).
Figure 39: Time-variation in the percentage of explained variation for different factors.

Note: The daily, intraday and overnight variation is calculated on a moving window of one month (21 trading days).
6.10 Time-Variation on Local 3-Months Window

**Figure 40:** Time-variation in loadings. Generalized correlations of continuous loadings estimated on the whole time horizon and on a moving window of three months (63 trading days).
Figure 41: Time-variation in locally estimated continuous factors. Left panel: Generalized correlations of 4 continuous PCA factors estimated on the whole time horizon and on a moving window of three months (63 trading days). Right panel: Generalized correlations of loadings estimated locally and the whole time horizon.

Figure 42: Time-variation in locally estimated continuous factors. Generalized correlations of loadings of first 7 continuous PCA factors estimated on the whole time horizon and on a moving window of three months (63 trading days).
Figure 43: Time-variation in the percentage of explained variation for different factors. The variation is calculated on a moving window of three months (63 trading days). Panel A: Continuous variation. Panel B: Total (continuous + jump) variation.
Figure 44: Time-variation in the percentage of explained variation for different factors. The daily, intraday and overnight variation is calculated on a moving window of three months (63 trading days).
Panel A: 4 Continuous PCA factors

Figure 45: Time-variation in the continuous loadings for different factors. Loadings are estimated on a moving window of three months (63 trading days) based on continuous returns. Different lines correspond to different months. Panel A: 4 Continuous PCA factors. Panel B: 4 Fama-French-Carhart factors.
Figure 46: Decomposition of time variation in factor structure for 4 continuous PCA factors. Time-varying loadings and volatilities are estimated on a moving window of three months (63 trading days) based on continuous returns. Left panel: (1) Systematic impact of factors $\Delta_k(t)^\top \Lambda_k(t) \sigma_k^2(t)$ with $\Lambda_k(t)$ being the continuous loadings of factor $k$ in month $t$ and $\sigma_k^2$ is the continuous quadratic variation of factor $k$ in month $t$. (2) Average loadings $\Delta_k(t)^\top \Lambda_k(t)$, (3) Volatility $\sigma_k^2(t)$. Right panel: The same quantities as in the left panel but normalized by the time average of the quantity of interest.
Figure 47: Decomposition of time variation in factor structure for 4 continuous Fama-French Carhart factors. Time-varying loadings and volatilities are estimated on a moving window of three months (63 trading days) based on continuous returns. Left panel: (1) Systematic impact of factors $\Lambda_k(t)^T \Lambda_k(t) \sigma_k^2(t)$ with $\Lambda_k(t)$ being the continuous loadings of factor $k$ in month $t$ and $\sigma_k^2$ is the continuous quadratic variation of factor $k$ in month $t$. (2) Average loadings $\Lambda^T_k(t) \Lambda_k(t)$, (3) Volatility $\sigma_k^2(t)$. Right panel: The same quantities as in the left panel but normalized by the time average of the quantity of interest.
**Figure 48:** Time-variation in the continuous loadings for 4 continuous PCA factors. Generalized correlations between the 4 continuous PCA factors estimated locally on a moving window of three months (63 trading days) and with continuous industry factors (market (M), oil (O), finance (F) and energy (E)).
6.11 Time-Variation on Local 1-Week Window

**Figure 49:** Time-variation in loadings. Generalized correlations of continuous loadings estimated on the whole time horizon and on a moving window of one week (5 trading days).
Figure 50: Time-variation in locally estimated continuous factors. Generalized correlations of loadings of first 7 continuous PCA factors estimated on the whole time horizon and on a moving window of one week (5 trading days).
Figure 51: Time-variation in the percentage of explained variation for different factors. The variation is calculated on a moving window of one week (5 trading days). Panel A: Continuous variation. Panel B: Total (continuous + jump) variation.
Panel A: 4 Continuous PCA factors

Panel B: 4 Fama-French-Carhart factors

Figure 52: Time-variation in the continuous loadings for different factors. Loadings are estimated on a moving window of one week (5 trading days) based on continuous returns. Different lines correspond to different months. Panel A: 4 Continuous PCA factors. Panel B: 4 Fama-French-Carhart factors.
Figure 53: Decomposition of time variation in factor structure for 4 continuous PCA factors. Time-varying loadings and volatilities are estimated on a moving window of one week (5 trading days) based on continuous returns. Left panel: (1) Systematic impact of factors $\Lambda_k(t)^T \Lambda_k(t) / N \sigma_k^2(t)$ with $\Lambda_k(t)$ being the continuous loadings of factor $k$ in month $t$ and $\sigma_k^2$ is the continuous quadratic variation of factor $k$ in month $t$. (2) Average loadings $\Lambda_k(t)^T \Lambda_k(t)$. (3) Volatility $\sigma_k^2(t)$. Right panel: The same quantities as in the left panel but normalized by the time average of the quantity of interest.
Figure 54: Decomposition of time variation in factor structure for 4 continuous Fama-French Carhart factors. Time-varying loadings and volatilities are estimated on a moving window of one week (5 trading days) based on continuous returns. Left panel: (1) Systematic impact of factors $\Lambda_k(t)^\top \Lambda_k(t) N \sigma_k^2(t)$ with $\Lambda_k(t)$ being the continuous loadings of factor $k$ in month $t$ and $\sigma_k^2(t)$ is the continuous quadratic variation of factor $k$ in month $t$. (2) Average loadings $\Lambda_k(t)^\top \Lambda_k(t) N$, (3) Volatility $\sigma_k^2(t)$. Right panel: The same quantities as in the left panel but normalized by the time average of the quantity of interest.