# TABLE 1 A: Descriptive Stats of TE Estimates

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 second | 2 seconds | 3 seconds | 5 seconds | 6 seconds | 10 seconds | 15 seconds | 30 seconds | 1 minute | 2 minutes |
| mean | 0.083899 | 0.100982 | 0.108426 | 0.112152 | 0.111875 | 0.105751 | 0.094233 | 0.068777 | 0.046439 | 0.032823 |
| std | 0.046414 | 0.056143 | 0.061806 | 0.070251 | 0.074058 | 0.086463 | 0.09865 | 0.125105 | 0.160852 | 0.205967 |
| min | -1.001113 | -1.087836 | -1.135966 | -1.085278 | -1.056745 | -1.226272 | -1.214433 | -1.597882 | -1.359837 | -1.685964 |
| 1% | -0.013553 | -0.024824 | -0.033492 | -0.051838 | -0.061424 | -0.09873 | -0.140703 | -0.232887 | -0.343977 | -0.472237 |
| 25% | 0.053702 | 0.065038 | 0.068962 | 0.066996 | 0.064036 | 0.049498 | 0.029932 | -0.012565 | -0.057649 | -0.098456 |
| 50% | 0.081572 | 0.099856 | 0.107933 | 0.112097 | 0.11181 | 0.105945 | 0.094494 | 0.069145 | 0.04703 | 0.033761 |
| 75% | 0.112077 | 0.13645 | 0.14804 | 0.157861 | 0.160266 | 0.162782 | 0.15945 | 0.151585 | 0.152572 | 0.167058 |
| 99% | 0.201031 | 0.234394 | 0.252702 | 0.27482 | 0.283416 | 0.305597 | 0.322633 | 0.359284 | 0.421736 | 0.517113 |

Table 1A shows the descriptive statistics of information transfer during the first quarter of 2018. The statistics were computed using two hour and ten minute windows for every pair of firms in the S&P 500 during the first quarter of 2018. The means are relatively high at the lower sampling rates ( < 30 seconds) whereas the mean value decreases at higher sampling rates. This evidence shows that on average less information transfer is captured at slower sampling rates. The standard deviation values increase as the sampling rate becomes slower. A possible explanation for this is the frequency of observations used to compute transfer entropy decrease yielding a more noisy information transfer estimate. Consequently the 75th percentile and 99th percentile values grow and the minimum 1st, 25th, and 50th percentiles values decay as the sample rate becomes slower.

# TABLE 1B: Means of TE Estimates by time period of the day

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 second | 2 seconds | 3 seconds | 5 seconds | 6 seconds | 10 seconds | 15 seconds | 30 seconds | 1 minute | 2 minutes |
| 9:30am-11:40am | 0.096855 | 0.117045 | 0.125477 | 0.129953 | 0.129737 | 0.1225 | 0.10949 | 0.081966 | 0.05812 | 0.044115 |
| 11:40am-1:50pm | 0.071486 | 0.088156 | 0.096403 | 0.101946 | 0.103059 | 0.100108 | 0.091045 | 0.067152 | 0.044207 | 0.029881 |
| 1:50pm-4pm | 0.083356 | 0.097745 | 0.103397 | 0.104558 | 0.10283 | 0.094646 | 0.082162 | 0.057214 | 0.03699 | 0.024473 |

Table 1B contains the average TE values computed for three two hour and ten minute windows during the first quarter of 2018 for pairs of firms in the S&P 500. Across sampling rates the means exhibit similar patterns to Table 1A. Ergo, the means decrease as the sampling rates become slower. Across windows the 9:30AM-11:40AM window has on average the highest information transfer.

# TABLE 1C: SAME AS TABLE 1B BUT 30 MINUTE WINDOWS

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 second | 2 seconds | 3 seconds | 5 seconds | 6 seconds | 10 seconds | 15 seconds | 30 seconds |
| 09:30AM-10:00AM | 0.098763 | 0.118435 | 0.126572 | 0.129811 | 0.128976 | 0.118183 | 0.104683 | 0.078373 |
| 10:00AM-10:30AM | 0.084598 | 0.100931 | 0.107299 | 0.109349 | 0.107803 | 0.097906 | 0.084393 | 0.057657 |
| 10:30AM-11:00AM | 0.077354 | 0.092932 | 0.099387 | 0.10085 | 0.100187 | 0.092463 | 0.081744 | 0.057732 |
| 11:00AM-11:30AM | 0.07335 | 0.08699 | 0.093411 | 0.096154 | 0.095332 | 0.0891 | 0.077333 | 0.056219 |
| 11:30AM-12:00PM | 0.069254 | 0.084666 | 0.091173 | 0.095287 | 0.095398 | 0.090091 | 0.079633 | 0.058871 |
| 12:00PM-12:30PM | 0.06494 | 0.079651 | 0.086311 | 0.090667 | 0.090818 | 0.087362 | 0.079692 | 0.057717 |
| 12:30PM-01:00PM | 0.06146 | 0.076236 | 0.083961 | 0.088504 | 0.089494 | 0.085744 | 0.078091 | 0.057232 |
| 01:00PM-01:30PM | 0.061309 | 0.075614 | 0.082234 | 0.086301 | 0.087759 | 0.08478 | 0.076479 | 0.057491 |
| 01:30PM-02:00PM | 0.061894 | 0.076321 | 0.083116 | 0.087708 | 0.089182 | 0.084689 | 0.075879 | 0.057695 |
| 02:00PM-02:30PM | 0.066622 | 0.080908 | 0.087459 | 0.091159 | 0.091348 | 0.085392 | 0.076397 | 0.053396 |
| 02:30PM-03:00PM | 0.06599 | 0.079429 | 0.085559 | 0.088587 | 0.088095 | 0.08211 | 0.072496 | 0.05155 |
| 03:00PM-03:30PM | 0.0715 | 0.084182 | 0.089958 | 0.090333 | 0.088006 | 0.078501 | 0.067295 | 0.043447 |
| 03:30PM-04:00PM | 0.086978 | 0.093023 | 0.091376 | 0.083968 | 0.079775 | 0.066754 | 0.055419 | 0.040678 |

We investigate the information transfer means at narrower windows to search for when the highest average information transfer occurs in during the morning period. Table 1C contains the average TE values computed for thirteen thirty-minute windows during the first quarter of 2018. Across all sampling rates the average TE values are highest during the first thirty minutes of the trading day. We then see a decay in TE means throughout the trading day. The 1, 2, 3, and 5 second sampling rates have a slight burst of information transfer within the last hour of the trading day.

# TABLE 2A: DENSITIES FOR STRONG NETWORK

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 second | 2 seconds | 3 seconds | 5 seconds | 6 seconds | 10 seconds | 15 seconds | 30 seconds | 1 minute | 2 minutes |
| Density | 0.361325 | 0.378285 | 0.383764 | 0.390074 | 0.392056 | 0.395974 | 0.396916 | 0.397413 | 0.3956 | 0.389073 |

‘

# TABLE 2B: DENSITIES FOR VERY STRONG NETWORK

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 second | 2 seconds | 3 seconds | 5 seconds | 6 seconds | 10 seconds | 15 seconds | 30 seconds | 1 minute | 2 minutes |
| Density | 0.096361 | 0.080947 | 0.074043 | 0.068487 | 0.067785 | 0.066014 | 0.066017 | 0.06657 | 0.067629 | 0.06917 |

Table 2 shows the network density of the strong and very strong networks. Recall that the strong networks are dichotomized where TE is between the and and the very strong networks are dichotomized where TE . The densities for the strong network across all sampling rates are higher than the very strong network. The densities are higher at fast sampling rates which indicates that the tails of the distribution are fatter at fast sampling rates.

# TABLE 3:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 second | 2 seconds | 3 seconds | 5 seconds | 6 seconds | 10 seconds | 15 seconds | 30 seconds | 1 minute | 2 minutes |
| AVG(weighted indegree) | 125.693 | 151.609 | 163.03 | 169.493 | 169.715 | 164.176 | 153.266 | 135.756 | 132.917 | 146.221 |
| AVG(weighted outdegree) | 125.693 | 151.609 | 163.03 | 169.493 | 169.715 | 164.176 | 153.266 | 135.756 | 132.917 | 146.221 |

Table 3 shows the average weighted in-degree and out-degree of the information transfer network at various sampling rates for the first quarter of 2018. Given that all the firms in the information transfer networks are connected the average weighted in-degree and out-degree values across all firms in the first quarter of 2018 are the same values. To state this differently the average of all of incoming information transfers from a set of firms to a particular firm is equivalent to the average of all outgoing connections from a set of firms to a firm.

# Table 4 Panel A:

*Dependent variable: den\_TE\_indeg*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 second | 2 seconds | 3 seconds | 5 seconds | 6 seconds | 10 seconds | 15 seconds | 30 seconds | 1 minute | 2 minutes |
|  |  |  |  |  |  |  |  |  |  |  |
| Intercept | 0.039\*\*\* | 0.060\*\*\* | 0.077\*\*\* | 0.091\*\*\* | 0.094\*\*\* | 0.091\*\*\* | 0.085\*\*\* | 0.071\*\*\* | 0.055\*\*\* | 0.043\*\*\* |
|  | 0 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 |
| den\_TE\_indeg\_t3 | 0.602\*\*\* | 0.484\*\*\* | 0.385\*\*\* | 0.296\*\*\* | 0.277\*\*\* | 0.251\*\*\* | 0.222\*\*\* | 0.124\*\*\* | 0.039\*\*\* | 0.020\*\*\* |
|  | -0.005 | -0.005 | -0.005 | -0.006 | -0.006 | -0.006 | -0.006 | -0.006 | -0.006 | -0.006 |
|  |  |  |  |  |  |  |  |  |  |  |
| Observations | 29,642 | 29,642 | 29,642 | 29,642 | 29,642 | 29,642 | 29,642 | 29,642 | 29,642 | 29,642 |
| R2 | 0.361 | 0.234 | 0.148 | 0.087 | 0.077 | 0.063 | 0.049 | 0.015 | 0.001 | 0 |
| Adjusted R2 | 0.361 | 0.234 | 0.148 | 0.087 | 0.077 | 0.063 | 0.049 | 0.015 | 0.001 | 0 |
| Residual Std. Error | 0.029 (df=29640) | 0.036 (df=29640) | 0.040 (df=29640) | 0.048 (df=29640) | 0.051 (df=29640) | 0.062 (df=29640) | 0.072 (df=29640) | 0.091 (df=29640) | 0.116 (df=29640) | 0.145 (df=29640) |
| 12.464\*\*\*(df=1; 29640) | 12.464\*\*\*(df=1; 29640) | 12.464\*\*\*(df=1; 29640) | 12.464\*\*\*(df=1; 29640) | 12.464\*\*\*(df=1; 29640) | 12.464\*\*\*(df=1; 29640) | 12.464\*\*\*(df=1; 29640) | 12.464\*\*\*(df=1; 29640) | 12.464\*\*\*(df=1; 29640) | 12.464\*\*\*(df=1; 29640) | 12.464\*\*\*(df=1; 29640) |

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

# Table 4 Panel B:

Dependent variable:den\_TE\_outdeg

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 second | 2 seconds | 3 seconds | 5 seconds | 6 seconds | 10 seconds | 15 seconds | 30 seconds | 1 minute | 2 minutes |
|  |  |  |  |  |  |  |  |  |  |  |
| Intercept | 0.015\*\*\* | 0.019\*\*\* | 0.023\*\*\* | 0.029\*\*\* | 0.033\*\*\* | 0.039\*\*\* | 0.037\*\*\* | 0.032\*\*\* | 0.027\*\*\* | 0.025\*\*\* |
|  | 0 | 0 | 0 | -0.001 | -0.001 | -0.001 | -0.001 | 0 | 0 | 0 |
| den\_TE\_outdeg\_t3 | 0.847\*\*\* | 0.838\*\*\* | 0.819\*\*\* | 0.773\*\*\* | 0.748\*\*\* | 0.680\*\*\* | 0.659\*\*\* | 0.605\*\*\* | 0.535\*\*\* | 0.419\*\*\* |
|  | -0.003 | -0.003 | -0.003 | -0.004 | -0.004 | -0.004 | -0.004 | -0.005 | -0.005 | -0.005 |
|  |  |  |  |  |  |  |  |  |  |  |
| Observations | 29,642 | 29,642 | 29,642 | 29,642 | 29,642 | 29,642 | 29,642 | 29,642 | 29,642 | 29,642 |
| R2 | 0.702 | 0.689 | 0.658 | 0.587 | 0.551 | 0.456 | 0.43 | 0.366 | 0.287 | 0.177 |
| Adjusted R2 | 0.702 | 0.689 | 0.658 | 0.587 | 0.551 | 0.456 | 0.43 | 0.366 | 0.287 | 0.177 |
| Residual Std. Error | 0.016 (df=29640) | 0.020 (df=29640) | 0.021 (df=29640) | 0.024 (df=29640) | 0.025 (df=29640) | 0.026 (df=29640) | 0.027 (df=29640) | 0.027 (df=29640) | 0.028 (df=29640) | 0.032 (df=29640) |
| F Statistic | 69708.855\*\*\*(df=1; 29640) | 65742.441\*\*\*(df=1; 29640) | 57145.232\*\*\*(df=1; 29640) | 42098.528\*\*\*(df=1; 29640) | 36305.070\*\*\*(df=1; 29640) | 24891.473\*\*\*(df=1; 29640) | 22354.649\*\*\*(df=1; 29640) | 17081.396\*\*\*(df=1; 29640) | 11921.764\*\*\*(df=1; 29640) | 6382.547\*\*\*(df=1; 29640) |

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Table 4 Panel A contains the autocorrelations of incoming information transfers computed from 9:30am-11:40am where the independent variable is the incoming information transfer at current morning for a particular firm and the dependent variable is the information transfer at the next morning window. Table 4 Panel B contains the autocorrelations for the outgoing information transfers computed from 9:30am-11:40am. The ’s for both Panels exhibit similar behaviors across sampling rates. At faster sampling rates we see more explained variation from the morning information transfers and a gradual decay as the sample rates become slower. The ’s for the outgoing morning information transfers in Table 4 Panel B are significantly higher than the incoming morning information transfers in Table 4 Panel A.

# Table 5 Panel A:

Dependent variable:TE\_outdeg

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 second | 2 seconds | 3 seconds | 5 seconds | 6 seconds | 10 seconds | 15 seconds | 30 seconds | 1 minute | 2 minutes |
|  |  |  |  |  |  |  |  |  |  |  |
| Asset\_turn | 0.24 | 0.292 | 0.317 | 0.419 | 0.461 | 0.762 | 1.013 | 1.56 | 1.904\* | 1.978\* |
|  | -1.095 | -1.356 | -1.429 | -1.416 | -1.397 | -1.3 | -1.251 | -1.174 | -1.148 | -1.141 |
| CAPM\_BETA | -2.429\*\* | -2.898\*\* | -2.958\*\* | -2.901\*\* | -2.881\*\* | -2.754\*\* | -2.653\*\* | -2.390\*\* | -2.026\* | -1.787 |
|  | -1.133 | -1.402 | -1.478 | -1.465 | -1.445 | -1.344 | -1.293 | -1.214 | -1.188 | -1.179 |
| I(FF\_IND\_12)[T.Chems] | 3.02 | 3.934 | 4.196 | 4.179 | 4.162 | 3.752 | 3.58 | 3.647 | 3.354 | 3.223 |
|  | -2.497 | -3.091 | -3.257 | -3.228 | -3.185 | -2.962 | -2.851 | -2.676 | -2.618 | -2.6 |
| I(FF\_IND\_12)[T.Durbl] | -0.495 | 0.184 | 0.644 | 0.943 | 1.062 | 1.276 | 1.33 | 1.666 | 1.922 | 1.318 |
|  | -3.07 | -3.801 | -4.005 | -3.97 | -3.917 | -3.642 | -3.505 | -3.291 | -3.219 | -3.197 |
| I(FF\_IND\_12)[T.Enrgy] | 0.077 | 0.362 | 0.47 | 0.694 | 0.805 | 1.079 | 1.333 | 1.571 | 1.967 | 2.089 |
|  | -2.47 | -3.058 | -3.222 | -3.194 | -3.151 | -2.93 | -2.82 | -2.648 | -2.59 | -2.572 |
| I(FF\_IND\_12)[T.Hlth] | 3.661\* | 4.400\* | 4.669\* | 4.673\* | 4.614\* | 4.072\* | 3.609\* | 2.407 | 1.345 | -0.102 |
|  | -1.883 | -2.331 | -2.456 | -2.434 | -2.402 | -2.233 | -2.149 | -2.018 | -1.974 | -1.96 |
| I(FF\_IND\_12)[T.Manuf] | 2.896 | 3.285 | 3.327 | 3.113 | 2.995 | 2.544 | 2.192 | 1.774 | 1.453 | 1.191 |
|  | -1.899 | -2.35 | -2.476 | -2.455 | -2.422 | -2.252 | -2.168 | -2.035 | -1.99 | -1.977 |
| I(FF\_IND\_12)[T.Money] | 3.613\*\* | 4.982\*\* | 5.457\*\*\* | 5.534\*\*\* | 5.477\*\*\* | 5.039\*\*\* | 4.747\*\*\* | 4.262\*\* | 3.672\*\* | 2.894\* |
|  | -1.586 | -1.963 | -2.068 | -2.05 | -2.023 | -1.881 | -1.81 | -1.7 | -1.662 | -1.651 |
| I(FF\_IND\_12)[T.NoDur] | -2.884 | -2.888 | -2.658 | -2.172 | -1.971 | -1.289 | -0.862 | -0.008 | 0.621 | 0.652 |
|  | -2.096 | -2.595 | -2.734 | -2.71 | -2.674 | -2.487 | -2.393 | -2.247 | -2.197 | -2.182 |
| I(FF\_IND\_12)[T.Other] | 0.538 | 0.801 | 0.966 | 1.169 | 1.172 | 1.317 | 1.374 | 1.6 | 1.957 | 1.735 |
|  | -1.71 | -2.116 | -2.23 | -2.21 | -2.181 | -2.028 | -1.952 | -1.832 | -1.792 | -1.78 |
| I(FF\_IND\_12)[T.Shops] | -2.973 | -3.589 | -3.66 | -3.58 | -3.583 | -3.58 | -3.586 | -3.479 | -3.325 | -3.207 |
|  | -2.35 | -2.91 | -3.065 | -3.039 | -2.998 | -2.788 | -2.683 | -2.519 | -2.464 | -2.447 |
| I(FF\_IND\_12)[T.Telcm] | -0.944 | -0.196 | 0.238 | 0.724 | 0.819 | 1.017 | 1.163 | 1.04 | 1.035 | 0.474 |
|  | -3.303 | -4.089 | -4.308 | -4.27 | -4.213 | -3.918 | -3.771 | -3.54 | -3.463 | -3.439 |
| I(FF\_IND\_12)[T.Utils] | -1.592 | -1.512 | -1.345 | -1.198 | -1.087 | -0.765 | -0.383 | 0.541 | 1.18 | 1.58 |
|  | -2.419 | -2.995 | -3.155 | -3.127 | -3.086 | -2.869 | -2.762 | -2.593 | -2.536 | -2.518 |
| Intercept | 61.979\*\*\* | 79.693\*\*\* | 86.937\*\*\* | 89.494\*\*\* | 88.705\*\*\* | 80.604\*\*\* | 71.165\*\*\* | 51.523\*\*\* | 36.085\*\*\* | 26.535\*\*\* |
|  | -5.393 | -6.677 | -7.034 | -6.972 | -6.88 | -6.398 | -6.157 | -5.78 | -5.654 | -5.615 |
| ROA | 9.903 | 9.619 | 8.721 | 7.373 | 7.405 | 6.48 | 5.803 | 3.387 | 1.17 | -0.855 |
|  | -8.05 | -9.967 | -10.5 | -10.408 | -10.27 | -9.55 | -9.191 | -8.629 | -8.44 | -8.382 |
| btm | -1.363 | 0.12 | 0.92 | 1.808 | 2.153 | 3.057 | 3.632 | 4.913\*\* | 5.859\*\* | 6.224\*\*\* |
|  | -2.217 | -2.745 | -2.892 | -2.866 | -2.828 | -2.63 | -2.531 | -2.376 | -2.324 | -2.308 |
| io\_percent | 3.995\* | 5.097\*\* | 5.379\*\* | 5.121\* | 4.980\* | 4.133\* | 3.425 | 1.849 | 0.459 | -0.468 |
|  | -2.077 | -2.571 | -2.709 | -2.685 | -2.65 | -2.464 | -2.371 | -2.226 | -2.177 | -2.162 |
| lev | -4.548\* | -4.543 | -4.263 | -3.491 | -3.169 | -1.76 | -0.814 | 0.98 | 1.603 | 2.069 |
|  | -2.684 | -3.323 | -3.501 | -3.471 | -3.425 | -3.185 | -3.065 | -2.877 | -2.814 | -2.795 |
| lnAT | -2.184\*\*\* | -3.227\*\*\* | -3.636\*\*\* | -3.740\*\*\* | -3.691\*\*\* | -3.219\*\*\* | -2.863\*\*\* | -2.182\*\*\* | -1.714\*\*\* | -1.370\*\*\* |
|  | -0.45 | -0.558 | -0.588 | -0.582 | -0.575 | -0.534 | -0.514 | -0.483 | -0.472 | -0.469 |
| numest | 0.071 | 0.058 | 0.05 | 0.041 | 0.041 | 0.052 | 0.062 | 0.073 | 0.065 | 0.067 |
|  | -0.082 | -0.102 | -0.107 | -0.106 | -0.105 | -0.097 | -0.094 | -0.088 | -0.086 | -0.086 |
|  |  |  |  |  |  |  |  |  |  |  |
| Observations | 487 | 487 | 487 | 487 | 487 | 487 | 487 | 487 | 487 | 487 |
| R2 | 0.142 | 0.153 | 0.16 | 0.161 | 0.159 | 0.138 | 0.118 | 0.082 | 0.062 | 0.054 |
| Adjusted R2 | 0.107 | 0.119 | 0.125 | 0.126 | 0.124 | 0.103 | 0.082 | 0.044 | 0.024 | 0.015 |
| Residual Std. Error | 9.385 (df=467) | 11.619 (df=467) | 12.241 (df=467) | 12.133 (df=467) | 11.972 (df=467) | 11.133 (df=467) | 10.715 (df=467) | 10.059 (df=467) | 9.839 (df=467) | 9.771 (df=467) |
| F Statistic | 4.071\*\*\*(df=19; 467) | 4.452\*\*\*(df=19; 467) | 4.667\*\*\*(df=19; 467) | 4.702\*\*\*(df=19; 467) | 4.636\*\*\*(df=19; 467) | 3.932\*\*\*(df=19; 467) | 3.285\*\*\*(df=19; 467) | 2.188\*\*\*(df=19; 467) | 1.637\*\*(df=19; 467) | 1.390(df=19; 467) |

# TABLE 5 Panel B:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 second | 2 seconds | 3 seconds | 5 seconds | 6 seconds | 10 seconds | 15 seconds | 30 seconds | 1 minute | 2 minutes |
| Asset\_turn | -0.12 | 0.575 | 1.031 | 1.842 | 1.539 | 1.241 | 1.477 | 0.439 | 1.222 | 0.487 |
|  | -1.02 | -1.155 | -1.184 | -1.215 | -1.244 | -1.292 | -1.284 | -1.152 | -0.909 | -0.845 |
| CAPM\_BETA | -1.175 | -2.301\* | -3.034\*\* | -4.132\*\*\* | -4.254\*\*\* | -5.210\*\*\* | -5.389\*\*\* | -5.365\*\*\* | -5.761\*\*\* | -4.387\*\*\* |
|  | -1.055 | -1.194 | -1.225 | -1.257 | -1.287 | -1.336 | -1.328 | -1.192 | -0.94 | -0.874 |
| I(FF\_IND\_12)[T.Chems] | -0.439 | 0.711 | 1.786 | 3.778 | 4.138 | 6.403\*\* | 6.370\*\* | 3.764 | 1.77 | -0.27 |
|  | -2.325 | -2.632 | -2.7 | -2.77 | -2.836 | -2.945 | -2.927 | -2.627 | -2.072 | -1.926 |
| I(FF\_IND\_12)[T.Durbl] | -3.962 | -3.097 | -1.865 | -0.281 | 0.958 | 3.047 | 5.438 | 1.916 | -0.854 | -0.38 |
|  | -2.859 | -3.236 | -3.32 | -3.406 | -3.487 | -3.622 | -3.6 | -3.23 | -2.548 | -2.368 |
| I(FF\_IND\_12)[T.Enrgy] | -1.198 | -1.762 | -2.35 | -3.908 | -4.925\* | -5.793\*\* | -5.935\*\* | -6.689\*\* | -5.496\*\*\* | -2.839 |
|  | -2.3 | -2.604 | -2.671 | -2.74 | -2.806 | -2.914 | -2.896 | -2.599 | -2.05 | -1.905 |
| I(FF\_IND\_12)[T.Hlth] | 1.248 | 2.755 | 4.033\*\* | 5.209\*\* | 4.952\*\* | 6.165\*\*\* | 5.509\*\* | 4.152\*\* | 1.309 | 0.441 |
|  | -1.753 | -1.984 | -2.036 | -2.088 | -2.138 | -2.221 | -2.207 | -1.981 | -1.563 | -1.452 |
| I(FF\_IND\_12)[T.Manuf] | 0.502 | 1.206 | 1.718 | 2.605 | 3.491 | 4.059\* | 3.799\* | 1.947 | 1.857 | 0.528 |
|  | -1.768 | -2.001 | -2.053 | -2.106 | -2.156 | -2.239 | -2.226 | -1.997 | -1.576 | -1.464 |
| I(FF\_IND\_12)[T.Money] | -4.738\*\*\* | -3.369\*\* | -1.397 | 1.22 | 2.133 | 4.946\*\*\* | 5.803\*\*\* | 3.682\*\* | 0.991 | -1.369 |
|  | -1.477 | -1.672 | -1.715 | -1.759 | -1.801 | -1.871 | -1.859 | -1.668 | -1.316 | -1.223 |
| I(FF\_IND\_12)[T.NoDur] | -3.412\* | -2.586 | -2.583 | -1.492 | -1.464 | -0.462 | 0.043 | -0.51 | -1.573 | -1.051 |
|  | -1.952 | -2.209 | -2.266 | -2.325 | -2.381 | -2.472 | -2.458 | -2.205 | -1.74 | -1.617 |
| I(FF\_IND\_12)[T.Other] | 0.36 | 1.52 | 2.251 | 2.846 | 3.485\* | 3.537\* | 2.904 | 1.313 | -0.27 | 0.774 |
|  | -1.592 | -1.802 | -1.848 | -1.896 | -1.942 | -2.016 | -2.004 | -1.798 | -1.419 | -1.319 |
| I(FF\_IND\_12)[T.Shops] | 1.33 | 1.343 | 1.127 | 0.363 | 0.788 | 0.049 | -0.453 | -0.712 | -1.75 | -0.049 |
|  | -2.189 | -2.477 | -2.541 | -2.607 | -2.669 | -2.772 | -2.756 | -2.473 | -1.951 | -1.813 |
| I(FF\_IND\_12)[T.Telcm] | -3.857 | -1.95 | -1.327 | 1.003 | 2.872 | 5.438 | 5.589 | 8.060\*\* | 6.165\*\* | 4.046 |
|  | -3.076 | -3.481 | -3.571 | -3.664 | -3.751 | -3.896 | -3.872 | -3.475 | -2.741 | -2.548 |
| I(FF\_IND\_12)[T.Utils] | -3.314 | -2.121 | -1.863 | -1.112 | -1.576 | -2.393 | -2.55 | -5.556\*\* | -4.773\*\* | -2.611 |
|  | -2.253 | -2.55 | -2.615 | -2.683 | -2.747 | -2.853 | -2.836 | -2.545 | -2.008 | -1.866 |
| Intercept | 17.242\*\*\* | 37.552\*\*\* | 54.725\*\*\* | 78.733\*\*\* | 90.093\*\*\* | 108.802\*\*\* | 110.771\*\*\* | 96.309\*\*\* | 64.881\*\*\* | 36.709\*\*\* |
|  | -5.022 | -5.685 | -5.831 | -5.982 | -6.125 | -6.361 | -6.323 | -5.674 | -4.476 | -4.16 |
| ROA | 15.657\*\* | 10.572 | 4.225 | -7.476 | -13.581 | -20.411\*\* | -25.319\*\*\* | -24.884\*\*\* | -14.782\*\* | -12.314\*\* |
|  | -7.497 | -8.486 | -8.705 | -8.93 | -9.144 | -9.496 | -9.439 | -8.47 | -6.682 | -6.21 |
| btm | -10.435\*\*\* | -9.771\*\*\* | -8.562\*\*\* | -5.941\*\* | -5.283\*\* | -4.12 | -2.784 | -2.44 | 1.151 | -0.952 |
|  | -2.065 | -2.337 | -2.397 | -2.459 | -2.518 | -2.615 | -2.599 | -2.332 | -1.84 | -1.71 |
| io\_percent | -1.588 | -1.245 | -1.141 | -0.601 | -0.365 | 1.382 | 1.097 | 1.6 | -0.778 | 0.447 |
|  | -1.934 | -2.189 | -2.246 | -2.304 | -2.359 | -2.45 | -2.435 | -2.185 | -1.724 | -1.602 |
| lev | -7.108\*\*\* | -7.637\*\*\* | -7.361\*\* | -5.477\* | -6.420\*\* | -4.964 | -3.477 | -2.546 | -0.368 | 0.042 |
|  | -2.5 | -2.83 | -2.903 | -2.978 | -3.049 | -3.167 | -3.147 | -2.824 | -2.228 | -2.071 |
| lnAT | 2.941\*\*\* | 1.769\*\*\* | 0.452 | -1.778\*\*\* | -2.836\*\*\* | -4.984\*\*\* | -5.674\*\*\* | -5.335\*\*\* | -3.382\*\*\* | -1.352\*\*\* |
|  | -0.42 | -0.475 | -0.487 | -0.5 | -0.512 | -0.531 | -0.528 | -0.474 | -0.374 | -0.347 |
| numest | 0.305\*\*\* | 0.296\*\*\* | 0.241\*\*\* | 0.145 | 0.098 | -0.049 | -0.158 | -0.201\*\* | -0.112 | -0.134\*\* |
|  | -0.077 | -0.087 | -0.089 | -0.091 | -0.093 | -0.097 | -0.096 | -0.086 | -0.068 | -0.063 |
|  |  |  |  |  |  |  |  |  |  |  |
| Observations | 487 | 487 | 487 | 487 | 487 | 487 | 487 | 487 | 487 | 487 |
| R2 | 0.288 | 0.192 | 0.139 | 0.147 | 0.181 | 0.317 | 0.373 | 0.406 | 0.33 | 0.181 |
| Adjusted R2 | 0.259 | 0.159 | 0.104 | 0.112 | 0.148 | 0.29 | 0.347 | 0.382 | 0.302 | 0.148 |
| Residual Std. Error | 8.740 (df=467) | 9.892 (df=467) | 10.147 (df=467) | 10.411 (df=467) | 10.659 (df=467) | 11.070 (df=467) | 11.003 (df=467) | 9.873 (df=467) | 7.789 (df=467) | 7.239 (df=467) |
| F Statistic | 9.945\*\*\*(df=19; 467) | 5.854\*\*\*(df=19; 467) | 3.981\*\*\*(df=19; 467) | 4.226\*\*\*(df=19; 467) | 5.429\*\*\*(df=19; 467) | 11.431\*\*\*(df=19; 467) | 14.618\*\*\*(df=19; 467) | 16.792\*\*\*(df=19; 467) | 12.087\*\*\*(df=19; 467) | 5.431\*\*\*(df=19; 467) |
| F Statistic | 4.071\*\*\*(df=19; 467) | 4.452\*\*\*(df=19; 467) | 4.667\*\*\*(df=19; 467) | 4.702\*\*\*(df=19; 467) | 4.636\*\*\*(df=19; 467) | 3.932\*\*\*(df=19; 467) | 3.285\*\*\*(df=19; 467) | 2.188\*\*\*(df=19; 467) | 1.637\*\*(df=19; 467) | 1.390(df=19; 467) |