

ECONOMIC FINDING

Cybersecurity Risk

Chris Florakis, Professor of Finance, University of Liverpool; Christodoulos Louca, Associate Professor in Finance, Cyprus University of Technology; Roni Michaely, Professor of Finance, University of Geneva; and Michael Weber, Associate Professor of Finance and Fama Faculty Scholar, Booth School of Business

Stocks with high exposure to cybersecurity risk exhibit high expected returns on average, but they perform poorly in periods of increasing attention to cybersecurity risk.

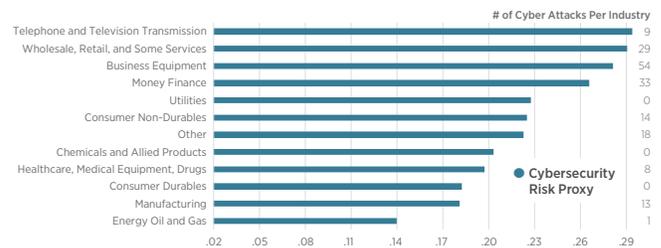
Cybersecurity risk is at the top of many firms' worry lists, and rightly so. Despite substantial investments in information security systems, firms remain highly exposed to cybersecurity risk, with possible losses amounting to \$6 trillion annually by 2021. One open question for researchers has been whether a firm's exposure to cybersecurity risk is priced into financial markets.

To address this question, the authors developed a firm-level measure of cybersecurity risk for all listed firms in the US, which allowed them to examine whether cybersecurity risk is priced in the cross section of stock returns. The authors analyzed firms that were subject to cyberattacks as a training sample, and then they compared the wording and language in the relevant risk-disclosure section in annual reports of the attacked firms with that of all other firms. They first extracted the discussion on cybersecurity risk in the firms' 10-K reports from 2007-2018, which contain information about the most significant risk factors for each firm.

Next, they identified a sample of firms that were subject to a major cyberattack (involving lost personal information by hacking or malware-electronic entry by an outside party) in any given year, arguing that those firms have high cybersecurity risk, and which then served as the authors' training sample. Finally, they estimated the similarity of each firm's cybersecurity-risk disclosure with past cybersecurity-risk disclosures of firms in the training sample (i.e., from the one-year period prior to the firm's filing date). The higher the measured similarity in cybersecurity risk disclosure for their sample firms and firms in the training sample, the greater the exposure to cybersecurity risk.

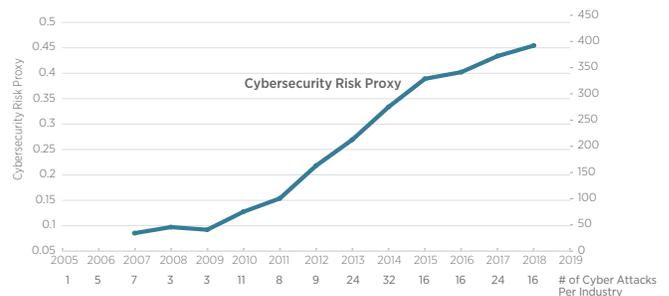
The authors then subject these measures to a number of validations that, in the end, drive their finding that firms with high exposure to cybersecurity risk outperform other firms by up to 8.3% per year. Among other findings, they

Figure 1 • Cybersecurity Risk Across Industries



Notes: This figure displays the average value of our cybersecurity risk measure and the number of cyber attacks by industry. Firms are classified into 12 industries according to Fama and French's 12 industry portfolios.

Figure 2 • Cybersecurity Risk By Year



Notes: This figure displays the average value of our cybersecurity risk measure and the number of cyber attacks by year. Based on the way our measure is constructed (i.e. we measure the similarity of each firm's cyber-related disclosures with those in past disclosures of firms that have been subject to cyber attacks), 2007 is the earliest year for which we get an estimate of cybersecurity risk (see Section 2 in the Working Paper for details).

offer one important caveat: A cybersecurity-mimicking portfolio performs poorly in times of heightened cybersecurity risk and investors' concerns about data breaches. These results support the predictions of asset-pricing theory that investors require compensation for bearing cybersecurity risk.