Appendix: State-Sponsored Cyber Attacks and Co-Movements in

Stock Market Returns: Evidence From US Cybersecurity Defense

Contractors

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Appendix A   Sampled Firms

Table 1 has a list of the firms in the sample. These firms represent a significant cross-section of cybersecurity service providers in the United States.

Acuson Corp, now a part of Siemens Medical Solutions, started as a pioneer in ultrasound technology. It provides wide-range of cybersecurity services to a variety of small and mid-sized firms.

CACI International Inc. is a multinational professional services and information technology company that provides wide range of cybersecurity solutions for the military, defense and intelligence agencies.

Cisco Systems Inc. is a global leader in networking and cybersecurity solutions, with a significant stake in developing secure communication systems and protecting information infrastructures across several sectors.

General Dynamics Corp. is a traditional defense contractor. Their portfolio includes a dedicated information technology sector responsible for cybersecurity solutions for government and commercial customers.

International Business Machines (IBM) Corporation has a legacy in technological innovation and has evolved to become a dominant player in the cybersecurity space, providing a comprehensive suite of security solutions and services to both government and private entities.

Lockheed Martin Corp. is another prominent defense contractor. It also houses an information systems & global technology solutions unit with a strong focus on providing cybersecurity and information technology services to a range of clients including, private firms, military, defense and intelligence agencies.

Microsoft Corp. is one of the world's leading technology companies. It has a significant

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Table 1: Sampled Cybersecurity Firms

Firms
Acuson Corp
Caci International Inc
Cisco Systems Inc
General Dynamics Corp
International Business Machs Corp
Lockheed Martin Corp
Microsoft Corp
Northrop Grumman Corp
Ratexchange Corp
Symantec Corp
Verizon Communications Inc
Booz Allen Hamilton Holding Corp
Science Applications International Corp
Hewlett Packard Enterprise Corp
Dell Technologies Inc
Raytheon Technologies Corp

stake in cybersecurity, given its vast digital ecosystem that spans across multiple industries worldwide.

Northrop Grumman Corp. is a major defense and aerospace company. It is also deeply involved in cybersecurity, providing critical solutions for a variety of sectors, including defense, intelligence and civilian agencies.

Ratexchange Corp, Symantec Corp, and Verizon Communications Inc. each have unique offerings in the cybersecurity space. Symantec, known for its Norton antivirus software, is an established player in consumer and enterprise cybersecurity solutions. Verizon, as a major telecommunications company, also provides cybersecurity solutions as part of its broader portfolio. Ratexchange Corporation is a major B2B e-commerce company.

Booz Allen Hamilton Holding Corp. is a defense contractor and a management and information technology consulting firm that has long been associated with government services, including cybersecurity.

Science Applications International Corporation (SAIC) and Hewlett Packard Enterprises are

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both major technology firms that have significant cybersecurity operations as part of their broader service offerings.

Dell Technologies Inc., well-known for its hardware products, also offers cybersecurity solutions, especially pertaining to securing network hardware and data protection.

Lastly, Raytheon Technologies Corp., another prominent defense contractor, also has a significant presence in the cybersecurity industry, particularly related to defense and intelligence sectors.

This ensemble of companies, with their varied focus, size and expertise, provides a representative sample to analyze the interplay between state-sponsored cyber attacks and market behavior in the cybersecurity industry.

Appendix B   Descriptive Statistics

Table 2: Descriptive Statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Market Integration Index	226	62.078	30.778	0.000	38.945	88.845	99.924
Employees (Ths)	143	99.140	55.239	13.000	65.150	125.700	260.000
Assets (Mil)	143	78,003.060	79,997.760	1,398.000	27,699.000	106,919.000	316,481.000
Liabilities (Mil)	143	49,597.370	58,257.400	1,053.000	15,430.000	54,341.000	247,209.000
Net Income (Mil)	143	5,909.228	7,396.684	−1,262.000	1,246.500	7,947.000	44,281.000
Stockholders' Equity (Mil)	143	24,852.430	24,784.610	−945.000	5,893.000	39,619.000	118,304.000

Table 2 presents descriptive statistics for the firms in our sample, providing insight into the essential characteristics of these firms. It lists statistics for a variety of firm-level financial, operational and market metrics.

Appendix C   Additional Tables

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Business and Politics

Table 3: Severity of Cyber Attacks and Market Integration (Accounting for Interstate Conflict)

	Model 1	Model 2	Model 3	Model 4	Model 5
		DV: Market Integration			
Intercept	49.093***	52.901***	52.404***	60.461***	60.732***
	[31.763, 66.422]	[32.262, 73.540]	[31.844, 72.964]	[31.017, 89.904]	[31.070, 90.394]
Severity	5.089**	5.393***	5.418***	5.480**	5.439**
	[0.970, 9.207]	[1.358, 9.429]	[1.494, 9.343]	[1.229, 9.730]	[1.236, 9.642]
Cyber Attacks	−0.468	−0.326	−0.487	−0.676	−0.696
	[−1.499, 0.563]	[−1.282, 0.631]	[−1.557, 0.583]	[−1.895, 0.544]	[−1.930, 0.537]
Assets		0.000	−0.001***	0.000	0.000
		[0.000, 0.000]	[−0.001, 0.000]	[−0.001, 0.000]	[−0.001, 0.000]
Liabilities		0.000	0.000**	0.000	0.000
		[0.000, 0.000]	[0.000, 0.001]	[0.000, 0.001]	[0.000, 0.001]
Net Income			0.000	0.000	0.000
			[−0.001, 0.001]	[−0.001, 0.001]	[−0.001, 0.001]
Stockholders' Equity			0.001**	0.000	0.000
			[0.000, 0.001]	[0.000, 0.001]	[0.000, 0.001]
Employees				−0.097	−0.098
				[−0.343, 0.149]	[−0.348, 0.153]
Interstate Conflict					5.346
					[−12.654, 23.345]
Num.Obs.	143	143	143	143	143
R2	0.024	0.058	0.081	0.091	0.092
R2 Adj.	0.010	0.030	0.040	0.044	0.038
AIC	1394.5	1393.4	1393.9	1394.3	1396.1
BIC	1406.3	1411.2	1417.6	1420.9	1425.7
RMSE	30.84	30.30	29.93	29.76	29.74
Std.Errors	by: Firm	by: Firm	by: Firm	by: Firm	by: Firm

Coefficients with 95 percent confidence intervals in parenthesis.*** p less than 0.01, ** p less than 0.05, * p less than 0.1.

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Table 4: Sampled Nasdaq CTA Cybersecurity Firms

Firms
Akamai Technologies Inc
Avantgo Inc
F 5 Networks Inc
Netscout Systems Inc
Networks Associates Inc
Fortinet Inc
Leidos Holdings Inc
Palo Alto Networks Inc
Qualys Inc
A10 Networks Inc
Varonis Systems Inc
Rapid7 Inc
Okta Inc
Broadcom Inc
Tenable Holdings Inc
Zscaler Inc
Cloudflare Inc
Crowdstrike Holdings Inc

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