

Introduction

Marriott 2018

Personal information for up to 500 million guests was involved, including:

- Names
- Contact details
- Passport numbers
- Encrypted payment card numbers

Encryption keys may also have been compromised.

Timeline:

- Marriott **detected** the malware attack on **Sep 8, 2018**.
- Marriott **announced** the database security incident on **Nov 30, 2018**.

Consequences:

- GDPR Fine: £ 18.4 M
- FTC/State Settlement: \$52 M, etc.

Given that mutual funds show preemptive behavior by:

- Trading before security class action announcements,
- Anticipating earnings surprises,
- Predicting ESG rating changes through ESG-focused fund trades.

Do funds trade before cyber attack announcement?

Mutual Funds' Preemptive Response to Major Cyber Attacks

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Methodology & Results

Do funds trade preemptively?

Panel A: Active Mutual Funds

	(1)	(2)	(3)	(4)	(5) Position Change _{t,t+1}	(6)	(7)	(8)
Time to Announcement (months)	-2	-1	1	2	-2	-1	1	2
High Cyber Risk Dummy _{t,t+1}	0.0006 (0.001)	-0.0020* (0.001)	0.0010 (0.001)	0.0001 (0.001)		-0.0009 (0.001)	0.0011 (0.001)	0.0005 (0.001)
Low Cyber Risk Dummy _{t,t+1}								
Observations	312,025	325,021	344,290	349,654	312,025	325,021	344,290	349,654
Adj. R ²	0.1344	0.1105	0.1205	0.1326	0.1344	0.1063	0.1326	
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Fund × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

Panel B: Index Funds

	(1)	(2)	(3)	(4)	(5) Position Change _{t,t+1}	(6)	(7)	(8)
Time to Announcement (months)	-2	-1	1	2	-2	-1	1	2
High Cyber Risk Dummy _{t,t+1}	0.0014 (0.001)	-0.0003 (0.000)	0.0009 (0.001)	-0.0002 (0.000)		-0.0020* (0.001)	-0.0001 (0.001)	-0.0007 (0.000)
Low Cyber Risk Dummy _{t,t+1}								
Observations	292,209	324,477	331,081	366,630	292,209	324,477	331,081	366,630
Adj. R ²	0.6597	0.6062	0.5688	0.6800	0.6597	0.6011	0.6310	0.6761
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

What kind of funds trade?

	(1)	(2)	(3)	(4)	(5) Position Change _{t,t+1}	(6)	(7)	(8)
Time to Announcement (months)	-2	-1	1	2	-2	-1	1	2
High Cyber Risk Dummy _{t,t+1}	0.0009 (0.001)	-0.0016* (0.001)	0.0012* (0.001)	-0.0006 (0.001)		-0.0013 (0.001)	0.0013 (0.001)	-0.0008 (0.0005)
High Cyber Risk Dummy _{t,t+1} × Disclose Cyber Risk Dummy _{t,t+1}	-0.0055** (0.002)	-0.0012 (0.003)	0.0011 (0.002)	-0.0013 (0.002)		-0.0013 (0.001)	0.0019 (0.001)	-0.0006 (0.002)
Low Cyber Risk Dummy _{t,t+1} × Disclose Cyber Risk Dummy _{t,t+1}	-0.0025 (0.005)	0.0024 (0.004)	0.0018 (0.004)	-0.0003 (0.005)		-0.0056 (0.004)	0.0015 (0.004)	0.0023 (0.003)
Observations	312,026	325,013	344,291	349,656	312,026	325,013	344,291	349,656
Adj. R ²	0.1344	0.0337	0.0468	0.1344	0.1344	0.0337	0.0468	0.0508
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Which stocks are being traded?

	(1)	(2)	(3)	(4)	(5) Position Change _{t,t+1}	(6)	(7)	(8)
Time to Announcement (months)	-2	-1	1	2	-2	-1	1	2
High Cyber Risk Dummy _{t,t+1}	0.0007 (0.001)	-0.0016* (0.001)	0.0012* (0.001)	-0.0006 (0.001)		-0.0008 (0.001)	0.0008 (0.001)	-0.0002 (0.0001)
High Cyber Risk Dummy _{t,t+1} × Hacked Ind Dummy _{t,t+1}	0.0008 (0.002)	-0.0014* (0.002)	0.0015 (0.002)	-0.0003 (0.002)		-0.0011 (0.002)	0.0008 (0.002)	-0.0001 (0.0001)
Low Cyber Risk Dummy _{t,t+1} × Hacked Ind Dummy _{t,t+1}	-0.0057** (0.002)	-0.0009 (0.002)	0.0045** (0.002)	0.0008 (0.002)		-0.0056** (0.002)	0.0023 (0.002)	-0.0003 (0.0003)
Observations	312,025	325,021	344,290	349,654	312,025	325,021	344,290	349,654
Adj. R ²	0.1344	0.1105	0.1205	0.1347	0.1345	0.0945	0.1063	0.1325
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stock FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

2. What kind of funds trade? Which stocks are being traded?

- Funds that mention cyber risk in their prospectuses trade more actively.

- Stocks in the attacked industry are traded the most (sell high-cyber-risk stocks, buy low-cyber-risk stocks).

- A better data privacy policy serves as a substitute for low cyber risk.

3. Do funds get flow rewarded?

- Yes, especially from institutional investors.

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