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# Non-monotonic Security Protocols and Failures in Financial Intermediation

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## [Security Protocols XXVI](#)

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## Abstract

Security Protocols as we know them are *monotonic*: valid security evidence (e.g. commitments, signatures, etc.) accrues over protocol steps performed by honest parties. Once's Alice proved she has an authentication token, got some digital cash, or casted a correct vote, the protocol can move on to validate Bob's evidence. Alice's evidence is never invalidated by honest Bob's actions (as long as she stays honest and is not compromised). Protocol failures only stems from

design failures or wrong assumptions (such as Alice's own misbehavior). Security protocol designers can then focus on preventing or detecting misbehavior (e.g. double spending or double voting).

We argue that general financial intermediation (e.g. Market Exchanges) requires us to consider new form of failures where honest Bob's actions can make honest good standing. Security protocols must be able to deal with *non-monotonic security* and *new types of failures* that stems from rational behavior of honest agents finding themselves on the wrong side.

This has deep implications for the efficient design of security protocols for general financial intermediation, in particular if we need to guarantee a *proportional burden* of computation to the various parties.

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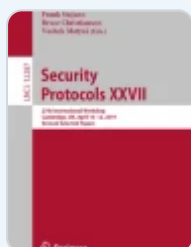
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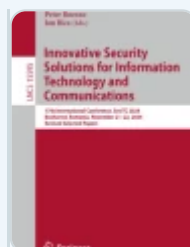
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## Notes

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1. Obviously the server would have had more load than a client, but this only happens because the server participates to several authentications with several clients at once.
2. The largest claimed example is the Danish sugar beet auction where 1229 Danish farmers auctioned their production [3]. However, an actual technical reading of the paper reveals that there were only three servers performing MPC over the secret shares generated by the 1200 bidders. As we will illustrate in Sect. 3 it is actually a good example of a monotonic security protocol.
3. See an additional discussion in [15] and a concrete implementation in [14].
4. Security evidence created during a protocol run should not extend beyond the protocol run. Several protocol failures are indeed due to protocol design errors where a credential could be used across sessions [1].
5. A formal definition of a Futures Market is given in [15] (Sect. 4).
6. See additional discussions on non-monotonic security in [14] (Sect. 5, Remark 1).
7. The 1229 parties full MPC variant is still out of reach for the foreseeable future

as experimental papers typically reported MPC with less than 10 parties [5].

8. See Sect. 7 of [14].
9. This does not violate the proportional burden requirement as each trader has the responsibility to prove the solvency if s/he still wants to be in the game.
10. <https://tickhistory.thomsonreuters.com>.
11. In some cases this fixed order might interfere with the security goal, if the order of actions may leak some information on who started the process.

## References

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1. Abadi, M., Needham, R.: Prudent engineering practice for cryptographic protocols. *IEEE Trans. Software Eng.* **22**(1), 6–15 (1996)  
[Article](#) [Google Scholar](#)
2. Allen, F., Santomero, A.M.: The theory of financial intermediation. *J. Bank. Finance* **21**(11–12), 1461–1485 (1997)  
[Article](#) [Google Scholar](#)
3. Bogetoft, P., et al.: Secure multiparty computation goes live. In: Dingledine, R., Golle, P. (eds.) *FC 2009*. LNCS, vol. 5628, pp. 325–343. Springer, Heidelberg (2009). [https://doi.org/10.1007/978-3-642-03549-4\\_20](https://doi.org/10.1007/978-3-642-03549-4_20)  
[Chapter](#) [Google Scholar](#)
4. Canetti, R., Lindell, Y., Ostrovsky, R., Sahai, A.: Universally composable two-party and multi-party secure computation. In: *ACM Symposium on Theory of*

5. Damgård, I., Keller, M., Larraia, E., Pastro, V., Scholl, P., Smart, N.P.: Practical covertly secure MPC for dishonest majority – or: breaking the SPDZ limits. In: Crampton, J., Jajodia, S., Mayes, K. (eds.) ESORICS 2013. LNCS, vol. 8134, pp. 1–18. Springer, Heidelberg (2013). [https://doi.org/10.1007/978-3-642-40203-6\\_1](https://doi.org/10.1007/978-3-642-40203-6_1)

6. Dierks, T., Allen, C.: The TLS Protocol Version 1.0 (1999)

7. Gong, L.: Fail-Stop Protocols: An Approach To Designing Secure Protocols (1994)

8. Harkins, D., Carrel, D.: The internet key exchange (IKE), Technical report (1998)

9. Kiayias, A., Zacharias, T., Zhang, B.: An efficient E2E verifiable e-voting system without setup assumptions. IEEE Secur. Priv. (2017)

10. Kosba, A., Miller, A., Shi, E., Wen, Z., Papamanthou, C.: Hawk: the blockchain model of cryptography and privacy-preserving smart contracts. In: IEEE Symposium on Security and Privacy, pp. 839–858. IEEE (2016)

11. Kumaresan, R., Moran, T., Bentov, I.: How to use bitcoin to play decentralized poker. In: ACM SIGSAC Conference on Computer and Communications Security, pp. 195–206. ACM (2015)

[Google Scholar](#)

12. Kumaresan, R., Vaikuntanathan, V., Vasudevan, P.N.: Improvements to secure computation with penalties. In: ACM SIGSAC Conference on Computer and Communications Security, pp. 406–417, ACM (2016)

[Google Scholar](#)

13. Malinova, K., Park, A., Riordan, R.: Do retail traders suffer from high frequency traders (2013). SSRN 2183806

[Google Scholar](#)

14. Massacci, F., Ngo, C.N., Nie, J., Venturi, D., Williams, J.: FuturesMEX: secure, distributed futures market exchange. In: IEEE Symposium on Security and Privacy, pp. 453–471. IEEE (2018)

[Google Scholar](#)

15. Massacci, F., Ngo, C.N., Nie, J., Venturi, D., Williams, J.: The seconomics (security-economics) vulnerabilities of decentralized autonomous organizations. In: Stajano, F., Anderson, J., Christianson, B., Matyáš, V. (eds.) Security Protocols 2017. LNCS, vol. 10476, pp. 171–179. Springer, Cham (2017). [https://doi.org/10.1007/978-3-319-71075-4\\_19](https://doi.org/10.1007/978-3-319-71075-4_19)

[Chapter](#) [Google Scholar](#)

16. Merkle, R.C.: A digital signature based on a conventional encryption function. In: Pomerance, C. (ed.) CRYPTO 1987. LNCS, vol. 293, pp. 369–378. Springer, Heidelberg (1988). [https://doi.org/10.1007/3-540-48184-2\\_32](https://doi.org/10.1007/3-540-48184-2_32)

17. Miller, S.P., Neuman, B.C., Schiller, J.I., Saltzer, J.H.: Kerberos authentication and authorization system. In: Project Athena Technical Plan (1987)

[Google Scholar](#)

18. Nakamoto, S.: Bitcoin: a peer-to-peer electronic cash system (2008)

[Google Scholar](#)

19. Sasson, E.B., et al.: Zerocash: decentralized anonymous payments from bitcoin. In: IEEE Symposium on Security and Privacy, pp. 459–474. IEEE (2014)

[Google Scholar](#)

20. Spulber, D.F.: Market microstructure and intermediation. J. Econ. Perspect. **10**(3), 135–152 (1996)

[Article](#) [Google Scholar](#)

21. Zhai, E., Wolinsky, D.I., Chen, R., Syta, E., Teng, C., Ford, B.: AnonRep: towards tracking-resistant anonymous reputation. In: USENIX Symposium on Networked Systems Design and Implementation, pp. 583–596 (2016)

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