14.462 Advanced Macroeconomics II
Spring 2021
Second Half - Townsend

Robert M. Townsend

Syllabus

Instructor: Robert M. Townsend
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Lectures: Tuesdays and Thursdays 1:00 - 2:30pm via Zoom
Recitations:
Office Hours: After class on Thursdays

Course Overview

This course will cover several topics related to liquidity and financial intermediation, featuring how these are changing with innovations made possible by new technologies. The focus of the course is on the design of financial contracts and markets, optimized regulation, e-payments and digital currency including CBDC, and optimal monetary policy.

Lecture 1: Design and Regulation of Financial Systems: Beyond the Hype of Bitcoin, Blockchain, and Distributed Ledgers lie Fundamental, Transformative Innovations.

Lecture 2: Improved Information Infrastructure: Distributed Ledgers, Data Base Management, Financial Accounts.

Lecture 3: E-Money and Digital-Payments: infrastructure, Liquidity, and an Example of Optimized Monetary Policy

Lecture 4: Encryption, Validation in Protocols, Hashes in Data Base Management, and Smart Contracts

Lecture 5: Redesigning Markets with the Combination of Mechanism Design and Encryption

Lecture 6: Real-World Application to Financial Infrastructure in Emerging Markets: Evidence on the Ground, What is Needed, How to Innovate, Guidance from Theory for the Operation of Competitive Markets.

Lecture 7: Financial Infrastructure, How to Achieve the Competitive Outcome, Appropriate and Inappropriate Regulation, Limits to Competition but with Remedies

Lecture 8: Payment Systems and the New Technologies

Lecture 9: Inherent Problems with Money-like Securities: Optimized Regulatory Solutions Using DLT and Smart Contract Technology

Lecture 10: Bubbles and Government Debt: Some Startling Propositions

Lecture 11: Transaction-Based Monetary and Crypto Currency Policy

Requirements

Students are expected to attend the lectures. Some pre-recorded material will be recorded asynchronously and will need to be reviewed in advance of the designated class. Asynchronous lectures are not a substitute for synchronous in-class. The grade will be based in part on class participation, including in class review of asynchronous lecture content and more open discussion (15%), the first part of each class. There are review sheets posted for each lecture to facilitate the review with a few class discussion topics listed there, too. A lecture summary will also be posted in advance of class. The second part of each lecture is focused on models and analytic material not covered in the asynchronous lecture.

Problem sets are quasi projects, hence more open-ended than usual with self-selection options. This replaces the usual student project/paper. Best answers to the p-sets will be presented in the 12th class (60%) (5/18). Final quiz in the last, 13th, class (25%) (5/20). The review sheets should be helpful for this, as an indication of what material you should be mastering.

Readings featured in each of the lectures are marked with an asterisk (*). There is also an additional supplementary reading list with material referenced in the lectures and additional related material.

Lecture 1 (4/1): Design and Regulation of Financial Systems: Beyond the Hype of Bitcoin, Blockchain, and Distributed Ledgers lie Fundamental, Transformative Innovations.

* Townsend, R. (2020). "Distributed Ledgers: Design and Regulation of Financial Infrastructure and Payments Systems." MIT press, Cambridge (MA) and London (England), Chs 1-2. https://direct.mit.edu/books/book/4932/Distributed-LedgersDesign-and-Regulation-of

Lecture 2 (4/8): Improved Information Infrastructure: Distributed Ledgers, Data Base Management, Financial Accounts

* Samphantharak, K., Schuh, S., & Townsend, R. M. (2018). "Integrated household surveys: An assessment of US methods and an innovation." Economic inquiry, 56(1), 50-80. http://libproxy.mit.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=126419582&site=ehost-live&scope=site

* Paweenawat, A. & Townsend, R. (2019). “The Impact of Isolationism: Disentangling Real and Financial Factors.” Working Paper. revised Jan 2019. http://robertmtownsend.net/sites/default/files/files/papers/working_papers/Villages%20-%2022%20April%202019.pdf

* Bond, Charlotte Anne, et al. "Integrated Macroeconomic Accounts for the United States." *Survey of Current Business* 87.11 (2007): 14-31. https://www.proquest.com/docview/219568208?accountid=12492

Schuh and Townsend (2020) “Starting from Scratch: A Multi-Modal Approach to Fully Integrated Household Financial Statements”

Lecture 3 (4/13): E-Money and Digital-Payments: infrastructure, Liquidity, and an Example of Optimized Monetary Policy

* Alvarez, F., Pawasutipaisit, A., & Townsend, R. M. (2019). “Cash Management in Village Thailand: Positive and Normative Implications.”

* Chandrasekhar, A. G., Townsend, R., & Xandri, J. P. (2019). “Financial Centrality and the Value of Key Players.” https://stanford.edu/~arungc/CTX.pdf

Lecture 4 (4/15): Encryption, Validation in Protocols, Hashes in Data Base Management, and Smart Contracts

* Townsend, Robert M and Nicolas Zhang (2020) “A Primer on Encryption,” Sept 2020 https://c19f9196-fcce-4334-aa07-d71aecbf6347.filesusr.com/ugd/33f99a_45c197ef587b4f58bee580b24a904bc3.pdf

* Morris, S., & Shin, H. S. (1997). “Approximate common knowledge and coordination: Recent lessons from game theory.” Journal of Logic, Language and Information, 6(2), 171-190. https://www.jstor.org/stable/40180102?seq=1#metadata_info_tab_contents

Lecture 5 (4/22): Redesigning Markets with the Combination of Mechanism Design and Encryption

* Townsend, Robert and Nicolas Zhang (2021) “Innovative financial designs utilizing homomorphic encryption and multiparty computation.” https://c19f9196-fcce-4334-aa07-d71aecbf6347.filesusr.com/ugd/33f99a_089b295c9aa74ff0b664b6257b67a98b.pdf

* Townsend, R. M. (1988). “Information constrained insurance: the revelation principle extended.” Journal of Monetary Economics, 21(2-3), 411-450. https://doi.org/10.1016/0304-3932(88)90038-4

* Townsend, R. M. (1987). “Economic organization with limited communication.” The American Economic Review, 954-971.
http://libproxy.mit.edu/login?url=https://www.jstor.org/stable/1810220
Doepke, M., & Townsend, R. M. (2006). “Dynamic mechanism design with hidden income and hidden actions.” Journal of Economic Theory, 126(1), 235-285.
https://doi.org/10.1016/j.jet.2004.07.008

Lecture 6 (4/27): Real-World Application to Financial Infrastructure in Emerging Markets: Evidence on the Ground from the Townsend Thai Project, What is Needed, How to Innovate, Guidance from Theory for the Operation of Competitive Markets.

* Prescott, E. C., & Townsend, R. M. (1984). “General competitive analysis in an economy with private information.” International Economic Review, 1-20.
http://libproxy.mit.edu/login?url=https://www.jstor.org/stable/2648863

* Townsend, R., & Xandri, J.P. (2019). “Regulation and the Optimal Design of Financial Markets.” Working Papers

Lecture 7 (4/29): Financial Infrastructure, How to Achieve the Competitive Outcome, Appropriate and Inappropriate Regulation, Limits to Competition but with Remedies

* Jain, A., & Townsend, R. M. (2020). “The economics of platforms in a Walrasian framework.” Economic Theory. https://link.springer.com/content/pdf/10.1007/s00199-020-01309-6.pdf

* Kilenthong, W. T., & Townsend, R. M. (2020). “A market based solution for fire sales and other pecuniary externalities.” Journal of Political Economy.
https://www.journals.uchicago.edu/doi/pdf/10.1086/712787

Lecture 8 (5/4): Payment Systems and the New Technologies

* Dubey, P. (1982). “Price-quantity strategic market games.” Econometrica: Journal of the Econometric Society, 111-126.
http://libproxy.mit.edu/login?url=https://www.jstor.org/stable/1912532

* Bech, M. L., & Garratt, R. (2003). The intraday liquidity management game. *Journal of Economic Theory*, *109*(2), 198-219.
https://doi.org/10.1016/S0022-0531(03)00016-4

Lecture 9 (5/9): Inherent Problems with Money-like Securities and Optimized Regulatory Solutions Using DLT and Smart Contract Technology

* Ostroy, J. M., & Starr, R. M. (1974). "Money and the Decentralization of Exchange." Econometrica, 1093-1113.
http://libproxy.mit.edu/login?url=https://www.jstor.org/stable/1914220

* Townsend, R. M., & Wallace, N. (1987). "Circulating Private Debt: An Example with a Coordination Problem." In Contractual Arrangements for Intertemporal Trade, Edward C. Prescott and Neil Wallace (eds.), Minneapolis: University of Minnesota Press.
http://www.robertmtownsend.net/sites/default/files/files/papers/published/CirculatingPrivateDebt1987.pdf

Daniel Aronoff, Robert M. Townsend and Nicolas Zhang. (2021). "Coordination Problems, Leverage Constraints and A Smart Contract Implementation for the Repo Market."

Kim, Kyungmin. (2015). "Summary of 'Money and the Decentralization of Exchange' and some comments."
https://econweb.ucsd.edu/~rstarr/281webpage/kim%20notes%20on%20Ostroy%20&%20Starr.pdf

Lecture 10 (5/11): Bubbles and Government Debt: Some Startling Propositions

* Tirole, J. (1985). "Asset bubbles and overlapping generations." Econometrica: Journal of the Econometric Society, pp1499-1528.
http://libproxy.mit.edu/login?url=https://www.jstor.org/stable/1913232

* Woodford, M. (1990). Public debt as private liquidity. The American Economic Review, 80(2), 382-388.
http://libproxy.mit.edu/login?url=https://www.jstor.org/stable/2006605

Bewley, T. (1977). The permanent income hypothesis: A theoretical formulation. *Journal of Economic Theory*, *16*(2), 252-292.
https://doi.org/10.1016/0022-0531(77)90009-6

Lecture 11 (5/13): Transaction-Based Monetary and Cryptocurrency Policy

* Townsend, R. M. (1980). "Models of money with spatially separated agents." Models of monetary economies, pp. 265-303.
http://www.robertmtownsend.net/sites/default/files/files/papers/published/ModelsofMoney1980.pdf

* Manuelli, R., & Sargent, T. J. (2010). "Alternative monetary policies in a turnpike economy." Macroeconomic dynamics, 14(5), 727-762.

http://dx.doi.org/10.1017/S1365100509990940

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Supplementary Reading List

Lecture 1: Design and Regulation of Financial Systems: Beyond the Hype of Bitcoin, Blockchain, and Distributed Ledgers lie Fundamental, Transformative Innovations.

Iansiti, M., & Lakhani, K. R. (2017). "The Truth About Blockchain." Harvard Business Review, https://hbr.org/2017/01/the-truth-about-blockchain

Adrian, T., & Shin, H. S. (2010). "The changing nature of financial intermediation and the financial crisis of 2007–2009." *Annu. Rev. Econ., 2*(1), 603-618.

Ayyagari, M., Beck, T., & Martinez Peria, M. S. (2017). "Credit growth and macroprudential policies: preliminary evidence on the firm level." *BIS Paper*, (91a).

Bank for International Settlements (February, 2017). "Distributed Ledger Technology in Payment, Clearing and Settlement: an analytical framework." BIS 2017, https://merltech.org/wp-content/uploads/2017/07/Buerau-of-International-Settlements-DLT.pdf

Bank for International Settlements (2018). "Cryptocurrencies: looking beyond the hype." BIS annual report (June, 2018), 91-114. https://www.bis.org/publ/arpdf/ar2018e.pdf

Briglevics, Tamás and Scott Schuh (2014). "U.S. consumer demand for cash in the era of low interest rates and electronic payments." Working Paper Series 1660, European Central Bank.

Buchak, G., Matvos, G., Piskorski, T., & Seru, A. (2018). "Fintech, regulatory arbitrage, and the rise of shadow banks." Journal of Financial Economics, 130(3), 453-483.

Carstens, A. (2019). "Central Banking and Innovation: Partners in the Quest for Financial Inclusion." The seventeenth C.D. Deshmukh Memorial Lecture.
https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=18949

Chodorow-Reich, G., Gopinath, G., Mishra, P., & Narayanan, A. (2020). "Cash and the economy: Evidence from India's demonetization." The Quarterly Journal of Economics, 135(1), 57-103.
https://academic.oup.com/qje/article/135/1/57/5567189

Eiger, Z. & Mandell, J. (2015). "P2P Lending Basics: How it Works, Current Regulations and Considerations." Morrison Foerster.

https://media2.mofo.com/documents/150129p2plendingbasics.pdf

Gorton, G., & Winton, A. (2003). "Financial intermediation. In Handbook of the Economics of Finance (Vol. 1, pp. 431-552)." Elsevier.
Greene, Claire, Scott Schuh and Joanna Stavins (2017) "The 2015 Survey of Consumer Payment Choice: Summary Results." Research Data Reports, No.17-3.
https://www.bostonfed.org/publications/research-data-report/2017/the-2015-survey-of-consumer-payment-_choice-summary-results.aspx

Kim, Laura, Raynil Kumar, and Shaun O'Brien (2020), "2020 Findings from the Diary of Consumer Payment Choice." Federal Reserve Bank of San Francisco.
https://www.frbsf.org/cash/publications/fed-notes/2020/july/2020-findings-from-the-diary-of-consumer-payment-choice/

Kim, Laura, Raynil Kumar, and Shaun O'Brien (2020), "Consumer Payments and the COVID-19 Pandemic: A supplement to the 2020 Findings from the Diary of Consumer Payment Choice." Federal Reserve Bank of San Francisco.
https://www.frbsf.org/cash/publications/fed-notes/2020/july/consumer-payments-covid-19-pandemic-2020-diary-consumer-payment-choice-supplement/

Stavins, J., Schuh, S., & Greene, C. (2017). "The 2015 Survey of Consumer Payment Choice: summary results (No. 17-3)." Federal Reserve Bank of Boston. https://www.bostonfed.org/-/media/Documents/Workingpapers/PDF/2017/rdr1703.pdf

Suberg (2020). "Europe Central Bank Proposes 'Unattractive' Rates for Digital Currency." Working Paper
https://cointelegraph.com/news/europe-central-bank-proposes-unattractive-rates-for-digital-currency

Hildebrand, N. N. V. (2019). "The Rise of Finance: 1850-2015. Three essays in economics. (Doctoral dissertation, Massachusetts Institute of Technology)."
https://dspace.mit.edu/handle/1721.1/122104

Hinzen, Franz J., John, Kose and Saleh, Fahad. (2019). "Proof-of-Work's Limited Adoption Problem." JEL Classification: E50, G12.
https://www.newyorkfed.org/medialibrary/media/research/conference/2019/fintech/Hinzen_PoW_LimitedAdoption

Lakhani, K. R., & Lansiti, M. (2017). "The truth about blockchain." Harvard Business Review, 95, 118-127.

Nakamoto, S. (2008). "A peer-to-peer electronic cash system." Bitcoin URL:
https://bitcoin.org/bitcoin.pdf

Philippon, T. (2016). “The fintech opportunity (No. w22476).” National Bureau of Economic Research.

Piketty and Zucman (2014) “Capital Is Back: Wealth-income Ratios In Rich Countries 1700–2010”
BIS (2019) “Establishing viable capital markets,” https://www.bis.org/publ/cgfs62.pdf

Rogoff, K. S. (2017). “The Curse of Cash: How Large-Denomination Bills Aid Crime and Tax Evasion and Constrain Monetary Policy.” Princeton University Press. Schuh and Stavins 2017

Lecture 2:
Improved Information Infrastructure: Distributed Ledgers, Data Base Management, Financial Accounts

Samphantharak, K., & Townsend, R. M. (2010). “Households as corporate firms: an analysis of household finance using integrated household surveys and corporate financial accounting (No. 46).” Cambridge University Press.

Paweenawat, Archawa, and Townsend, Robert M. (2012). “Village Economic Accounts: Real and Financial Intertwined.” American Economic Review, 102(3): 441-446.
https://dspace.mit.edu/bitstream/handle/1721.1/73202/Townsend_Village%20Economic.pdf?sequence=1&isAllowed=y

Piketty, T., & Zucman, G. (2014). “Capital Is Back: Wealth-Income Ratios in Rich Countries 1700–2010.” The Quarterly Journal of Economics, 129(3), 1255-1310.

US Department of Commerce. Bureau of Economic Analysis. 1985. “An Introduction to National Economic Accounting.” Methodology Paper Series MP-1. Washington, DC: GPO.
http://www.robertmtownsend.net/sites/default/files/files/papers/published/IntermediationCostlyBilateral1978.pdf

Auten, G., & Splinter, D. (2019). “Top 1 Percent Income Shares: Comparing Estimates Using Tax Data.” In AEA Papers and Proceedings (Vol. 109, pp. 307-11).

Batty, M., Bricker, J., Briggs, J., Holmquist, E., McIntosh, S., Moore, K. B., Reber, S., Shatto, M., Sweeney, T. & Henriques, A. (2019). “Introducing the distributional financial accounts of the United States”.

Bond, C. A., Martin, T., McIntosh, S. H., & Mead, C. I. (2007). “Integrated macroeconomic accounts for the United States.” Survey of Current Business, 87(11), 14-31.

Browning, Martion., Crossley, Thomas F., and Winter Joachim (2014). “The Measurement of Household Consumption Expenditures.” Annual Review of Economics, vol. 6(2014), pp. 475-501
https://www.annualreviews.org/doi/full/10.1146/annurev-economics-080213-041247

Raj Chetty, John N. Friedman, Nathaniel Hendren, Michael Stepner, and the Opportunity Insights Team
First Version: May 2020 This Version: November 2020

Fan, Yifei (2020): "Some Thoughts on CBDC Operations in China", Central Banking, 1 April. https://www.centralbanking.com/fintech/cbdc/7511376/some-thoughts-on-cbdc-operations-in-china

Lee, Micheal Junho, Antonie Martin, and Robert M. Townsend (2021). "Zero Settlement Risk Token Systems." Working Paper.

Lee, Micheal Junho, Antonie Martin, and Robert M. Townsend (2021). "Optimal Design of Tokenized Markets." Working Paper.

Mallett, Jacky (2009). "Limits on the Communication of Knowledge in Human Organizations." Studies in Emergent Order 2: 1–18.

Piketty, T., Saez, E., & Zucman, G. (2018). "Distributional national accounts: methods and estimates for the United States." The Quarterly Journal of Economics, 133(2), 553-609.

Smith, M., Zidar, O., & Zwick, E. (2019). "Top wealth in the united states: New estimates and implications for taxing the rich." Unpublished manuscript. http://www.ericzwick.com/wealth/wealth.pdf

Townsend, M. Robert (1978). "Intermediation with Costly Bilateral Exchange." Review of Economic Studies 45 (3): 417–425.

Lecture 3:
E-Money and Digital-Payments: infrastructure, Liquidity, and an Example of Optimized Monetary Policy

Allen, Franklin and Douglas Gale (2000). "Financial Contagion," Journal of Political Economy, vol. 108(1), pp. 1–33

Alvarez, F., & Lippi, F. (2009). "Financial innovation and the transactions demand for cash. Econometrica." 77(2), 363-402.

Bech, Moren L. and Enghin Atalay (2010). "The Topology of the Federal Funds Market," Physica A: Statistical Mechanics and its Applications, vol. 389(22), pp. 5223-5246.

Boss, Michael, Helmut Elsinger, Martin Summer and Stefan Thurner (2003). "The Network Topology of the Interbank Market." Quantative Finance, vol. 4(6), pp. 677-684.

Cocco, João F., Francisco J. Gomes and Nuno C. Martins (2009)."Lending relationships in the interbank market." Journal of Financial Intermediation, vol. 18(1), pp. 24-48.

Duffie, D., Gârleanu, N., & Pedersen, L. H. (2005). “Over-the-counter markets.” Econometrica, 73(6), 1815-1847.

Ingves, Stefan, (2017). “Do We Need an e-krona?” Speech at the Swedish House of Finance, Stockholm, 8 December 2017.https://www.bis.org/review/r180123c.pdf

Hendershott, T. & Madhavan, A. (2015). "Click or Call? Auction versus Search in the Over-the-Counter Market." Journal of Finance, vol. 70(1), pp. 419-447, 02.

Jack, W., Suri, T., & Townsend, R. M. (2010). “Monetary theory and electronic money: Reflections on the kenyan experience.” FRB Richmond Economic Quarterly, 96(1), 83-122.
Jack and Suri, 2014MISSING

Kiyotaki, Nobuhiro and Randall Wright (1989). “On Money as a Medium of Exchange.” Journal of Political Economy, vol. 97(4), pp. 927-954.

Kapoor, Raunak., Pelupessy, Alfa Gratia., and Kusuma, Linggo Cindra (2017). “Agent Network Accelerator Research.” Indonesia Country Report (Dec. 2017). https://www.microsave.net/wp-content/uploads/2018/12/ANA-Indonesia.pdf

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Lagos, R., & Zhang, S. (2019). “On money as a medium of exchange in near-cashless credit economies (No. w25803).” National Bureau of Economic Research.

Lagos, R. and S. Zhang (2020): “Turnover Liquidity and the Transmission of Monetary Policy.” American Economic Review, 110, 1635–1672.
http://eprints.lse.ac.uk/105095/

Longstaff, F. A. (2004). “The Flight-to-Liquidity Premium in US Treasury Bond Prices.” Journal of Business, 77(3).
http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=EC4DFFFC173D568BC7269E8846988EC4?doi=10.1.1.407.4251&rep=rep1&type=pdf

Miller, M. H., & Orr, D. (1966). “A Model of the Demand for Money by Firms.” The Quarterly journal of economics, 80(3), 413-435.

Suri, T. (2017). Mobile money. *Annual Review of Economics*, *9*, 497-520.

Summer, M. (2013). “Financial Contagion and Network Analysis.” Annual Reviews of Financial Economics, 5, 1–38.

Upper, Christian and Andreas Worms (2004). “Estimating bilateral exposures in the German interbank market: Is there a danger of contagion?” European Economic Review, vol. 48(4), pp. 827-849.

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Lecture 4:
Encryption, Validation in Protocols, Hashes in Data Base Management, and Smart Contracts

Berlin, M., & Mester, L. J. (1999). "Deposits and relationship lending." The Review of Financial Studies, 12(3), 579-607.

Budish, E. (2018). "The economic limits of bitcoin and the blockchain." National Bureau of Economic Research Working Paper, No.24717.

Coles, P. A., & Shorrer, R. (2012). "Correlation in the multiplayer electronic mail game." The BE Journal of Theoretical Economics, 12(1).

Chwe, M. S. Y. (1995). "Strategic reliability of communication networks." http://www.chwe.net/michael/p.pdf

De Jaegher, K.J.M.. (2015). "Beneficial Long Communication in the Multi-Player Electronic Mail Game." Working Papers 15-09, Utrecht School of Economics. https://ideas.repec.org/p/use/tkiwps/1509.html

Green, E. J., & Oh, S. N. (1991). "Contracts, constraints and consumption." The Review of Economic Studies, 58(5), 883-899.

Halpern, J. Y., & Moses, Y. (1990). "Knowledge and common knowledge in a distributed environment." Journal of the ACM (JACM), 37(3), 549-587.

Harris, M., & Townsend, R. M. (1981). "Resource allocation under asymmetric information." Econometrica: Journal of the Econometric Society, 33-64.

Narayanan, A., Bonneau, J., Felten, E., Miller, A., & Goldfeder, S. (2016). "Bitcoin and cryptocurrency technologies: a comprehensive introduction." Princeton University Press.

Prescott, Edward. (2003). "Communication in Models with Private Information: Theory and Computation." The Geneva Papers on Risk and Insurance Theory, 28: 105–130.

Townsend, R. M. (1982). "Optimal multiperiod contracts and the gain from enduring relationships under private information." Journal of political Economy, 90(6), 1166-1186.

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Lecture 5:
Redesigning Markets with the Combination of Mechanism Design and Encryption

Bertolai, J. D., Cavalcanti, R. D. O., & Monteiro, P. K. (2014). “Run theorems for low returns and large banks.” Economic Theory, 57(2), 223-252.

Budish, E., Cramton, P., & Shim, J. (2015). “The high-frequency trading arms race: Frequent batch auctions as a market design response.” The Quarterly Journal of Economics, 130(4), 1547-1621.

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Ennis, H. M. & Keister, T. (2008). "Run equilibria in a model of financial intermediation," Staff Reports 312, Federal Reserve Bank of New York.

Green, E. J., & Lin, P. (2003). “Implementing efficient allocations in a model of financial intermediation.” Journal of Economic Theory, 109(1), 1-23.

Lyon, Richard K. 1996. “Optimal Transparency in a Dealer Market with an Application to Foreign Exchange.” Journal of Financial Intermediation, 5 (3): 225–254.

Malinowski, Bronislaw (1922). “Argonauts of the Western Pacific: An Account of Native Enterprise and Adventure in the Archipelagos of Melanesian New Guinea.” London: Routledge & Kegan Paul.

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Zhu, Haoxiang (2013). “Do dark pools harm price discovery?” Review of Financial Studies, vol. 27(3), pp. 747-789.

Karaivanov, Alexander and Townsend, Robert M. "Dynamic Financial Constraints: Distinguishing Mechanism Design from Exogenously Incomplete Regimes." Econometrica, 82 (3) 2014: 887–959.
http://robertmtownsend.net/sites/default/files/files/papers/published/DynamicFinancialConstraints.pdf

Bogetoft, P., Christensen, D. L., Damgård, I., Geisler, M., Jakobsen, T., Krøigaard, M., Nielsen, J. D., Nielsen, J. B., Nielsen, K., & Pagter, J. (2009). *Secure multiparty computation goes live*. 325–343. https://doi.org/10.1007/978-3-642-03549-4_20

Bogdanov, D., Kamm, L., Kubo, B., Rebane, R., Sokk, V., & Talviste, R. (2016). Students and taxes: A privacy-preserving study using secure computation. *Proceedings on Privacy Enhancing Technologies*, *2016*(3), 117–135. https://doi.org/10.1515/popets-2016-0019

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Abidin, A., Aly, A., Cleemput, S., & Mustafa, M. A. (2016). An mpc-based privacy-preserving protocol for a local electricity trading market. In S. Foresti & G. Persiano (Eds.), *Cryptology and network security* (pp. 615–625). Springer International Publishing.

Lapets, A., Volgushev, N., Bestavros, A., Jansen, F., & Varia, M. (2016). Secure mpc for analytics as a web application. *2016 IEEE Cybersecurity Development (SecDev)*, 73–74. https://doi.org/10.1109/SecDev.2016.027
Lapets, A., Volgushev, N., Bestavros, A., Jansen, F., & Varia, M. (2016). Secure mpc for analytics as a web application. *2016 IEEE Cybersecurity Development (SecDev)*, 73–74. https://doi.org/10.1109/SecDev.2016.027

Lecture 6:
Real-World Application to Financial Infrastructure in Emerging Markets: Evidence on the Ground from the Townsend Thai Project, What is Needed, How to Innovate, Guidance from Theory for the Operation of Competitive Markets.

Acemoglu, Daron, & Zilibotti, Fabrizio (1997). "Was Prometheus Unbound by Chance? Risk, Diversification, and Growth" The Journal of Political Economy, vol. 105(4) pp. 709-751 http://economics.mit.edu/files/234

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