

[Home](#) > [Complex Systems, Multi-Sided Incentives and Risk Perception in Companies](#) > Chapter

# Complexity and Some Numerical Algorithmic Turning-Point Problems Inherent in Excessive Outstanding Shares



| Chapter | First Online: 07 September 2019

| pp 783–816 | [Cite this chapter](#)



**Complex Systems, Multi-Sided  
Incentives and Risk Perception in  
Companies**

[Michael I. C. Nwogugu](#)

 418 Accesses  2 Citations

## Abstract

Having excessive numbers of shares outstanding is either common or prevalent among listed companies in emerging markets and especially in Central/Eastern European, African and Asian stock markets (i.e. where such companies usually have between two-times and twelve-times the average numbers of outstanding shares of listed companies in developed countries like the US, UK and Japan, on an un-diluted basis)—and this condition can cause behavioral anomalies and sometimes contravenes established finance theories.

## Access this chapter

Log in via an institution →

## Subscribe and save

✓ Springer+

from €37.37 /Month

- Starting from 10 chapters or articles per month
- Access and download chapters and articles from more than 300k books and 2,500 journals
- Cancel anytime

View plans →

## Buy Now

### ^ Chapter

**EUR 29.95**

Price includes VAT (Poland)

- Available as PDF
- Read on any device
- Instant download
- Own it forever

Buy Chapter →

### ^ eBook

**EUR 96.29**

Price includes VAT (Poland)

- Available as EPUB and PDF
- Read on any device
- Instant download
- Own it forever

Buy eBook →

### ^ Hardcover Book

**EUR 128.39**

Price includes VAT (Poland)

- Durable hardcover edition
- Dispatched in 3 to 5 business days
- Free shipping worldwide - [see info](#)

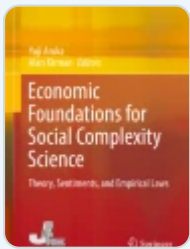
Buy Hardcover Book →

Tax calculation will be finalised at checkout

**Purchases are for personal use only**

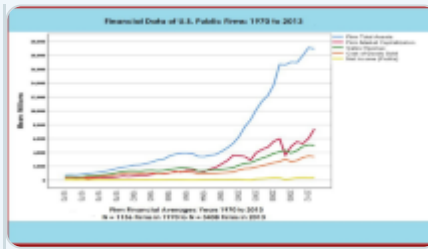
[Institutional subscriptions](#) →

## Similar content being viewed by others



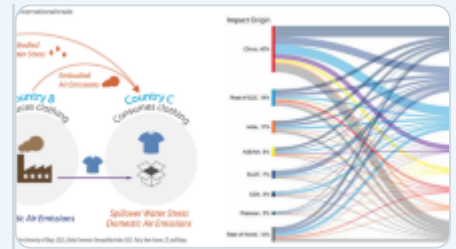
**The Divergence Rate of Share Price from Company Fundamentals: An Empirical Study at the Regional Level**

Chapter | © 2017



**Profits crisis: evolving patterns of firm size and performance in traditional U.S. industries**

Article | 17 April 2023



**Environmental factors and financial market spillover**

Article | Open access  
30 May 2025

## Explore related subjects

Discover the latest articles, books and news in related subjects, suggested using machine learning.

[Capital Markets](#)

[Chromosome abnormality](#)

[Corporate Crime](#)

[Mathematics in Business, Economics and Finance](#)

[Mathematical Finance](#)

[Quantitative Finance](#)

## Notes

1. See Othman ([2012](#)), Domshlak et al. ([2011](#)), Filipe and Fred ([2011](#)), Melnik et al. ([2013](#)), Miklashevich ([2003](#)), and Arthur ([1999](#)).

2. See Wong et al. ([2017](#)) and Xia ([2011](#)).
3. See Chen et al. ([2013](#)), Cozman ([2010](#)), Seneta ([2013](#)), Li and Du ([2007](#)), and Lan and Zhang ([2017](#)).

## References

---

Abdullah, S., Yusof, N., & Nor, M. (2010). Financial Restatements and Corporate Governance Among Malaysian Listed Companies. *Managerial Auditing Journal*, 25(6), 526–552.

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

Ahmed, M., Chai, W., Ding, X., et al. (2009). *Statistical Arbitrage in High Frequency Trading Based on Limit Order Book Dynamics*. Working Paper. <http://web.stanford.edu/class/msande444/2009/2009Projects/2009-2/MSE444.pdf>.

Albrecher, H., & Kainhofer, R. (2002). Risk Theory with a Nonlinear Dividend Barrier. *Computing*, 68(4), 289–311.

[Google Scholar](#)

An, H., & Zhang, T. (2013). Stock Price Synchronicity, Crash Risk, and Institutional Investors. *Journal of Corporate Finance*, 21, 1–15.

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

Armstrong, C., Larcker, D., Ormazabal, G., & Taylor, D. (2013). The Relation Between Equity Incentives and Misreporting: The Role of Risk-Taking Incentives. *Journal of Financial Economics*, 109(2), 327–350.

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

Arthur, W. B. (1999). Complexity and the Economy. *Science*, 284, 107-109.

[Google Scholar](#)

Ascioglu, A., Hegde, S., Krishnan, G., & McDermott, J. (2012). Earnings Management and Market Liquidity. *Review of Quant Finance & Accounting*, 38, 257-274.

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

Azcue, P., & Muler, N. (2015). Optimal Dividend Payment and Regime Switching in a Compound Poisson Risk Model. *SIAM Journal on Control & Optimization*, 53(5), 3270-3298.

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

Baber, W., Fairfield, P., & Haggard, J. (1991). The Effect of Concern About Reported Income on Discretionary Spending Decisions: The Case of Research and Development. *Accounting Review*, 66(4), 818-829.

[Google Scholar](#)

Bai, L., & Paulsen, J. (2010). Optimal Dividend Policies with Transaction Costs for a Class of Diffusion Processes. *SIAM Journal on Control & Optimization*, 48(8), 4987-5008.

[Google Scholar](#)

Baltas, I., Xepapadeas, A., & Yannacopoulos, A. (2018). Robust Portfolio Decisions for Financial Institutions. *Journal of Dynamics & Games*, 5(2), 61-94.

[Google Scholar](#)

Baltas, I., & Yannacopoulos, A. (2016). Uncertainty and Inside Information. *Journal Of Dynamics & Games*, 3(1), 1-24.

Bambaci, J., Bender, J., et al. (2013). *Harvesting Risk Premia for Large Scale Portfolios—Analysis of Risk Premia Indices for the Ministry of Finance, Norway*. [https://www.regjeringen.no/contentassets/f453b48778c342d9a7ed8d6810d6cea4/harvesting\\_risk.pdf](https://www.regjeringen.no/contentassets/f453b48778c342d9a7ed8d6810d6cea4/harvesting_risk.pdf).

Bar-Yosef, S., & Prencipe, A. (2013). The Impact of Corporate Governance and Earnings Management on Stock Market Liquidity in a Highly Concentrated Ownership Capital Market. *Journal of Accounting, Auditing and Finance*, 28, 292–316.

[Google Scholar](#)

Battiston, S., & Glattfelder, J. B. (2009). Backbone of Complex Networks of Corporations: The Flow of Control. *Physics Review-E*, 80, 036104.

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

Beatty, A., & Weber, J. (2006). Accounting Discretion in Fair Value Estimates: An Examination of SFAS 142 Goodwill Impairments. *Journal of Accounting Research*, 44, 257–288.

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

Bekaert, G., Harvey, C., & Lundblad, C. (2007). Liquidity and Expected Returns: Lessons from Emerging Markets. *Review of Financial Studies*, 20, 1783–1832.

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

Bergstresser, D., & Philippon, T. (2006). CEO Incentives and Earnings Management. *Journal of Financial Economics*, 80, 511–529.

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

Boeing, G. (2016). Visual Analysis of Nonlinear Dynamical Systems: Chaos, Fractals, Self-Similarity and the Limits of Prediction. *Systems*, 4(4), 37.

[Google Scholar](#)

Bolton, P., Mehran, H., & Shapiro, J. (2011). *Executive Compensation and Risk Taking*. FRB of New York Staff Report No. 456.

[Google Scholar](#)

Brink, A., & Rankin, F. (2014). The Effects of Risk Preference and Loss Aversion on Individual Behavior Under Bonus, Penalty, and Combined Contract Frames. *Behavioral Research in Accounting*, 25(2), 145–170.

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

Brockman, P., Chung, D., & Perignon, C. (2009). Commonality in Liquidity: A Global Perspective. *Journal of Financial and Quantitative Analysis*, 44, 851–882.

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

Bushman, R., & Piotroski, J. (2005). Financial Reporting Incentives for Conservative Accounting: The Influence of Legal and Political Institutions. *Journal of Accounting & Economics*, 42, 107–148.

[Google Scholar](#)

Carlin, B. I. (2009). Strategic Price Complexity in Retail Financial Markets. *Journal of Financial Economics*, 91(3), 278–287.

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

Cecchini, M., Aytug, H., et al. (2010). Detecting Management Fraud in Public Companies. *Management Science*, 56, 1146–1160.

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

Chandra, A., & Thenmozhi, M. (2017). Behavioural Asset Pricing: Review and Synthesis. *Journal of Interdisciplinary Economics*, 29, 1–31.

[Google Scholar](#)

Chen, S., Li, Z., & Zeng, Y. (2018). Optimal Dividend Strategy for a General Diffusion Process with Time-Inconsistent Preferences and Ruin Penalty. *SIAM Journal on Financial Mathematics*, 9(1), 274–314.

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

Chen, Z., Wu, P., & Li, B. (2013). A Strong Law of Large Numbers for Non-additive Probabilities. *International Journal of Approximate Reasoning*, 54(3), 365–377.

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

Cornett, M., McNutt, J., & Tehranian, H. (2009). Corporate Governance and Earnings Management at Large U.S. Bank Holding Companies. *Journal of Corporate Finance*, 15, 412–430.

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

Cozman, F. (2010). Concentration Inequalities and Laws of Large Numbers Under Epistemic and Regular Irrelevance. *International Journal of Approximate Reasoning*, 51, 1069–1084.

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

Dellnitz, M., & Junge, O. (1999). On the Approximation of Complicated Dynamical Behavior. *SIAM Journal of Numerical Analysis*, 36(2), 491–515.

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



Deprez, O. (2004). Discussion of “Optimal Dividends: Analysis with Brownian Motion”. *North American Actuarial Journal*, 8(2), 111.

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

DeYoung, R., Peng, E., & Meng, Y. (2013). Executive Compensation and Business Policy Choices at U.S. Commercial Banks (October 1, 2010). *Journal of Financial and Quantitative Analysis*, 48(1), 165–196.

[Google Scholar](#)

Domshlak, C., Hullermeier, E., Kaci, S., & Prade, H. (2011). Preferences in AI: An Overview. *Artificial Intelligence*, 17(7-8), 1037–1052.

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

Dreschler, I. (2013). Uncertainty, Time-Varying Fear, and Asset Prices. *Journal of Finance*, 68(5), 1843–1889.

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

Du, K. (2016, August). *Investor Expectations, Earnings Management, and Asset Prices*. Working Paper. Pennsylvania State University, USA. Available at SSRN <https://ssrn.com/abstract=2852553>.

Dutta, S., Biswal, M., et al. (2018). Fuzzy Stochastic Price Scenario Based *Portfolio Selection* and Its Application to BSE Using Genetic Algorithm. *Applied Soft Computing*, 62, 867–891.

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

Erkens, D., Hung, M., & Matos, P. (2012). Corporate Governance in the 2007–2008 Financial Crisis: Evidence from Financial Institutions Worldwide. *Journal of Corporate Finance*, 18(2), 389–411.

Fama, E., & French, K. (2008). Dissecting Anomalies. *Journal of Finance*, 63, 1653–1678.

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

Fang, Y., & Wu, R. (2009). Optimal Dividends in the Brownian Motion Risk Model with Interest. *Journal of Computational and Applied Mathematics*, 229(1), 145–151.

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

Feduzi, A., & Runde, J. (2014). Uncovering Unknown Unknowns: Towards a Baconian Approach to Management Decision-Making. *Organizational Behavior and Human Decision Processes*, 124(2), 268–283.

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

Filipe, J., & Fred, A. (Eds.). (2011). *Agents and Artificial Intelligence: Third International Conference, ICAART 2011, Rome, Italy*. Berlin: Springer.

[Google Scholar](#)

Fischer, P., & Louis, H. (2008). Financial Reporting and Conflicting Managerial Incentives: The Case of Management Buyouts. *Management Science*, 54, 1700–1714.

[Google Scholar](#)

Flannery, M., Kwan, S., & Nimalendran, M. (2013). The 2007–09 Financial Crisis and Bank Opacity. *Journal of Financial Intermediation*, 22, 55–84.

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

Forbes, K., Warnock, J., & Francis, E. (2012). Capital Flow Waves: Surges, Stops, Flight, and Retrenchment. *Journal of International Economics*, 88(2), 235–251.

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

Francis, W., Hasan, I., & Li, L. (2014). *Abnormal Real Operations, Real Earnings Management, and Subsequent Crashes in Stock Prices*. Bank of Finland Research Discussion Papers #19; 2014. <http://www.suomenpankki.fi/pdf/173785.pdf>.

Fudenberg, D., & Tirole, J. (1995). A Theory of Income and Dividend Smoothing Based on Incumbency Rents. *Journal of Political Economics*, 103, 75–93.

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

Gao, L., & Kling, G. (2012). The Impact of Corporate Governance and External Audit on Compliance to Mandatory Disclosure Requirements in China. *Journal of International Accounting, Auditing and Taxation*, 21(1), 17–31.

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

Gao, H., & Yin, C. (2008). The Perturbed Sparre Andersen Model with a Threshold Dividend Strategy. *Journal of Computational and Applied Mathematics*, 220(1-2), 394–408.

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

Ge, W., & Kim, J. (2013a). Real Earnings Management and the Cost of New Corporate Bonds. *Journal of Business Research*, 67, 641–647.

[Google Scholar](#)

Ge, W., & Kim, J. B. (2013b). Boards, Takeover Protection, and Real Earnings Management. *Review of quantitative Finance & Accounting*, 43, 651–682.

[Google Scholar](#)

Gerber, H., & Shiu, E. (2006). On Optimal Dividends: From Reflection to Refraction. *Journal of Computational and Applied Mathematics*, 186(1), 4–22.

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

Goncalo, J., & Duguid, M. (2008). Hidden Consequences of the Group-Serving Bias: Causal Attributions and the Quality of Group Decision Making. *Organizational Behavior and Human Decision Processes*, 107(2), 219–233.

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

Gul, F., & Leung, S. (2004). Board Leadership, Outside Directors' Expertise and Voluntary Corporate Disclosures. *Journal of Accounting and Public Policy*, 23(5), 351–379.

[Google Scholar](#)

Gülpınar, N., & Çanakoğlu, E. (2017). Robust Portfolio Selection Problem Under Temperature Uncertainty. *European Journal of Operational Research*, 256(2), 500–523.

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

Hall, B., & Liebman, J. (1998). Are CEOs Really Paid Like Bureaucrats? *The Quarterly Journal of Economics*, 113, 653–691.

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

Han, Y., & Li, P. (2017). An Empirical study of Chance-Constrained Portfolio Selection Model. *Procedia Computer Science*, 122, 1189–1195.

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

Haw, I., Hu, B., Hwang, L., & Wu, W. (2004). Ultimate Ownership, Income

Management and Legal and Extra-Legal Institutions. *Journal of Accounting Research*, 42, 423–462.

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

Healy, P. (2005). The Effect of Bonus Schemes on Accounting Decisions. *Journal of Accounting Economics*, 7, 85–107.

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

Hermalin, B., & Weisbach, M. (2003). Boards of Directors as an Endogenously Determined Institution: A Survey of the Economic Literature. *FRBNY Economic Policy Review*, 4, 7–26.

[Google Scholar](#)

Hermalin, B., & Weisbach, M. (2012). Information Disclosure and Corporate Governance. *Journal of Finance*, 67(1), 195–234.

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

Hou, D., & Xu, Z. (2016). A Robust Markowitz Mean-Variance Portfolio Selection Model with an Intractable Claim. *SIAM Journal on Financial Mathematics*, 7(1), 124–151.

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

Hribar, P., Jenkins, N., & Johnson, W. B. (2006). Stock Repurchases as an Earnings Management Device. *Journal of Accounting and Economics*, 41, 3–27.

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

Huang, X., & Di, H. (2016). Uncertain *Portfolio Selection* with Background Risk. *Applied Mathematics and Computation*, 276, 284–296.

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

Hutchinson, M. (2002). An Analysis of the Association Between Firms Investment Opportunities, Board Composition and Firm Performance. *Asia Pacific Journal of Accounting and Economics*, 9, 17-39.

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

Hutton, A., Marcus, A., & Tehranian, H. (2009). Opaque Financial Reports, R Square, and Crash Risk. *Journal of Financial Economics*, 94, 67-86.

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

Jana, P., Roy, T., & Mazumder, S. (2009). Multi-objective Possibilistic Model for Portfolio Selection with Transaction Cost. *Journal of Computational and Applied Mathematics*, 228(1), 188-196.

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

Jeanblanc-Picqué, M., & Shiryaev, A. (1995). Optimization of the Flow of Dividends. *Russian Mathematical Surveys*, 20, 257-277.

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

Johnson, S., Boone, P., Breach, A., & Friedman, E. (2000). Corporate Governance in the Asia Financial Crisis. *Journal of Financial Economics*, 58, 141-186.

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

Kakushadze, Z. (2016). *On Origins of Alpha*.

<https://arxiv.org/ftp/arxiv/papers/1511/1511.01395.pdf>.

Kerestecioglu, F., & Cetin, I. (2004). Optimal Input Design for Detection of Changes Towards Unknown Hypothesis. *International Journal of Systems Science*, 35(7), 435-444.

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

Kim, H., Kwon, O., & Oh, G. (2016). A Causality Between Fund Performance and Stock Market. *Physica A: Statistical Mechanics and its Applications*, 443, 439–450.

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

Kim, J., Li, Y., & Zhang, L. (2011a). Corporate Tax Avoidance and Stock Price Crash Risk: Firm-Level Analysis. *Journal of Financial Economics*, 100, 639–662.

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

Kim, J., Li, Y., & Zhang, L. (2011b). CFOs Versus CEOs: Equity Incentives and Crashes. *Journal of Financial Economics*, 101, 713–730.

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

Kim, J., & Zhang, L. (2013). Accounting Conservatism and Stock Price Crash Risk: Firm-Level Evidence. *Contemporary Accounting Research*, 33, 412–441.

[Google Scholar](#)

Kim, J., & Zhang, L. (2014). Financial Reporting Opacity and Expected Crash Risk: Evidence from Implied Volatility Smirks. *Contemporary Accounting Research*, 31, 851–875.

[Google Scholar](#)

Koenigsgruber, R., & Stefan, P. (2014). Earnings Management and Participation in Accounting Standard-setting. *Central European Journal of Operations Research*, 23(1), 31–52.

[Google Scholar](#)

Kuehn, C., Malavolta, G., & Rasmussen, M. (2018). Early-Warning Signals for

Bifurcations in Random Dynamical Systems with Bounded Noise. *Journal of Mathematical Analysis and Applications*, 464(1), 58–77.

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

Kwan, S. (2010). *Financial Crisis and Bank Lending*. Federal Reserve Bank of San Francisco. Working Paper.

[Google Scholar](#)

Kwon, Y. (2005). Accounting Conservatism and Managerial Incentives. *Management Science*, 51, 1626–1632.

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

Lan, Y., & Zhang, N. (2017). *Strong Limit Theorems for Weighted Sums of Negatively Associated Random Variables in Nonlinear Probability*.  
<https://arxiv.org/pdf/1706.05788.pdf>.

Lei, Q., Lin, B., & Wei, M. (2013). Types of Agency Cost, Corporate Governance and Liquidity. *Journal of Accounting and Public Policy*, 32, 147–172.

[Google Scholar](#)

Li, B., Zhu, Y., et al. (2018). Multi-period Portfolio Selection Problem Under Uncertain Environment with Bankruptcy Constraint. *Applied Mathematical Modeling*, 56, 539–550.

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

Li, D., & Du, Y. (2007). *Artificial Intelligence with Uncertainty*. Boca Raton: CRC Press.

[Google Scholar](#)



Li, E., Livdan, D., & Zhang, L. (2009). Anomalies. *The Review of Financial Studies*, 22(11), 4302-4331.

[Google Scholar](#)

Lin, J., & Hwang, M. (2010). Audit Quality, Corporate Governance, and Earnings Management: A Meta-Analysis. *International Journal of Auditing*, 14(1), 55-77.

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

Liu, X., & Tse, C. (2012). Dynamics of Network of Global Stock Market. *Accounting & Finance Research*, 1, 1-12.

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

Liu, J., Wang, W., et al. (2010). A novel Fuzzy Framework for Nonlinear System Control. *Fuzzy Sets and Systems*, 161(21), 2746-2759.

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

Ma, Y., Zhuang, X. T., & Li, L. (2011). Research on the Relationships of the Domestic Mutual Investment of China Based on the Cross-Shareholding Networks of the Listed Companies. *Physica-A*, 390, 749-759.

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

Mardjono, A. (2005). A Tale of Corporate Governance: Lessons Why Firms Fail. *Managerial Auditing Journal*, 20(3), 272-283.

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

Marquardt, C., & Wiedman C. (2005). Earnings Management Through Transaction Structuring: Contingent Convertible Debt And Diluted EPS. *Journal of Accounting Research*, 43, 205-243.

[Google Scholar](#)

Marquis, J., Gel, E., et al. (2015). Impact of Number of Interactions, Different Interaction Patterns, and Human Inconsistencies on Some Hybrid Evolutionary Multiobjective Optimization Algorithms. *Decision Sciences*, 46(5), 981–1006.

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

Mashayekhi, B., & Bazaz, M. (2008). Corporate Governance and Firm Performance in Iran. *Journal of Contemporary Accounting & Economics*, 4(2), 156–172.

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

Melnik, S., Ward, J., Gleeson, J., & Porter, M. (2013). Multi-stage Complex Contagions. *Chaos*, 23, 013124. <http://dx.doi.org/10.1063/1.4790836>.

Miklashevich, I. (2003). Mathematical Representation of Social Systems: Uncertainty and Optimization of Social System Evolution. *Non Linear Phenomena in Complex Systems*, 6(2), 678–686.

[Google Scholar](#)

Milch, K., Weber, E., Appelt, K., et al. (2012). From Individual Preference Construction to Group Decisions: Framing Effects and Group Processes. *Organizational Behavior and Human Decision Processes*, 108(2), 242–255.

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

Mohammed, S., & Ringseis, E. (2001). Cognitive Diversity and Consensus in Group Decision Making: The Role of Inputs, Processes, and Outcomes. *Organizational Behavior and Human Decision Processes*, 85(2), 310–335.

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

Moon, H., Conlon, D., Humphrey, S., et al. (2003). Group Decision Process and Incrementalism in Organizational Decision Making. *Organizational Behavior and Human Decision Processes*, 92(1-2), 67-79.

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

Nakano, M., & Nguyen, P. (2012). Board Size and Corporate Risk Taking: Further Evidence from Japan. *Corporate Governance: An International Review*, 20(4), 369-387.

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

Nalpas, N., Simar, L., & Vanhems, A. (2017). Portfolio Selection in a Multi-moment Setting: A Simple Monte-Carlo-FDH Algorithm. *European Journal of Operational Research*, 263(1), 308-320.

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

Nguyen, T., Sutton, N., & Pham, D. (2015). The Post-repurchase Announcement Drift: An Anomaly in Disguise? *Managerial Finance*, 41(2), 205-224.

[Google Scholar](#)

Nwogugu, M. (2006). Regret Minimization, Willingness-To-Accept-Losses and Framing. *Applied Mathematics and Computation*, 179(2), 440-450.

[Google Scholar](#)

Nwogugu, M. (2007). Decision-Making, Risk and Corporate Governance: A Critique of Methodological Issues in Bankruptcy/Recovery Prediction Models. *Applied Mathematics and Computation*, 185(1), 178-196.

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

Nwogugu, M. (2013). Decision-Making, Sub-Additive Recursive “Matching” Noise

and Biases in Risk-Weighted Index Calculation Methods in In-Complete Markets with Partially Observable Multi-Attribute Preferences. *Discrete Mathematics, Algorithms & Applications*, 5, 1350020.

[Google Scholar](#)

Nwogugu, M. (2016). *Complexity and Some Numerical Turning-Point Problems Inherent in Excessive Outstanding Shares and International Portfolio Selection*. Available in [www.ssrn.com](http://www.ssrn.com).

Nwogugu, M. (2017a). The Historical and Current Concepts of “Plain” Interest Rates, Forward Rates and Discount Rates Are or Can Be Misleading. In *Anomalies in Net Present Value, Returns and Polynomials; And Regret Theory in Decision-Making*. Basingstoke: Palgrave Macmillan.

[Google Scholar](#)

Nwogugu, M. (2017b). Some Biases and Evolutionary Homomorphisms Implicit in the Calculation of Returns. In *Anomalies in Net Present Value, Returns and Polynomials; And Regret Theory in Decision-Making*. Basingstoke: Palgrave Macmillan.

[Google Scholar](#)

Nwogugu, M. (2017c). Regret Theory and Asset Pricing Anomalies in Incomplete Markets with Dynamic Unaggregated Preferences. In *Anomalies in Net Present Value, Returns and Polynomials; And Regret Theory in Decision-Making*. Basingstoke: Palgrave Macmillan.

[Google Scholar](#)

Nwogugu, M. (2017d). Spatio-Temporal Framing Anomalies in the NPV-MIRR-IRR Model and Related Approaches. In *Anomalies in Net Present Value, Returns and Polynomials; And Regret Theory in Decision-Making*. Basingstoke: Palgrave Macmillan.

Omidi, F., Abbasi, B., & Nazemi, A. (2017). An Efficient Dynamic Model for Solving a Portfolio Selection with Uncertain Chance Constraint Models. *Journal of Computational and Applied Mathematics*, 319, 43-55.

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

Othman, A. (2012). *Automated Market Making: Theory and Practice*. PHD Thesis. School of Computer Science, Computer Science Department, Carnegie Mellon University, USA. <https://www.cs.cmu.edu/~aothman/abethesis.pdf>.

Paese, P., Bieser, M., & Tubbs, M. (1993). Framing Effects and Choice Shifts in Group Decision Making. *Organizational Behavior and Human Decision Processes*, 56(1), 149-165.

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

Pascoa, M. (1993). Approximate Equilibrium in Pure Strategies for Nonatomic Games. *Journal of Mathematical Economics*, 22, 223-241.

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

Petrohilos-Andrianos, Y., & Xepapadeas, A. (2016). On the Evolution of Compliance and Regulation with Tax Evading Agents. *Journal of Dynamics & Games*, 3(3), 231-260.

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

Peyer, U., & Vermaelen, T. (2009). The Nature and Persistence of Buyback Anomalies. *Review of Financial Studies*, 22(4), 1693-1745.

[Google Scholar](#)

Press, B. (1978). Flicker Noises in Astronomy and Elsewhere. *Comments in Astrophysics*, 7(4), 103–119.

[Google Scholar](#)

Qin, Z., Li, X., & Ji, X. (2009). Portfolio Selection Based on Fuzzy Cross-Entropy. *Journal of Computational and Applied Mathematics*, 228(1), 139–149.

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

Quigley, T., & Hambrick, D. (2012). When the Former CEO Stays on as Board Chair: Effects on Successor Discretion, Strategic Change, and Performance. *Strategic Management Journal*, 33, 834–859.

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

Rashid, A., De-Zoysa, A., Lodh, S., & Rudkin, K. (2010). Board Composition and Firm Performance: Evidence From Bangladesh. *Australasian Accounting Business and Finance Journal*, 4(1), 76–95. [http://ro.uow.edu.au/aabfj/vol4/iss1/5/?utm\\_source=ro.uow.edu.au%2Faabfj%2Fvol4%2Fiss1%2F5&utm\\_medium=PDF&utm\\_campaign=PDFCoverPages](http://ro.uow.edu.au/aabfj/vol4/iss1/5/?utm_source=ro.uow.edu.au%2Faabfj%2Fvol4%2Fiss1%2F5&utm_medium=PDF&utm_campaign=PDFCoverPages).

Roehner, B. (2005). Stock Markets Are Not What We Think They Are: The Key Roles of Cross-Ownership and Corporate Treasury Stock. *Physica A: Statistical Mechanics and Its Applications*, 347, 613–625.

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

Roychowdhury, S. (2006). Earnings Management Through Real Activities Manipulation. *Journal of Accounting and Economics*, 42, 335–370.

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

Sánchez-Sánchez, F., & Vargas-Valencia, M. (2018). Games with Nested

Constraints Given by a Level Structure. *Journal of Dynamics & Games*, 5(2), 95–107.

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

Seneta, E. (2013). A Tricentenary History of the Law of Large Numbers. *Bernoulli*, 19(4), 1088–1121.

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

Shanteau, J., & Troutman, C. (1992). A Psychophysical Evaluation of Diminishing Returns in Riskless Decision Making. *Organizational Behavior and Human Decision Processes*, 52(3), 569–579.

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

Siegel, J. (2005). Can Foreign Firms Bond Themselves Effectively by Submitting to U.S. Law? *Journal of Financial Economics*, 75, 319–359.

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

Song, F. (2009). Intergroup Trust and Reciprocity in Strategic Interactions: Effects of Group Decision-Making Mechanisms. *Organizational Behavior and Human Decision Processes*, 108(1), 164–173.

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

Song, Q., Liu, A., & Yang, S. (2017). Stock *Portfolio Selection* Using Learning-to-Rank Algorithms with News Sentiment. *Neurocomputing*, 264, 20–28.

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

Szyszka, A. (2013). Asset-Pricing Anomalies and Investment Strategies. In *Behavioral Finance and Capital Markets*. New York: Palgrave Macmillan.

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

Taksar, M. (2001). Optimal Risk and Dividend Distribution Control Models for an Insurance Company. *Mathematical Methods of Operations Research*, 51, 1–42.

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

Taleb, N. (2009). Finiteness of Variance Is Irrelevant in the Practice of Quantitative Finance. *Complexity*, 14(3), 66–76.

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

Tang, Y., Wu, J., & Zhang, L. (2014). Do Anomalies Exist Ex Ante? *Review of Finance*, 18(3), 843–875.

[Google Scholar](#)

Thanassoulis, J. (2013). Industry Structure, Executive Pay, and Short-Termism. *Management Science*, 59, 402–419.

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

Tille, C., & Van Wincoop, E. (2008). *International Capital Flows Under Dispersed Information: Theory and Evidence*. Working Paper.

[http://people.virginia.edu/~ev4n/papers/Information\\_sep\\_26.pdf](http://people.virginia.edu/~ev4n/papers/Information_sep_26.pdf).

Tsamenyi, M., Enninful-Adu, E., & Onumah, J. (2007). Disclosure and Corporate Governance in Developing Countries: Evidence from Ghana. *Managerial Auditing Journal*, 22(3), 319–334.

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

Vagais, D., & Van Dijk, M. (2011). *International Capital Flows and Liquidity*.

<http://www.tinbergen.nl/~sofie2012/papers/VagiasDijk2011.pdf>.



Van Ginkel, W., & van Knippenberg, D. (2008). Group Information Elaboration and Group Decision Making: The Role of Shared Task Representations. *Organizational Behavior and Human Decision Processes*, 105(1), 82–97.

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

Wang, B., Li, Y., & Watada, J. (2017). Multi-Period Portfolio Selection with Dynamic Risk/Expected-Return Level Under Fuzzy Random Uncertainty. *Information Sciences*, 385–386, 1–18.

[Google Scholar](#)

Weron, R. (2001). Levy-Stable Distributions Revisited: Tail Index  $> 2$  Does Not Exclude the Levy-Stable Regime. *International Journal of Modern Physics-C*, 12(2), 209–223.

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

Wong, K., Yam, S., & Zheng, H. (2017). Utility-Deviation-Risk Portfolio Selection. *SIAM Journal on Control & Optimization*, 55(3), 1819–1861.

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

Wu, C., & Lerner, P. (2009). Price Volatility in the Context of Market Microstructure. In G. Gregoriou (Ed.), *Stock Market Volatility* (pp. 51–69). Boca Raton: Chapman and Hall/CRC.

[Google Scholar](#)

Wu, Q., & Robin, A. (2014). Firm Growth and the Pricing of Discretionary Accruals. *Review of Quant Finance & Accounting*, forthcoming.

[Google Scholar](#)

Xia, J. (2011). Risk Aversion and Portfolio Selection in a Continuous-Time Model.

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

Yang, G., & Liu, X. (2018). Goal-Based Portfolio Choice Model with Discounted Preference. *Journal of Computational and Applied Mathematics*, 238, 365–380.

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

Yeo, K., & Melny, I. (2019). Deep Learning Algorithm for Data-Driven Simulation of Noisy Dynamical System. *Journal of Computational Physics*, 376, 1212–1231.

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

Yin, G., Jin, H., & Jin, Z. (2009). Numerical Methods for Portfolio Selection with Bounded Constraints. *Journal of Computational and Applied Mathematics*, 233(2), 564–581.

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

Yue, W., & Wang, Y. (2017). A New Fuzzy Multi-Objective Higher Order Moment Portfolio Selection Model for Diversified Portfolios. *Physica A: Statistical Mechanics and Its Applications*, 465, 124–140.

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

Zhao, Y., Chen, K., Zhang, Y., & Davis, M. (2011). Takeover Protection and Managerial Myopia: Evidence from Real Earnings Management. *Journal of Accounting and Public Policy*, 31(1), 109–135.

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

Zhao, P., & Qingxian, Q. (2016). Portfolio Selection Problem with Value-at-Risk Constraints Under Non-extensive Statistical Mechanics. *Journal of Computational and Applied Mathematics*, 298, 64–71.

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

Zheng, Y., Osmer, E., & Zheng, L. (2017). The Relative Pricing of Cross-Listed Securities: The Case of Chinese A- and H-Share. *The Quarterly Review of Economics and Finance*, in press, corrected proof.

[Google Scholar](#)

## Author information

---

### Authors and Affiliations

**Enugu, Nigeria**

Michael I. C. Nwogugu

## Copyright information

---

© 2019 The Author(s)

## About this chapter

---

### Cite this chapter

Nwogugu, M.I.C. (2019). Complexity and Some Numerical *Algorithmic Turning-Point* Problems Inherent in Excessive Outstanding Shares. In: Complex Systems, Multi-Sided Incentives and Risk Perception in Companies. Palgrave Macmillan, London. [https://doi.org/10.1057/978-1-137-44704-3\\_15](https://doi.org/10.1057/978-1-137-44704-3_15)

[.RIS↓](#) [.ENW↓](#) [.BIB↓](#)

DOI	Published	Publisher Name
<a href="https://doi.org/10.1057/978-1-137-44704-3_15">https://doi.org/10.1057/978-1-137-44704-3_15</a>	07 September 2019	Palgrave Macmillan, London

Print ISBN	Online ISBN	eBook Packages
978-1-137-44703-6	978-1-137-44704-3	<a href="#">Economics and Finance</a>
		<a href="#">Economics and Finance (R0)</a>

# Publish with us

---

[Policies and ethics](#) 

## Search

Search by keyword or author



## Navigation

Find a journal

---

Publish with us

---

Track your research