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Evolution, finance, and the population genetics of relative wealth

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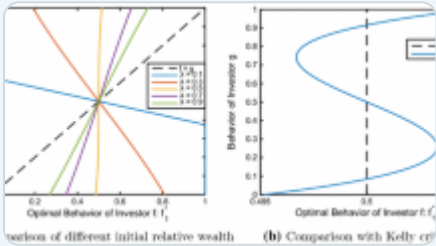
Abstract

Attempts to use evolutionary ideas in finance have often neglected mathematical population genetics. Population genetics provides a natural approach to certain problems in finance that involve the relative wealth that accrues to competing investment strategies. In our model, competing investment strategies differ only in their allocation to a risky asset versus a riskless asset. Here we use results from the population genetics of natural selection to find the investment strategy that maximizes the expected increase in relative wealth. Though we focus on single-period analysis, some of our key findings are reminiscent of those from the growth optimal portfolio literature, e.g., the Kelly criterion.

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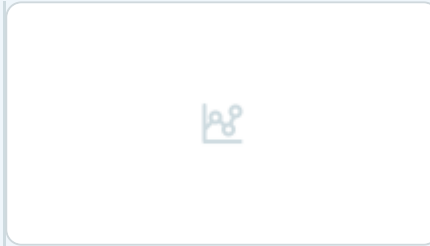
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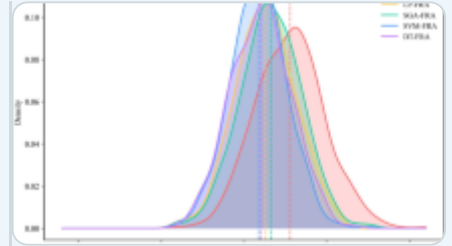
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References

Alchian, A. (1950). Uncertainty, evolution and economic theory. *Journal of Political Economy*, 58, 211-221.

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

Bakshi, G. S., & Chen, Z. (1996). The spirit of capitalism and stock prices. *American Economic Review*, 80(1), 133-157.

[Google Scholar](#)

Bell, R. M., & Cover, T. M. (1980). Competitive optimality of logarithmic investment. *Mathematics of Operations Research*, 5, 161-166.

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

Blume, L., & Easley, D. (1992). Evolution and market behavior. *Journal of Economic Theory*, 58, 9-40.

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

Blume, L., & Easley, D. (1993). Economic natural selection. *Economics Letters*, 42, 281-289.

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Brennan, T. J., & Lo, A. W. (2011). The origin of behavior. *Quarterly Journal of Finance*, 1, 55. doi:[10.1142/S201013921100002X](https://doi.org/10.1142/S201013921100002X).

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Browne, S. (1999). Reaching goals by a deadline: digital options and continuous-time active portfolio management. *Advances in Applied Probability*, 31, 551-577.

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

Browne, S. (2000). Can you do better than Kelly in the short run? In O. Vancura, J. Corenlius, & W. R. Eadington (Eds.), *Finding the edge: mathematical analysis of casino games* (pp. 215-231). Reno: University of Nevada.

[Google Scholar](#)

Burnham, T. C. (2002). Altruism and spite in a selfish gene model of endogenous preferences. *Journal of Bioeconomics*, 3, 123-148.

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

Burnham, T. C., Dunlap, A., & Stephens, D. W. (2015). Experimental evolution and economics. *SAGE Open*. October-December 2015, 1-17.

Clark, A. E., & Oswald, A. J. (1996). Satisfaction and comparison income. *Journal of Public Economics*, 61(3), 359-381. September.

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

Clark, A. E., Paul, S. E., & Shields, M. A. (2008). Relative income, happiness, and utility: An explanation for the Easterlin paradox and other puzzles. *Journal of Economic Literature*, 46(1), 95-144.

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

Cole, H. L., Mailath, G. J., & Postlewaite, A. (2001). Investment and concern for relative position. *Review of Economic Design*, 6, 241-261.

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

Corneo, G., & Jeanne, O. (1997). On relative wealth effects and the optimality of growth. *Economics Letters*, 54, 87-92.

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

Crow, J. F., & Kimura, M. (1970). *An introduction to population genetics theory*. New York: Harper and Row.

[Google Scholar](#)

Dempster, E. R. (1955). Maintenance of genetic heterogeneity. *Cold Spring Harbor Symposium Quantitative Biology*, 20, 25–32.

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

Evstigneev, I. V., Hens, T., & Schenk-Hoppé, K. R. (2006). Evolutionary stable stock markets. *Economic Theory*, 27, 449–468.

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

Evstigneev, I. V., Hens, T., & Schenk-Hoppé, K. R. (2009a). Evolutionary finance. In T. Hens & K. R. Schenk-Hoppe (Eds.), *Handbook of financial markets: dynamics and evolution* (Chapter 9, pp. 507–566). San Diego: North-Holland.

Evstigneev, I. V., Hens, T., & Schenk-Hoppé, K. R. (2009b). Survival and evolutionary stability of the Kelly rule (August 18, 2009). Swiss Finance Institute Research Paper No. 09-32. SSRN: <http://ssrn.com/abstract=1468523> or doi:[10.2139/ssrn.1468523](https://doi.org/10.2139/ssrn.1468523)

Felsenstein, J. (1976). The theoretical population genetics of variable selection and migration. *Annual Review of Genetics*, 10, 253–280.

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

Frank, R. H. (1985). *Choosing the right pond: Human behavior and the quest for status*. New York, NY: Oxford University Press.

[Google Scholar](#)

Frank, S. A. (2011). Natural selection. I. Variable environments and uncertain return on investments. *Journal of Evolutionary Biology*, 24, 2299–2309.

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

Frank, S. A. (1990). When to copy or avoid an opponent's strategy. *Journal of Theoretical Biology*, 145, 41-46.

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Frank, S. A., & Slatkin, M. (1990). Evolution in a variable environment. *American Naturalist*, 136, 244-260.

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

Gillespie, J. H. (1973). Natural selection with varying selection coefficients: A haploid model. *Genetical Research*, 21, 115-120.

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

Gillespie, J. H. (1977). Natural selection for variances in offspring numbers: A new evolutionary principle. *American Naturalist*, 111, 1010-1014.

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

Haldane, J. B. S., & Jayakar, S. D. (1962). Polymorphism due to selection of varying direction. *Journal of Genetics*, 58, 237-242.

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

Hens, T., & Schenk-Hoppé, K.-R. (2003). Evolutionary stability of portfolio rules in incomplete markets. Discussion Papers 03-03, University of Copenhagen. Department of Economics.

Karlin, S., & Taylor, H. M. (1981). *A second course in stochastic processes*. New York: Academic Press.

[Google Scholar](#)

Kelly, J. L. (1956). A new interpretation of information rate. *Bell System Technical*

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

Lande, R. (2007). Expected relative fitness and the adaptive topography of fluctuating selection. *Evolution*, 61, 1835-1846.

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

Lensberg, T., & Schenk-Hoppe, K. R. (2006). On the evolution of investment strategies and the Kelly rule: A Darwinian approach. Swiss Finance Institute Research Paper Series 06-38, Swiss Finance Institute.

Lo, A. W. (2004). The adaptive markets hypothesis. *Journal of Portfolio Management*. 30 Anniversary Issue, 15-29.

Maynard Smith, J. (1982). *Evolution and the theory of games*. Cambridge: Cambridge University Press.

[Book](#) [Google Scholar](#)

Metcalfe, J. S. (1998). *Evolutionary economics and creative destruction*. London: Routledge.

[Book](#) [Google Scholar](#)

Park, S. (2009). Portfolio choice when relative income matters. *The Journal of Socio-Economics*, 38, 530-533.

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Robson, A. J. (1992). Status, the distribution of wealth, private and social attitudes to risk. *Econometrica*, 60(4), 837-857.

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Schweber, S. S. (1977). The origin of the Origin revisited. *Journal of the History of Biology*, 10, 229–316.

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

Schweber, S. S. (1978). The genesis of natural selection—1838: some further insights. *Bioscience*, 28, 321–326.

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

Schweber, S. S. (1980). Darwin and the political economists: divergence of character. *Journal of the History of Biology*, 13, 195–289.

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Seeger, J., & Brockmann, H. J. (1987). What is bet hedging? *Oxford Surveys in Evolutionary Biology*, 4, 182–211.

[Google Scholar](#)

Thorp, E. O. (1997). The Kelly criterion in blackjack, sports betting, and the stock market. Paper presented at the 10th international conference on gambling and risk taking. (Reprinted from *Handbook of Asset and Liability Management* by S. A. Zenios and W. Ziemba, Ed., 2006, Elsevier.)

Weber, M. M. (1958). *The protestant ethic and the spirit of capitalism*. New York, NY: Charles Scribner's Sons.

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