Colby Granstrom
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Value Added by a Computational Financial Econometrician

The *man on the spot,* cannot be consistently beaten just as Hayek would have us believe. Information is too scarce and far too scattered to understand the nuances of every marketplace. However, I do believe that with our current computational power and understanding of asset prices, financial economists can provide a causal framework or map for people not in the trenches. It is our job to build strong intuition through our basic understanding, as well as using the latest methods for asset pricing in achieving greater market efficiency.

This value added does not replace the individual market makers, but adds increased competition temporarily until the model is built into the price. What the financial economist does is add efficiency to markets and helps us to understand the markets that much better. Buchanan says it beautifully in this quote,

> A general solution, if there is one, emerges as a result of a whole network of exchanges, bargains, trades, side payments, agreements, contracts which, finally

> at some point, ceases to renew itself. At each stage in this evolution solution, there are gains to be made, there are exchanges possible, and this being true, the direction of movement is modified.

As he states it, economics is not a roadmap to a better allocation of resources, it does provide a roadmap of individual marketplaces.

Thanks to incredible innovation in technology our roadmaps are improving at an incredibly fast pace. The ability to store and analyze data in real-time allows us to draw new and impactful conclusions that open the door to new area of study.

In relation to this, Hamilton, in his paper titled *Computing power and the power of econometrics*, goes over the new level of analysis that is possible in today's technology landscape,

> One can learn about the mechanics of the microstructure of how financial markets operate, such as the ultimate determinants of bid-ask spreads and differences between observed prices and the price that would hold in a frictionless world, by studying how the properties of the time series change as mh shrinks. See Hansen and Lunde (2006) for an interesting discussion of these possibilities.

As data centers grow and the methods by which we store, extract, and run the information improves, all the markets will grow to a stronger form of efficiency. However, I do think it is important to look at technology and mathematical gains in a

Buchanan-context and understand that a smaller bid-ask spread does not mean computers and mathematicians are replacing economists. It simply means that economists are now required to be proficient enough in these tools to incorporate them into their studies.

In a data-driven world, it becomes more important than ever to make sure our data contains no bias. This is extremely difficult to do, but it is paramount that studies done by financial economist contains no bias whatsoever. If the study cannot be replicated with random sampling that is unbiased than the conclusions cannot be taken at face value. Many economists are aware of this truth, but I think more should take the initiative to understand how the data is collected and be able to see bias when it is present. The onus of these new obstacles is on the professional to protect the integrity of the field.

The bottom line is that the economic problem is not an efficiency or optimal allocation one. Buchanan says this in relation to the new abilities of technology, “An economic problem arises when mutually conflicting ends are present, when choices must be made among them. A technological problem, by comparison, is characterized by the fact that there is only one end to be maximized.” In other words, the net gains of where we go

with technology and our ability to analyze data will not solve the economic problem of two individuals in exchange with one another. It will definitely not solve the allocation of resources, people, and money either, but with new ways of seeing the data, financial

economist will be able to make the men on the spot more efficient and add efficiency to free markets with statistical interpretations.

Hayek also puts computation and technology advances into context. As economist we will never be able to compute the optimal allocation or understand how decisions will be made from one location. Our market system operates the same as it did 50 years ago with the exception of added liquidity in almost all situations. The information is as spread out and dynamic as ever before. One of my favorite quotes on the matter comes

from Hayek when he explains that:

> The shipper who earns his living from using otherwise empty or half-filled journeys of tramp-steamers, or the estate agent whose whole knowledge is almost exclusively one of temporary opportunities, or the *arbitrageur* who gains from local differences of commodity prices, are all performing eminently useful functions based on special knowledge of circumstances of the fleeting moment not known to others (AER 9)

The men and women on the spot will always have something the economist doesn't. For that reason, we will probably always continue to have economist. I say this because if the

riddle of perfect allocation of resources was solved, then economist would become obsolete. While many markets like equities have evolved to the point of near perfect efficiency, there are still people and systems out-performing the market today. Deals

are still made between two human beings and I fail to buy in 100% that only greater risk will yield higher returns.

One such computational method for asset pricing involves options pricing using Black Scholes option pricing model and Monte Carlo simulation on prices. Many hedge funds have adopted something similar to Black Scholes and continue to find arbitrage opportunities and earn above the classic Beta measure might explain. Using econometric models to simulate asset prices can give accurate insight to what the volatility of the underlying asset might be. Once a company is able to find an accurate model, running the asset path through different payoffs such as Black Scholes yields a look into market value of an asset. While no model will consistently beat the market forever, the success of many hedge funds using this technique fits in with the theory that the markets are not 100% efficient and computational economics has the power to find small inefficiencies and profit from them.

Another important tool for the financial economist is the monte Carlo pricing engine. The addition of stochastic volatility and implementation of variance reduction techniques such as control variate, allow pricing simulations to be more accurate than

ever. It also allows us to make assumptions about the distribution that has allowed us to make use of the data. We know that volatility is not constant over time and that it grows with time. Interpreting this data and knowing where the outputs are originating from is extremely important as an economist.

Looking to the future, I suspect that the study and implementation of economics will grow more computational in nature. I don't even know if the financial economists will be doing the computation work or if the processes of computation will be divided up to individuals own comparative advantage ensuring more efficiency in the work place, but there is no doubt in my mind that statistical inference will be paramount for financial economist to be able to continue on. In the future, more than ever, financial economist will need to be able to translate data outputs and then ultimately draw concrete conclusions on future events. Making markets more liquid and more efficient is our job and hopefully there are some profits to come out of the process.

References

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