Funding Options from the Market

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Abstract

Investors face many different versions of The Portfolio Problem. Consider, for example, holding shares and call options on a publicly-traded equity. The options are in-the-money and live. How best should the investor go about exercising those options? They could fund from capital or use the secondary market to fund the options, as follows. When market price is above strike price, it may be possible to sell shares into market in advance of exercising the call options. This operation can yield residual cash or shares. How much should an investor do this and when? This paper presents a specific numerical example where we trade out of options when the market price breaches a 2:1 ratio to strike price and provides descriptive statistics for investors' wealth in simulation with standard Gaussian motion for share price and specific trading rule.

Keywords: Finance, Trading, Derivatives,

JEL Codes: C00 General; G00 General

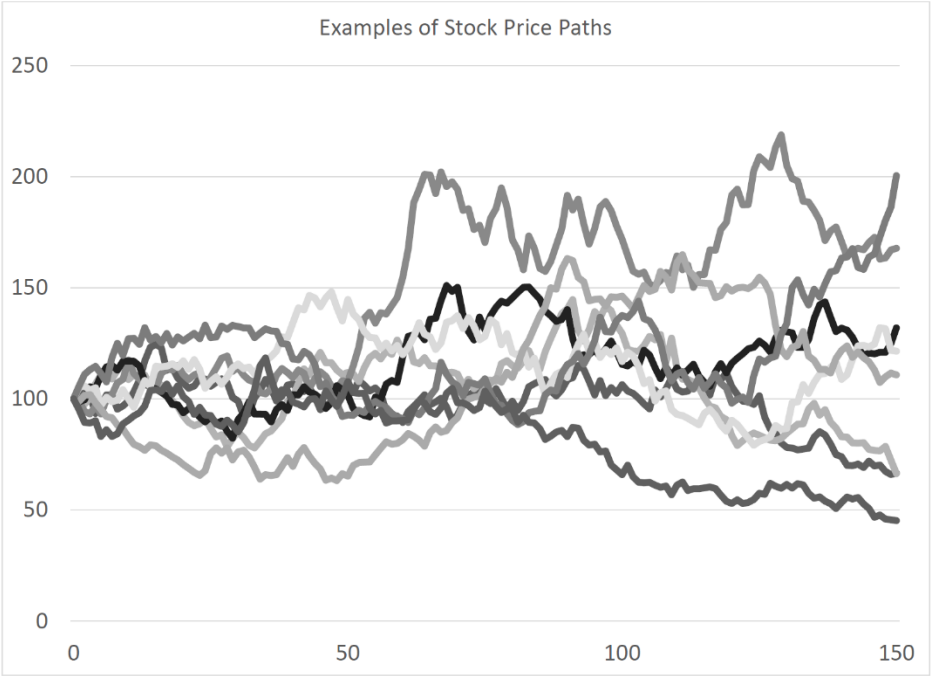
Funding Options from the Market

Howe Street is an important part of global mining industry known as “Junior Mining” or minerals exploration. It is a high-risk, intellectual business similar to medical research or technology development. There is well-developed financial industry around the junior mining business that is widely known for many things, such as the widespread use of warrants in equity financing. I will refer to call options in this paper, but am really talking about warrants. There is a lot of knowledge on the street about exercising these derivatives that I don’t know anything about, but I will explore a Trading Strategy that is based on a simple heuristic that some people on the street may well follow.

Please note that the calculations described in this paper are available online at the following link: http://cdn.ceo.ca/1drff7q-2018-10-05-NewtonResearch-Public.xlsx

Background Info on Project

The simulations here follow as in (Bell, 2014). I use the standard, lognormal model for prices with initial value 100, drift zero, and sigma 4% per time step. I simulate 100 different paths for prices over 250 time steps each. See several examples of Price Paths below.



The broad range of values in these paths is reflective of the volatility on Howe Street. It is possible to use different models for this, such as multi-fractal multi-fractal model for asset returns (Bell, 2012), or real data.

This paper explore simple heuristic where fund all options fully when can get full share free, but important research into optimal trading strategy for particular model. Example Carr & Madan (2001) use numerical solution to functional analysis formulation of portfolio problem where hold stock and put option. Very sophisticated method that deserves application to situation where holding shares and call option!

Trading Strategy

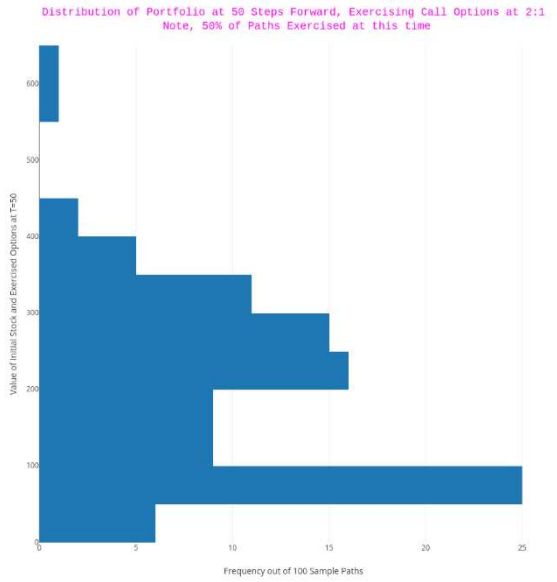
Suppose simply that the investor behaves as follows. Exercise options at $60 strike price fully if and only if price goes above $120. Exercise fully first time it happens. If it doesn't happen, then they don't exercise!

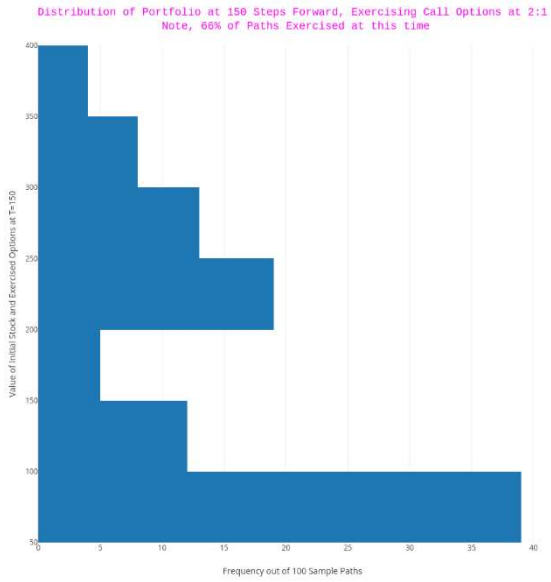
I do not consider the value of the options themselves, only the valuation of the equity. It is possible to use model-prices for the options, warrants, or other derivatives, but this paper focuses simply on funding the options from the market. It may be possible to expand this model to consider the valuation of options that are out-of-the-money alongside extended price paths and repeatedly funding the company to receive more shares and warrants over time. The Howe Street business is very much about buying again and again to fund these junior mining companies, which are generally not going concerns as they have no revenue.

Histograms of Portfolio Value After Some Time

I allow trading strategy to run for each price path, 100 different paths and consider the distribution of total value of stock holdings at a couple different time points. One point is 50 time steps forward and the other is 150 steps forward. I show distribution of wealth at each time across all paths. For some paths, the options have been exercised already and investor has double the amount of shares that they started with. For others, still owns 1 unit of shares and 1 call option that may or may not still be in the money!

Note that 50% of options exercised after 50 time steps. This is an interesting feature that could be described as "bullish" on the street. Note also that there is a large mass of probability at particularly low values after 150 time steps. That probability would be concerning to investors considering this strategy and further investigation would be warranted. Are there similarities between the price paths that cause investors to end up with such low wealth? What's going on down there?



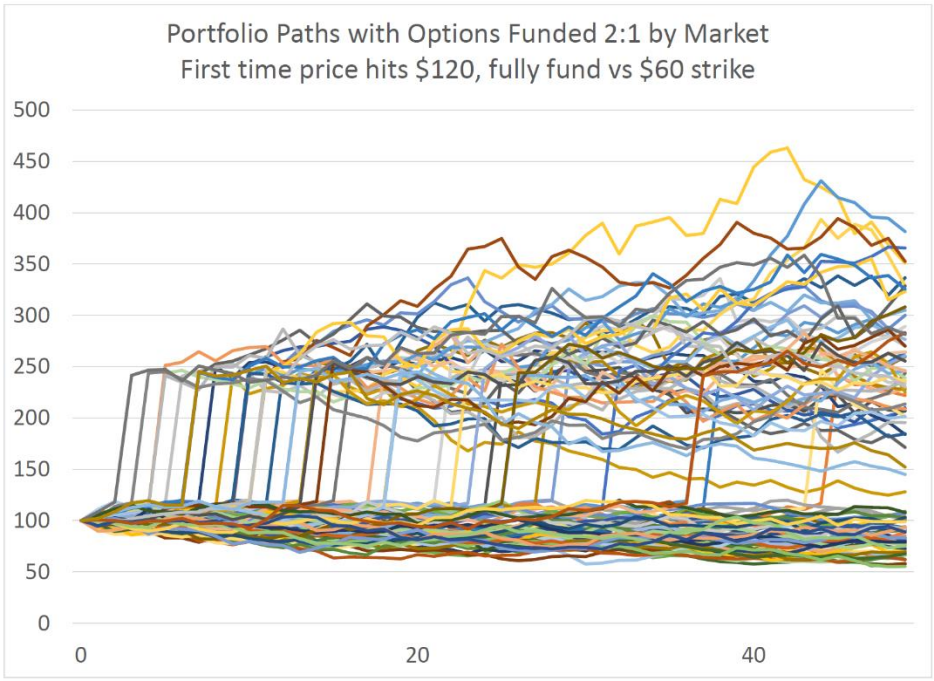


Although these histograms provide some basic insight into the shape of the data, they do not distinguish between paths where actually exercised options and ones where they didn't.

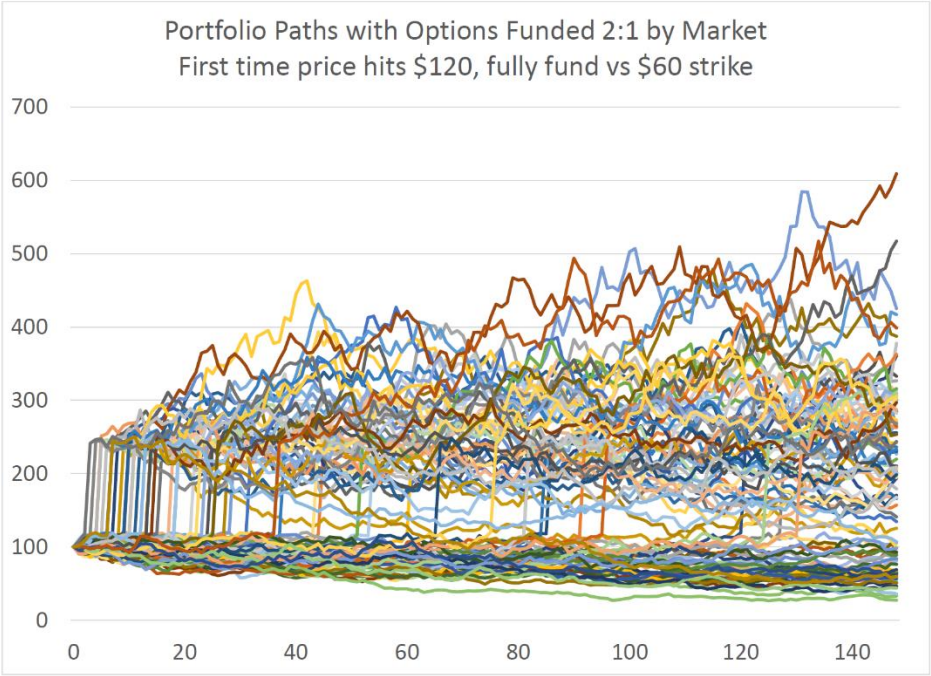
Wealth Paths

I use simulations of Price Paths and Trading Strategy to construct Wealth Paths, which show total shareholdings at particular time. As before, this does not include anything about the option value. Can clearly see paths where options get funded by market as place where Wealth Path jumps.

The first graph shows all 100 runs of Wealth Paths prepared here for the first 50 time steps. Many options were exercised by the end of that time. As noted before, the options were exercised in more than 50% of all simulations by 50 time steps.



The second graph zooms-out to show what happens over 150 time steps. It's a messy graph, but you can see that the rate of funding options markets slows down drastically. We have tripled the time length for the graph, but the number of paths where options were exercised only increased from one-half to two-thirds!



Note how the trading strategy causes a break in structure of paths in this longer graph of 150 days. The Price Paths all stay clustered together in a Gaussian cloud by construction, but the Wealth Paths have different features. There is a random cluster that breaks away, which is driven by times where you successfully fund the options from the market. This break-away cluster occurs because of the Trading Strategy and marks great success.

Note also the volatility apparent in the longer graph of Portfolio Paths. Looking back to the several examples of Price Paths that I provided initially, note that the range is $50-200. The range of Portfolio Paths with this trading strategy is more like $50-500. This increased upside is not a certainty, but indicates the opportunity available with these options trading strategies.

Discussion

It's great for an investor to have live call options that are in-the-money, but what should they with them? This is a broad question that I address with a specific numerical example. These calculations can be extended simply to a setting where you invest in the company repeatedly and receive more shares and derivatives each time, which is what some investors do on Howe Street. There are certainly other interesting versions of the Portfolio Problem on Howe Street that deserve close consideration.

References

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