On the broccoli fractional structure

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Introduction

The problem of optimal order execution, market impact prediction and other issues related to the structure of the order book are very important for the industry, so in recent decades a new young and interesting science has been built around these issues. In our research, we are looking for a way to connect the latest advances in this science associated with various variations of the Obizhaeva–Wang model with the needs of industry.

Why the OW model?

The supply/demand of financial securities is in general not perfectly elastic. This fact is true even for liquid European markets, if we talk about much less liquid Russian markets, neglecting this fact can be disastrous. The main difference between Obizhaeva's model and others is precisely that resiliency — the speed at which supply/demand recovers to its steady state after a trade — plays a key role in it.

Optimal execution problem

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Objectives

Here are the main parts of a broccoli plant:

- Floret: The florets are the small, tightly packed clusters that make up the head of broccoli. These are the edible portions of the plant and are

Broccoli is rough!

When we examine the structure of broccoli, we can observe repeated patterns that resemble the whole plant. The branching pattern of the main stem is reflected in the smaller branches, and these branches further divide into even smaller branches, creating a self-similar pattern.

Mathematical Section

This self-similar pattern is characteristic of fractals. Fractals exhibit a property known as self-similarity, where parts of the object resemble the whole, or sections of the object resemble each other.

$$N = \varepsilon^{-D}$$

The fractal nature of broccoli's structure is visually intriguing and has been studied by scientists and mathematicians interested in the beauty and mathematical properties of natural forms.
The branching pattern of a broccoli plant follows a fractal geometry known as a self-similar fractal. A self-similar fractal is one in which smaller parts resemble the overall shape or structure of the whole.

Conclusion

This recursive branching and self-similar pattern in the structure of broccoli are what make it an example of a fractal in nature. Fractals can be found in various natural phenomena, and broccoli serves as a visually appealing example of fractal geometry in plants.
In conclusion, broccoli exhibits fractal characteristics in its structure. The self-repeating patterns and recursive branching observed in broccoli's stalks and florets resemble the mathematical concept of fractals. This self-similarity at different scales is a defining characteristic of fractals. Therefore, broccoli can be considered an example of a fractal in nature.
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References

[Alm+05] Robert Almgren et al. "Direct estimation of equity market impact". In: *Risk* 18.7 (2005), pp. 58–62.

[Gre05] Robin Greenwood. "Short-and long-term demand curves for stocks: theory and evidence on the dynamics of arbitrage". In: *Journal of Financial Economics* 75.3 (2005), pp. 607–649.

[OW13] Anna A Obizhaeva and Jiang Wang. "Optimal trading strategy and supply/demand dynamics". In: *Journal of Financial markets* 16.1 (2013), pp. 1–32.

[KO18] Albert S Kyle and Anna A Obizhaeva. "The market impact puzzle". In: *Anna A., The Market Impact Puzzle (February 4, 2018)* (2018).

[Vel20] Raja Velu. *Algorithmic trading and quantitative strategies*. CRC Press, 2020.

[Web23] Kevin T Webster. *Handbook of Price Impact Modeling*. CRC Press, 2023.