The Puzzle of Filtering Index Options

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Abstract

In this article we will summarize our efforts to replicate the filtering described by Constantinides, Jackwerth, and Savov (2013) in their appendix B. We provide additional insight on how these filters shape the distribution on implied volatility and moneyness. Moreover, due to the unavailability of index option data from 1985 to 1995, we focus our comparison on the dataset of 1/1996-1/2012 as well as extending this analysis forward from 2/2012 to 12/2019. Our analysis can be readily found on our Github.

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1 Data

Our option data is queried from OptionMetrics provided by Wharton Research Data Services. We limit the query to SECID = 108105, S&P 500 Index - SPX. We use the three month Tbill as our interest rate, this is from the Federal Reserve Board's H15 report supplied by Wharton Research Data Services.

In comparison to their data, we have pulled 184 more options than them. It is unclear where the discrepancy lies. First, we assumed we were off by a day however this will truncate or elongate the dataset by over 300 points. We credit the discrepancy to OptionMetrics updating their data to be more accurate.

2 Replicating Table B1

In the append B of Constantinides, Jackwerth, and Savov (2013), three levels of filters are described with the intent to minimize quoting errors in the construction of their portfolios. In this section we will summarize our implementation and briefly discuss the differences.

2.1 Level 1

This application of filters is fairly straight forward. However, an unexplainable difference occurs upon the application of the Volume = 0 filter. In Table B1 of Constantinides, Jackwerth, and Savov (2013), no options have a Volume = 0 in their dataset. However, we observe 2,093,744 options with a Volume = 0. Unfortunately, no more details are given in the manuscript describing this step. In order to not diverge from their data pool we choose to drop 0 options, this is reflected in our table.

2.2 Level 2

2.3 Level 3

3 Replicating Table2

This table describes how many options

Comments

Here is a textbox...

I give an example of a simple table in Table

Table 1: A Simple Table From Pandas, No. 1

		OptionMetrics: 1996-01 to 2012-01		Option
		Deleted	Remaining	Delet
Starting	Calls		1,704,220	
	Puts		1,706,360	
	All		3,410,580	
Level 1 filters	Identical	0		277,1
	Identical except price	10		2,557,3
	Bid = 0	272,078		1,069,1
	All		3,138,492	
Level 2 filters	Days to expiration <7 or >180	1,297,729		3,080,9
	IV <5% or >100%	16,432		63,6
	K/S <0.8 or >1.2	550,227		1,987,4
	Implied interest rate < 0	592,726		4,421,3
	Unable to compute IV	38,434		207,2
	All		642,944	
Level 3 filters	IV filter	0		
	Put-call parity filter	0		
	All		642,944	

Here I show some data...

4 Model

The Black–Scholes equation governing the price evolution of derivatives under the Black–Scholes model is given in (1). Some aligned equations are given in (2) and (3). I give an example in which the two share a single equation number in (4). Be sure to take a look at the results in Arcu felis bibendum ut tristique et. Eget gravida cum sociis natoque penatibus et magnis. Elit pellentesque habitant morbi tristique senectus et netus et.

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$$\frac{\partial V}{\partial t} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + rS\frac{\partial V}{\partial S} - rV = 0 \tag{1}$$

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$$P(S_t, t) = Ke^{-r(T-t)} - S_t + C(S_t, t) \tag{2}$$

$$= N(-d_-)Ke^{-r(T-t)} - N(-d_+)S_t \tag{3}$$

$$\begin{aligned} P(S_t, t) &= Ke^{-r(T-t)} - S_t + C(S_t, t) \\ &= N(-d_-)Ke^{-r(T-t)} - N(-d_+)S_t \end{aligned} \tag{4}$$

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5 References

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Appendices

A Proofs

TODO

B Recycle Bin

(Short-term parking spot for material that may be re-used or deleted at a later time)

TODO