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The lifecycle of exchange-traded derivatives

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ABSTRACT

Using a comprehensive dataset covering most derivatives trades reported to US exchanges since 1954, we present distributional estimates of the rate at which derivative trading volumes rise and fall.

Results suggest that the lifecycle of cleared derivatives shifted in the 2000's. Derivatives with low trading volumes moved to modest volumes with increased probability. Prior to that shift, less popular contracts were likely to remain at low volumes or be delisted altogether. This additional resilience from low levels of trading improved the trajectory of trading volumes for the marginal contract, despite the decade's launch of a record number of new contracts and historic abundance of rarely traded contracts. The New York Mercantile Exchange, an exchange that shifted abruptly to electronic trading, provides some evidence that this shift was driven by new technology.

We present our analysis as a non-stationary Markov model, estimated using Bayesian methods. This approach offers simple summary statistics to inform the launch of a new derivatives contract, organized in a model that describes the dynamics of the derivatives market as a whole. This facilitates distributional comparisons among historical groups of contracts (e.g. across time, exchange, or product type) as well as simulation of new derivatives emerging over time.

1. Introduction

What are the chances that a new derivative will reach a sustainable level of liquidity? This is an important question for new contract innovators (Sandor, 1973). It also became an important question for policy makers as the United States crafted and implemented the Dodd-Frank reforms. With the stated aims of improving the stability and transparency of derivatives markets, those reforms envisioned regulatory changes that, according to industry participants, might shift trading activity away from swaps markets in favor of futures markets (Gensler, 2013). A 2011 white paper by the International Swaps and Derivatives Association described this shift and its potential adverse impacts on trading dynamics (ISDA Research Staff and NERA Economic Consulting, 2011).

This policy debate was taking place in the absence of up-to-date empirical evidence on the lifecycle of derivatives and how that lifecycle has changed with recent shifts in the underlying structure of derivatives markets. Such shifts include electronic trading, the financialization of commodities markets, and the proliferation of new contracts. Silber (1981) and Carlton (1984) provided some of the first summary statistics on the survival of new futures contracts. Their core conclusions - that most new derivatives fail and that they do so soon after their launch - remained widely cited, when the U.S. Commodity Futures Trading Commission (CFTC) agreed to facilitate more comprehensive research on the subject in response to industry concerns (Gorton and Rouwenhorst, 2004; Hung et al., 2011).

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Researchers had previously identified correlates to high trading volumes within niches of the derivatives markets such as the size of the underlying spot market, the volatility of the contract, or the availability of cross-hedges (Black, 1986; Corkish et al., 1997; Brorsen and Fofana, 2001; Hung et al., 2011). There had also been case studies on the failures of individual markets to sustain high trading (Working, 1953; Sandor, 1973; Johnston and McConnell, 1989). Together, those informed theoretical models of the economic optimization process underlying contract innovation and subsequent trading (Cuny, 1993; Duffie and Jackson, 1989; Tashjian and Weissman, 1995; Pennings and Leuthold, 2001).

But prior to Gorham and Kundu (2012), there had been few attempts to provide an empirical description of US derivatives trading in decades. Among the important findings in that work were:

- Since 1955, the average contract had a life span (longest stretch of non-zero trading) of six years.
- A cluster of the most traded contracts to date were launched in the 1980's.
- US derivatives markets show a tendency toward liquidity-driven monopoly, with the dominant contract accounting for 95 percent of all trading within a product niche.

Here we extend that work using a comprehensive dataset on cleared derivatives (futures, options, and swaps reported to the CFTC) augmented with data on historic futures absent from most electronic databases. The primary aim is to provide statistics necessary to inform policy and serve as base-rates for decision-making surrounding the launch or delisting of derivatives contracts (Kahneman and Tversky 1973, 1982; Bar-Hillel, 1980). Those statistics are offerd in the form of a Markov model, which estimates the probability of a contract trading within a ranges of annual volume given the previous year's volume. This model allows for statistical comparisons of the trajectory of growth and decay of contracts over time and across many contract groups of interest such as exchanges and product categories. Previous studies have proposed many plausible explanations for the success of individual contracts. Our contribution to that literature is providing a full picture of how markets succeed. Our model also allows us to identify clusters of contracts growing (or decaying) at statistically distinct rates. In some cases, those clusters suggest causal factors such as the introduction of electronic trading.

2. Material and methods

2.1. Data

The core data used here comes from the Futures Industry Association's monthly and annual volume reports. These have been compiled since 1954 from exchange data and subsequently made available to the CFTC. To this, we have added monthly volumes reported to the CFTC under the US Commodity Exchange Act. This gives a near complete set of all futures contracts since 1956 (with annual data to 1954) and of regulated agricultural futures contracts back to 1940 (with annual data to 1931). We have also added information on unregulated contracts available in CFTC Annual Reports, historic log books from exchanges available in the CFTC library, and the CFTC's internal database of futures contracts.

The subset of that data used in this analysis covers 22993 total annual observations of 4658 distinct contracts across 42 exchanges; running between 1954 and 2012. Those values are broken down by year in Fig. 1.

Including marginal product categories and exchanges provides a picture of the dynamics of the entire market over time and minimizes survivorship bias in the resulting statistics. New contracts or exchanges cannot know a priori which sub sample of the data will best reflect the path of their flagship contracts, so they should benefit from base-rates describing the full derivatives markets.

Fig. 2 provides the empirical cumulative distribution function (ECDF) for the longest stretch of non-zero trading across all contracts. For roughly 50 percent of all contracts, the longest stretch of non-zero trading was three years or less. The comparable figure in Gorham and Kundu (2012) was six years, suggesting that the sample does include esoteric derivatives outside of the FIA's reported futures. These numbers do not necessarily represent the time between launch and delisting. It is not possible to satisfactorily identify delisted contracts in the data. As we describe later, contracts at low trading volumes has been particularly resilient in recent years, so simple definitions of delisting might throw out many contracts that will continue to trade in the future. Also, the merger of exchanges means that many contracts are not in fact delisted when they cease reporting in the database, but are re-listed on new exchanges (Jouzaitis, 1987).

Fig. 3 is the ECDF of annual trading volumes by contract for every year in the sample, with an overlay in color highlighting the ECDFs for each decade. In each figure, individual lines represent the ECDFs for a single year. Lines approaching a right angle in the upper left hand corner represent years with more concentrated trading. Each line's y-intercept represents the percent of all contracts trading at a volume of 0. The ECDF for each year is colored chronologically, with the lines representing the oldest years in the sample in red and the most recent years in purple.

In this graphic we see clear patterns in concentration over time. Markets grew more concentrated between the 1950's and 1990's with some retrenchment between the 1980's and 1990's. That trend reversed sharply in the 2000's, with the annual ECDFs approaching a right angle.

Not surprisingly most contracts trade at low volumes in any given year. However, that masks tremendous difference in the overall distribution of trading across the market. That difference is visible in Fig. 3, but comes into more stark relief in the time series in Fig. 4, displaying the trading volume for the median contract across time. The median contract's trading volume was many times higher in the 1980's and 1990's than at any time before or after.