



Dark pool trading strategies, market quality and welfare[☆]



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ABSTRACT

We show that when a continuous dark pool is added to a limit order book that opens illiquid, book and consolidated fill rates and volume increase, but spread widens, depth declines, and welfare deteriorates. The adverse effects on market quality and welfare are mitigated when book-liquidity builds but so are the positive effects on trading activity. All effects are stronger when traders' valuations are less dispersed, access to the dark pool is greater, horizon is longer, and relative tick size larger.

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1. Introduction

Dark pools are Alternative Trading Systems (ATs) that do not provide their best-priced orders for inclusion in the consolidated quotation data. They offer subscribers venues where anonymous, undisplayed orders interact away from

the lit market yet execute at prices no worse than the National Best Bid Offer (NBBO). Dark pools today represent a considerable fraction of volume (Fig. 1). In the U.S. there are over 50 dark pools, and the 19 of them for which data are available (from Rosenblatt Securities Inc.) account for more than 14% of consolidated volume. In Europe the 16 dark markets which report to Rosenblatt account for approximately 4.5% of volume, and in Canada they represent 2% of volume.

The most active types of dark pools in the U.S., Europe, and Canada are Bank/Broker pools followed by Independent/Agency pools (Fig. 1). The Bank/Broker pools are operated by banks and are used both for agency and proprietary trading. These pools generally offer continuous execution and execute at prices derived from the NBBO. The Independent/Agency pools, like ITG POSIT, are instead operated by agency brokers and offer periodic executions at the midpoint of the NBBO. In Market Maker pools, liquidity can only be provided by the manager of the pool. Consortium-Sponsored pools are owned by several banks which already own their dark pool and use the

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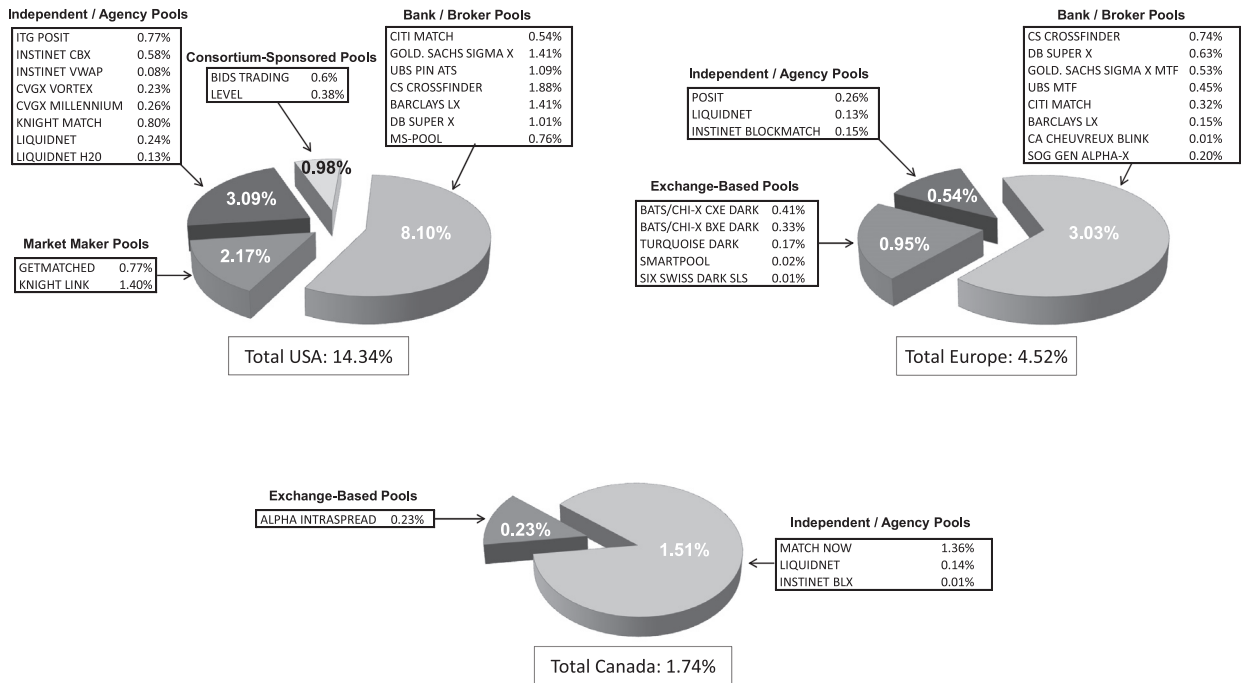


Fig. 1. Dark pools volume. Percentage of consolidated U.S., European, and Canadian equity volume, December 2012. Data source: Rosenblatt Securities Inc.

Consortium-Sponsored pools as trading venues of last resort. Finally, Exchange-Based dark pools are owned by exchanges and offer continuous execution.

The rising market share of dark trading recently prompted three major U.S. exchanges to publicly urge the Securities and Exchange Commission (SEC) to put rules in place to curb dark pool trading. Exchange officials are concerned that dark pools divert volume away from lit venues, rather than attracting new order flow to the market. With declining trading volumes worldwide, such a diversion of order flow is a real threat to exchanges' bottom lines. Consequently, it is important for exchanges to understand which factors cause order flow to go dark, and under what circumstances dark pools are likely to primarily divert volume away from lit venues as opposed to create more opportunities for trades to take place. Regulators are concerned about the effects of dark trading on market quality and welfare. Order migration away from lit markets to dark pools may adversely influence the incentive for traders to provide liquidity in the lit market, potentially resulting in higher trading costs. Dark pools may also affect the distribution of welfare between retail and institutional investors, as dark venues are primarily used by institutional traders.

In this paper we build a theoretical model that enables us to address the concerns raised by exchanges and regulators in a realistic market setting. Specifically, we populate our model with fully rational traders who form their optimal trading strategies based on their private valuations. All traders in our model can choose to submit a one-share market or limit order to a transparent limit order book (LOB) with a discrete price grid. In addition, some traders may submit orders to a dark pool. If sufficient two-sided trading interest is routed to the dark pool, orders are exe-

cuted at the midquote of the prevailing NBBO.¹ The dark pool executes orders continuously, meaning that traders with access to the dark pool can simultaneously access the lit and the dark markets. To model this simultaneous access, we introduce an additional order type, Immediate-or-Cancel (IOC) orders. These orders are first routed to the dark pool, and if they do not execute are routed back to the lit market as a market order. Our model closely resembles real world order book markets competing with Bank/Broker dark pools, and this group of dark pools executes 57%, 67%, and 87% of dark volumes in the U.S., Europe, and Canada, respectively (Rosenblatt Securities Inc., 2012). We use this rich setup to address the concerns raised by exchange officials and regulators, market participants, and media about order migration, market quality, and welfare.

Our theoretical model builds on Parlour (1998), but in the spirit of Buti and Rindi (2013) we extend her model to include a price grid, a dark pool, and additional order types. We also differentiate between traders with and without access to the dark pool. We start by modeling a benchmark LOB where traders decide whether to submit a market order, a limit order, or to refrain from trading based on the information they infer about future execution probabilities from the current state of the LOB. The model runs for four periods, and the LOB starts empty. We then introduce a dark pool which also starts empty, accepts orders from traders with access, and attempts to

¹ What is important is that the price in the dark pool is derived from the NBBO, not whether or not trades execute at the midquote. However, for tractability, our dark pools always execute at the midquote of the NBBO.

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