



# A practical framework for estimating transaction costs and developing optimal trading strategies to achieve best execution

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## Abstract

In this paper we provide both a decision framework to estimate transaction costs and develop optimal trading strategies to achieve best execution. The methodology is based on an unbundling approach whereby costs are categorized into transparent and hidden, and fixed and variable components. The classification serves as the foundation for developing execution strategies for a fund's implementation goals. For example, the methodology easily adapts to strategies aimed at preserving asset value, achieving the closing price or volume weighted average price ("VWAP"), and minimizing tracking error. Further, we show how to determine the best execution strategy ("BES") from a set of optimal strategies given a fund's goal and objectives via a set of decision-making criteria. Ultimately, best execution translates to lower transaction costs and higher portfolio returns. © 2004 Elsevier Inc. All rights reserved.

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## 1. Introduction

Transaction costs represent dollars paid by buyers not received by sellers and vice versa. In finance these costs serve as premiums paid above decision prices for buys, and discounts

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offered below decision prices for sells. Empirical evidence reveals that transaction costs range from 30–75 basis points (bp) on average to more than 200–300 bp for large and illiquid orders (Wagner and Glass, 2001). With such market friction it is small wonder managers often under perform paper portfolio benchmarks.

Transaction cost analysis (“TCA”) has evolved into two areas: measurement and estimation. Costs are *measured* after trading (ex-post) to determine the portfolio slippage due to trading and to evaluate the performance of traders and brokers. Costs are *estimated* before trading (ex-ante) and used to devise an appropriate implementation scheme. Notable cost measurement research is attributable to Treynor (1981), Berkowitz et al. (1988), Perold (1988), Edwards and Wagner (1993), and Wagner and Glass (2001). Their work provides evidence that transaction costs add up to more than simply broker commission and spreads. In short, these costs are far from trivial. More recently, TCA research shifted to cost estimation. While this research area has not been given nearly the same level of attention it is nonetheless as impressive. The most notable work here is attributable to Almgren and Chriss (1997, 1999), and Bertsimas and Lo (1998). They show that proper implementation requires simultaneous evaluation of cost and associated trading risk term. We build on this research and provide readers with a framework to estimate costs and develop strategies to achieve best execution.

## 2. Transaction costs

Transaction cost components include fixed and variable, and visible (transparent) and hidden (non-transparent) components. Fixed costs are unavoidable and independent of market prices. Variable costs depend on market prices and are manageable through implementation strategies. Visible costs are those components with cost structure easily observable from the market (e.g., commissions, taxes, etc.), while non-transparent costs are not market observable (e.g., market impact). In total, there are nine transaction cost components. A list of unbundled costs is provided in Table 1. The table depicts the classification of nine transaction cost components into categories of fixed and variable costs, and visible and non-transparent costs. The non-transparent, variable cost components represent those cost that are most manageable during the implementation of an investment decision.

Transaction costs occur at all stages of the investment cycle and include investment-related, trading-related, and opportunity cost. Investment-related costs are implicit byprod-

Table 1  
A list of unbundled costs

	Fixed	Variable
Visible	Commissions Fees	Taxes Spreads
Non-transparent	n/a	Delay cost Price appreciation Market impact Timing risk Opportunity cost

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