

# **Performance Appraisal of Stock Trade Using Transaction**

## **Cost Analysis: A Study on S & P 500**

### ***1.01 Introduction***

Portfolio performance relies on upon many elements, for example, stock picking capacity, planning ideal portfolio portion, and market timing. Be that as it may, as of late literature begin tending to the significance of transaction cost analysis in measuring portfolio performance. Perold (1988) initially distinguished these bits of knowledge of transaction cost saying that transaction cost that can influence portfolio performance depends on cost of trading as well as on not having the capacity to trade (known as opportunity cost). It is later extended by different researchers giving it considerably more extensive meaning of extended implementation shortfall. This favor name is basically only transaction cost yet that incorporates all settled and variable obvious charges as well as every single imperceptible charge that were not taken a gander at precisely by traders previously. In this segment, all these unmistakable and imperceptible parts of transaction costs and appraisals significant to this examination are addressed.

### ***1.02 Transaction and transaction cost***

Transactions are recently the exchange protest's future possession between two people, and the substance of transaction is simply the proprietorship exchange, not the question moves starting with one then onto the next. It is for the most part expressed that,

transaction is quite recently the trading of products or administration by the medium of currency. In summery it can be stated that transaction is a movement of purchasing or offering s or interests among individuals; and to a widespread definition, every one of the exercises among endeavors, people, venture and individual can be named as transaction.

Transaction costs are those costs that emerge amid the implementation of any investment choice. In financial terms, they are the costs paid by purchasers yet not got by dealers, as well as the costs paid by merchants however not got by purchasers. Ordinarily, the brokerage house (who assumes the part of go-between in budgetary market) gets the measure of the transaction cost from both purchaser and vender to encourage the trade between the gatherings. Nonetheless, as a general rule it is much intricate and points of interest are characterized underneath as execution costs.

### ***1.03 Directly observable transaction costs***

The execution costs that are specifically detectable and settled are broker commission, exchange fees, taxes and rebates. These are clarified next.

#### **1.03.01 Broker fee and commissions**

Brokers charge fees and commissions from both purchaser and merchant of budgetary security to cover the costs of their organizations, which give network to various trades and between dealer networks. Broker commissions can have both settled and variable segments. The settled segment can be a level commission for every month or a level charge for each trade, regularly with a for each trade least charge.

### **1.03.02 Exchange Fees**

Stock trade likewise assumes a part in the monetary market to easily encourage the trades in the market. It capacities to match orders from various broker-dealers or electronic communication networks (ECNs) and charges fees for the administration it gives. The center results of each trade is the stock of open purchase and offer intrigue that traders are hoping to execute on the trade. To pull in liquidity, trades charge higher fees for orders devouring liquidity than for orders providing liquidity. With an end goal to pull in liquidity, a few trades go similarly as paying traders that supply liquidity, while charging just the traders that expend liquidity. Like broker commissions, exchange fees are consulted ahead of time of execution.

### **1.03.03 Taxes**

According to Benjamin Franklin, “In this world nothing can be said to be certain, except death and taxes.” taxes are charged from the net benefits of the trading operation by the fitting ward in which the operation is domiciled. High-recurrence trading creates here and now benefits that are generally subject to the full tax rate, not at all like investments of one year or more, which fall under the diminished tax capital increases umbrella in many locales. A nearby guaranteed or contracted bookkeeper ought to have the capacity to give an abundance of information relating to legitimate taxation rates. Suitable tax rates can be resolved ahead of time of trading movement.

### **1.03.04 Rebates**

The rebate part is another transaction cost segment that is the side effect of the new market condition. Trading settings charge a utilization fee utilizing a straight

commission fee structure, a creator taker display, or a taker-producer (upset) show. In a straight commission demonstrate, both sides are charged a fee for use of the framework. In the producer taker demonstrate, the speculator who posts liquidity is furnished with a rebate and the financial specialist who takes liquidity is charged a fee. In an upset or taker-creator display, the speculator posting liquidity is charged a fee and the financial specialist who brings liquidity is given a rebate. In both cases the fee charged will be higher than the rebate given to guarantee that the trading scene will procure a benefit. Brokers might pass this part onto their customers. In the situations when it doesn't go through the part the broker will pay the fee or gather the rebate for their own benefit pool. The commission rate charged to financial specialists in these cases is probably going to as of now have this fee and additionally rebate installed in its sum.

#### ***1.04 Invisible/indirect components of transaction costs***

There are different costs in executing trades that are not evident and concealed likewise is similarly vital and is considered as a major aspect of the transaction costs, for example, bid-ask spread, investment delay cost, price thankfulness cost, market impact cost, market timing hazard costs, and opportunity cost. The following are the meanings of these parts.

##### **1.04.01 Bid-ask spreads**

The spread cost is the difference between best offer (ask) and best bid price. It is intended to compensate market makers for the risks associated with acquiring and holding an inventory while waiting to offset the position in the market. This cost

component is also intended to compensate for the risk potential of adverse selections or transactions with an informed investor (i.e., acquirement of toxic order flow). Spreads represent the round-trip cost of transacting for small orders (e.g., 100 share lots) but do not accurately represent the round-trip cost of transacting blocks (e.g., 10,000 shares).

#### **1.04.02 Investment Delay costs**

Delay cost refers to the cost of investment delay, which is also referred to as the *latency cost*. It is the adverse change in the market price of the traded security that occurs from the time an investment decision is made until the time the trade is executed. For example, consider a trader who decides to buy a stock at 10 a.m. Eastern time when that stock was trading at \$90.25 per share. It took 10 seconds from the time the order was placed for the broker to execute, at which time the price improved (or decreased) to \$90.30 (or \$90.20) and the order was executed at this price. Delay cost is then calculated as the difference between these two prices ( $\$90.30 - \$90.25 = \$0.05$  per share). This additional cost adversely affects the trader. However, a trader may save some cost if the price decreases ( $\$90.25 - \$90.20 = \$0.05$  per share). Whether the share price would go up or down is beyond the control of the trader. It is simply a result of the time delay in executing an order.

#### **1.04.03 Price Appreciation costs**

The price thankfulness cost alludes to the loss of investment incentive amid the execution of an extensive position. A place of impressive size may not be promptly consumed by the market and may should be “sliced” into littler squares. The littler pieces are then executed one square at once over a specific day and age. Amid execution,

the price of the traded security may acknowledge or devalue thus of regular market movements, conceivably creating an incremental misfortune in esteem. Such misfortune in esteem is known as price gratefulness cost and can be assessed utilizing data on past trades. The price thankfulness cost is unique in relation to the market impact cost, or the antagonistic change in price produced by the trading movement itself, examined accordingly.

#### **1.04.04 Market impact costs**

Market impact cost measures the adverse change in the market price due to the execution of a market order. More precisely, the cost of market impact is the loss of investment value caused by the reduction in liquidity following market order-driven trades. When a trader places a market order, it usually is executed at the ask price; based on the size of the trade, the ask price may quickly jump higher, adversely affecting the trader. Typically, in a buy order, a large buy order at the market may signal to the market that good news will be revealed, or it may be an indication of an informed trading. As a result, market makers quickly increase the spread upward to avoid any potential loss to the informed trader. A sell order at market price may cause a further downward shift in the bid price, which is an indication to market makers that the informed trader may have some negative information about the stock. Accordingly, the spread of the bid and ask would increase, further lowering the bid price from its current level.

The market impact cost can be divided into two parts: (1) temporary market impact and (2) permanent market impact. That is, Market impact cost = Temporary market impact cost + Permanent market impact cost. A temporary market impact is a sudden movement

of the price in response to news, which can shoot the price up or down; after a few minutes, it settles back to the original price or near the original price before the news hit the market. Traders may be affected by such sudden but temporary movement of the stock price in a short period of time. Permanent market impact is a case in which the price shoots up or down and remains near the new changed price, causing the sudden effect to remain permanent during the rest of the trading hours.

#### **1.04.05 Timing Risk costs**

Timing hazard costs are because of arbitrary, un-estimated price developments of the traded security that happen while the execution strategy is holding up to pinpoint or “hit” the ideal execution price. The cost of timing danger portrays by how much, by and large, the price of the traded security can haphazardly acknowledge or devalue inside 1 second, 10 seconds, 1 moment et cetera from the time an investment choice is made until the market order is executed.

#### **1.04.06 Opportunity costs**

The opportunity cost is the cost related with failure to finish an order. Regularly, opportunity cost goes with point of confinement order-based strategies, yet it can likewise be available in market-arrange execution.

The failure to satisfy an order can be because of one of a few variables: (i) the market price never crossed the farthest point price; (ii) The market did not have the liquidity (order or supply) adequate to satisfy the order at the coveted price; (iii) The price moved away so rapidly that satisfying the order would render the transaction unbeneficial, and

the transaction was wiped out subsequently; (iv) The opportunity cost is measured as the benefit anticipated that would be produced had the order been executed.

### ***1.05 Implementation shortfall***

The implementation shortfall (IS) contains both immediate and aberrant cost of trade and the opportunity cost of not having the capacity to trade as initially proposed by Perold (1988). It gauges the effectiveness of executing investment choices. It is figured as the distinction between the acknowledged trades and the trades recorded in paper trading. The paper trading process typically keeps running in parallel with the live procedure and records all the trades as though they were executed at attractive price at ideal circumstances.

### ***1.06 S & P 500:***

It remains for Standard and Poor 500. It is a blend of 500 securities, where some are vast capitalization and some are little capitalization firms recorded in the NASDAQ and NYSE. Utilizing market capitalization as weight the estimation of S&P 500 (which speaks to the aggregate market portfolio) is produced. The total number of symbol in S & P 500 are 505 on November 2016.

### ***1.07 Performance measurement***

#### **1.07.01 Relative Performance Measurement (RPM)**

The relative execution measure evaluates at what rate of volume or trades all through the predefined time frame the trade could have been executed on far and away superior



terms than it was really executed. In the current literature, RPM is assessed against a few benchmarks, for example, VWAP, TWAP, and OHLC to gauge the portfolio performance of a trader or portfolio administrator.

#### **1.07.02 VWAP and TWAP:**

The most mainstream benchmarks are the volume-weighted normal price (VWAP, articulated “vee-wop”) and the time-weighted normal price (TWAP, articulated “tee-wop”). Different benchmarks incorporate midpoints of the open, high, low, and close prices (OHLC) inside the given trading interim that are intended to intermediary for the intra-period scope of price development and measure the calculation's ability to explore instability. Both the VWAP and the TWAP benchmarks can be founded on day by day, hourly, or considerably higher-recurrence price information encompassing the trade. VWAP is frequently thought to be a decent pointer of market price all through the period under thought (a moment, 60 minutes, a day, and so forth.). Execution equipped to beat VWAP commonly prevails at limiting market impact, and VWAP-based execution measures mirror the accomplishment of cost minimization strategies. Then again, VWAP-based execution measurements don't evaluate the execution of strategies attempting to limit chance or different factors other than market cost. TWAP benchmarking measures the capacity of the execution calculation to time the market. TWAP benchmark price registers the price that would be gotten if the order were part into equivalent measured packages and traded one bundle at any given moment at similarly dispersed time interims inside the assigned trading day and age.

### **1.07.03 OHLC (Open, High, Low, Close)**

OHLC benchmark is a basic normal of the open, high, low, and close prices recorded amid the trading time of premium: (i) The OHLC benchmark fuses the intra-period price unpredictability by including the high and low price values; (ii) The OHLC benchmark does not, in any case, represent volume or liquidity accessible on the market.

### **1.07.04 Best execution**

The observation that best execution is a tricky idea has turned out to be extremely exaggerated in the business. Truly, “best execution” is an extremely basic and direct idea: Best execution (as expressed in optimal trading strategies) is the way toward deciding the strategy that gives the most elevated probability of accomplishing the investment goal of the reserve. The strategy comprises overseeing transaction costs amid all periods of the investment cycle, and deciding when it is proper to exploit steadily changing market conditions.

Wayne Wagner portrayed best execution in considerably less complex terms:

*It is the process of maximizing the investment idea.*

Best execution does not rely on upon how shut the execution price strikes a discretionary benchmark price, (for example, the open, close, high, low, VWAP, and so forth.). Or maybe, it depends on the financial specialist's capacity to settle on appropriate trading choices by consolidating all market vulnerabilities and the current market conditions. A definitive objective of best execution is to guarantee that the trading choices are predictable with the general investment goals of the store. (See Kissell and Malamut

(2007) for an examination on guaranteeing consistency amongst contributing and trading consistency.)

To decide if best execution has been met requires the execution assessment to be made in view of the “information set” that was accessible toward the start of trading consolidated with the investment goal of the store. In the event that either the data set or the hidden investment goal is not known or is not accessible it is just unrealistic to decide whether best execution was accomplished—paying little heed to how close the transaction prices were to any benchmark price.

#### **1.07.04.01      *Goal of implementation***

Implementation is the way toward deciding reasonable proper trading strategies and adjustment strategies that will bring about best execution. Lamentably, it is impractical for financial specialists to pre-assess and decide the most ideal approach to execute a position under every single conceivable situation, yet speculators can create standards and rules to make these undertakings faster, simpler, and more productive amid trading. In Wayne Wagner’s terminology, *Implementation is the Journey to Best execution*.

#### **1.07.04.02      *Benchmark price Performance***

Benchmark price execution measures are the easiest of the TCA execution assessment procedures. These are expected to look at particular measures, for example, net contrast and following blunder, or to recognize impermanent and perpetual impact. A portion of the all the more generally utilized benchmark prices include:

\_ Open—as an intermediary for entry price.

\_ Close—knowledge into end-of-day following mistake and is all the more ordinarily utilized by list finances that utilization the end price in valuation of the store.

\_ Next Day Open—as an approach to recognize brief and perpetual market impact.

\_ Next Day Close or Future Day Close—likewise to recognize transitory and lasting impact.

### **1.07.05      Benchmark**

#### **1.07.05.01      *VWAP benchmark***

The VWAP benchmark is utilized as an intermediary for reasonable market price. It helps speculators decide whether their execution prices were in line and steady with reasonable market prices.

The calculation is:

$$VWAP_{t_k}^m = \frac{\sum_{j=1}^{\Pi} P_j \times V_j}{\sum_{j=1}^{\Pi} V_j}$$

Where VWAP is the volume weighted normal price over the trading time frame. A positive esteem shows better execution and a negative esteem demonstrates underperformance.

Interim VWAP examination fills in as a decent measure of execution quality and makes a pleasant showing with regard to representing genuine market conditions, trading action, and market development. The interim VWAP, notwithstanding, suffers from three issues. In the first place, the bigger the order the nearer the outcomes will be to the VWAP price, as the order price will turn into the VWAP price. Second, genuine

execution can wind up noticeably skewed if there are huge square trades that happen at outrageous prices (highs or lows) in intersection scenes, particularly in situations where financial specialists have constrained chance to take an interest with those trades. Third, the VWAP measure does not permit simple examination crosswise over stocks or over the same stock on various days. For instance, it is impractical to decide whether missing VWAP by 3 bps in one stock is preferable execution over missing VWAP by 10 bps in another stock. On the off chance that the primary stock has low instability and the second stock has high unpredictability, missing VWAP by 10 bps in the second name may in truth be preferable execution over missing VWAP by 3 bps in the principal name. There are three diverse VWAP execution measurements utilized: entire day, interim, and VWAP to end of day.

Entire Day VWAP: Used for financial specialists who traded over the whole trading day from open to close. There is right now no “official” VWAP price on the day yet various suppliers, for example, Bloomberg, Reuters, and so on. do offer one. These sellers decide precisely what trades will be incorporated into the VWAP figuring’s yet they may not utilize all the market trades. For instance, a few suppliers may channel trades that were postponed or arranged in light of the fact that they don't feel these prices are characteristic of what all market members had reasonable access to.

Interim VWAP: Used as an intermediary for the reasonable market price amid the time the financial specialist was in the market trading. The interim VWAP is a particular VWAP price for the financial specialist over their particular trading skyline and should be figured from tic information. This is in contrast with an entire day VWAP price that

is distributed by numerous merchants.

VWAP to End of Day: Used to assess those orders that were finished before the finish of the day. In these cases, the broker or trader settled on a cognizant choice to complete the trade before the finish of the day. This VWAP to End of Day gives some knowledge into what the reasonable market price was including even after the order was finished. It decides whether the choice to complete the order early was proper. This is an extremely valuable metric to assess after some time to decide whether the trader or broker is gifted at market timing. Be that as it may, it requires an adequate number of perceptions and a vast tic informational index.

It is significant that some B/Ds and sellers allude to the VWAP examination as a cost as opposed to a pickup/misfortune or execution sign. For those gatherings, a positive esteem demonstrates a higher cost (therefore underperformance) and a negative esteem shows a lower cost (subsequently better execution) and is the direct inverse of the importance in the recipe above. Shockingly, portrayal of costs, P/L, or G/L as a metric is not steady crosswise over industry members and financial specialists should know about these distinctions.

#### **1.07.05.02      *Participation Weighted price (PWP) benchmark***

Support weighted price (PWP) is a variety of the VWAP analysis. It is proposed to give a correlation of the normal execution price to the imaginable acknowledged price had they took an interest with a predefined rate of volume amid the length of the order.

The PWP benchmark likewise has some natural impediments like the VWAP metric. To begin with, while PWP provides knowledge into reasonable and sensible prices amid

a predefined time skyline it doesn't permit simple examination crosswise over stocks or crosswise over days because of various stock price unpredictability and day by day price development. Besides, financial specialists could conceivably control the PWP by trading at a more forceful rate to push the price up for purchase arranges or down for offer orders, and give the market the feeling that despite everything they have more to trade. Since transitory impact does not disseminate momentarily, the PWP price processed over a somewhat longer skyline could remain misleadingly high (purchase orders) or falsely low (offer orders) because of brief impact cost. Members may hold prices at these falsely higher or bring down levels sitting tight for the non-existent orders to arrive. The final product is a PWP price that is more worthwhile to the financial specialist than what might have happened in the market if the order had really traded over that skyline.

**1.07.05.03      *Relative Performance Measure (RPM)***

The relative execution measure (RPM) is a percentile positioning of trading action. It gives a sign of the rate of aggregate movement that the financial specialist beat in the market. For a purchase arrange, it speaks to the rate of market action that executed at a higher price and for an offer order it speaks to the rate of market movement that executed at a lower price. The RPM is designed according to the percentile positioning utilized as a part of institutionalized scholarly tests and gives an expressive measurement that is more reliable and powerful than different measures.

The RPM was initially introduced in *Optimal trading strategies* (2003) and Kissell (2007) and depended on a volume and trade metric. That unique plan, notwithstanding,

had now and again little example size and expansive trade rate impediments predisposition. For instance, the first detailing considered the greater part of the financial specialist's trades at the normal transaction price as outperformance. In this way, in circumstances where the financial specialist executed an extensive size at a solitary price every one of the shares were considered as outperformance and the final product would exaggerate the real execution. Leslie Boni (2009) additionally explains on this point in her “Grading Broker Algorithms,” Journal of trading, Fall 2009, and gives some critical understanding and enhancements. To help address these limitations, The RPM formulation is revised as follows:

$$RPM = \frac{1}{2}[RPM_{trade} + RPM_{vol}]$$

The RPM is computed based on trading volume as follows:

$$RPM_{trade} = \frac{\sum trades^{p_i \geq p^*}}{\sum trades}$$

$$RPM_{vol} = \frac{\sum vol^{p_i \geq p^*}}{\sum vol}$$

This plan of RPM is presently the normal of the rate of volume that traded at our execution price or better and 1 short the normal of the rate of volume that traded at our price or more regrettable. In this way, in effect, it treats half of the financial specialist's orders as better execution and a large portion of the order as more regrettable execution.



As expressed, the first definition treated the greater part of the financial specialist's shares as better execution and expanded the measure.

The RPM is in numerous effects a favored measure to the VWAP metric since it can be utilized to analyze execution crosswise over stocks, days, and unpredictability conditions. What's more, it is not affected to an indistinguishable degree from VWAP when expansive squares trade at extraordinary prices.

The RPM will join to half as the speculator represents all market volume in the stock on the day like how the VWAP meets to the normal execution price for expansive orders.

Brokers accomplishing reasonable and sensible prices for their speculators ought to accomplish a RPM score around half. RPM scores reliably more prominent than half are an indication of predominant execution and scores reliably under half are an indication of substandard execution. The RPM measure can likewise be mapped to a subjective score, for instance:

Table: 1.07.05.03.01 Meaning of RPM scores

| <b>RPM</b> | <b>Quality</b> |
|------------|----------------|
| 0% - 20%   | Poor           |
| 20% - 40%  | Fair           |
| 40% - 60%  | Average        |
| 60% - 80%  | Good           |
| 80% - 100% | Excellent      |

## ***1.08 Review of literature***

Transactions Costs are a critical part of security trading that may have several impacts on prices and stockholder portfolios among which some are not instinctively evident. Basically, Transactions Costs in stock markets fall into two classes, direct trading costs and indirect trading costs. The direct trading costs incorporate the market makers bid-ask spread, the business expenses, and any trade assessments, for example, stamp duty. The indirect expenses incorporate the expenses of obtaining and handling information about share values, organizations, market developments and whatever other information which might be significant to the choice to trade. Transactions Costs are huge parts of portfolio and venture returns. Legitimate and productive administration of transaction cost is as similarly vital as creating ideal portfolio allotment. With a specific end goal to decrease transaction costs, bigger merchants have been included in option trading frameworks. The expanded enthusiasm for transaction cost administration has brought on expanded development in the literature in the course of recent years. The key test with Transactions Costs literature is that absence of information required to examine many purposes of intrigue. Specifically, openly accessible databases don't show whether a trade was a purchase or offer or whether a trade spoke to all or some portion of the requested amount. Moreover, recognizing whether the trades are of institutional speculators or retail is hard to distinguish. The target of this literature review is to condense the discoveries of the current literature on value Transactions Costs.

### **1.08.01 Measuring Transactions Costs**

Transaction costs can be sufficiently vast to generously decrease or even wipe out the notional profit for a venture methodology suggesting that it is vital to quantify, investigate and control Transactions Costs. Transactions Costs have two noteworthy segments, explicit and implicit Transactions Costs. Explicit costs contain commissions and other fixed charges that are charged by brokers that incorporate expenses, stamp duties, and taxes for which there is an explicit accounting charge. Commissions ordinarily differ around 0.2% of traded esteem, and have been declining because of extreme rivalry among merchants. Commissions differ by value, advertise system and broker type. For instance, Gregoriou (2003) report that intersection systems (where common purchasers and merchants are coordinated at foreordained costs without mediation by a market producer) charge as meager as 2% for every share, while commissions on troublesome trades executed by authority intermediaries might be as high as 10-15% for each share. Trades likewise cause implicit costs, which are harder to gauge which comprise three noteworthy parts, for example, value impacts, opportunity costs and the bid-ask spread. Each of these concept is quickly reviewed to comprehend the transaction costs.

#### **1.08.01.01 Price Impacts**

Institutional merchants who make large trades request expanded liquidity from business sectors. By chance, their trades regularly move costs toward the trade, bringing about “market impact” or “price impact”. The price impact because of substantial trades typically differs with trade size and market capitalization. Looking at on the US data,

Madhavan and Chang (1997) find that the market effect of substantial (block transaction) trades for illiquid stocks that are in the littlest 20% of market capitalization, go from 3.04% for the littlest blocks to 6.21% for the biggest blocks. Keim and Madhavan (1996), in any case, differentiate that block trades extremely fluid Dow Jones Industrial stocks find moderately little price impacts, running from 0.15% to 0.18%. Costs additionally change by time of day that dealer's trade. A few reviews record efficiently higher expenses at the nearby because of substantial request lopsided characteristics and merchants hesitance to convey inventories overnight as well as weekends.

#### **1.08.01.02    Opportunity Costs**

Missed trade or inadequate execution is the wellspring of Opportunity expenses. It brings about when a request is just somewhat filled or is not executed by any stretch of the imagination, and additionally when a request is executed with a postponement, amid which there is a value keep running against the enthusiasm of the merchant. Opportunity expenses are hard to gauge and rely on upon the prudence or significance of a broker that the merchant needs to execute orders. Subsequently, an “execution setback” happens which is the distinction between a genuine portfolio and a speculative portfolio.

#### **1.08.01.03    Bid-Ask Spreads**

A standout among the most imperative attributes that speculators search for in a composed monetary market is liquidity. Liquidity is the capacity to purchase or offer noteworthy amounts of a security rapidly, anonymously, and with generally little value affect. To look after liquidity, many composed trades utilize market makers, which are

people who stand prepared to purchase or offer at whatever point general society wishes to purchase or offer. As a byproduct of giving liquidity, market producers are allowed monopoly rights by the trade to post distinctive costs for buys and deals. They purchase at the bid price,  $P_b$  and offers at a higher ask price  $P_a$ . The capacity to purchase low and offer high is the market makers' essential wellspring of pay for giving liquidity in the market. Their pay is characterized as  $PQ - P_b$ , which thus is characterized as the bid-ask spread. The bid-ask spread shifts relying upon the stocks' liquidity. Cited spreads fluctuate generally, from under 0.3% for the most fluid (biggest market capitalization) stocks to 4-6% for the slightest fluid (littlest market capitalization) stocks. Offered and request that costs tend ascent after a purchase request (or fall after an offer request). Lee (1993) affirms that compelling spreads are, by and large, bring down then cited spreads. Demsetz (1968) demonstrates that it is conceivable to increment or diminishing this cost by a pretty much comprehensive meaning of which exercises are to be considered trade activities(see Loeb (1983), Keim (1989) and Hong and Stoll (1996) for further subtle elements). The consideration of the Bid-ask spread in trade expenses can be seen best by considering the dismissed issue of “promptness” in free market activity investigation. The offer ask spread is the markup that is paid for promptness of trade in sorted out business sectors. The authority or market producer acquires, notwithstanding expenses, wage through purchasing and offering for his own particular record by standing prepared to venture in amid periods when offered ask citations, put together by untouchables are too far separated to keep trade dynamic without wide bounced in cost. The master can expand the rate of trade with smaller value developments amid such

periods by offering a smaller offer ask spread than untouchables are at present submitting. This part of the master includes judgment, venture, and hazard taking. Regardless, focused conditions in the offer ask spread, or markup will gauge the cost of trades. A man who has quite recently acquired a security and yearnings to rapidly trade it will, on the normal, be compelled to endure a markdown equivalent to the spread found in the commercial center. This markdown (in addition to business commissions) measures the cost of a quick round-excursion trade. Under less focused economic situations, this spread may to some degree overstate the hidden cost to the individuals who needs round-excursion trades, be that as it may, for any given level of rivalry (since business commissions don't shift with the time taken to finish an trade), contrasts in spread will show contrasts in the cost of fast consummation of trade.

### **1.09 Scope of the study**

The study limited to intraday transaction data of S & P 500 companies for a period of six months from period June 2016 to November 2016 of a trader.

### **1.10 Significance of the Study**

- (a) The study can be highly useful for the small traders of US market.
- (b) Study will be very much useful for software development company and stock market consultant.
- (c) The trader in developing country like India, Japan, China, and Bangladesh can also take advantage from the study.

### **1.11 Limitations of the Study**

Since the study considers limited number of company and trading days generalization of the findings across 15,000 symbols listed in the US which traded secondly throughout the year may not be appropriate. The research conducted the period of six months from June 2016 to November 2016.

### **1.12 Research Gap**

(a) The earlier studies, done by several researchers, developed different methods of portfolio performance but no comparative performance analysis is done in the existing literature.

(b) Number of studies have addressed the TCA (transaction cost analysis), Optimal trading strategies, Algorithmic trading strategies and High frequency trading. However specific study on performance analysis using TCA has not yet been done with respect to S & P 500 companies listed in NASDAQ & NYSE.

### **1.13 Objectives of the study**

The trader needs to strike a balance between the cost and risk related to the trade. The best execution thus becomes an important research issue in financial management, which still remains as a “puzzle” in academic literature. Although the idea of performance analysis is conceptually correct but it is difficult to test empirically. In this research, the following specific objectives are addressed:

- (a) to identify the factors influencing transaction costs of stock trade,
- (b) to assess the transaction costs associated with the stock trade,

(c) to have a performance appraisal of stock trade of S & P 500 companies by using transaction cost analysis,

(d) to suggest measures for having effective control over transaction costs.

### **1.14 Hypotheses of the study**

The hypotheses governing the propose of the study are given below:

1. **H01:** There is no significant association between transaction cost (measured by implementation shortfall) and market timing of the transaction
2. **H02:** There is no significant association between relative performance (RPM) and transaction cost (measured by implementation shortfall);
3. **H03:** There is no significant association between RPM and APM (Absolute performance or ABS\_RPM) benchmark performance;
4. **H04:** There is no significant association between RPM and VWAP benchmark performance;
5. **H05:** There is no significant association between RPM and TWAP benchmark performance;
6. **H06:** There is no significant association between RPM and OHLC benchmark performance;
7. **H07:** There is no significant association between RPM and IMP\_SHORTFAL, ABS\_RPM, VWAP, TWAP, OHLC benchmark performances,
8. **H08:** There is no significant association between performance and trade timing.



## **1.15 Problem Statement**

In this research, the further extension on implementation shortfall model to enhance and refine the transaction cost analysis is concentrated. What's more, utilizing genuine market data on a specimen of stocks from the US monetary market, the vital components that add to the relative performance measure for a trader is measured and distinguished. Literature distinguishes a few variables, (for example, VWAP, TWAP, OHLC, and Implementation shortfall) that independently can add to the relative performance measurement. Be that as it may, no research has led, as per the best of our insight, a near assessment among all components to assess and distinguish which of the current variables assumes imperative part. This will be the key commitment of this research that one make such a near analysis taking a gander at all elements joined to recognize the vital factor(s) adding to the relative performance measurement in a portfolio setting.

## **1.16 Research methodology**

The study is conducted using the following research methodology:

### **1.16.01 Types of Research**

It is an empirical research with hypothesis testing.

### **1.16.02 Universe of the Study**

The universe of the study comprises of S & P 500 companies listed in USA.

### 1.16.03 The Data

The study conducts an empirical analysis based on secondary data collected from US stock market. Intraday trading data of S & P 500 Companies are selected from the US stock exchange. An appropriate sample size of 81 Stock at 95% confidence level, and 10% confidence interval are taken for the study using fair representation of all the sectors proportionately that are part of S & P 500.

#### 1.16.03.01 Stock selection

Total number of stock in S & P 500 list are 505 on November 2016 and 81 stock selection procedure are given in the following table:

**Table: 1.16.03.01 Stock selection criteria:**

| <b>Global Industry Classification Standard (GICS) Sector</b> | <b>Number of Stock</b> | <b>Proportion (%)</b> | <b>Number of Selected stock</b> |
|--|------------------------|-----------------------|---------------------------------|
| Consumer Discretionary                                       | 85                     | 16.8                  | 14                              |
| Consumer Staples   | 37                     | 7.3                   | 6                               |
| Energy   | 36                     | 7.1                   | 6                               |
| Financials   | 64                     | 12.7                  | 10                              |
| Health Care  | 59                     | 11.7                  | 9                               |
| Industrials  | 69                     | 13.7                  | 11                              |
| Information Technology                                       | 68                     | 13.5                  | 11                              |
| Materials  | 25                     | 5.0                   | 4                               |
| Real Estate  | 29                     | 5.7                   | 5                               |
| Telecommunications Services                                  | 5                      | 1.0                   | 1                               |
| Utilities  | 28                     | 5.5                   | 4                               |
| <b>Total</b>   | <b>505</b>             | <b>100.0</b>          | <b>81</b>                       |

The review considers six months back to back intraday traded data of a trader. Not all traders can engage in short selling as a result the only focus was on buy side transaction and its analysis.

#### **1.16.04 Data Analysis Tools and Techniques**

Initially collected print data rearranged and the required field calculated by using JAVA platform computer software. Microsoft excel, E-views and other statistical packages are also used in conducting analysis.

#### **1.16.05 Analysis of Data**

To fulfill the objectives of the study and mainly to determine the relationship among variables (i.e. Imp\_shortfal, RPM, APM, different phase of time, OHLC, VWAP, TWAP). Microsoft excel, E-views and other statistical packages are used to conduct the study. All these variable data series are tested for their stationarity as Granger and Newbold (1974) note that the regression result with non-stationary data is spurious. For incorporating stationary data series, it is significant to examine the existence of unit root in the data series. In this case unit root test is applied by considering Augmented Dickey-Fuller (ADF) Test. All of our variables are stationary at level. Then applying several regression model which describes the relationships between a dependent variable and more than one independent variables. Multicollinerity is tested to determine the whether variables got serial correlation or not. To find out the long run and short run it is required to run the VECM model. Before running VECM, Unit root and co-integration is required. If the variables are integrated then VECM can run, otherwise it is not possible to run VECM rather VAR model. After getting integration VECM is conducted. So Wald test is conducted to determine the short run relationship and significant of coefficient. The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another. The basic information of the

regression outputs are as follows:

## **1.17 Chapterization**

The present study is sought after under the accompanying Chapterization Scheme:

Chapter 1: The introductory chapter concentration was given on the conceptual framework and introduces historical perspective and theoretical background of transaction cost.

Chapter 2: This chapter discusses research design of the study. The section deals with the survey of literature with an expectation to recognize the intuitive factors and discover the research gap. Objectives, hypotheses, research methodology, scope and significance of the study are also discussed in this chapter.

Chapter 3: This chapter describes and analysis the factors influencing transaction costs in stock market. In this section, further review of all three mathematical frameworks of Implementation Shortfall and improving the analysis by providing further classification on opportunity cost that previous studies have not addressed.

Chapter 4: The objective of fourth chapter is to identify the transaction costs associated with stock trade in stock market. To achieve this objective this chapter try to find out the association between transaction cost (measured by implementation shortfall) and market timing of the transaction.

Chapter 5: The fifth chapter describe the performance appraisal of stock trade by using transaction cost analysis. This chapter also describe the relationship between transaction cost and other performance measurement. This chapter also try to find out the appropriate timing for the best execution price.

Chapter 6: The Epilogue chapter includes the summary of findings, discussion, suggestive measures for reducing transaction costs, and scope for further research and conclusion.

### ***1.18 Findings, suggestions and conclusion***

In this research, further review of all three mathematical frameworks of IS and improving the analysis by providing further classification on opportunity cost that previous studies have not addressed. The model used by Kissell [2006] and attempt to further classify components of opportunity cost is closely followed. The study discovered two additional components that are not addressed by Kissell [2006] or others. These two subcomponents are, however, additional venues for traders to manage carefully in order to control transaction costs while trading. By further identifying these factors, the study contribute to the existing literature with a view that traders can now detect and manage these factors properly to reduce the IS of trading. As a result, along with stock picking ability, traders will be able to implement trading strategy by appropriately executing trades through controlling these two new factors that add to opportunity cost. In addition, using a numerical experiment, it is also shown that this model calculates ISs that are equal to all three existing models. To our knowledge, we are the first to provide such calculations and to identify factors that contribute to the IS. By being able to detect and control these factors, traders will be able to reduce or eliminate these costs while executing trades.

Understanding and managing transaction cost is highly critical to portfolio performance in an environment in which more than half of mutual funds have consistently underperformed the S&P 500. Sophisticated investors, mutual fund managers, and hedge fund managers who have superior analytical ability in stock selection and follow optimal asset allocation techniques also must pay close attention to IS identified in the literature. IS is relevant especially for short-term traders (or day traders) and dynamic traders because these traders engage in trading quite frequently in a short period of time. Transaction cost from frequent trading can add up to a large amount and essentially eat up the profits if proper care is not taken to avoid or contain any the factors identified in the literature. Amihud and Mendelson [2013] emphasized that in today's decimalization era of high-frequency trading, transaction cost is an essential element of market microstructure that cannot be removed but can and should be managed. Transaction cost is also considered in recent research to evaluate the effectiveness of dynamic portfolio strategies (Kim and Viens [2012]) and optimal portfolio decisions (Garleanu and Pedersen [2013]). Understanding and measuring transaction cost accurately is undoubtedly an important issue for any trader or portfolio manager and has been a subject of research among academicians and practitioners.

In this research, the opportunity cost component is further investigated and classified. It is done in order to better understand elements of opportunity costs to enable traders to notice and address them and thus minimize overall transaction cost. Accordingly, a subdivision is done of the trading-related opportunity cost of Kissell [2006] into two categories: (1) first trading-related opportunity cost and (2) residual trading-related

opportunity cost. By appropriately setting the price for the first trade, if traders can execute all shares they will be better able to reduce these costs.

When transaction cost for this extended model is calculated, the result shows that one can reach the same transaction cost as Wagner and Edwards [1993] and Kissell [2006]. Exhibit 3.01 displays the IS models based on Perold [1988], Wagner and Edwards [1993], Kissell [2006], and the present model. Before presenting this experiment in calculating IS, it would be useful first to provide the definition of each cost component of opportunity costs.

Again, it is beyond the scope of this study to pursue this calculation, and it remains a topic for future research. It should be noted that for a sequence of multiple trades, further extension based on second, third, and other trades is possible to add other sequential trading-related opportunity costs in a similar fashion. The residual trading-related opportunity cost is the difference between the closing price and the last executed trading price, which is also beyond the scope of this research.

Reduction of the opportunity cost can be attained by using this pre-trade analysis to approve orders sized properly for present market situations. For large orders, the investor must decide whether to risk market impact or spread the trade over several days, risking exposure to a price change. Setting price limits efficiently (so that the order is filled or almost filled) will ensure that the FTROC- and RTROC-related opportunity cost will be as low as possible for the trader. If the price trend is higher, opportunity cost will be minimal from setting the price aggressively in the first trade so that all or almost all trading volume is executed, and residual trading cost will tend to zero. The

opportunity cost, on the other hand, can be reduced by setting a passive pricing strategy and executing less in the first trade and more on the later trade if the price trend is downward.

In addition to setting the price limit, good communication between the broker (who executes the order) and trader is vital to permit swift execution and to alter any implementation strategy (if necessary). A trader must decide how to balance the costs of trading with the opportunity cost. It should be noted that there is a trade-off between trading rapidly and being persistent. Executing a full trade rapidly drops opportunity costs but increases probable market impact costs. Slower implementation, on the other hand, lowers market impact but increases opportunity cost because the full order may not be executed or the trade may be filled later at a disadvantageous (average) price.

The study shows the calculation for each of the four models to give a clear picture of the cost. Any experienced trader can imagine that it is extremely challenging to accurately predict the market and make a choice between market impact and price impact; as such, accurately modeling transaction costs in a back test is also challenging. Although it is virtually impossible to account for every eventuality, it is worthwhile to explore multiple back tests assuming different turnover levels to better understand the balance between transaction and opportunity costs so that in future trade a trader is able to reduce the first trade-related and residual trade-related opportunity costs as much as possible.

Transaction costs play a very significant role in affecting investment performance. Above and beyond the fixed charges (such as fees, taxes, and commission), other hidden



or variable factors may adversely increase trading costs for traders. These factors, like delay cost, price appreciation cost, market impact cost, timing risk cost, and opportunity cost, can add to costs of transaction and reduce portfolio return.

The study by Perold [1988] was the first to formally identify this as IS, which traders and fund managers must consider while analyzing portfolio performance. Once security selection is done, prompt action in taking a position, avoiding price run in executing transaction, and ability to complete total transaction are equally important to performing well. Partial trade or adverse price effect due to front run may lower the return of investment. Although various factors are beyond the control of the trader, such as ability to trade at the right price and complete the total transaction, traders must be prompt in executing investment decisions and should review carefully those factors that are part of opportunity costs, as identified in the literature and extended in our research, so they can avoid or reduce these costs of investing.

Although these costs may not be such a significant factor for long-term traders who wish to buy and hold assets for a long time, they are highly important for day traders and dynamic portfolio managers. The work of Wagner and Edwards [1993] extended the transaction cost by incorporating various factors, such as price impact, timing cost, opportunity cost, and commission, that add up to total transaction costs, which can significantly affect portfolio performance. The model proposed by Kissell [2006] further modified cost elements that Wagner and Edwards [1993] incorporated.

The study closely follow and extend the Kissell [2006] model by further identifying trading-related costs that consist of opportunity costs. Our research contributes to the

existing literature by extending the opportunity cost subcomponents that traders or fund managers can identify and, by taking an appropriate trading implementation strategy, reduce or eliminate from total transaction cost. Our innovative sub classification of opportunity costs is one of the key contributions of this research because these subcomponents have not been discovered in previous literature.

To validate this proposed framework, the study provide a single numerical experiment of calculating IS for all three existing models along with our model and show that all four models provide the same IS. Traders and fund managers now have two additional factors they can identify that adversely affect IS; they can control these factors by identifying their sources and creating implementation strategies to remove or reduce them while executing trades. As a result of lower IS, portfolio or fund performance can be improved. TCM is the key to reducing first trading– and residual trading–related opportunity costs, which require a balance with market impact and price impact cost. After thorough back testing, market price trend, and pre-trade analysis, setting price limits efficiently (so that the order is filled or almost filled) will ensure the first trading–related opportunity cost and residual trading–related opportunity cost are as low as possible for the trader. If the price trend is higher, opportunity cost will be at a minimum from setting price aggressively in the first trade so that all or almost all trading volume is executed (so that residual trading cost will tend to zero). The opportunity cost, on the other hand, can be reduced by setting a passive pricing strategy and executing less in the first trade and more on the later trade if the price trend is downward.

In addition to setting the price limit, good communication between the broker (who executes the order) and trader is vital to permit swift execution and to alter any implementation strategy (if necessary). Readers can pursue future research focusing on testing portfolio performance with IS for day traders and dynamic portfolio managers using a benchmark portfolio for comparative evaluation. This research can provide further insight into whether there is any relationship between higher performances and lower IS via carefully controlling extended components of opportunity cost. In addition, a further extension of TCA should incorporate both buy and sell trading for all sequential trades (not only buy-side analysis, as has been done in previous research) and further test the relationship between IS and trading performance.

The research investigate whether there is any relationship between implementation shortfall and trading day of the week. There are five trading days in a week. The result shows that Fridays and Mondays are significantly affecting negatively on the transaction cost. However, since the coefficient for Monday is not significant, it is difficult to argue in its favor as opposed to Fridays. The study further analyze the relationship by dividing the trading day into three trading hours, namely, FPT (First Phase Timing-9:30-12 noon), MTP (Mid Phase Timing -12noon-2pm) and LTP (Last Phase Timing-2pm-4pm). The findings indicate that transaction on Fridays, LTP (from 14:00 to 16:00) is significant to reduce the transaction cost. It clearly implies that the best time to execute the stock transaction is Friday and at LTP. On Monday, Thursday, and Friday total execution costs are little and have negative relationship with transaction cost. So, the

study can conclude that transaction at eleventh hour on Friday is highly desirable as it gives the lowest transaction cost and possibly improves return as a result.

It implies that if anybody wants to acquire more profit/less transaction cost it is better to trade on Fridays and Mondays. Transact in LPT of Friday to get rid of high transaction cost. Besides, it will be better to transact on Monday, Thursday and Friday to avoid High execution cost.

The study also investigate whether implementation shortfall has any impact on relative portfolio performance. From regression analysis one can inferred that there is a relationship between RPM and Imp\_shortfal, ABS\_RPM, VWAP, TWAP and OHLC individually. So the relative performance of stock trade is highly associated with these variables. All of these independent variables did not get long run impact with RPM; only two variables (e.g. IMP\_SHORTFAL, VWAP) have long run association. In addition, Wald test identifies that the coefficients for all variables are significant and have short run relation. At last my focus is to find out the best time and the best seconds for transection. Based on the frequency of the transection of 734 trading days it reveals that transection within the first minute is the best for transecting at low cost while the last trading hours are best for overall transaction cost.

So, if anybody wants to get better price s/he must try to transect within on minute, but s/he wants to get best price, transect with in first half second.

### ***1.19 Scope of Further Research***

The study/research focused only buy side trade and trades of only one trader. An interesting future extension of the research would be to expand the analysis taking into consideration of sell-side analysis. If short selling is allowed, does implementation shortfall matter? The study hope that such research will further enhance the depth of understanding of portfolio performance and impact of implementation shortfall in portfolio analysis.