The Ticker Tape: Yesterday, Today and Tomorrow

by Sam H. Hale, CMT

From our markets in the United States, we're privileged to have access to the finest data streams in the world. This has been especially true since the introduction of the ticker in 1867, which is the **primary** source for most of the data with which we work. Nothing can be more important to the analyst than the quality and integrity of the data being used. The quality and quantity have grown progressively better since brokers first left their "seats" in 1871 for the start of continuous trading. There have been phenomenal technological advances that have accelerated in just the last 30-odd years to the point where even we professionals sometimes scratch our heads.

There is a two-fold purpose to this article. It will first present historical insights into the published works of important tape readers of the past who contributed greatly to our craft. Then it will progress into the computer era and strive to bring the reader up to date on the very latest technologies so that he or she fully understands the tape's composition. The analyst should derive a deeper understanding of our basic data source in order to know when and how to question the reliability of the data as it might affect a particular application. Readers will be made aware by examples that just because data streams from a vendor's latest, fastest computer doesn't mean they can be blindly accepted as being absolutely factual and/or up to date. Depending upon an analyst's specialty, even in something so basic as point and figure charting, it will be shown how easily a vendor's output can be flawed. Hopefully, thinking will be stimulated on ways to expand the use of available data by illustrating some never before broadly disseminated indicators developed by the author, that will make the computer the tape reader.

The Grandfather of Technical Analysis

Some analytical techniques and sound philosophy can be traced to the market literature from around the turn of the century from the pens of Charles H. Dow and Richard D. Wyckoff. Both were financial writers uniquely qualified to write not just from observations and interviews but from practical knowledge.

Prior to teaming with Edward Jones to form Dow, Jones and Company, which published its first edition of *The Wall Street Journal* on July 8, 1889, Charles H. Dow was a partner of NYSE Member Firm Goodbody, Glynn and Dow. Mr. Dow held the seat during his mid-thirties and executed orders on the floor where he obviously gained many insights about which he would later write, especially in the famous editorials that appeared in the two-year period prior to his death in 1902 at age 51.

Mr. Dow, called "The Grandfather of Technical Analysis",[1] was posthumously awarded the 1984 Market Technicians Association Annual Award. His successor as editor of *The Wall Street Journal,* William Peter Hamilton, as well as others such as Samuel A. Nelson and Robert Rhea, further developed Mr. Dow's editorials and systematized what would later be known as "The Dow Theory" from his now familiar concepts of market movements.

Mr. Dow wrote of "the law of action and reaction" in which "it seems to be a fact that a primary movement in the market will generally have a secondary movement in the opposite direction of at least three-eighths of the primary movement." He also wrote of "double tops", the theory of "averages" (time up/down), periodicity and "responsive" buying/selling. Mr. Dow noted that "this method is employed more particularly by those who watch the tape." In his July 20, 1901, editorial, Mr. Dow wrote of the "book method" in which "prices are set down, giving each change of one point as it occurs, forming thereby lines having a general direction but running into diagonals as the market moves up and down." This method is now popularly known as "point and figure" charting. More than 100 professional members of the MTA list this among the methodologies they employ in their analyses.

"The Best Indicator of Supply and Demand — The Ticker Tape"

Another market analyst who not only expounded on this method but also made significant contributions to the study of tape reading, trading and the market just after the turn of the century was Richard D. Wyckoff. Mr. Wyckoff was about 22 years younger than Mr. Dow. Nonetheless, by the time Mr.

Dow published the first edition of *The Wall Street Journal*, Mr. Wyckoff was in his eleventh year on Wall Street, having progressed from being a runner to opening his own brokerage office. He also developed as a writer and around 1907 launched a monthly publication called *The Ticker*. This magazine was later merged into *The Magazine of Wall Street*. By that time, he had been studying the market for 20-odd years and had become a proficient "tape reader". He wrote, arguably, the best book ever produced on tape reading, in 1910. Using the pseudonym Rollo Tape, Mr. Wyckoff wrote the insightful *Studies in Tape Reading*.[2] Responding to the criticism, "the average man never makes a success of tape reading," Mr. Wyckoff responded, "Right you are! The average man never makes a success of anything."

Similar to Mr. Dow's book method (point and figure), Mr. Wycoff, in the early 1900s, constructed from the tape an eighth-point chart of a stock. Instead of recording "X's" at each price level, he plotted the cumulative volume at that price. An example is pictured in *Exhibit One*.

EXHIBIT ONE

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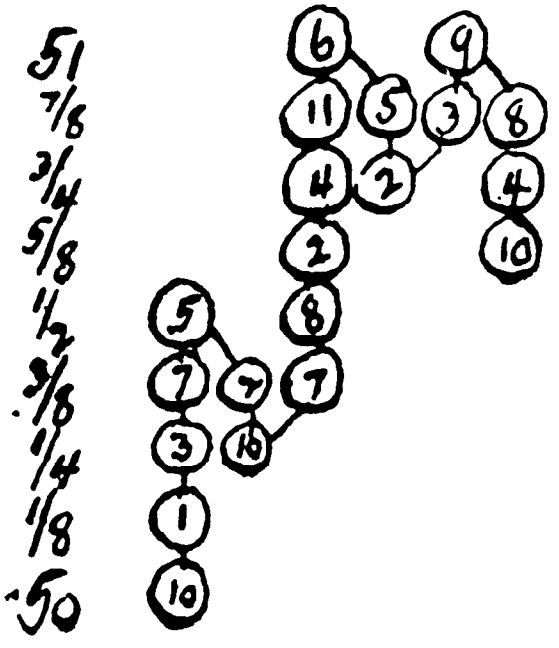
Richard Wyckoff ("The Analyst") originated what he called a "Volume Chart" It was an adaptation of what Charles H. Dow had called the "book method" wherein, instead of plotting "X's", the cumulative volume at each price was entered. Below is an example from his 1910 book *Studies in Tape Reading* below. Mr. Wyckoff noted, "When made to cover a day's movement in a stock, this chart is particularly valuable in showing the quantity of stock absorbed at various levels."



Volume Chart

In a 1912 address to the Finance Forum[3] in New York City, Mr. Wyckoff said, "...I was once a fundamentalist myself. No amount of study in the field of statistics will give one the slightest hint as to Supreme Court decisions, Government prosecutions, stock market object lessons, big shake outs, etc., all of which can take place without fundamentals batting an eye. You can have all your fundamentals right and draw wrong conclusions; or your conclusion may be correct but one fundamental which you overlook may upset all your calculations. Then, there are *unknown* factors which *nobody* can analyze. These are continually cropping up and nullifying all those which are known...."

This brings us up to the pivotal point in tape reading, which is **Supply and Demand**. We all know that this same principle governs all branches of trade, whether manufacturing, railroading or dealing in any of thousands of different commercial lines. We have a picture of what happens on the floor of the Stock Exchange, and it is faithfully recorded on the ticker tape — the best indicator of this Supply and Demand.

Over the next two decades, Mr. Wyckoff developed further insights with his studies of Supply and Demand. In 1965, I acquired his two-volume, leather bound study course which was copyrighted in the 1930s and was tutored by the late Bob Evans. Mr. Wyckoff's course material was later revised and published into an updated course still offered by The Stock Market Institute.[4]

An example of an intraday Wyckoff Wave[5] chart is shown in *Exhibit Two*. Please note an added dimension to the customary price, volume, time data — *activity*. Sixty years later, it's rare to see such a revealing picture of the anatomy of the market. Some of the principles learned from the Wyckoff material were incorporated into the computerized tape studies that I began in 1968. These will be discussed later.

The surprise hit at the 1992 Annual Market Technicians Association Seminar was the methodical, rational presentation of Rebekah Helzel, at that time a currency trader for Bank of America, now a proprietary trader for BA Securities. Ms. Helzel exclusively used the Wyckoff Supply/Demand studies in her analysis and presentation, and credited Dr. Henry O. Pruden[6] for introducing her to the Wyckoff methodologies.

Wyckoff Promotes Gann

W.D. Gann, another tape reader, trader and teacher, who was posthumously awarded the 1983 MTA Annual Award, credited Richard Wyckoff with making him famous in *The Ticker* magazine in 1909.[7] In 1923, Mr. Gann published *Truth of the Stock Tape*. Of all the books and courses Mr. Gann subsequently

EXHIBIT TWO

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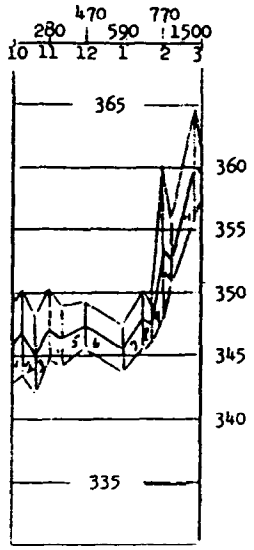
Included in his early 1930's course of instruction was "The Wyckoff Wave Chart of Tape Readings". To aid subscribers and students master the understanding of "Price Movement, Time and Comparative Lifting Power or Pressure, Volume and the Intensity of Action (Activity)" these "significant figures" were published daily.

The only explanation which would not be obvious to the technician would be "activity". "The intensity of the trading is indicated by the small figures in Column 7 of the table and by the two irregular dotted lines which appear in the chart, running along, one above and the other below the solid line which represents the price path. The market's relative activity, that is, the pace of trading, is reflected in the size of the index numbers recorded in the table (Column 7) which are proportional to the change in activity. Thus, an index number of 1 or 2 reflects dullness; a unit of 3 to 4, moderately active trading; and 6 to 7, high activity. In extremely active markets, when the tape is late, the activity index may rise to as high as 10 or more.

"By casually (not mathematically) comparing the activity with the volume and duration of the buying and selling waves, we are able to judge whether the supply or demand is of good or poor quality. For example, suppose we have two buying waves each of 10 minutes duration and each showing a volume of 100,000 shares. And suppose that the activity index registers 5 on the first, but only 3 on the second wave. Obviously, demand must be of poorer quality on the first wave than on the second because, while the market is more active on wave number one, since time and volume are the same, this greater activity can be accounted for only by trading in smaller lots as compared with wave number two.

"...it should be noted that the activity index has no relationship to the price movement as recorded in the Wave Chart table, and it is only indirectly related to the time and volume figures because it represents the rate at which orders are flowing into the market, not a ratio between time and volume."



PERIOD	TIME	DURATION	PRICE	CHANGE	VOLUME	ACTIVITY
Opening.			345			
1	10:20	20	347	+ 2	142	3½
2	10:40	20	344⅞	- 2⅛	65	3
3	11:00	20	347⅜	+ 2½	73	3
4	11:20	20	346½	- 0⅞	55	2½
5	12:00	40	347½	+ 1	135	2
6	1:00	60	345½	- 2	120	2
7	1:30	30	348	+ 2½	72	2½
8	1:45	15	347½	- 0½	23	1½
9	2:00	15	353¾	+ 6¼	85	6½
10	2:15	15	352¾	- 1	53	2½
11	2:50	35	360⅛	+ 7⅜	597	5
12	3:00	10	359¾	- 0⅜	80	2

wrote, I found this book to be among the most lucid. In it Mr. Gann lists the essential qualifications for becoming a successful tape reader: Patience, Nerve, Knowledge, Health and Rest. He follows with his "Rules for Successful Trading": Capital; Limit Risk; Don't Overtrade—the Greatest Evil; Never Let a Profit Run into a Loss; Don't Buck the Trend; When in Doubt, Get Out; Trade in Active Stocks; Distribute Risk Equally; Don't Fix a Price Or Point to Buy and Sell; Accumulate a Surplus, Don't Buy Stocks just Because They Pay Dividends Nor Sell Them Because They Do Not.[8]

Mr. Gann developed many interesting concepts and made some very significant contributions to the art of technical analysis. I am privileged to have known for several years a financier, Mr. W. King Grant, Sr., who worked with Mr. Gann at the peak of his success in New York. Mr. Gann dedicated some of his books to Mr. Grant's uncle, Clarence Kirven. When Mr. Kirven died, King Grant, Jr., knowing of my interest in the works of Mr. Gann, loaned me Mr. Kirven's library. His father subsequently gave me his large book of hand-drawn graphs that he used when working with Mr. Gann. Mr. Grant was successful in the commodity markets and became a member of the Chicago Board of Trade and New Orleans Cotton Exchange. Now 89, he most vividly recalls the Gann Circle Graph and the value of "squaring price and time".[9] Mr. Grant went on to become a highly successful entrepreneur and philanthropist, unlike

Mr. Gann, who, in spite of the promotional hype of his taking "50 million dollars from the market", did not leave a large estate.[10] In recent years, there have been countless promotion pieces published, some even claiming to have uncovered the Master Time Factor. In my opinion, unfortunate exaggerated claims have tended to taint an otherwise brilliant legacy of analytical discoveries made by Gann.

Substituting "Pros" for "Pools"

Several books have been published with an emphasis on the ticker tape. I shall reference three. The first, an often quoted book, is Humphrey Neill's 1931 *Tape Readings and Market Tactics*.[11] It became very popular with the original editions having five printings and reprint editions in 1959 and 1970. In the Foreword to the 1959 edition, Mr. Neill wrote, "I suggest you mentally read 'pros' instead of 'pools' and 'operator' in place of 'pool operations'. There are no pools operating in the markets today...pools manipulating prices is [sic] taboo under the Securities & Exchange Act of the mid-1930's." In his Foreword to the 1970 edition, Mr. Neill mentioned an earlier project with Simon & Schuster in which they used his book in connection with a reprint of Gerald M. Loeb's 1937 book, *The Battle for Investment Survival*.

Mr. Loeb has been labeled "The Wizard of Wall Street". In his book he states, "In my opinion, far and away the most important thing to master in Wall Street is the tape. It is possible to see only the tape, and nothing else, and make a lot of money. It is a safety valve and automatic check on everything you do if you understand how to read it. My main point is to develop a realistic attitude; 99.99% and more of those who try to deal in Wall Street think they are right and the tape is wrong. Stocks that are high and going higher are a good buy. Stocks that are 'cheap' and growing cheaper don't interest me from a buying angle."

The third book is another little classic on tape reading, *Ticker Technique* by Orline D. Foster, which was written in 1935 and subsequently revised and edited by Dr. Robert Peersons, Jr. in 1965. The revised edition added material by Don Worden and Herbert Liesner. Much of the material added by Mr. Worden had previously been published in the 1963 edition of *Encyclopedia of Stock Market Techniques*.

FITCH SHEETS

In the Foreword to the 1970 edition of his book, Mr. Neill mentions the availability of daily records of consecutive trades published by Francis Emory Fitch—and "in this way one may become a relaxed arm-chair tape reader and student of market tactics". In his book sixty years earlier, Richard Wyckoff had mentioned the Fitch sheets. They are still available today — in printed form from 1930 and on computer readable tape from 1968.[12] For decades the New York Stock Exchange had made the data available to Fitch for processing and, in turn, received copies of the tabular listings. The Exchange now offers a wide variety of data services through its Market Data Products[13] division, including all trades and quotes from all U. S. Exchanges and NASDAQ.

Mr. Neill also mentioned the tape-reading data and services of 1994's recipient of the MTA Annual Award, Don Worden, developer of the "$100,000 Index". Mr. Worden had tabulated every NYSE transaction of 1,000 shares or larger since 1957. In 1962, he began devoting full time to his stock market studies and published *The Worden Tape Reading Studies*. In a 1963 article[14] he felt the ultimate perspective of price moves was gained from the point and figure chart, but "for a pure and revealing picture of volume — nothing is so revealing as a tabulation of large blocks". He, too, had referenced the daily lists of transactions published by Francis Emory Fitch, Inc., but noted, "bringing these transactions into a summarized enough form so that they can be used is a staggering job". By the mid-1960's, Mr. Worden's data were computed by the Quotron Computer Center. Several years ago Mr. Worden discontinued the tape studies. When I asked him why in 1994, he said, "It doesn't work anymore". Our probes into the advances of the ticker feed discussed later may shed some light on this observation.

More Tips on Tape Reading

Some insightful "tips from the big traders" regarding tape readings were included in the expanded 1964 edition of *The Sophisticated Investor* by Burton Crane and Sylvia Crane Eisenlohr.[15] A couple of those tips: James C. Kellogg III (Spear, Leeds & Kellogg and former Chairman of the NYSE) is quoted as saying, "when he trades in stocks other than those in which he specializes, he is using the tape as a signal". In Kellogg's words, "I'm more interested in finding stocks that have values, stocks that should have gone up but didn't. However, I don't want to buy them if nobody else is interested in them, so I wait until the tape tells me that volume is developing and the price is rising. Then I buy." Mr. Kellogg also said, "Don't buy the sympathy stock."

William M. Meehan, a leading specialist at the time, in warning about relying on maxims, is quoted as saying, "Never sell a dull tape. Maybe a thing like that works nine times, but the one time in ten that it works in reverse is apt to be a violent surprise. I once had a friend who used to work by rules such as that. He wasn't hurt much by 1929 or 1937 but the averages caught up with him in 1938 and 1939. Why?

Because in 30-odd years in the market, he had never seen stocks go down with volume declining every day. To him, this was a bullish signal. So he bought something at 25 and kept buying as prices fell. They picked up the pieces of his fortune when it hit 11. Generally speaking, however, watch for a stock that goes up on increasing volume — especially, watch for a stock that rises on bad news."

History of the Ticker

On November 15, 1867, nine years before Alexander Graham Bell's first words were carried by telephone, telegraph operator Edward A. Calahan revolutionized the securities and commodities industries by transmitting last sale prices direct from the New York Stock Exchange to a brokerage firm. This new reporting system replaced "pad shovers", messengers who ran from office to office with handwritten trading sheets. Sixteen years later Thomas Edison's famous glass domed ticker, which would become the standard for almost a half-century, was unveiled. In 1925, a 285 character per minute (cpm) version was introduced. There were almost 10,000 of these tickers in operation in 1929. Beginning September 2, 1930, the 500 cpm "black box" almost doubled quotation speeds. This became the standard for the next 34 years, until transmission speeds advanced up to 900 cpm, when the new high speed ticker developed for the Exchange by the Teletype Corporation began transmitting prices. These machines changed speeds automatically to keep pace with the activity, printing at 500, 600, 700, 800 or 900 characters per minute. This variable speed "clatter" reflected "tone changes" on the floor. The new high speed ticker was capable of handling volume of up to ten million shares without a tape delay, which was over twice the average daily volume (4.9 million shares) at the time.

The consolidated tape was introduced in 1975. There is no longer a NYSE-only tape. All transactions in NYSE listed stocks from the Intermarket Trading System's (ITS) participating exchanges and broker-dealer participants in NASD/CAES (Computer Assisted Execution System) are transmitted on Network "A".

Into the 1960s and early 1970s, it was common to see traders and analysts scanning the paper ribbon. I employed a clerk to copy every price in a selected group of stocks until 1968, when my first computer, a DEC PDP 8I, arrived. It was an ordeal getting required clearance to connect to the ticker feed, to say nothing of developing the machine language programming required for it to read the tape. Even Dow Jones & Company calculated its hourly averages by hand until 1963.

This high speed ticker wasn't fast enough, and on January 19, 1976, a new circuit began transmitting market data up to 40 times faster. Trans-Lux no longer leases them, but Marianne Johnson,[16] who was product manager for the "900" personal ticker, says there are only a "smattering" of them still around which were purchased and are privately maintained. However, there are many Trans-Lux LED Jet displays scrolling across the walls of brokerage offices and on exchange floors.

MTA member Jim Yates, former President of Bridge Data and now head of Affinity Plus, Inc.,[17] which saves on optical discs over a million transactions per day (every trade, every market in North America), calls the visual moving ticker "obsolete" because it is impossible for it to remain current. He compares it to commodity tickers which give indications of current markets by transmitting last prices, not every trade. In *fast* market periods, entries are entered on a *best efforts* basis.

The Computer Era

A large IBM computer complex was installed by the NYSE in late 1964. In March 1965, fully automated quotations became available as a result. On December 20, 1966, transmission of trade and quote data from the floor became fully automated. In 1972, the New York and American Stock Exchanges joined forces to form The Securities Industry Automation Corporation (SIAC) to provide computer services to the entire industry. SIAC's software controls communications, safe-storage, queuing and recovery. The NYSE reports that with its "Common Software" program, it has established an up-time record of 99.99%.

There were over *49 million trades* in 1994 on the NYSE alone. Accurate tape reading today requires a computer receiving data on the high speed line. However, it is important that the analyst/trader be aware of the speed and capacity of the **vendor's** processing and forwarding equipment that feeds the user's quotation device or computer. Currently, there are over 100 market data vendors connected to the Consolidated Tape. Simply using Quotron's last sale price as a standard, I have timed some highly advertised systems' prices and quotes running several *minutes* behind in periods of heavy activity.

National Market System

In the historical *The New York Stock Exchange: The First 200 Years*,[18] author Richard Blodgett and archivist Steven Wheeler termed the Securities Act Amendments of 1975 "the most important federal securities legislation since the 1930s". It mandated a National Market System. The Intermarket Trading System (ITS) began limited operation in 1978, became fully operational in 1982, electronically linking eight exchanges and the NASD/CAES.

On the ITS all participating markets now compete for the buy and sell orders through an electronic interface with SIAC's host systems. The result has been an enormous investment in technology, which in turn has further revolutionized the industry. The Consolidated Quote System employed by participating exchanges and the NASD reflects the highest bid and lowest offer. The ITS generates quotes in which NASD/CAES registered market makers can execute 19c-3 (defined elsewhere in this report) trades. In the ITS plan, when a market (or doable limit) order arrives to a market with an inferior quote, the market maker must send through ITS a commitment to trade with the best quote generator, or match the quote. Otherwise, a "trade through" complaint may be registered within five minutes, if it is other than 100 shares or not a regular-way trade. Each participant is responsible for watching for the best ITS quote because these orders are not automatically routed. A public customer may expect to receive a price as good as the best quote, but many orders are not exposed to the auction market where there *might* be price improvement.

Dot and Superdot

In 1976, the New York Stock Exchange introduced DOT — the Designated Order Turnaround — for market orders of fewer than 200 shares and limit orders of 100 shares or less. From the Common Message Switch (CMS — see *Exhibit Three*) these orders

EXHIBIT THREE

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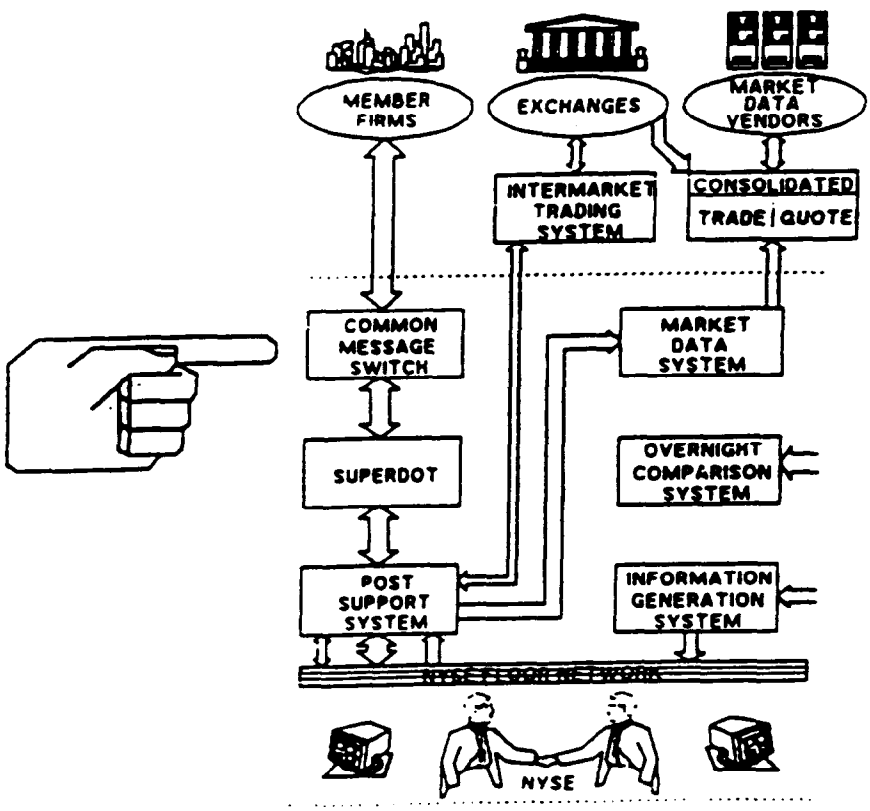
NYSE TRADING SYSTEMS

Common Message Switch

- Provides reliable communications connections and control between member firms and SIAC host systems.
- Supports over 450 circuits ranging from 1,200 to 19.200 baud, handling a variety of communications protocols.
- Receives, edits and validates equity and options orders for NYSE and AMEX. Formats associated reports.
- Handles queuing, flow control and priority routing.
- Provides daily executed trade input to comparison and analysis databases.



went to DOT, which cataloged them, and sent them on to the Post Support System (PSS) and then on to the proper trading location. There have been numerous improvements through the years, and the system is now known as "SuperDOT". In the SuperDOT system, round-lot executions are not automatic, they are exposed to the crowd. The order may be executed by the specialist with a broker in the crowd or with the current quote, or he may "stop" the order. When stopped, the order is guaranteed that price if a better price is not obtained within thirty minutes, unless the specialist extends the time. I concluded from a published 1992 study that, at that time, 16 percent of post-opening SuperDOT "stopped" orders received price improvement.

SuperDOT now has projected capacity to handle in excess of a 1 1/4 billion-share day, more than twice the record of October 20, 1987, without significant communication delays. Its current order size restrictions are 30,099 shares for market orders, and 99,999 shares for limit orders. The Individual Investor Express Delivery Service was introduced in 1988 to give priority to orders of less than 2,100 shares. The Exchange reports that 98% of orders routed to SuperDOT are executed and reported back within less than half a minute. In 1994, 85% of the orders originating from member firm trading desks and their customers reached the trading floor electronically through the Exchange's SuperDOT system.

While some ITS participants have excellent reporting speeds for transactions in eligible securities to SIAC, for dissemination on the Consolidated Tape, analysts should be aware of the rules. The Consolidated Tape Association Plan requires each participant to only report last sale data "as promptly as possible" and to ensure that, under normal conditions, not less than 90 percent of such last sale data are reported within 90 seconds after execution. Therefore, there is no assurance that prices flowing in from multiple markets are being viewed in the time sequence in which the trade occurred. Thus, I reason that money flow, tick volume and other measures, such as changes for point and figure charts based upon chronological tape prints from the Consolidated Tape, are subject to question. Hans R. Stoll, Director of the Financial Markets Research Center at Vanderbilt University, is quoted as saying that there is a lack of adherence to the 90-second rule. "There are situations where the trades are coming hot and heavy, and they're not getting reported."[19] It should be noted that another newer rule, 19c-3, from the Securities Acts Amendments of 1975, permits Exchange members to make dealer markets in securities issued after that time. Roughly half the NYSE listings are eligible for such inside trading.

Most data display products I have investigated default to the Consolidated Tape, although some afford the ability to select a specific market. For my computerized tape reading studies, only NYSE prints are preferred, although incorrect sequencing of trade and quote data from the Exchange sometimes occurs, too. A study of the Equity Consolidated Audit Trade File (CAUD)[20] placed the overall accuracy at approximately 98 percent.

There are three ways trades are reported from the Exchange: The Display Book reporting of exclusively SuperDOT orders is effected automatically with the execution report; non-exclusive SuperDOT trades are entered using the Display Book keyboard by the specialist's clerk; trades occurring in the "crowd" are entered on "mark sense" cards prepared by a NYSE floor reporter who stands by the specialist. In a study four years ago, the median print delay times were: 6 seconds, 14 seconds and 16 seconds, respectively. As the volume of transactions to SuperDOT has continued, it is very likely the overall delay figures are now even less. For full year 1994, roughly 65% of the trades were reported to CTS through the Display Book. Over the same time period, almost all (98%) of the quotes were updated by the Display Book.

Dirk vanden Heuvel, managing editor of *Market Charts*,[21] a leading source for point and figure charts, shares my preference for primary market prints only on its graphs. They contract with Muller Data Corp. to screen the transaction tapes for the required changes.

Modern "Pioneer"

As mentioned earlier, I began computerized tape reading in 1968 on 100 issues. From this group a Growth Stock Index of 13 blue chips in the Nifty Fifty was constructed. *Exhibit Four* has graphs from that era that show a Force Line beneath the index. This line was the transaction volume algebraically summed according to up, down or zero tick. The divergence indications are self explanatory.

Studies of groupings and sectors continue to hold great interest for me. A four year surge in new listings, which saw the number of companies grow 587 to 2,361 at the end of 1994, is partly attributable to the growth in closed-end investment company shares. When these are combined with the listings of preferred shares, rights, warrants and certain foreign shares, summary statistics from all trades are *not* an accurate picture of what is happening in our *stock* market. Distortions in the advance-decline line have similarly resulted from these inclusions, prompting some, such as Paul F. Desmond of *Lowry Reports*, to take out these shares. MTA Board Member Phil Roth, as well as Lazlo Birinyi[22] and others, maintain an A–D Line using only the components in the S&P 500 index.

EXHIBIT FOUR

This index of mature growth stocks was maintained from 1968 and included Avon, Coca Cola, Control Data, Disney, Hewlett-Packard, IBM, Johnson & Johnson, Minnesota Mining, Merck, Northwest Airlines, Polaroid, Texas Instruments and Xerox. There were frequent divergences in price levels between it and the S&P 500 Index, as shown below.

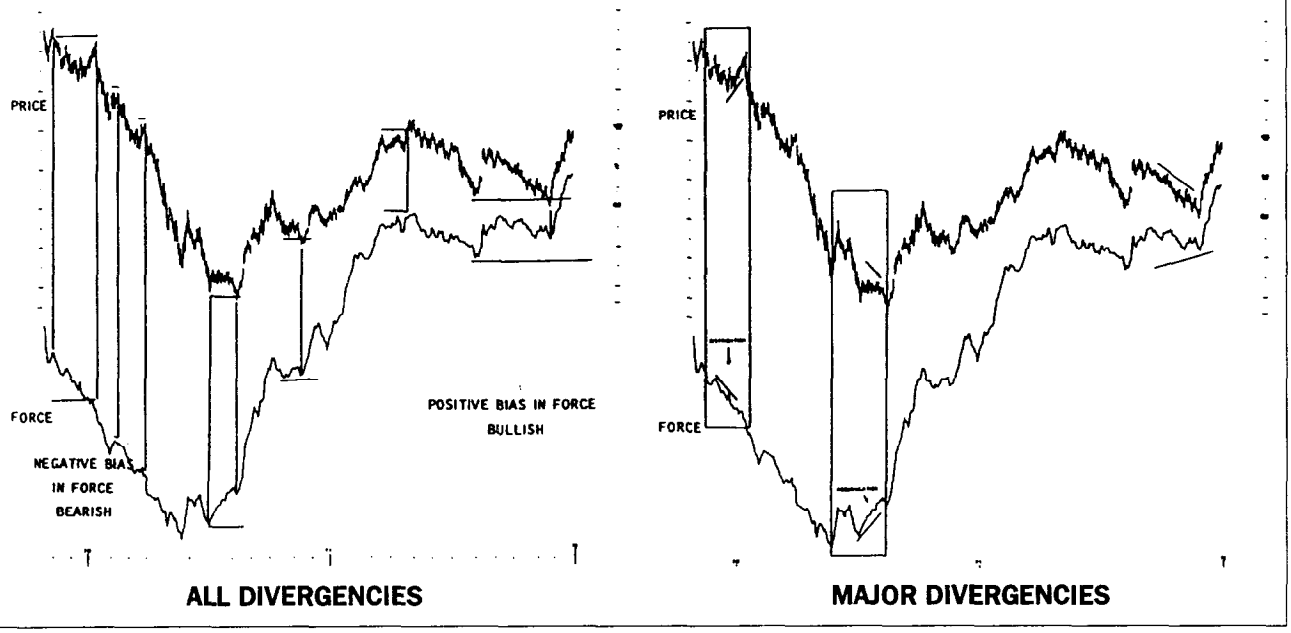
	1/73-10/74	10/74-5/75	5/75-9/75	9/75-7/76	7/76-3/78
S&P	-50%	+54%	-15%	+31%	-19%
GSI	-62%	+69%	-24%	+37%	-29%

Two graphs follow. The first illustrates divergences of significance to the shorter time frame analyst. The second highlights the Major Alerts created by pronounced divergences between the Force Line and Price and are clearly marked.

As noted in the text, the Force Line is the algebraic sum of up/down transactions computed from the NYSE ticker.

13 Growth Stock Index

Illustrating Force Line/Price Divergences



ALL DIVERGENCIES — MAJOR DIVERGENCIES

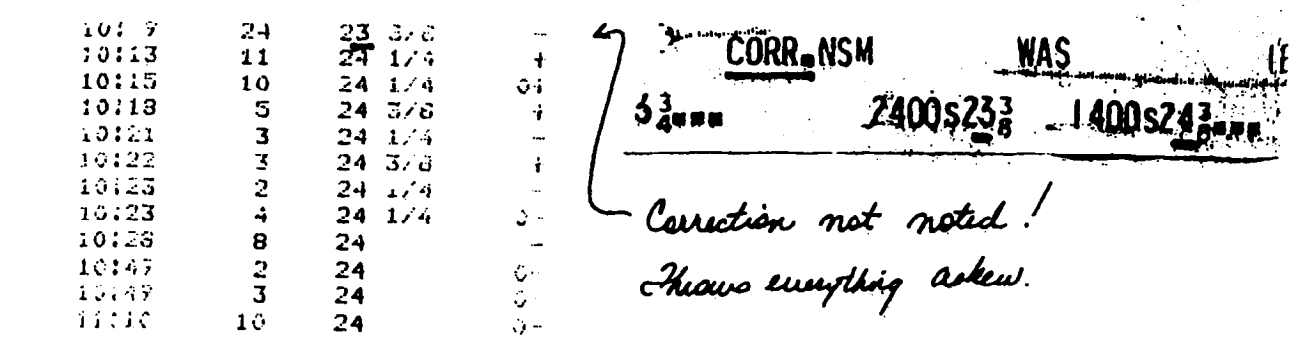
It "Ain't" Necessarily So

When I went to the CBOE as a market maker, it became necessary to rely on remote interrogation of a then popular independent main frame service for my trade-by-trade data. Having been so close to transaction data for years, I began to sense there must be some glitches in their software. I was shocked that such a major service could have been successfully offering its services to institutions, for high fees, for several years without perfected programs. Management of that firm could not believe it either, but when I proved to them there were problems, part of the amicable settlement was for me to consult them on their correction. One key problem was as basic as the program's failing to properly handle "special" trades (OPENED, SOLD, CANCEL, CORRECT, CASH and NEXT DAY SETTLEMENTS, etc.). Examples are shown in *Exhibit Five,* where the original paper tape print was compared to the summary printout. One scan totally ignored the opening transaction! By the way, four years ago the NYSE began to phase in new procedures that make available order-by-order components of opening trades and intraday bunched trades that are processed through SuperDOT.

We Are Not Alone in Our Studies

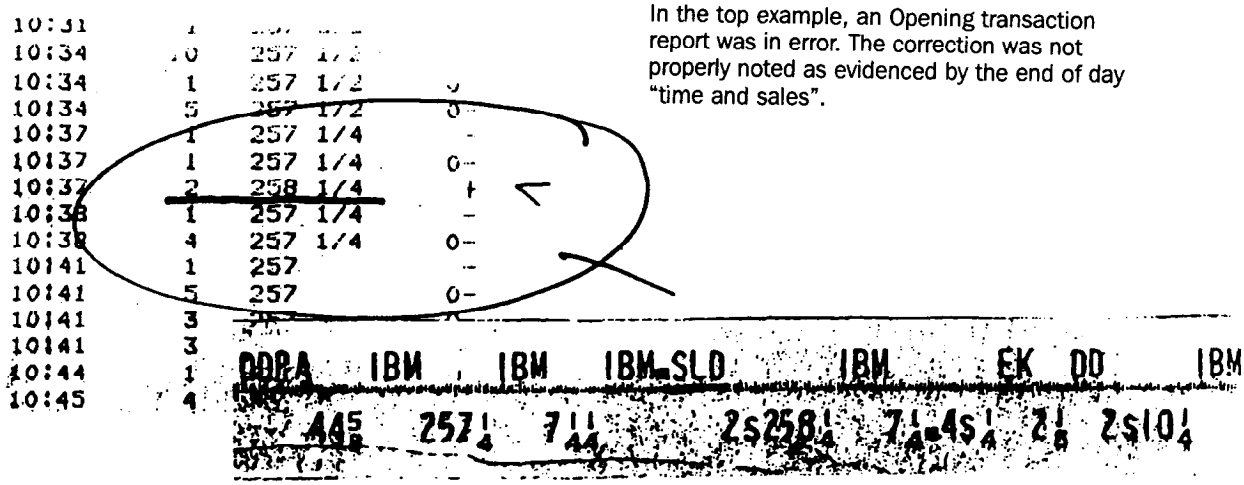
Academic interests in transactional data are growing.[23] Among the products and services the NYSE makes available through its Market Data Products division "for purposes of academic research" are CD-ROM files with detailed quote and transaction data from the Consolidated Tape. These data are available by subscription beginning January, 1993, with each TAQ (Trade and Quote) CD containing every trade and quote for a month on all NYSE, AMEX and NASDAQ NMS stocks. New TAQ releases are published monthly with about a four week lag. The source code was developed on Microsoft Fortran version 5.1, and may be modified, recompiled, and distributed for use on any CPU platform.

EXHIBIT FIVE

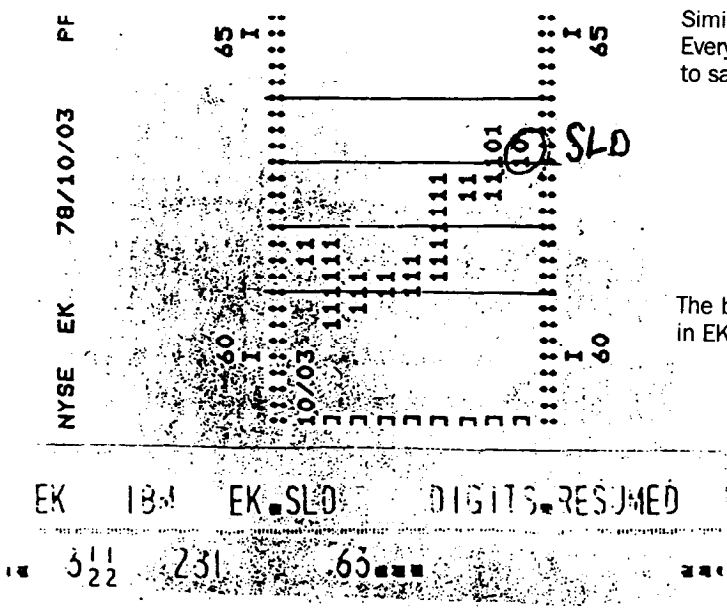


Programs that do not properly read and adjust for "special" trades are valueless.

In the top example, an Opening transaction report was in error. The correction was not properly noted as evidenced by the end of day "time and sales".



Similarly, the IBM "SOLD" trade was not noted. Every P&F graph of 1/2 point or less will be wrong, to say nothing of the summary tic measures.



The bottom example again shows a "SLD" trade in EK. The P&F graph is, therefore, in error.

EXHIBIT FIVE

(continued)

10:44	514	295	NT
10:44	20	295	0+
10:44	2	294 3/4	-
10:45	1	294 3/4	0-
10:46	1	294 3/4	0-
10:46	4	294 3/4	0-
10:47	2	294 1/2	-
10:47	1	294 1/2	0-
10:48	9	294 1/4	-
10:48	2	294 1/4	0-
10:49	1	294 1/4	0-
10:49	3	294 1/4	0-
10:49	1	294 1/3	-
10:49	1	294	-
10:50	2	294 1/8	+
10:51	1	294	-
10:51	2	294	0-

This IBM OPD trade of 51,400 shares was incorrectly eliminated. You can see how the summary data on the two scans didn't match for Aug. 3. The difference is 51,400, of course.

							===UP/DOWN===			--ZERO TICK--		
DATE	HIGH	LOW	CLOSE	VOL	$XACT	UP	DOWN	NET	UP	DOWN	NET
78/ 8/ 1	281 5/8	279	279 1/8	1553	320	594	-230	364	1069	-484	585
78/ 8/ 2	291 1/2	279	291 1/2	1947	423	799	-270	529	1522	-425	1097
78/ 8/ 3	295	285 1/2	285 1/2	2405	452	403	-384	19	910	-981	-71
78/ 8/ 4	289 5/8	284 1/2	288 1/2	1610	417	566	-244	322	1045	-565	480
78/ 8/ 7	290 1/2	286	286	2194	308	455	-434	21	1393	-801	592

IBM

DATE	HIGH	LOW	CLOSE	VOL	UP	DOWN	NET
78 8 1	281.63	279.00	279.13	1553	1069	484	585
78 8 2	291.50	279.00	291.50	1947	1522	425	1097
78 8 3	295.00	285.50	285.50	2405	910	1495	-585
78 8 4	289.63	284.50	288.50	1610	1045	565	480
78 8 7	290.50	286.00	286.00	2194	1393	801	592

In the example below, the volumes for June 14, 1977, do not match. What is correct, 26,445,000 or 25,359,000? In this case, the former was the correct total volume and the latter was the volume of common stocks only.

MARKET INFORMATION FOR 77/ 6/14

VOLUME	VOLUME	10 MA	30 MA
NYSE	26445000	21051800	20602533
AMEX	2523000	2464800	2459300
NYSE-C	24756000	20042800	19909433
NYSE-P	575000	495900	513700
AMEX-C	2220000	2157300	2173767

DATE	HIGH	LOW	CLOSE	VOL	UP	DOWN	NET
77 6 13	53.94	53.94	53.94	20257	11480	8777	2703
77 6 14	54.42	54.42	54.42	25359	17018	8341	8677
77 6 15	54.42	54.42	54.42	22618	12147	10471	1676
77 6 16	54.56	54.56	54.56	24296	13879	10417	3462
77 6 17	54.64	54.64	54.64	21928	12751	9177	3574

The Exchange Survives

It occurs to me that the New York Stock Exchange is glad for researchers to delve into these data as it becomes obvious what an overall excellent comparative result they are getting from their monumental investments in new technologies. Many can recall the intense rivalries in the late 1960s and early 1970s that prompted an article in *Institutional Investor* titled, "Can the New York Stock Exchange Survive?"[24] What the magazine later referred to as "the structural chaos in which the securities industry is presently enmeshed", together with the market conditions in the 1973-1974 period, contributed to a bear market in NYSE membership prices. NYSE seat prices bottomed at $35,000 in 1977, as low as they had been since 1943. Apparently the Exchange's "energetic attempt" to shift to offense, which was the subject of yet another article, was successful, as seat prices recovered to a high of $1,150,000 ten years later, and volume has continued to grow year after year. On that infamous day in 1987, the *day's* volume exceeded the entire *year's* volume of thirty years earlier.

Looking Ahead

I am excited about the future as speed and accuracy of the trade/quote data continue to improve. Exchange officials tell me that in the last twelve years the NYSE has invested over a billion dollars in new technology. There are over 5,000 electronic devices on the NYSE floor, and last August the Exchange announced[25] another $125 million system of new computers to facilitate even more speedy and accurate trading. Since 1988, the Exchange[26] has been able to reduce the number of support personnel from 800 to 500. That trend is expected to continue as its 140 runners will be replaced by cellular telephones and hand-held computers that allow brokers to receive orders and to report trades while remaining in the trading crowd.

Research

For some time now, we have been able to generate good measures of "current" from the NYSE common stock data. The graph shown as *Exhibit Six* reveals measures developed over 20 years ago and included in my 1978 copyrighted study, *Transactional Data Analysis*. Although these measures are very straightforward in revealing why the averages are moving as they are, as far as I know they are unique in that I haven't seen or heard of them from any other source. The upper line is THE AVERAGE VOLUME PER TRADE ON PRICE ADVANCES; the lower line is THE AVERAGE VOLUME PER TRADE ON PRICE DECLINES. Please note how, on the secondary reaction following the 1974 low of the deepest bear market in our (pre-retirement age) lifetime, the average trade marking prices higher was expanding in size as the average trade on price concessions was diminishing. My common sense reasoning is that this is what one would expect to happen if a strong bull move were in its developing stages. But only with such a measure can we really know what and how *they* are doing. We learned long ago, it's not what they're *saying*, but what they're *doing* that's important!

Using the NYSE TAQ data, we can develop programs to achieve a measure of pressure based upon the trend of data from where trades are executed within the bid/ask spread. However, as explained earlier with the last sale entries, quote entries can be out of sequence with the trade. Quotes are on a separate feed and may be updated prior to the last sale's being printed. Another measure I am thinking about is the amount of cumulative time (on a transaction basis) that issues remain on plus-ticks and/or plus tick-bid. Come to think of it, this is not very different from what Messrs. Dow and Wyckoff were working on about around a century ago — **Supply and Demand**! But, instead of studying 700 daily trades on the New York Stock Exchange, our computers must screen 195,000.[27] Yet, **the principles remain the same**!

Conclusions

It would be a mistake for the serious student of trading and investing to ignore stock and commodity market writings dating back as far as a century by assuming they are irrelevant to today's markets. Many changes have evolved with advancing technology in the 128-year history of the ticker, but there are still some valuable insights to be learned from the market legends.

Neither should one be satisfied that there is no room left for analytical discovery by assuming that we have it all with today's colorful data displays. There remains significant room for improvement, not only *from* the ticker, through faster data collection and re-transmission by the vendors, but *to* the ticker from the originating exchange and NASDAQ. This report has revealed that even the NYSE, which is the standard by which others have been measured, is not yet perfect in the sequential reporting of last sale prices and quotations.

Readers should now more fully understand how easily data can be flawed: last sales may not be reported in the sequence in which the trade actually occurred, and quotations may be updated before a transaction which prompted the update is disseminated. Such facts are important not only to the transactional data analyst but even to a public customer who, when watching for a specific transaction report,

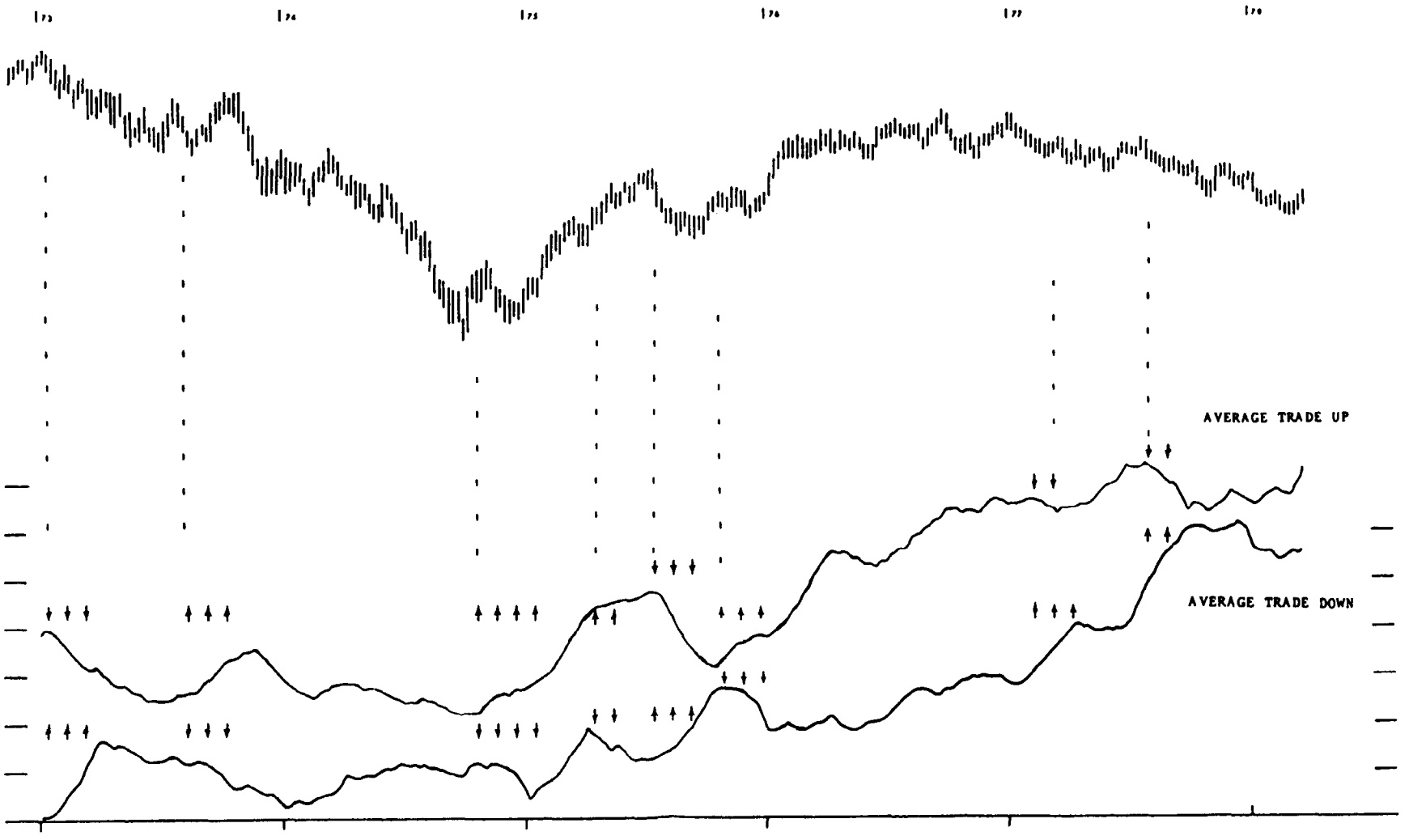


EXHIBIT SIX

Hale's Average Size Trade Indicator

The top line is the Average Volume Per Trade on Price Advances. The lower line is the Average Volume Per Trade on Price Declines. This graph covers a five year period including the major bear market low in 1974.

may erroneously think that an order was not filled when it appeared to be entitled, or that the price was out of line with the price/quote displayed at the reported time of the trade. It has been shown that the timeliness and accuracy of the data feed is of great importance and that there are significant differences in reporting efficiencies among various vendors.

Scores of research papers have been published by academics in the past few years using the transactional data obtained from the Exchange's Market Data Products Division and the Institute for the Study of Security Markets. With the cooperation of the NYSE, the ISSM has available price and volume data for every trade and quote on the NYSE and AMEX from 1983 and NASDAQ from 1990 through 1992, time stamped to the nearest second. These data have been the source for several highly publicized articles, some critical, especially those relating to the NASDAQ market. The debate caused by several of these studies may lead to some of the desired improvements mentioned earlier.

Among the many market professionals with whom I've spoken in preparing this report, I was surprised at the small number of analysts who were aware of the availability of these detailed historical trade and quote data files. It appears the academic community has devoted much more research effort in their use than have professional market analysts.

I continue to be amazed that with all the computer power involved in driving our display terminals, many vendors are duplicating each other's output. I am hopeful that this report will stimulate some to review the situation and to not only realize the importance of correct, sequential trade reporting, but to incorporate new ways to manage the data in the development of more accurate studies of supply and demand.

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6. MTA Board Member Dr. Henry O. Pruden is Distinguished Visiting Professor in the School of Finance and Economics at Golden Gate University, San Francisco, CA.

7. "What Fits A Man to Write As an Authority," Promotion Piece, by W.D. Gann, p. 9.

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9. *My Life Story*, W. King Grant, Sr. Privately Published for Family, (1973).

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