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Knowledge about Stock Exchange

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ABSTRACT: A stock exchange, securities exchange, or bourse is an exchange where stockbrokers and traders can buy and sell securities, such as shares of stock, bonds and other financial instruments. Stock exchanges may also provide facilities for the issue and redemption of such securities and instruments and capital events including the payment of income and dividends. Securities traded on a stock exchange include stock issued by listed companies, unit trusts, derivatives, pooled investment products and bonds. Stock exchanges often function as "continuous auction" markets with buyers and sellers consummating transactions via open outcry at a central location such as the floor of the exchange or by using an electronic trading platform.[2]

To be able to trade a security on a certain stock exchange, the security must be listed there. Usually, there is a central location for record keeping, but trade is increasingly less linked to a physical place as modern markets use electronic communication networks, which give them advantages of increased speed and reduced cost of transactions. Trade on an exchange is restricted to brokers who are members of the exchange. In recent years, various other trading venues such as electronic communication networks, alternative trading systems and "dark pools" have taken much of the trading activity away from traditional stock exchanges.[3]

Initial public offerings of stocks and bonds to investors is done in the primary market and subsequent trading is done in the secondary market. A stock exchange is often the most important component of a stock market. Supply and demand in stock markets are driven by various factors that, as in all free markets, affect the price of stocks (see stock valuation).

There is usually no obligation for stock to be issued through the stock exchange itself, nor must stock be subsequently traded on an exchange. Such trading may be off exchange or over-the-counter. This is the usual way that derivatives and bonds are traded. Increasingly, stock exchanges are part of a global securities market. Stock exchanges also serve an economic function in providing liquidity to shareholders in providing an efficient means of disposing of shares.

KEYWORDS-stock,exchange,shares,brokers,trading,market,counter

I. INTRODUCTION

Stock market-based economies launched with BC Phoenicia's large trade network.[4] The beginnings of lending were in Italy in the late Middle Ages. In the 1300s, Venetian lenders would carry slates with information on the various issues for sale and meet with clients, much like a broker does today. [5] The Real Merchants of Venice introduced the principle of exchanging debts between moneylenders; a lender looking to unload a high-risk, high-interest loan might exchange it for a different loan with another lender. These lenders also bought government debt issues.[6] As the natural evolution of their business continued, the lenders began to sell debt issues to the first individual investors in the late 1900s. The Venetians were the leaders in the field and the first to start trading securities from other governments, yet did not embark on private trade with India. Nor did the Italians connect on land with the Chinese Silk Road. Along the potential overland trade route, Habsburg (Austrian) emperor Frederick II repulsed advances by Mongol Batu Kahn (Golden Horde) in 1241.[7] There is little consensus among scholars as to when corporate stock was first traded. Some view the key event as the Dutch East India Company's founding in 1602,[8] while others point to much earlier developments (Bruges, Antwerp in 1531 and in Lyon in 1548). The first book in history of securities exchange, the Confusion of Confusions, was written by the Dutch-Jewish trader Joseph de la Vega and the Amsterdam Stock Exchange is often considered the oldest "modern" securities market in the world.[9] On the other hand, economist Ulrike Malmendier of the University of California at Berkeley argues that a share market existed as far back as ancient Rome, that derives from Etruscan "Argentari". In the Roman Republic, which existed for centuries before the Empire was founded, there were societates publicanorum, organizations of contractors or leaseholders who performed temple-building and other services for the government. One such service was the feeding of geese on the Capitoline Hill as a reward to the birds after their honking warned of a Gallic invasion in 390 B.C. Participants in such organizations had partes or shares, a concept mentioned various times by the statesman and orator Cicero. In one speech, Cicero mentions "shares that had a very high price at the time". Such evidence, in Malmendier's view, suggests the instruments were tradable, with fluctuating values based on an organization's success. The societas declined into obscurity in the time of the emperors, as most of their services were taken over by direct agents of the state.

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Tradable bonds as a commonly used type of security were a more recent innovation, spearheaded by the Italian city-states of the late medieval and early Renaissance periods.[10]

A 17th-century engraving depicting the Amsterdam Stock Exchange

Joseph de la Vega, also known as Joseph Penso de la Vega and by other variations of his name, was an Amsterdam trader from a Spanish Jewish family and a prolific writer as well as a successful businessman in 17th-century Amsterdam. His 1688 book Confusion of Confusions[11] explained the workings of the city's stock market. It was the earliest book about stock trading and inner workings of a stock market, taking the form of a dialogue between a merchant, a shareholder and a philosopher, the book described a market that was sophisticated but also prone to excesses, and de la Vega offered advice to his readers on such topics as the unpredictability of market shifts and the importance of patience in investment.


London Stock Exchange in 1810

In England, the Dutch King William III sought to modernize the kingdom's finances to pay for its wars, and thus the first government bonds were issued in 1693 and the Bank of England was set up the following year. Soon thereafter, English joint-stock companies began going public.

London's first stockbrokers, however, were barred from the old commercial center known as the Royal Exchange, reportedly because of their rude manners. Instead, the new trade was conducted from coffee houses along Exchange Alley. By 1698, a broker named John Castaing, operating out of Jonathan's Coffee House, was posting regular lists of stock and commodity prices. Those lists mark the beginning of the London Stock Exchange.[12]

One of history's greatest financial bubbles occurred around 1720. At the center of it were the South Sea Company, set up in 1711 to conduct English trade with South America, and the Mississippi Company, focused on commerce with France's Louisiana colony and touted by transplanted Scottish financier John Law, who was acting in effect as France's central banker. Investors snapped up shares in both, and whatever else was available. In 1720, at the height of the mania, there was even an offering of "a company for carrying out an undertaking of great advantage, but nobody to know what it is".

By the end of that same year, share prices had started collapsing, as it became clear that expectations of imminent wealth from the Americas were overblown. In London, Parliament passed the Bubble Act, which stated that only royally chartered companies could issue public shares. In Paris, Law was stripped of office and fled the country. Stock trading was more limited and subdued in subsequent decades. Yet the market survived, and by the 1790s shares were being traded in the young United States. On May 17, 1792, the New York Stock Exchange opened under a Platanus occidentalis (buttonwood tree) in New York City, as 24 stockbrokers signed the Buttonwood Agreement, agreeing to trade five securities under that buttonwood tree.[13]


The New Oriental Bank and Share Market, Bombay (now Mumbai) in 1875 acting as Bombay Stock Exchange

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Bombay Stock Exchange was started by Premchand Roychand in 1875.[14] While BSE Limited is now synonymous with Dalal Street, it was not always so. In the 1850s, five stock brokers gathered together under a Banyan tree in front of Mumbai Town Hall, where Horniman Circle is now situated.[15] A decade later, the brokers moved their location to another leafy setting, this time under banyan trees at the junction of Meadows Street and what was then called Esplanade Road, now Mahatma Gandhi Road. With a rapid increase in the number of brokers, they had to shift places repeatedly. At last, in 1874, the brokers found a permanent location, the one that they could call their own. The brokers group became an official organization known as "The Native Share & Stock Brokers Association" in 1875.[16]

The Bombay Stock Exchange continued to operate out of a building near the Town Hall until 1928. The present site near Horniman Circle was acquired by the exchange in 1928, and a building was constructed and occupied in 1930. The street on which the site is located came to be called Dalal Street in Hindi (meaning "Broker Street") due to the location of the exchange.

On 31 August 1957, the BSE became the first stock exchange to be recognized by the Indian Government under the Securities Contracts Regulation Act. Construction of the present building, the Phiroze Jeejeebhoy Towers at Dalal Street, Fort area, began in the late 1970s and was completed and occupied by the BSE in 1980. Initially named the BSE Towers, the name of the building was changed soon after occupation, in memory of Sir Phiroze Jamshedji Jeejeebhoy, chairman of the BSE since 1966, following his death.

In 1986, the BSE developed the S&P BSE SENSEX index, giving the BSE a means to measure the overall performance of the exchange. In 2000, the BSE used this index to open its derivatives market, trading S&P BSE SENSEX futures contracts. The development of S&P BSE SENSEX options along with equity derivatives followed in 2001 and 2002, expanding the BSE's trading platform.

Historically an open outcry floor trading exchange, the Bombay Stock Exchange switched to an electronic trading system developed by Cmc ltd. in 1995. It took the exchange only 50 days to make this transition. This automated, screen-based trading platform called BSE On-Line Trading (BOLT) had a capacity of 8 million orders per day. Now BSE has raised capital by issuing shares and as on 3 May 2015 the BSE share which is traded in NSE only closed with ₹999.[17]

II. DISCUSSION

Stock exchanges have multiple roles in the economy. This may include the following:[18]

Raising capital for businesses

Besides the borrowing capacity provided to an individual or firm by the banking system, in the form of credit or a loan, a stock exchange provides companies with the facility to raise capital for expansion through selling shares to the investing public.[19]

Capital intensive companies, particularly high tech companies, typically need to raise high volumes of capital in their early stages. For this reason, the public market provided by the stock exchanges has been one of the most important funding sources for many capital intensive startups. In the 1990s and early 2000s, hi-tech listed companies experienced a boom and bust in the world's major stock exchanges. Since then, it has been much more demanding for the high-tech entrepreneur to take his/her company public, unless either the company is already generating sales and earnings, or the company has demonstrated credibility and potential from successful outcomes: clinical trials, market research, patent registrations, etc. This is quite different from the situation of the 1990s to early-2000s period, when a number of companies (particularly Internet boom and biotechnology companies) went public in the most prominent stock exchanges around the world in the total absence of sales, earnings, or any type of well-documented promising outcome. Though it is not as common, it still happens that highly speculative and financially unpredictable hi-tech startups are listed for the first time in a major stock exchange. Additionally, there are smaller, specialized entry markets for these kind of companies with stock indexes tracking their performance (examples include the Alternext, CAC Small, SDAX, TecDAX).

Alternatives to stock exchanges for raising capital

Alternative investment funds refer to funds that include hedge funds, venture capital, private equity, angel funds, real estate, commodities, collectibles, structured products, etc. Alternative investment funds are an alternative to traditional investment options (stocks, bonds, and cash).

Research and Development limited partnerships

Companies have also raised significant amounts of capital through R&D limited partnerships. Tax law changes that were enacted in 1987 in the United States changed the tax deductibility of investments in R&D limited partnerships. In order for a partnership to be of interest to investors today, the cash on cash return must be high enough to entice investors.

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Venture capital

A general source of capital for startup companies has been venture capital. This source remains largely available today, but the maximum statistical amount that the venture company firms in aggregate will invest in any one company is not limitless (it was approximately $15 million in 2001 for a biotechnology company).

Corporate partners

Another alternative source of cash for a private company is a corporate partner, usually an established multinational company, which provides capital for the smaller company in return for marketing rights, patent rights, or equity. Corporate partnerships have been used successfully in a large number of cases.

Mobilizing savings for investment

When people draw their savings and invest in shares (through an initial public offering or the seasoned equity offering of an already listed company), it usually leads to rational allocation of resources because funds, which could have been consumed, or kept in idle deposits with banks, are mobilized and redirected to help companies' management boards finance their organizations. This may promote business activity with benefits for several economic sectors such as agriculture, commerce and industry, resulting in stronger economic growth and higher productivity levels of firms.

Facilitating acquisitions

Companies view acquisitions as an opportunity to expand product lines, increase distribution channels, hedge against volatility, increase their market share, or acquire other necessary business assets. A takeover bid or mergers and acquisitions through the stock market is one of the simplest and most common ways for a company to grow by acquisition or fusion.

Profit sharing

Both casual and professional stock investors, as large as institutional investors or as small as an ordinary middle-class family, through dividends and stock price increases that may result in capital gains, share in the wealth of profitable businesses. Unprofitable and troubled businesses may result in capital losses for shareholders.

Corporate governance

By having a wide and varied scope of owners, companies generally tend to improve management standards and efficiency to satisfy the demands of these shareholders and the more stringent rules for public corporations imposed by public stock exchanges and the government. This improvement can be attributed in some cases to the price mechanism exerted through shares of stock, wherein the price of the stock falls when management is considered poor (making the firm vulnerable to a takeover by new management) or rises when management is doing well (making the firm less vulnerable to a takeover). In addition, publicly listed shares are subject to greater transparency so that investors can make informed decisions about a purchase. Consequently, it is alleged that public companies (companies that are owned by shareholders who are members of the general public and trade shares on public exchanges) tend to have better management records than privately held companies (those companies where shares are not publicly traded, often owned by the company founders, their families and heirs, or otherwise by a small group of investors).

Despite this claim, some well-documented cases are known where it is alleged that there has been considerable slippage in corporate governance on the part of some public companies, particularly in the cases of accounting scandals. The policies that led to the dot-com bubble in the late 1990s and the subprime mortgage crisis in 2007–08 are also examples of corporate mismanagement. The mismanagement of companies such as Pets.com (2000), Enron (2001), One.Tel (2001), Sunbeam Products (2001), Webvan (2001), Adelphia Communications Corporation (2002), MCI WorldCom (2002), Parmalat (2003), American International Group (2008), Bear Stearns (2008), Lehman Brothers (2008), General Motors (2009) and Satyam Computer Services (2009) all received plenty of media attention.

Many banks and companies worldwide utilize securities identification numbers (ISIN) to identify, uniquely, their stocks, bonds and other securities. Adding an ISIN code helps to distinctly identify securities and the ISIN system is used worldwide by funds, companies, and governments.

However, when poor financial, ethical or managerial records become public, stock investors tend to lose money as the stock and the company tend to lose value. In the stock exchanges, shareholders of underperforming firms are often penalized by significant share price decline, and they tend as well to dismiss incompetent management teams.

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| Volume 4, Issue 12, December 2017 |

Creating investment opportunities for small investors

As opposed to other businesses that require huge capital outlay, investing in shares is open to both the large and small stock investors as minimum investment amounts are minimal. Therefore, the stock exchange provides the opportunity for small investors to own shares of the same companies as large investors.

Government capital-raising for development projects

Governments at various levels may decide to borrow money to finance infrastructure projects such as sewage and water treatment works or housing estates by selling another category of securities known as bonds. These bonds can be raised through the stock exchange whereby members of the public buy them, thus loaning money to the government. The issuance of such bonds can obviate, in the short term, direct taxation of citizens to finance development—though by securing such bonds with the full faith and credit of the government instead of with collateral, the government must eventually tax citizens or otherwise raise additional funds to make any regular coupon payments and refund the principal when the bonds mature.

Barometer of the economy

At the stock exchange, share prices rise and decreases depending, largely, on economic forces. Share prices tend to rise or remain stable when companies and the economy in general show signs of stability and growth. A recession, depression, or financial crisis could eventually lead to a stock market crash. Therefore, the movement of share prices and in general of the stock indexes can be an indicator of the general trend in the economy.

Listing requirements

Each stock exchange imposes its own listing requirements upon companies that want to be listed on that exchange. Such conditions may include minimum number of shares outstanding, minimum market capitalization, and minimum annual income.

Examples of listing requirements

The listing requirements imposed by some stock exchanges include:

- New York Stock Exchange: the New York Stock Exchange (NYSE) requires a company to have issued at least 1.1 million shares of stock worth $40 million and must have earned more than $10 million over the last three years.[20]
- NASDAQ Stock Exchange: NASDAQ requires a company to have issued at least 1.25 million shares of stock worth at least $70 million and must have earned more than $11 million over the last three years.[21]
- London Stock Exchange: the main market of the London Stock Exchange requires a minimum market capitalization (£700,000), three years of audited financial statements, minimum public float (25%) and sufficient working capital for at least 12 months from the date of listing.
- Bombay Stock Exchange: Bombay Stock Exchange (BSE) requires a minimum market capitalization of ₹250 million (US$3.1 million) and minimum public float equivalent to ₹100 million (US$1.3 million).[22]

Ownership

Stock exchanges originated as mutual organizations, owned by its member stockbrokers. However, the major stock exchanges have demutualized, where the members sell their shares in an initial public offering. In this way the mutual organization becomes a corporation, with shares that are listed on a stock exchange. Examples are Australian Securities Exchange (1998), Euronext (merged with New York Stock Exchange), NASDAQ (2002), Bursa Malaysia (2004), the New York Stock Exchange (2005), Bolsas y Mercados Españoles, and the São Paulo Stock Exchange (2007).

The Shenzhen Stock Exchange and Shanghai Stock Exchange can be characterized as quasi-state institutions insofar as they were created by government bodies in China and their leading personnel are directly appointed by the China Securities Regulatory Commission.

Another example is Tashkent Stock Exchange established in 1994, three years after the collapse of the Soviet Union, mainly state-owned but has a form of a public corporation (joint-stock company). Korea Exchange (KRX) owns 25% less one share of the Tashkent Stock Exchange.[23]

In 2015, there were 15 licensed stock exchanges in the United States, of which 13 actively traded securities. All of these exchanges were owned by three publicly traded multinational companies, Intercontinental Exchange, Nasdaq, Inc., and Cboe Global Markets, except one, IEX.[24][25] In 2013, a group of financial corporations announced plans to

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| Volume 4, Issue 12, December 2017 |

open a members owned exchange, MEMX, an ownership structure similar to the mutual organizations of earlier exchanges.[26][24]

Other types of exchanges

In the 19th century, exchanges were opened to trade forward contracts on commodities. Exchange traded forward contracts are called futures contracts. These commodity markets later started offering future contracts on other products, such as interest rates and shares, as well as options contracts. They are now generally known as futures exchanges.

III. RESULTS

A Stock exchange is a corporation or mutual organization which provides facilities for stockbrokers and traders to trade stocks and other securities. It may be a physical trading room where the traders gather, or a formalised communications network. Creation of a stock exchange is a strategy of economic development: it provides a means of raising capital for investment. Stock markets may enhance economic activity through the creation of liquidity: a liquid equity market makes investment more attractive because it allows individuals to acquire equity and when required to sell it quickly and cheaply. At the same time, companies enjoy permanent access to capital raised through equity issues. It has been found that countries that open stock markets grow faster, on average, than the control groups.[1]

An alternative view is that market liquidity may also hurt economic growth, because it encourages short-termism.[2] A downside of raising capital on a stock exchange is that it may result in loss of company control, typically to powerful large investors. Foreign ownership of securities and assets is often unappealing.[3] Extremely low income levels keep share ownership beyond the reach of most people in developing countries.

Countries without a stock exchange include Democratic Republic of the Congo.[4]

The Mongolian Stock Exchange as of 2006 was the world's smallest stock exchange by market capitalisation.[5][6]

Planned

Angola

The Angola Debt and Stock Exchange (Bodiva) is a stock exchange in Angola. First announced in 2006,[7] the Stock Exchange was hoping to open during the first quarter of the 2008 fiscal year,[8] though in August 2008 Aguinaldo Jaime said that the launch would be "a task for the next government... maybe late 2008 or the beginning of 2009".[9] On December 19, 2014, the capital market in Angola started.

Afghanistan Stock Exchange

Afghanistan Stock Exchange is part of the planned Economic development of Afghanistan. It will operate Afghanistan's first liquid exchange to offer the most diverse array of financial products and services. AFX will bring together cash equities exchanges and foreign exchanges, to be the leader for listings, trading in cash equities, equity and interest rate derivatives, bonds and the distribution of market data in Afghanistan.

New or revised

Maldives Stock Exchange

The Maldives Stock Exchange, is a private sector Stock Exchange in Malé. It was first established on 14 April 2002. It is very small, with only 10 companies listed.[10]

Iraq Stock Exchange

The Iraq Stock Exchange was incorporated and began operations in June 2004.[11] It operates under the oversight of the Iraq Securities Commission, an independent commission modeled after the U.S. Securities and Exchange Commission. Before the 2003 invasion of Iraq, it was called the Baghdad Stock Exchange and was operated by the Iraqi Ministry of Finance. Now it is a self-regulated organization like the New York Stock Exchange, owned by the 50 or so member brokerage firms.[12] The trading floor is now open six hours a week.[13]

Trading is done with pen and paper. Buyers shout at or call into their brokers, who stand their white dry-erase boards that list each company's share buy and sell price. This continues despite plans to implement electronic trading.[14][15]

Trading was suspended for several months in 2006 due to violence,[14] and is subject to power outages.

The ISX opened to foreign investors on August 2, 2007.

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| Volume 4, Issue 12, December 2017 |

Dar es Salaam Stock Exchange

The Dar es Salaam Stock Exchange is a stock exchange located in Dar es Salaam, the largest city in Tanzania. It was incorporated in September 1996 and trading started in April 1998; it is a member of the African Stock Exchanges Association. There are currently 27 listed companies.

Douala Stock Exchange

The Douala Stock Exchange is the official market for securities in Cameroon. It is located in Douala. It was created in December 2001. Until 2006, its sole listing was Société des Eaux Minérales du Cameroun (SEMC). Now it also includes Société Africaine Forestière et Agricole du Cameroun (SAFACAM).[16]

IV. CONCLUSIONS

Stock market data systems communicate market data—information about securities and stock trades—from stock exchanges to stockbrokers and stock traders.

History

The earliest stock exchanges were in France in the 12th century and in Bruges and Italy in the 13th. Presumably data about trades in those times was written down by scribes and traveled by courier. In the early 19th century Reuters sent data by carrier pigeons between Germany and Belgium[1] In London early exchanges were located near coffee houses[2] which may have played a part in trading.

Chalk boards

In the late 1860s, in New York, young men called "runners" prices between the exchange and broker's offices, and often these prices were posted by hand on large chalk boards in the offices.[3] Updating a chalk board was an entry point for many traders getting into financial markets and as mentioned in the book Reminiscences of a Stock Operator those updating the boards would wear fur sleeves so they wouldn't accidentally erase prices.

The New York Stock Exchange is known as the "Big Board", perhaps because of these large chalk boards. Until recently, in some countries such chalkboards continued in use. Morse code was used in Chicago until 1967 for traders to send data to clerks called "board markers".[4]

Newspapers

From 1797 to 1811 in the United States, the New York Price Current was first published. It was apparently the first newspaper to publish stock prices, and also showed prices of various commodities.

In 1884 the Dow Jones company published the first stock market averages, and in 1889 the first issue of the Wall Street Journal appeared. As time passed, other newspapers added market pages.[5] The New York Times was first published in 1851, and added stock market tables at a later date.

Electronic systems

In 1863 Edward A. Calahan of the American Telegraph Company invented a stock telegraph printing instrument which allowed data on stocks, bonds, and commodities to be sent directly from exchanges to broker offices around the country. It printed the data on 0.75 inches (1.9 cm) wide paper tape wound on large reels. The sound it made while printing earned it the name "stock ticker". Other inventors improved on this device, and ultimately Thomas Edison patented a "universal stock ticker", selling over 5,000 in the late 19th century.[3]

In the early 20th century Western Union acquired rights to an improved ticker which could deal with the increasing volume of stocks sold per day.[3]

At the time of the stock market crash in October, 1929, trading volumes were so high that the tickers fell behind, contributing to the panic. In the 1930s the New York Quotation Stock Ticker became widely used. A further improvement was in place in 1960.[3]

In 1923 Trans Lux Corporation delivered a rear projection system which projected the moving ticker onto a screen where all in a brokerage office could see it. It was a great success, and by 1949 there were more than 1400 stock-ticker projectors in the U.S. and another 200 in Canada. In 1959 they started shipping a Trans-Video system called CCTV which gave a customer a small video desk monitor where he could monitor the tickers.[6]

In August 1963 Ultronics introduced Lectrascan, the first wall mounted all electronic ticker display system. By 1964 there were over 1100 units in operation in stock broker offices in the U.S. and Canada.[7]

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| Volume 4, Issue 12, December 2017 |

Competition, including Ultronics' Lectrscan electron wall system, led Trans-Lux to introduce the Trans-Lux Jet. Jets of air controlled lighted disks which moved on a belt on the broker's wall. Brokers ordered over 1000 units in the first six months, and by the middle of 1969 more than 3000 were in use in the U.S. and Canada.[6]

Automatic quotation boards

A quotation board is a large vertical electronic display located in a brokerage office, which automatically gives current data on stocks chosen by the local broker. In 1929 the Teleregister Corporation installed the first such display, and by 1964 over 650 brokerage offices had them.

The information included the previous day's closing price, opening price, high for the day, low for the day, and current price. Teleregister offered data from the New York, American, Midwest, Chicago Mercantile, Commodity, New York Cocoa, New York coffee and sugar, New York Mercantile, New York Produce, New York Cotton, and New Orleans Cotton exchanges, along with the Chicago Board of Trade.[8]

Some firms had a battery of telephone operators seated in front of a Teleregister board to supply commission houses with price and volume data. In 1962 two such batteries handled over 39,000 calls per day.[9]

In 1955 Scantlin Electronics, Inc. introduced a competitive display system very similar in appearance but with digits twice the size of Teleregister's, fitting into the same board area. It was less expensive and soon was installed in many broker offices.

Stock market quotation systems

In the late 1950s brokers had become accustomed to several problems doing business with their customers. To make a trade, an investor had to know the current price for the stock. The investor got this from a broker who could find it on his board. If the last trade (or the stock itself) hadn't made it to the board (or there was no board) the broker telegraphed a request for the price to that firm's "wire room" in New York. There, such requests would be forwarded to the floor of the appropriate exchange, where messengers could copy down prices at the locations where those stocks were traded, and telephone answers back to the wire room. Typical elapsed times were between 15 and 30 minutes just to inform the broker.[10]

Quotron

Jack Scantlin of Scantlin Electronics, Inc. (SEI) developed the Quotron I system, consisting of a magnetic tape storage unit that could be sited at a brokerage and Desk Units with a keyboard and printer. The storage unit recorded the data from the ticker line. Brokers could enter the stock symbol on a desk unit. This triggered a backward search on the magnetic tape (which continued recording incoming ticker data). When a transaction was located, the price was sent to the desk unit, which printed it on a tape.

The first Quotron units were installed in 1960, and were an immediate success. By the end of 1961 brokers were leasing Quotrons in some 800 offices, serving some 2,500 desk units across the United States.[10]

Ultronics vs. Quotron

Quotron's success attracted the attention of Robert S. Sinn, who observed its disadvantages: it could only give a last price. The opening price, high and low for the day, and share volume were not available. His system received the ticker transmissions from the various stock and commodity exchanges. These were then automatically interpreted by a hard wired digital computer updating a drum memory with the last sale prices and at the same time computing and updating highs and lows and total volume for each stock. As these items were updated a data packet would be generated for transmission by AT&T Dataphone at 1000 bits/second to identical magnetic drum storage devices in each major city in the United States. These slave drum memory units located in the metropolitan centers in the US could then be accessed by desk units in local stock brokerage offices again using Dataphone transmission. The desk units would set up the ticker symbol code for the desired stock by mechanical means actuating micro switches. The local control box would continuously interrogate each desk unit in sequence and send a request data packet by Dataphone to the local drum memory which would then send return data packets back to the local brokerage office. Each packet both for request and answer would contain the request stock alphabetic symbols plus a desk unit identifier. Because the desk units set up the requested stock code statically the desk unit would automatically update the stock price, volume, and highs and lows without any operator intervention because the control unit could complete the interrogation of all desk units in the office in about every one or two seconds, This is the first use of data packet transmission with the sender's identification imbedded in the data packet in order to avoid switching- a forerunner of the internet? There was no switching in the entire system; all was done with data packets containing sender identifiers.

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| Volume 4, Issue 12, December 2017 |

Sinn formed Ultronic Systems Corp. in December 1960, and was president and CEO from then until he left the company in 1970. By the fall of 1961 Ultronics had installed its first desk units (Stockmaster) in New York and Philadelphia, followed by San Francisco and Los Angeles. The Stockmaster desk units offered the user quick access and continuous monitoring of last sale, bid, ask, high, low, total volume, open, close, earnings, and dividends for each stock on the NYSE and the AMEX plus commodities from the various U.S. commodity exchanges. Ultimately Ultronics and General Telephone (which bought Ultronics in 1967) installed some 10,000 units world-wide. In June 1964 Ultronics and the British news company Reuters signed a joint venture agreement to market Stockmaster worldwide outside of North America. This venture lasted for 10 years and was very successful, capturing the worldwide market for U.S. stock and commodity price information. Ultronics invented time division multiplex equipment to utilize Reuters' voice grade lines to Europe and the Far East to transmit U.S. stock and commodity information plus Reuters' teletype news channels.[11][12]

In the early 1960s when these first desk top quotation units were developed the only real time information available from the various stock and commodity exchanges were the last sale and the bid and ask ticker lines. The last sale ticker contained every trade with both price and volume for each trade. The bid-ask ticker contained only the two prices and no size. The volume of data on the last sale ticker was therefore much greater than on the bid-ask ticker. Because of this, on high volume days the last sale ticker would run as much as fifteen minutes behind the bid-ask ticker. This time difference made having the bid-ask on their desk top unit extremely important to a stockbroker even though there was an extra charge to the exchange for this information.[13]

Scantlin Electronics reacted immediately to the Ultronic threat. In early 1962 they began work on their own computer-based system and put it into service in December, 1962. It used four Control Data CDC 160A computers in New York which recorded trading data in magnetic core memory. Major cities hosted Central Office equipment connected to newly designed Quotron II desk units in brokerage offices on which a broker could request, for any stock, price and net change from the opening, or a summary which included highs, lows, and volumes (later SEI added other features like dividends and earnings). The requests went to a Central Office, which condensed and forwarded them to the New York computer. Replies followed the sequence in reverse. The data was transmitted on AT&T's Dataphone high-speed telephone service. In 1963 the new system was accepted by many brokers, and was installed in hundreds of their offices.[10]

At the end of each day, this same system transmitted stock market pages to United Press International, which in turn sold them to its newspaper customers all over the world.

When Ultronics introduced their Stockmaster desk units in 1961 they priced the service at approximately the same price as the Quotron desk units. They did not want a price competition only a performance competition. All of these stock quote devices were sold on leases with monthly rental charges. The cost of the system, desk units and installation was therefore born solely by the vendor not the customer (broker). The pricing at that time made the units quite profitable and allowed the companies to finance the cost and use rapid accounting depreciation of the equipment. In 1964 Teleregister introduced their Telequote desk units at prices significantly less than Stockmaster or Quotron. This forced Ultronics and Scantlin to reduce the prices of their Stockmaster and Quotron systems. The Telequote desk units never did gain a significant share of the desk top quotation business, but their price cutting did seriously reduce the overall profitability of this business in the U.S.. Ultronics was fortunate to have made the joint venture arrangement with Reuters for the stock quotation business outside of North America where this price cutting was not a factor.[14]

The 1962 Cuban Missile Crisis blocked Ultronics from winning a historic first. In July 1962 AT&T launched the first commercial satellite (Telstar) to transmit television and telephone voice channels between the U.S. and England and France. This was a non-synchronous satellite which circled the earth in an elliptical orbit of about 2.5 hours, such that it gave only about 20 minutes of communication between the U.S. and Europe on each pass. Ultronics arranged with AT&T to use one of its voice channels to transmit U.S. stock prices to Paris in October 1962. All of the arrangements were made-a Stockmaster unit was installed in the Bache brokerage office on Rue Royale and all of the American Stockbrokers and the press and television were ready for this historic event. About two hours before the pass the stock transmission was cancelled because U.S. president John Kennedy was going to use the pass to send his speech to France concerning the Cuban missile crisis.[14]

Am-Quote

In 1964 Teleregister introduced the Am-Quote system[15] with which a broker could enter code numbers into a standard telephone; a second later a pleasant (prerecorded) voice repeated the code numbers and provided the required price information. This system, like Ultronics', made use of magnetic drums.

Computerized quoting

NASDAQ, founded in 1972 was the first electronic stock market. It was originally designed only as an electronic quotation system, with no ability to perform electronic trades.[16] Other systems soon followed and by the turn of the century, every exchange was using this model.

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