COMPUTER HISTORY *and* ***U.S. ECONOMICS***

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On Oct 9, 2008, the DOW and NASDAQ sank to alarming lows (**8,579.19 and 1,645.12) with the DOW dropping over 5000 points (from ~14,100) in one year despite urgent US government lowering of interest rates AND a 700 billion dollar bail-out plan to attempt to solve a credit crisis created by poor lending practices (primarily in Real Estate).** Three months later the DOW and NASDAQ had not significantly changed despite even more bail-out money given to automobile manufacturers, and additional lowering of interest rates. This triggered what was termed "The Great Recession."

In 2018 the economy had almost fully recovered, with stock markets at all time **highs**

with the exception of a typical "Correction" in February 2018 (overdue since 2013)

Let's frame this in a context relevant to our high-tech careers ……..

Computer History (Memorize everything highlighted in Yellow)

Much of the following is from sources no longer available online:
http://209.85.165.104/search?q=cache:t4gXKDRo518J:timelines.ws/subjects/Computer.HTML+%22history+of+the+personal+computer%22+powerpc+intel+motorola&hl=en&ct=clnk&cd=9&gl=us
http://www.timelinesdb.com

PRE -1900 H**istory of the modern computer begins with two technologies - automated calculation and programmability**. Early mechanical devices included the **abacus (**2700–2300 BC), the **slide rule (1600's)** ..... In 1837, Charles Babbage designed a fully programmable mechanical computer "The Analytical Engine".

1914 Thomas J. Watson Sr. began the Computing-Tabulating-Recording Co., a predecessor to IBM. He converted the financial business into the international giant **IBM**. In 1924 .

1937 **Alan Turing** published a paper showing that a universal machine could be designed to perform the functions and do the work of any device designed for problem-solving. More important, his paper showed that a digital computer could theoretically be designed to do the work of any analog computer. He is considered the **founder of artificial intelligence**.

1941 "Z machines". The Z3 (1941) was the first working machine featuring binary arithmetic, including **floating point arithmetic** and a measure of programmability.

1943 Top Secret, 1946 announced **THE FIRST COMPUTER**, the Electronic Numerical Integrator and Calculator (**ENIAC**), at the University of Pennsylvania. It up an entire room, weighed 30 tons and used 18,000 vacuum tubes to perform functions such as counting to 5,000 in one second. ENIAC, costing $450,000, was designed by the U.S. Army during World War II to make artillery calculations. The development of ENIAC paved the way for modern computer technology--but even today's average calculator possesses more computing power than ENIAC did.

1945 The 1st "**bug**" in a computer program**. A moth** was removed with tweezers from a relay and taped into the log.

1946 John Tukey, statistician at Bell Labs, coined the term "**bit** "for binary digit.

1947 **Hewlett-Packard** incorporated

1947 **TRANSISTOR** invented at Bell Labs.

1951 **UNIVAC**, first computer for **commercial purposes**, was demonstrated in **Philadelphia**

1953 Remington-Rand developed **1st high-speed printer** for use on Univac mainframe computer.

1954 1st **FORTRAN** computer program

1955 Stanford's **1st programming course**, Math 139: Theory and Operation of Computing Machines.

1956 **IBM** developed a way to store computer data on a metal disk instead of on tape or drum. The **first commercial disk drive**, called RAMAC (random access method of accounting and control), was developed by IBM and sold for $50,000. It used 50 disk platters, each 2-feet in diameter. Together they held 5 megabytes of data. His Random Access Method of Accounting Control began the disk drive industry.

1956 The computer **mouse** was invented at SRI Int'l.

1958 John Tukey statistician, became the 1st person to define the programs on which electronic calculators ran as **"software."**

1958 **First video game** created by physicist William Higinbothanm (a tennis game like "Pong")

1959 Robert Noyce of Fairchild Semiconductor constructed **first INTEGRATED CIRCUIT (IC)**. Both **Texas Instruments** and Fairchild claimed independent discovery of the IC. Noyce went on to found Intel Corp. Jack Kilby of Texas Instruments had made a working prototype in 1958.

1960 **IBM** Pres. Thomas J. Watson committed $5 billion to develop the **System/360** computer. It became the most profitable series ever made.

1960 The PDP-1 was the 1st mini-computer built by the Digital Computer Corp. The **video game, Space War,** was written for it.

1962 The first recorded description of the **social interactions** that could be enabled through **networking** was a series of memos written by J.C.R. Licklider of MIT discussing his "Galactic Network" concept. He envisioned a globally interconnected set of computers through which everyone could quickly access data and programs from any site. In spirit, the concept was very much like the Internet of today. Licklider was the first head of the computer research program at **DARPA**, 4 starting in October 1962.

1964 The 1st **BASIC** program ran on a computer at Dartmouth.

1965 Gordon Moore, later Intel Chairman, noted that chips seem to double in power every 18 months. Thus was born **moore's law**. moore later asserted that his claim was that the **number of components that can be packed on a computer chip doubles every 2 years**.

1966 Texas Instruments introduced its 1st hand-held **calculator**

1967 Bell Labs in New Jersey, devised a new semiconductor **memory** device in which information could be stored and updated, and which was **non-volatile**. It retained its contents even after it was turned off.

1968 **INTEL** founded.

1968 Stanford Research Institute first demonstrated in SF the computer mouse along with a **graphical user interface (GUI)**, display editing, integrated text and graphics, hyper documents and 2-way video-conferencing with shared work spaces.

1968 The Cambridge company Bolt Beranek and Newman won a Dept. of Defense ARPA (Advanced Research Projects Agency) contract to develop **packet** switches called Interface Message Processors (IMP).

1969 The **first internet message** was a packet switch delivered to UCLA from BBN Corp. **the 1st two machines of ARPANET were connected** at Prof. Len Kleinrock's lab at UCLA. The US Dept. of Defense's Advanced Research and Projects Agency (ARPANET) launched a self-healing computer network with TCP/IP (Transmission Control Protocol / Internet Protocol). By the early 1980's the military component became a separate network and the true birth of today's Internet is marked.

1969 **Bell Labs**, wrote the first version of the **UNIX** operating system on a PDP-7, a $72,000 closet sized DEC computer that arranged memory in 8,192 18-bit words. UNIX programming language was created by Bell labs in 1970. Ken Ritchie and others helped develop Unix. Ritchie later invented the C programming language.

1969 **Intel 's** 1st product was a random access **memory (RAM)** chip. Marcian the 4004 chip for a Japanese customer, The 4004 packed 2300 transistors onto a single silicon chip.

1970 **Amdahl** Corp., a manufacturer of IBM mainframe compatible products, was formed at Sunnyvale, California

1971 **INTEL** created the **first MICROPROCESSOR.** The 4004, the world's first microprocessor

1971 **The 1st laser printer** was made at Xerox PARC in Palo Alto, Ca.

1971 Ray Tomlinson put the @ sign into the first e-mail message

1972 **1st scientific hand-held calculator**, the HP-35, was introduced at $395. This made the slide-rule obsolete.

1972 Xerox's Palo Alto Research Center (PARC) combined packet switching from the Arpanet and single wire broadcasting to lay the foundations for computer networks. This system was called **Ethernet** and marked the **first Internet message**. IEEE committee 802.3 later defined ethernet standard.

1972 Atari built the **videogame Pong**

1972 Vinton Cerf, hearing-impaired since birth, developed **E-MAIL**-like text messaging protocols for the Arpanet.

1972 Seymour Cray left Control Data Corp. and co-founded **Cray** Research Inc. There he built the Cray-1 and Cray-2 supercomputers. They were used to help the defense system create sophisticated weapons systems and the oil industry to construct geologic models for predicting mineral deposits.

1972 Intel Corp. brought out the 8008 microprocessor, the **first** to use **8-bit addressing**. it had 3,500 transistors.

1973 **ALTO,** the **1st complete computer** with a graphical interface, mouse and ethernet networking, went live at PARC.

1975 Gary Kildall, working as a consultant to Intel, was asked to design and develop a language called PL/M for the 8080 chip. He wrote a primitive **operating system** for it which he called **CP/M**.

1975 PARC engineers demonstrated an improved user interface using **icons** and the 1st use of **pop-up menus**.

1976 **Stephen Wozniak and Steven Jobs founded APPLE** computer. They incorporated Jan 3, 1977.

1976 Gary Kildall separated out the parts of CP/M version 1 that addressed the specific format of the diskettes, and placed them in a separate module he called the **BIOS, for Basic Input/Output System**. That way, the system could easily be adapted to new hardware without having to rewrite or even revise the complex heart of the software.

1977 **MICROSOFT** was formed as a partnership.

1978 The 1st Computer **Bulletin Board** System was Ward & Randy's CBBS in Chicago.

1978 Robert Miner of Oracle Corp. developed the world's 1st **relational database** program using IBM's Structured Query Language.

1979 **COMPUSERVE** began operation as the **1st computer information service**.

1979 the **Motorola 68000 microprocessor** was chosen to be used in the **macintosh** computer, which introduced the first graphical user interface. ***(the heart of the apple computers for many years)***

1979 (wikipedia) **VISICALC first SPREADSHEET program available for personal computers. it may well be the application that turned the microcomputer from a hobby for computer enthusiasts into a serious business tool**

1980 (wikipedia) **SuperCalc** was a spreadsheet application published by Sorcim in 1980, and originally bundled (along with WordStar) as part of the CP/M software package included with the Osborne 1 portable computer.An improvement over VisiCalc, SuperCalc was notable for being one of the first spreadsheet programs capable of iteratively solving circular references (cells that depend on each other's results). It would be over 10 years after the introduction of SuperCalc before this feature was implemented in Microsoft Excel, although in Lotus 1-2-3, manual programming of iterative logic could also be used to solve this issue.Versions of SuperCalc were later released for the Apple II family, for PCs running DOS., *DR. WUNDERLICH in 1982 WORKED ON A BETA-TEST VERSION OF THIS FOR HIS UNDERGRADUATE RESEARCH AT THE UNIVERSITY OF TEXAS WHERE HE CODED GRADUATE STUDENT RESEARCH PAPERS ON FINANCIAL FORECASTING AND RISK ANALYSIS, THEN PERFORMED SENSITIVITY ANALYSIS ON NET PRESENT VALUES VIA VARYING ALL VARIABLES TO CREATE "SPIDER WEB DIAGRAMS" THAT WERE PRINTED ON MAINFRAME*

1980 The computer game **Pac-Man** was first released in Japan. Pac-Man, with its characters: Blinky, Pinky, Inky and Clyde, epitomized the arcade games of the 1980s.

1980 IBM delivered its 1st prototype PC to Microsoft. IBM selected Microsoft to create MS-DOS, the operating system for its first PC. Steve Ballmer arrived from Proctor & Gamble as an assistant to Gates. Paul Allen bought the QDOS operating system (Quick and Dirty Operating System) from a rival company for $50,000. It was renamed MS-DOS and licensed to IBM. The IBM 5150 PC standardized the marketplace. ***(first "IBM PC" and included the ms-dos operating system)***

1982 **Commodore's** VIC-20, criticized in print as being underpowered, became the first computer to sell more than 1 million units and was the best-selling computer of 1982. ***(WAS HEADQUARTERED IN PHILADELPHIA AREA)***

1982 Control Video Corp. was founded as an online video game company. It transformed to Quantum Computer Services, a private online service for Apple and IBM, and then became America Online (**AOL**) in 1989. In 1998 Kara Swisher wrote "aol.com: How Steve Case beat Bill Gates, Nailed the Netheads, and Made Millions in the War for the Web.

1983 **TCP/IP** became the standard for Internet protocol.

1983 Compaq unveiled its 1st portable computer. *(the beginning of **IBM pc clones** that eventually took over the entire pc market) – now this type of machine is referred to as a **"wintel" machine)** – i.e., a microsoft **WINDOWS** **OPERATING SYSTEM** running in an **INTEL microprocessor** based PC)*

1984 Tim Berners-Lee, a researcher at cern, envisioned a computer system for researchers to share documents and databases. this grew to become the **WORLD WIDE WEB**. *(this was software and a set of rules – i.e., "protocols"-- http hypertext transfer protocol)*

1984 Michael Dell (19), a student at the Univ. of Texas, founded **Dell** Computer in Austin, Texas.

1984 John Lasseter left his animation job at Disney to join George Lucas' special effects computer group. The division was purchased in 1986 by Steve Jobs and became **Pixar**.

1985 Intel introduced its **32-bit** 80386 microcomputer chip.

1985 **NINTENDO of japan launched its first home video game console: the nintendo entertainment system**.

1986 The **US Computer Fraud and Abuse Act**. Under the act the release of a computer **virus** illegal, but the construction of viruses was not.

1986 Microsoft acquired Forethought, the developer of **PowerPoint**, for $14 million. Microsoft created its own version 3 years later. Robert Gaskins had engaged Dennis Austin to do the initial programming for PowerPoint 1.0 for Macs.

1987 Creative Labs introduced the SoundBlaster **sound card** that became a standard in personal computers. Sim Wong Hoo was the founder of Creative Tech. He later authored "Chaotic Thoughts from the Old Millennium."

1989 **NINTENDO** of japan launched its game boy product, a portable, **hand-held** system with interchangeable game packs. the game was designed by Gunpei Yokoi

1989 The **Univ. of Phoenix** enrolled 8 students in the world's **first online campus**. (http://www.uopphx.edu/online).

1990-1992 **DR**. WUNDERLICH DESIGNED TWO NEURAL NETWORK PROCESSORS *(AND BUILT ONE) SEE "NEUROCOMPUTER DESIGN"*

1991 The FTC began to investigate claims that **MICROSOFT had monopolized** the market for pc operating systems.

1994 **APPLE** introduced the power macintosh using the **POWERPC CHIP** co-developed with **IBM (mostly developed by IBM). it was able to run both apple and microsoft software.**

1994 **FRONT PAGE**, the first software program to allow people to develop a web site without mastering a programming language.

1994 **Yahoo:** "Yet Another Hierarchical Officious Oracle."

1995 **MICROSOFT** released **internet explorer** 3.0 and gave it away for free in a challenge to netscape's navigator browser..

1996 DR WUNDERLICH HELPED INCORPORATE THE FIRST 64-BIT PROCESSING IN IBM S/390 COMPUTERS

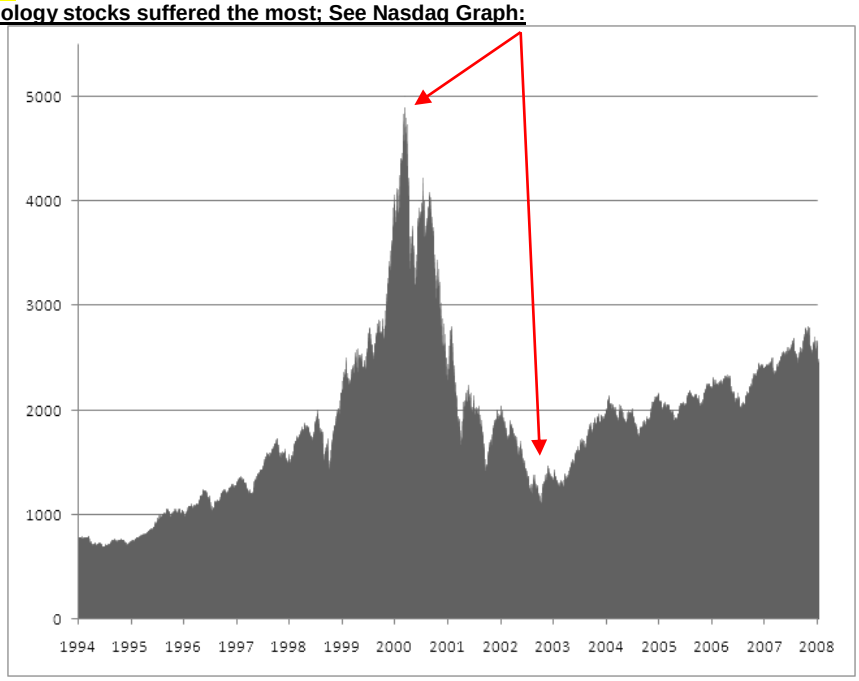
1998 U.S. Federal and state regulators filed an **antitrust suit against MICROSOFT** accusing it of using illegal actions to destroy competition.

1998 Sergey Brin, a Russian immigrant, and Larry Page of Stanford Univ. raised $1 million and launched **GOOGLE SEARCH ENGINE**

2000 **The us justice dept. and 17 states filed to split microsoft corp. into 2 corporations**.

2001 Intel unveiled its new **64-bit processor**

2001, 2002 **THE COLLAPSE OF THE DOT-COM BUBBLE**, the September 11th attacks, and accounting scandals contributed to a relatively mild contraction in the North American economy. **However, Technology stocks suffered the most; See Nasdaq Graph:**



2002 **IBM stopped making desktop computers** and sold manufacturing operations to a contract manufacturer.

2004 **EUROPEAN UNION REGULATORS** slapped a $613 million anti-trust fine against **MICROSOFT**.

2004 Mark Zuckerberg creates **FACEBOOK**

2005 **APPLE** introduced a **music-playing cell phone and pencil-thin ipod.**

2008 The **EU FINED MICROSOFT $1.3 BILLION** for charging rivals too much for software information.

2008 The **DOW** and **NASDAQ** sank to alarming lows (8,579.19 and 1,645.12) with the **DOW dropping over 5000 points** in one year despite urgent us government lowering of interest rates and a 700 billion dollar bail-out plan to attempt to solve a credit crisis created by poor lending practices for housing.

2020's AI: GOOD: Virtual and Augmented Reality to help humanity (Medicine, etc); QUESTIONABLE: Automated Journalism & Stock-picking, Deep-fakes, Autonomous cars and planes, Neural implants, Social engineering, Customer service without people

2020's ROBOTICS: GOOD: Hazardous Waste Clean-up (Covid, Nuclear, etc), Tedious tasks, Exploration, Search & Rescue, QUESTIONABLE: Autonomous weapons, Companions

U.S. ECONOMY:

Recessions (Originally from 2008 wiikipedia, then updated by Dr.W.)

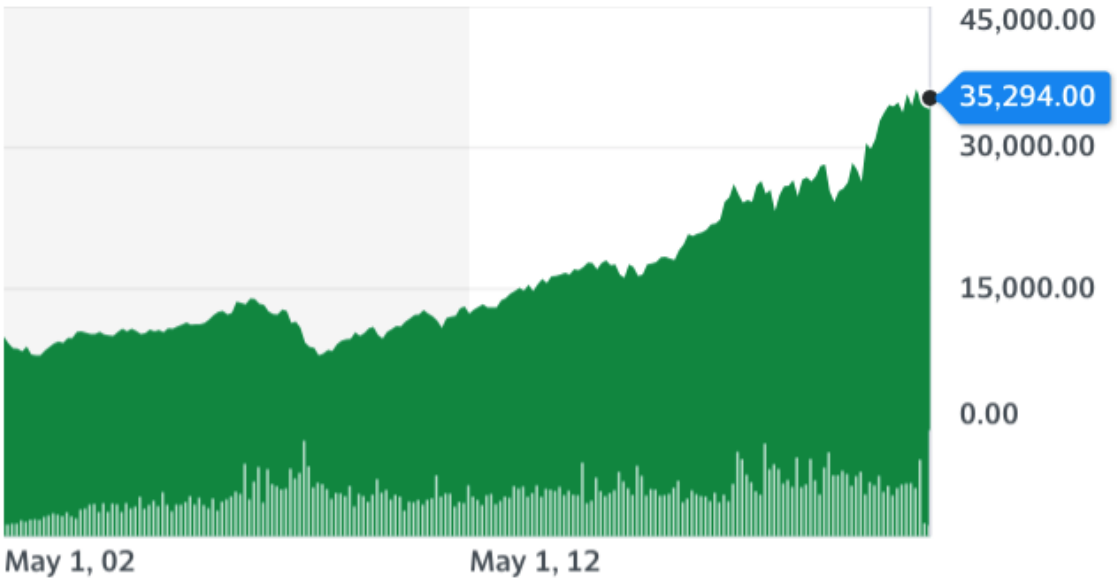
Name	Dates	Duration	Causes
Panic of 1797	1797–1800	3 years	The effects of the deflation of the Bank of England crossed the Atlantic Ocean to North America and disrupted commercial and real estate markets in the United States and the Caribbean. Britain's economy was greatly affected by developing disflationary repercussions because it was fighting France in French Revolutionary Wars at the time.
Depression of 1807	1807–1814	7 years	The Embargo Act of 1807 was passed by the United States Congress under President Thomas Jefferson. It devastated shipping-related industries. The Federalists fought the embargo and allowed smuggling to take place in New England.
Panic of 1819	1819–1824	5 years	The first major financial crisis in the United States featured widespread foreclosures, bank failures, unemployment, and a slump in agriculture and manufacturing. It also marked the end of the economic expansion that followed the War of 1812.
Panic of 1837	1837–1843	6 years	A sharp downturn in the American economy was caused by bank failures and lack of confidence in the paper currency. Speculation markets were greatly affected when American banks stopped payment in specie (gold and silver coinage).
Panic of 1857	1857–1860	3 years	Failure of the Ohio Life Insurance and Trust Company burst a European speculative bubble in United States railroads and caused a loss of confidence in American banks. Over 5,000 businesses failed within the first year of the Panic, and unemployment was accompanied by protest meetings in urban areas.
Panic of 1873	1873–1879	6 years	Economic problems in Europe prompted the failure of the Jay Cooke & Company, the largest bank in the United States, which bursted the post-Civil War speculative bubble. The Coinage Act of 1873 also contributed by immediately depressing the price of silver, which hurt North American mining interests.
Long Depression	1873–1896	23 years	The collapse of the Vienna Stock Exchange caused a depression that spread throughout the world. It is important to note that during this period, the global industrial production greatly increased. In the United States, for example, industrial output increased fourfold.
Panic of 1893	1893–1896	3 years	Failure of the United States Reading Railroad and withdrawal of European investment lead to a stock market and banking collapse. This Panic was also precipitated in part by a run on the gold supply.
Panic of 1907	1907–1908	1 year	A run on Knickerbocker Trust Company deposits on October 22, set events in motion that would lead to a severe monetary contraction.
Post-World War I recession	1918–1921	3 years	Severe hyperinflation in Europe took place over production in North America. It was a brief, but very sharp recession and was caused by the end of wartime production, along with an influx of labor from returning troops. This in turn caused high unemployment.
Great Depression	1929–1939	10 years	Stock markets crashed worldwide, and a **banking collapse** took place in the United States.
Recession of 1953	1953–1954	1 year	After a post-Korean War inflationary period, more funds were transferred into national security. The Federal Reserve changed monetary policy to be more restrictive due to fears of further inflation.
Recession of 1957	1957–1958	1 year	Monetary policy was tightened during the two years preceding 1957, followed by an easing of policy at the end of 1957. The budget balance resulted in a change in budget surplus of 0.8% of GDP in 1957 to a budget deficit of 0.6% of GDP in 1958, and then to 2.6% of GDP in 1959.
1973 oil crisis	1973–1975	2 years	A quadrupling of oil prices by OPEC coupled with high government spending due to the Vietnam War lead to stagflation in the United States.
Early 1980s recession	1980–1982	2 years	The Iranian Revolution sharply increased the price of oil around the world in 1979, causing the 1979 energy crisis. This was caused by the new regime in power in Iran, which exported oil at inconsistent intervals and at a lower volume, forcing prices to go up. Tight monetary policy in the United States to control inflation lead to another recession. The changes were made largely because of inflation that was carried over from the previous decade due to the 1973 oil crisis and the 1979 energy crisis.
Early 1990s recession	1990–1991	1 year	Industrial production and manufacturing-trade sales decreased in early 1991.
Early 2000s recession	2001–2003	2 years	**COLLAPSE OF DOT-COM BUBBLE**, **Many Tech Stock P/E Ratios (PRICE/EARNINGS) = 100 to 200**. Also Sept 11th attacks, and accounting scandals
2008	**2008-2012**	**4 years**	**"HOUSING BUBBLE" TRIGGERED "The Great Recession"** Due to poor lending practices (primarily in Real estate).
2020	2020	1 year	**COVID RECESSION** Global Pandemic killed 890,00 Americans (as of 2/2/22), caused shut down of schools and businesses; And seriously impacted medical facilities and global supply chain; And took several years to fully recover (economically **and otherwise!**)

U.S. STOCK MARKETS

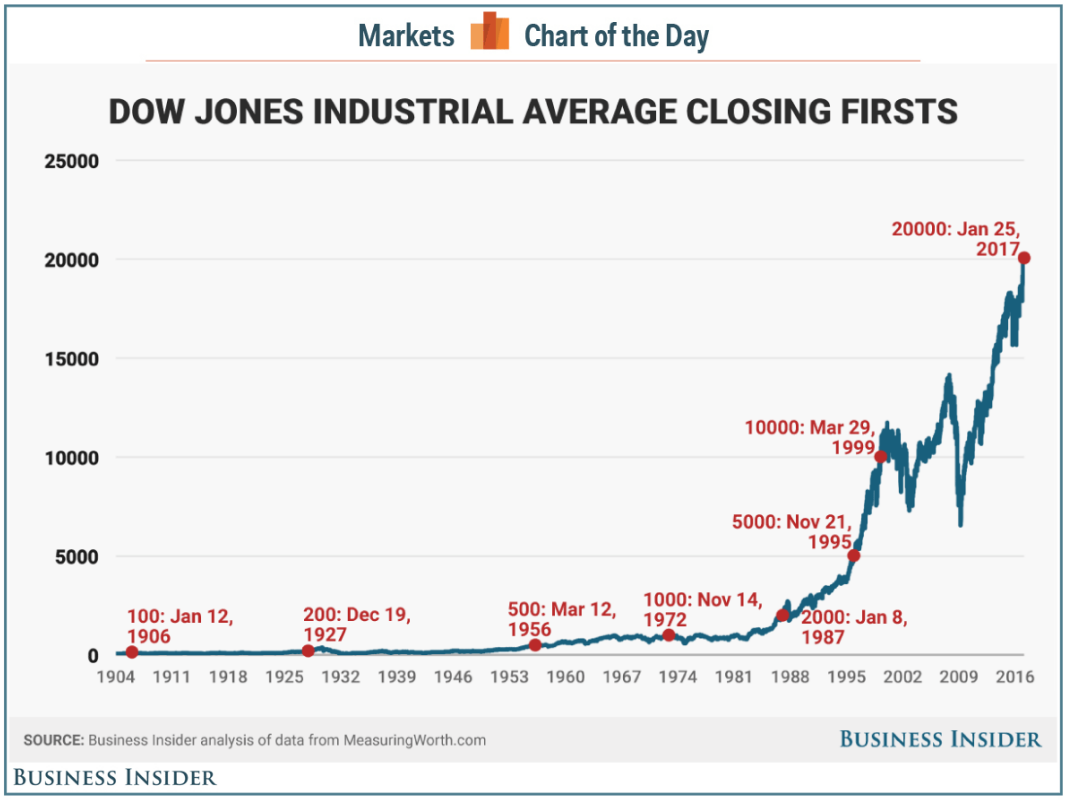
DOW JONES INDUSTRIAL AVERAGE *(part of the New York Stock Exchange)*

(From Wikipedia)
also called the **DJIA**, **Dow 30**, the **Dow Jones** or **The Dow**) is one of several stock market indices. **THE AVERAGE CONSISTS OF 30 OF THE LARGEST AND MOST WIDELY HELD PUBLIC COMPANIES** in the United States.

February 2, 2022: 35,294!



https://finance.yahoo.com/quote/YM%3DF?p=YM%3DF



http://www.businessinsider.com/dow-jones-industrial-average-landmarks-2017-1

The Dow Jones Industrial Average consists of the following 30 very large companies
Highlighted Companies are those with likely the *most* hi-tech jobs **(no need to memorize these!)**

Company	Symbol	Industry	Date Added
3M	NYSE	MMM	Conglomerate
American Express	NYSE	AXP	Consumer finance
Apple	NASDAQ	AAPL	Consumer electronics
Boeing	NYSE	BA	Aerospace and defense
Caterpillar	NYSE	CAT	Construction and mining equipment
Chevron	NYSE	CVX	Oil & gas
Cisco Systems	NASDAQ	CSCO	Computer networking
Coca-Cola	NYSE	KO	Beverages
DowDuPont	NYSE	DWDP	Chemical industry
ExxonMobil	NYSE	XOM	Oil & gas
General Electric	NYSE	GE	Conglomerate
Goldman Sachs	NYSE	GS	Banking, Financial services
The Home Depot	NYSE	HD	Home improvement retailer
IBM	NYSE	IBM	Computers and technology
Intel	NASDAQ	INTC	Semiconductors
Johnson & Johnson	NYSE	JNJ	Pharmaceuticals
JPMorgan Chase	NYSE	JPM	Banking
McDonald's	NYSE	MCD	Fast food
Merck	NYSE	MRK	Pharmaceuticals
Microsoft	NASDAQ	MSFT	Software
Nike	NYSE	NKE	Apparel
Pfizer	NYSE	PFE	Pharmaceuticals
Procter & Gamble	NYSE	PG	Consumer goods
Travelers	NYSE	TRV	Insurance
UnitedHealth Group	NYSE	UNH	Managed health care
United Technologies	NYSE	UTX	Conglomerate
Verizon	NYSE	VZ	Telecommunication
Visa	NYSE	V	Consumer banking
Walmart	NYSE	WMT	Retail
Walt Disney	NYSE	DIS	Broadcasting and entertainment

NASDAQ

(From Wikipedia)

The **Nasdaq Composite** is a stock market index of all of the common stocks and similar securities listed on the NASDAQ stock market, meaning that it has over **3,000 components**. It is highly followed in the U.S. as an indicator of the **PERFORMANCE OF STOCKS OF TECHNOLOGY COMPANIES AND GROWTH COMPANIES**.

Since **both U.S. and non-U.S. companies** are listed on the NASDAQ stock market, the index is not an exclusively U.S. index

February 2, 2022: 15,254 !!!!

https://finance.yahoo.com/quote/NQ%3DF?p=NQ%3DF

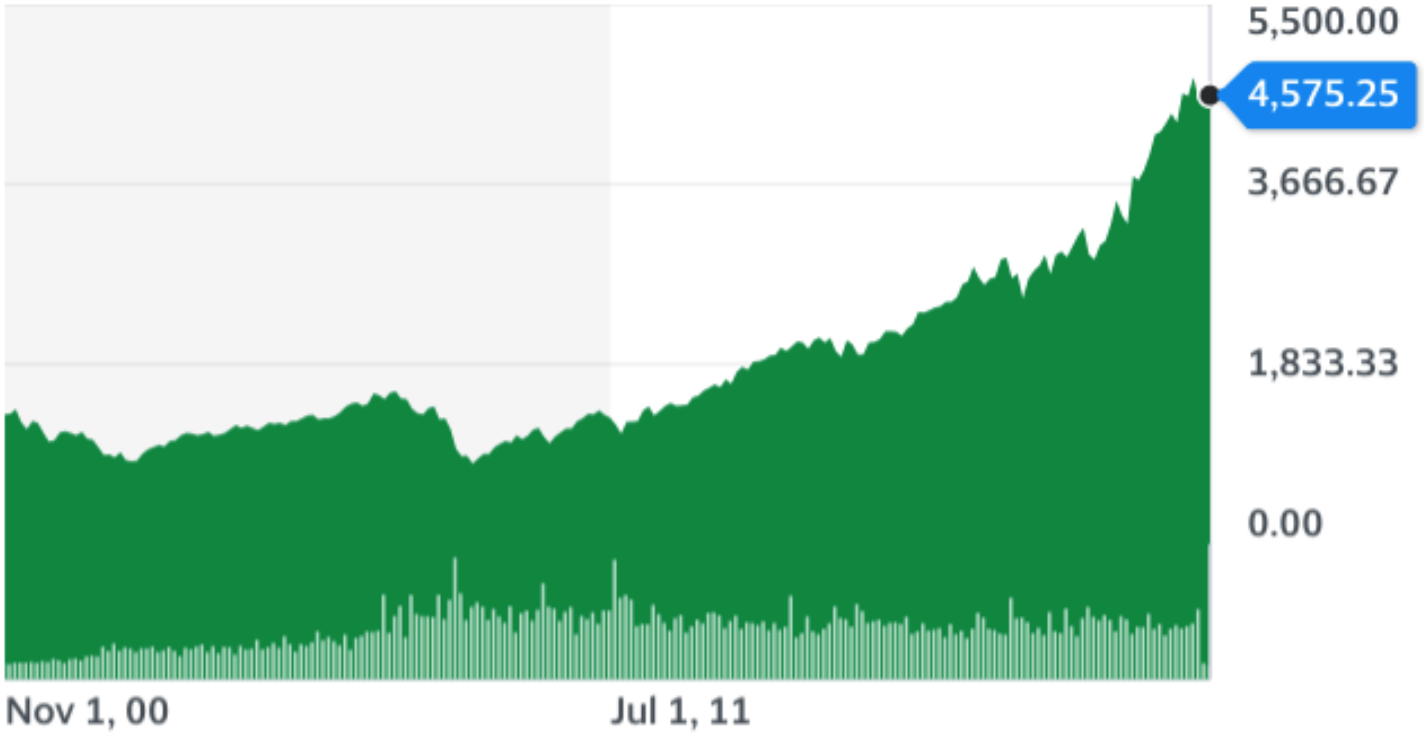
NASDAQ 100 index of largest non-financial companies on NASDAQ.

Highlighted Companies likely have many hi-tech jobs **(There's no need to memorize these!)**

1. Activision Blizzard (ATVI)
2. Adobe Systems Incorporated (ADBE)
3. Alexion Pharmaceuticals (ALXN)
4. Align Technology, Inc. (ALGN)
5. Alphabet Inc. Class A (GOOGL)
6. Alphabet Inc. Class C (GOOG)
7. Amazon.com, Inc. (AMZN)
8. American Airlines Group (AAL)
9. Amgen Inc. (AMGN)
10. Analog Devices (ADI)
11. Apple Inc. (AAPL)
12. Applied Materials, Inc. (AMAT)
13. ASML Holding (ASML)
14. Autodesk, Inc. (ADSK)
15. Automatic Data Processing, Inc. (ADP)
16. Baidu.com, Inc. (BIDU)
17. Biogen, Inc (BIIB)
18. BioMarin Pharmaceutical, Inc. (BMRN)
19. Broadcom Limited (AVGO)
20. CA Technologies (CA)
21. Cadence Design Systems, Inc. (CDNS)
22. Celgene Corporation (CELG)
23. Cerner Corporation (CERN)
24. Charter Communications, Inc. (CHTR)
25. Check Point Software Technologies Ltd. (CHKP)
26. Cintas Corporation (CTAS)
27. Cisco Systems, Inc. (CSCO)
28. Citrix Systems, Inc. (CTXS)
29. Cognizant Technology Solutions Corporation (CTSH)
30. Comcast Corporation (CMCSA)
31. Costco Wholesale Corporation (COST)
32. CSX Corporation (CSX)
33. CTrip International (CTRP)
34. Dentsply Sirona (XRAY)
35. Dish Network, Inc. (DISH)
36. Dollar Tree, Inc. (DLTR)
37. eBay Inc. (EBAY)
38. Electronic Arts (EA)
39. Expedia, Inc. (EXPE)
40. Express Scripts, Inc. (ESRX)
41. Facebook, Inc. (FB)
42. Fastenal Company (FAST)
43. Fiserv, Inc. (FISV)
44. Gilead Sciences, Inc. (GILD)
45. Hasbro, Inc. (HAS)
46. Henry Schein, Inc. (HSIC)
47. Hologic, Inc. (HOLX)
48. IDEXX Laboratories, Inc. (IDXX)
49. Illumina, Inc. (ILMN)
50. Incyte Corporation (INCY)
51. Intel Corporation (INTC)
52. Intuit, Inc. (INTU)
53. Intuitive Surgical Inc. (ISRG)
54. J.B. Hunt Transport Services, Inc. (JBHT)
55. JD.com (JD)
56. KLA-Tencor Corporation (KLAC)
57. Lam Research, Inc. (LRCX)
58. Liberty Global plc Ordinary A (LBTYA)
59. Liberty Global plc Ordinary C (LBTYK)
60. Liberty Interactive (LVNTA)
61. Liberty Interactive (QVCA)
62. Marriott International, Inc. (MAR)
63. Maxim Integrated Products (MXIM)
64. MercadoLibre (MELI)
65. Microchip Technology (MCHP)
66. Micron Technology, Inc. (MU)
67. Microsoft Corporation (MSFT)
68. Mondelēz International (MDLZ)
69. Monster Beverage (MNST)
70. Mylan N.V. (MYL)
71. NetEase, Inc. (NTES)
72. Netflix (NFLX)
73. NVIDIA Corporation (NVDA)
74. O'Reilly Automotive, Inc. (ORLY)
75. PACCAR Inc. (PCAR)
76. Paychex, Inc. (PAYX)
77. PayPal Holdings, Inc. (PYPL)
78. QUALCOMM Incorporated (QCOM)
79. Regeneron Pharmaceuticals (REGN)
80. Ross Stores Inc. (ROST)
81. Seagate Technology Holdings (STX)
82. Shire plc (SHPG)
83. Sirius XM Radio, Inc. (SIRI)
84. Skyworks Solutions, Inc. (SWKS)
85. Starbucks Corporation (SBUX)
86. Symantec Corporation (SYMC)
87. Synopsys, Inc. (SNPS)
88. T-Mobile US (TMUS)
89. Take-Two Interactive, Inc. (TTWO)
90. Tesla, Inc. (TSLA)
91. Texas Instruments, Inc. (TXN)
92. The Kraft Heinz Company (KHC)
93. The Priceline Group (PCLN)
94. Twenty-First Century Fox Class A (FOXA)
95. Twenty-First Century Fox Class B (FOX)
96. Ulta Beauty (ULTA)
97. Verisk Analytics (VRSK)
98. Vertex Pharmaceuticals (VRTX)
99. Vodafone Group, plc. (VOD)
100. Walgreens Boots Alliance (WBA)
101. Western Digital (WDC)
102. Workday, Inc. (WDAY)
103. Wynn Resorts (WYNN)
104. Xilinx, Inc. (XLNX)

SOME OTHER INDICES

S & P 500 covers 500 large companies having common stock listed on the NYSE or NASDAQ



https://finance.yahoo.com/quote/ES%3DF?p=ES%3DF

NYSE Composite: covering all common stock listed on the New York Stock Exchange, including American depositary receipts, real estate investment trusts, tracking stocks, and foreign listings. Over 2,000 stocks are covered in the index, of which over 1,600 are from United States corporations and over 360 are foreign listings

https://www.cnbc.com/quotes/ibm?qsearchterm=ibm

DIVIDEND YIELD (= ~5% per year) always very high; Healthy P/E (Price/Earnings) Ratio = 20.87 for industry sector. Great long-term hold !

International Business Machines Corp

IBM:NYSE

RT Quote | Last NASDAQ LS, VOL From CTA | USD

EXPORT WATCHLIST +

After Hours: Last | 8:10 AM EST

136.02 ▲ +0.49 (+0.36%)

Volume 7,546

Close

135.53 ▲ +1.96 (+1.47%)

Volume 5,973,555

52 week range 112.82 - 145.99

1D 5D 1M 3M 6M YTD 1Y 5Y ALL

KEY STATS

Open	133.76	52 Week High	145.99	Market Cap	121.543B
Day High	135.96	52 Week High Date	06/10/21	Shares Out	896.80M
Day Low	132.50	52 Week Low	112.82	Dividend	6.56
Prev Close	135.53	52 Week Low Date	02/03/21	Dividend Yield	4.84%
10 Day Average Volume	8.02M	Beta	1.08	YTD % Change	1.4

RATIOS/PROFITABILITY

EPS (TTM)	6.49	Revenue (TTM)	57.35B	Gross Margin (TTM)	54.90%
P/E (TTM)	20.87	ROE (TTM)	23.86%	Net Margin (TTM)	8.22%
Fwd P/E (NTM)	14.14	EBITDA (TTM)	11.965B	Debt To Equity (MRQ)	273.55%

EVENTS

Earnings Date	04/18/2022	Ex Div Date	02/10/2022	Div Amount	1.64
Split Date	-	Split Factor	-		

ANALYST CONSENSUS & TRENDS

MORE

STRONG BUY	5
BUY	1
HOLD	14
SELL	1
UNDERPERFORM	2

The current Price Target for IBM is **$143.75**

RETURNS

MORE

SECTOR RANGE INDUSTRY RANGE INDUSTRY AVG

5 Day	-0.42%	-31%	IBM	+27%
1 Month	+1.40%	-59%	IBM	+20%
3 Months	+12.45%	-71%	IBM	+78%
YTD	+1.40%	-59%	IBM	+92%
1 Year	+17.71%	-91%	IBM	+578%

https://www.cnbc.com/quotes/AAPL

Apple Inc

AAPL:NASDAQ

RT Quote | Last NASDAQ LS, VOL From CTA | USD

EXPORT WATCHLIST +

After Hours: Last | 8:20 AM EST

174.83 ▲ +0.22 (+0.13%)

Volume 1,302,626

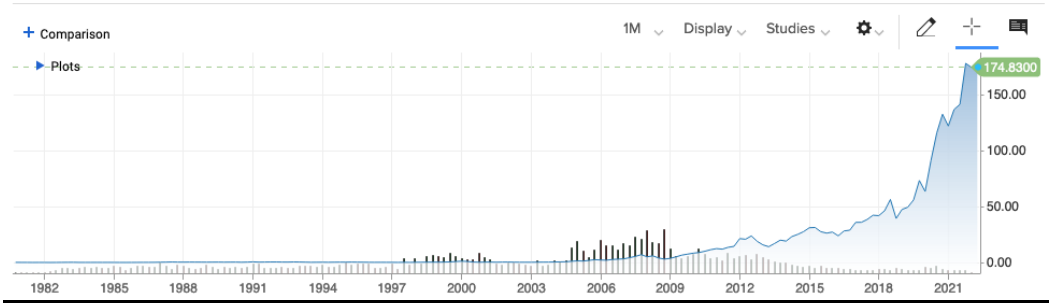
Close

174.61 ▼ -0.17 (-0.10%)

Volume 76,240,366

52 week range 116.21 - 182.94

1D 5D 1M 3M 6M YTD 1Y 5Y ALL



KEY STATS

Open	174.01	52 Week High	182.94	Market Cap	2.865T
Day High	174.84	52 Week High Date	01/04/22	Shares Out	16.406B
Day Low	172.31	52 Week Low	116.21	Dividend	0.88
Prev Close	174.61	52 Week Low Date	03/08/21	Dividend Yield	0.50%
10 Day Average Volume	119.95M	Beta	1.19	YTD % Change	-1.67

RATIOS/PROFITABILITY

EPS (TTM)	6.02	Revenue (TTM)	378.323B	Gross Margin (TTM)	43.02%
P/E (TTM)	28.99	ROE (TTM)	145.57%	Net Margin (TTM)	26.58%
Fwd P/E (NTM)	29.56	EBITDA (TTM)	128.218B	Debt To Equity (MRQ)	170.71%

EVENTS

Earnings Date	04/26/2022	Ex Div Date	02/04/2022	Div Amount	0.22
Split Date	-	Split Factor	-		

ANALYST CONSENSUS & TRENDS

MORE

STRONG BUY	14
BUY	23
HOLD	7
SELL	0
UNDERPERFORM	0

The current Price Target for AAPL is **$187.65**

RETURNS

MORE

SECTOR RANGE INDUSTRY RANGE INDUSTRY AVG

5 Day	+9.28%	-4%	AAPL	+22%
1 Month	-1.67%	-50%	AAPL	+20%
3 Months	+16.39%	-69%	AAPL	+78%
YTD	-1.67%	-53%	AAPL	+92%
1 Year	+30.17%	-91%	AAPL	+558%

https://www.cnbc.com/quotes/MSFT?qsearchterm=msft

Microsoft Corp

MSFT:NASDAQ

RT Quote | Last NYSE Arca, VOL From CTA | USD

EXPORT WATCHLIST +

After Hours: Last | 8:17 AM EST

310.33 ▲ +1.57 (+0.51%)

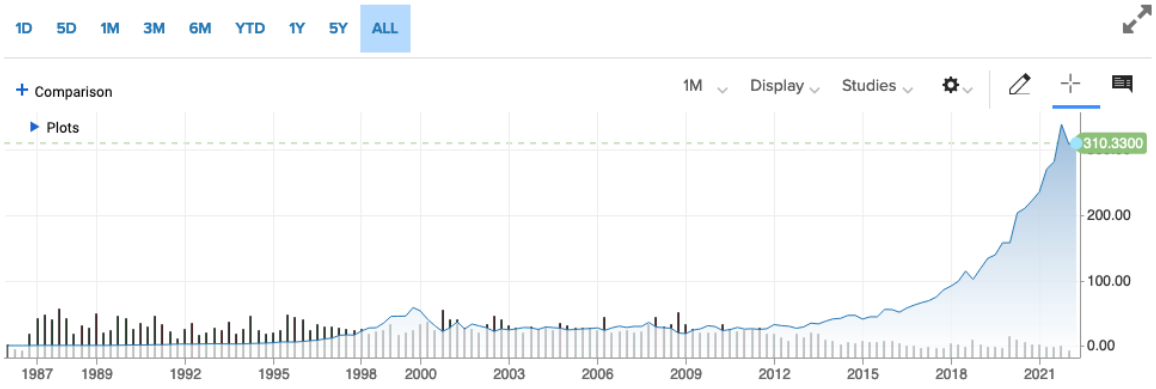
Volume 541,996

Close

308.76 ▼ -2.22 (-0.71%)

Volume	52 week range
38,241,824	224.26 - 349.67

1D 5D 1M 3M 6M YTD 1Y 5Y ALL



KEY STATS

Open	310.41	52 Week High	349.67	Market Cap	2.318T
Day High	310.63	52 Week High Date	11/22/21	Shares Out	7.508B
Day Low	305.13	52 Week Low	224.26	Dividend	2.48
Prev Close	308.76	52 Week Low Date	03/04/21	Dividend Yield	0.80%
10 Day Average Volume	57.92M	Beta	0.89	YTD % Change	-8.19

RATIOS/PROFITABILITY

EPS (TTM)	9.40	Revenue (TTM)	184.903B	Gross Margin (TTM)	68.83%
P/E (TTM)	32.85	ROE (TTM)	49.05%	Net Margin (TTM)	38.50%
Fwd P/E (NTM)	32.94	EBITDA (TTM)	91.616B	Debt To Equity (MRQ)	42.16%

EVENTS

Earnings Date	04/25/2022	Ex Div Date	02/16/2022	Div Amount	0.62
Split Date	-	Split Factor	-		

ANALYST CONSENSUS & TRENDS

MORE

STRONG BUY	19
BUY	29
HOLD	3
SELL	0
UNDERPERFORM	0

The current Price Target for MSFT is **$370.97**

RETURNS

MORE

SECTOR RANGE INDUSTRY RANGE INDUSTRY AVG

5 Day	+7.03%	-4%	MSFT	+22%
1 Month	-8.19%	-50%	MSFT	+20%
3 Months	-7.32%	-69%	MSFT	+78%
YTD	-8.19%	-53%	MSFT	+92%
1 Year	+28.84%	-91%	MSFT	+558%

https://www.cnbc.com/quotes/GOOGL?qsearchterm=google **GOOGLE !**

Alphabet Class A

GOOGL:NASDAQ

RT Quote | Last NYSE Arca, VOL From CTA | USD

EXPORT WATCHLIST +

After Hours: Last | 8:24 AM EST

3,017.00 ▲ +264.12 (+9.59%)

Volume 161,801

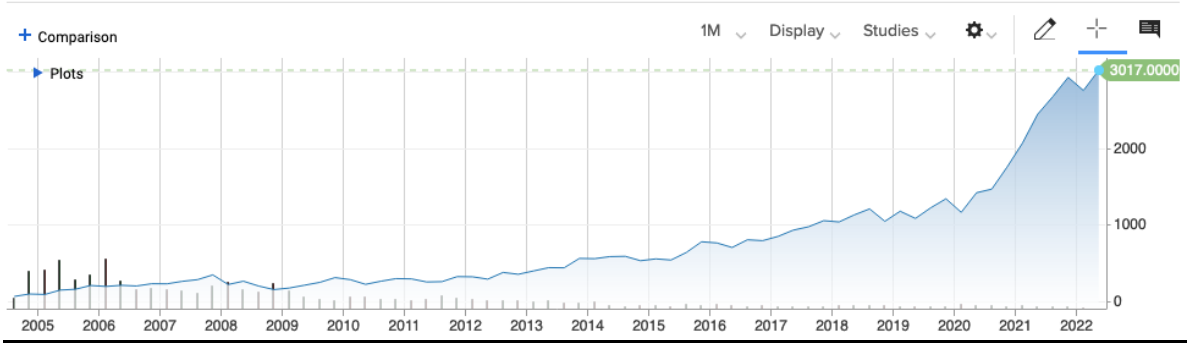
Close

2,752.88 ▲ +46.81 (+1.73%)

Volume 2,236,691

52 week range 1,906.37 - 3,019.33

1D 5D 1M 3M 6M YTD 1Y 5Y ALL



KEY STATS

Open	2,751.89	52 Week High	3,019.33	Market Cap	1.827T
Day High	2,755.85	52 Week High Date	11/19/21	Shares Out	663.76M
Day Low	2,687.37	52 Week Low	1,906.37	Dividend	-
Prev Close	2,752.88	52 Week Low Date	02/02/21	Dividend Yield	-
10 Day Average Volume	2.31M	Beta	1.07	YTD % Change	-4.98

RATIOS/PROFITABILITY

EPS (TTM)	103.79	Revenue (TTM)	239.21B	Gross Margin (TTM)	56.51%
P/E (TTM)	26.52	ROE (TTM)	30.87%	Net Margin (TTM)	29.52%
Fwd P/E (NTM)	25.38	EBITDA (TTM)	85.197B	Debt To Equity (MRQ)	5.94%

EVENTS

Earnings Date	04/25/2022	Ex Div Date	-	Div Amount	-
Split Date	-	Split Factor	-		

ANALYST CONSENSUS & TRENDS

MORE

STRONG BUY	17
BUY	30
HOLD	2
SELL	0
UNDERPERFORM	0

The current Price Target for GOOGL is **$3,444.23**

RETURNS

MORE

SECTOR RANGE INDUSTRY RANGE INDUSTRY AVG

5 Day	+8.44%	-4%	GOOGL	+22%
1 Month	-4.98%	-50%	GOOGL	+20%
3 Months	-5.36%	-69%	GOOGL	+78%
YTD	-4.98%	-53%	GOOGL	+92%
1 Year	+45.42%	-91%	GOOGL	+558%

Beware of too many Tech **IPO**'s (Initial Price Offerings), i.e., first-time listings of a stock by a company when it **"goes public"** … especially during times when there is a proliferation of SPAC's (Special Purpose Acquisition Companies) making money available for sometimes not-so-stable ventures, etc. … make sure these companies are actually making a product or providing a clearly valuable service, and they are earning money. Watch their P/E (Price/Earnings) ratio.

Also, I have no comment on **Cryptocurrency** (Bitcoin, etc.) other than consider the risks and what is actually "backing" their value. Read more here:

- https://www.forbes.com/sites/earlcarr/2021/12/30/cryptocurrency-risk-or-opportunity-the-good-the-bad--the-ugly/?sh=3b8ed03b74c8
- https://www.investopedia.com/tech/what-are-legal-risks-cryptocurrency-investors/