Zoltán Farkas, Antal Ürmös, Ákos Nemcsics: Analysis of Stock Price History of American Computer Related Chip Manufacturers

1 Department of Natural Sciences, Institute of Electrophysics, Óbuda University, 1084, Tavaszmező utca 17, Budapest, Hungary

2,3 Department of Microelectronics and Technology, Institute of Electronics and Communication Systems, Óbuda University, 1084, Tavaszmező utca 17, Budapest, Hungary

e-mail: [1]farkas.zoltan@kvk.uni-obuda.hu, [2]urmos.antal@kvk.uni-obuda.hu, [3]nemcsics.akos@kvk.uni-obuda.hu

Abstract: The decade long price history of Standard and Poor's 500 index and three computer related semiconductor (chip) manufacturers is commented and compared to bitcoin price. It is concluded that the price change of only the AMD is comparable to that of bitcoin.

Keywords: stock price; semiconductor manufacturer; technical analysis; exchange price;

1. Introduction

A share is a security embodying an ownership relationship. In general, the shareholders of a company can have a say in the management of the company to the extent corresponding to their share of ownership, e.g. through the decisions regarding the person of the senior managers and the strategic directions. The shares of many companies are bought and sold on organized secondary markets - stock exchanges. According to general opinion, the company's stock exchange price (through the value judgment of the investor community, through supply and demand effects) refers to the company's expected profitability, product and resource market position. Of course, in the market, which is ultimately at the level of an unstructured, collective, distributed decision-making mechanism, there are phenomena that separate the evaluation of a given company or industry, or even entire national economies, from the value that can be considered economically rational. Popular e.g. to refer to the short-term positive feedback, self-stimulating processes of certain speculations. Nevertheless, the long-term development of stock exchange prices is just as pivotal to the description of economic processes as the periodic economic reports of a company or the income, monetary and fiscal data characterizing national economies.

In this article, we analyze the long-term evolution of the prices of the leading semiconductor companies involved in American computer technology (AMD, Intel, Nvidia), for which we also use the data series of the stock market indices that characterize the market prices at an aggregate level as background data. Data sources: stockcharts.com, finance.yahoo.com, macrotrends.net.

2. Explanation of possible deviations of exchange price records

The analysis of individual share prices over many decades requires considerable caution. There are three sources of potential anomalies beyond the reliability of the data. In most developed economies, fluctuating inflation was present during the period under review, so obviously the purchasing value of one American dollar (USD) was several times higher in 1980 than in 2022, when this study was written. The sources of the other two anomalies are the companies themselves, or rather their management. On the one hand, companies can pay dividends, so compared to the day before the dividend, on the day after the dividend (assuming all other factors remain unchanged, which rarely happens on the stock market), the value of the stock decreases with the dividend. Economically (from the point of view of determining the value of the company), we act correctly if we consider the value of the dividend as part of the share price on the day after the dividend, technically this means that we use the dividend to buy the same share. On the other hand, for various reasons, companies sometimes decide on a share split, in which case the value of a share falls to the proportion corresponding to the level of the split on the day before the split. Thus, e.g. if a share is divided into ten shares on the trading day, the value of a split share will obviously fall to a tenth on the trading day. The stock split typically affects securities whose value has multiplied over the years. OTP, MOL and Richter are also excellent examples of this in the Hungarian securities market. In the decades after the issue, the price of the three mentioned securities reached HUF 20,000-100,000, which is high compared to Hungarian income conditions. After the division, the price of all three shares is currently It is in the range of 1500-20000 HUF. However stock splits and dividends may influence the stock price on other channels than the trivial ones discussed above [1].

An excellent example of the need for a stock split is the American Berkshire Hathaway. In 1962, Warren Buffett, one of the most successful and famous exponents of value-based investing, began buying shares in the patina textile conglomerate. The top manager of the company at the time first made a verbal purchase offer to Buffett at the price of 11.5 USD, and after Buffett turned the offer around, another purchase offer came from the same manager, this time at the price of 11.375 USD (at that time, the fraction of share prices in the USA was the 0.5 integer exponent expressed in powers). This ethically questionable move angered Buffett, who then ("just because") acquired majority ownership in Bershire Hathaway, a company in an industry Buffett knew was in decline. Five years later, Buffett used his company to enter additional economic sectors and industries. At the start of the macrotrends.net data series (March 28, 1980), Berkshire Hathaway's price was $280. The market turbulence around Black Monday 1987 pushed the exchange price back from 4,250 to 2,850 USD, which increased to 8,675 USD on December 29, 1989. On October 17, 1990, the rate was $5,700, which rose to $84,000 on July 6, 1998. On March 9, 2000, it reached its low after the mentioned peak at USD 40,800. The 2000s high was $151,600 on December 11, 2007, which corresponded to a stronger American annual salary. This "mere" price tripling from low to high marks the more modest period of growth in Berkshire Hathaway's history. The next low was $70,000 on March 3, 2009, and from there the stock price rose to $544,400 on March 25, 2022, which is currently the all-time-high. (Figure 1 and Figure 2).

As mentioned above Buffett is widely considered as the doyen of value based investing (to which an alternative investment approach is the investing into a sortiment of „growth” stocks). However Martin and Puthebpurackal states that the management of Berkshire Hathaway invested in large capitalization (large cap) growth stock rather than value stocks [2].

Figure 1

Price chart of Berkshire Hathaway (A series) (Chart Courtesy of StockCharts.com)

Figure 2

Price chart of Berkshire Hathaway (A series) (Chart Courtesy of StockCharts.com)

3. The Standard&Poor's 500

We somewhat arbitrarily choose the year 1980 as the starting point of our investigation. In October 1979 and April 1980, the Standard and Poor's 500 (hereinafter SP500) stock market index showing the weighted average price of the 500 leading American (USA) companies turned from a decrease to an increase of 100 points. The upward trend peaked at 140 points in November 1980, and then decreased from there until August 1982, where it again turned upward to just above 100 points. Subsequently, with minor fluctuations, the index rose to 333 points, which it reached on August 17, 1987, after which a considerable decrease began. On December 4, 1987, following the memorable "Black Monday" (October 19, 1987), it turned to an increasing trend again after the decrease at 223 points. After a period of slower growth, the index reached a maximum of 360 points on July 16, 1990, and then reached a minimum of 294 points on October 11, 1990, before the first Gulf War. After the "upturn" following the war, the index grew slowly, the period between the beginning of 1991 and the beginning of 1995 was good for the value of the index to rise from 360 to approximately 460. What followed was already the 21st century. century, we can date the Internet's gradual intrusion into our everyday life from 1995, at first it was a "toy" of university citizens and yuppie (young professionals), now it has become a critical infrastructure. The SP500 opened at around 459 points on January 3, 1995, and had a value of 1553 points on March 27, 2000. In this dazzling rise (approximately 25.7% annual return calculated with compound interest), the South-East Asian crisis (July

1997) and the Russian (in a broader sense, emerging market) crisis (from August 1998) only caused short pauses and declines of a few months (much more severe in the currency and income of the countries concerned). After stagnation, during the burst (correction) of the "dotcom bubble" (speculatively overpriced market) from 1,530 points on September 1, 2000 to a "triple bottom" between July 23, 2002 and March 11, 2003 (three local minimums can be observed on the price chart approx. at the same level) formation, fell to a minimum of 770 points (Figure 3).

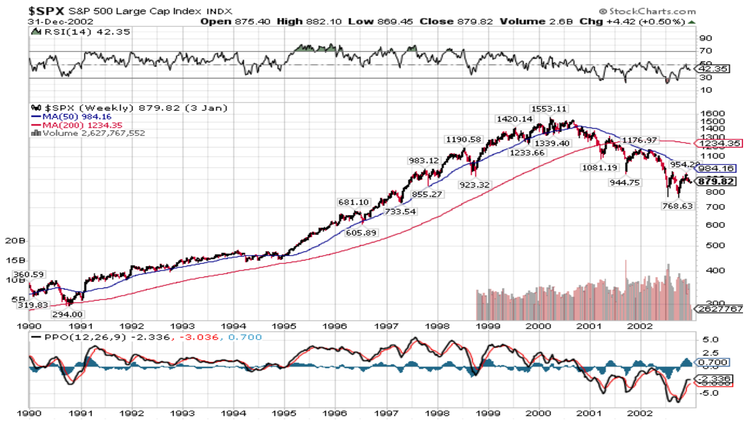

Figure 3

Price chart of SP 500 index (Chart Courtesy of StockCharts.com)

After that, the index was again characterized by a rebound, slow (2004-2006), and then rapid growth from September 2006 to July 17, 2007, which again turned from the exchange rate between 1550-1580 and again with a "double top" (two maximums on the price chart at approximately the same exchange price) into decline. Then came the biggest fall so far (the crisis of 2007, in the public mind of 2008), which the financial public considered the most serious crisis after 1929, the team of eternal optimists (who were realistic enough to have cash that could be used to buy assets even at the bottom of the crisis) called it a "once-in-a-lifetime opportunity to buy shares". Fortunately, the latter were right and the index rebounded after reaching the minimum value of 666 points on March 9, 2009 and reached 929 points on May 8, 2009. The long-term upward trend had setbacks (2018) and stagnation (2010-11 and 2015), but the trend remained until February 19, 2020, when the index peaked at 3389 points, and then fell back to 2020 due to uncertainties caused by the COVID epidemic. March 23 to 2237 points. From there, there was a rebound to 2,874 points on April 17, 2020, and then again a consolidated rise until the end of 2021, on January 3, 2022, 4,818 points was the current (October, 2022) authoritative maximum (Fig 4). Bayraktar, Poor and Sircar analyzed the fractal dimension of SP 500 index on minutewise data [3]. maximum.

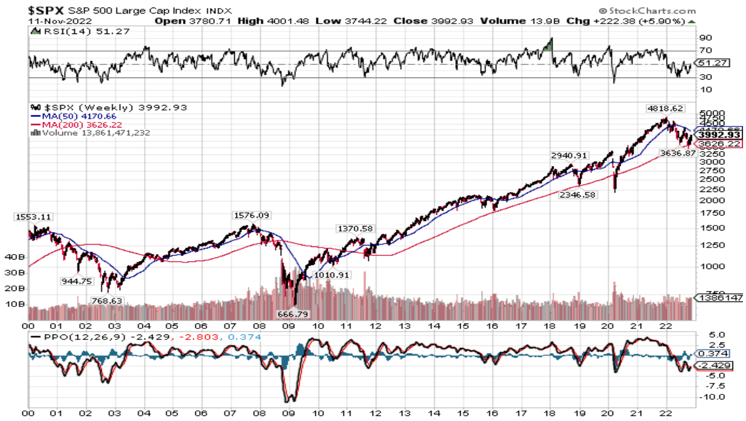

Figure 4

Price chart of SP 500 index (Chart Courtesy of StockCharts.com)

4. Chip manufacturers' price records

Price data for Intel on finance.yahoo.com and macrotrends.net starts at $0.1893 on March 17, 1980. From there, with larger price changes ("fluctuations"), it rose to roughly $0.9 by 1990-91.

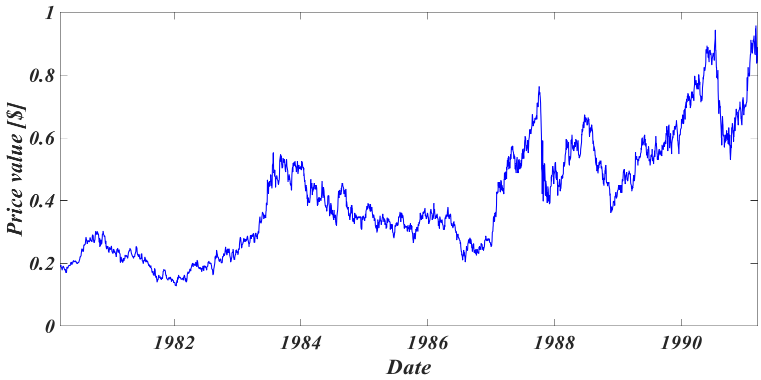

Figure 5

Price Chart of Intel Corporation between 1980 and 1991 (source of data: Macrotrends.net)

From there, over the next decade, the exchange price increased to almost 45 USD annually in a growth-stagnation-growth pattern. In the period in question, computer technology and the Internet entered the public consciousness (a rapid increase in the volume of computer production), and, as we saw in the development of the SP 500 index, it was also a favorable period for the American stock market as a whole.

Figure 6

Price Chart of Intel Corporation (Chart Courtesy of StockCharts.com).

At the beginning of the 2000s, the bursting of the "dotcom bubble" also affected Intel sensitively, the exchange price fell below USD 10, and from there it could not rise substantially and permanently above USD 20 in the following decade. The 2007-2008 crisis pushed Intel's price below $10 again, from where it bounced back to around $15 in 2010-11. Then there was another exponential rise, by 2020-21 the paper reached around USD 65, which is currently the authoritative maximum.

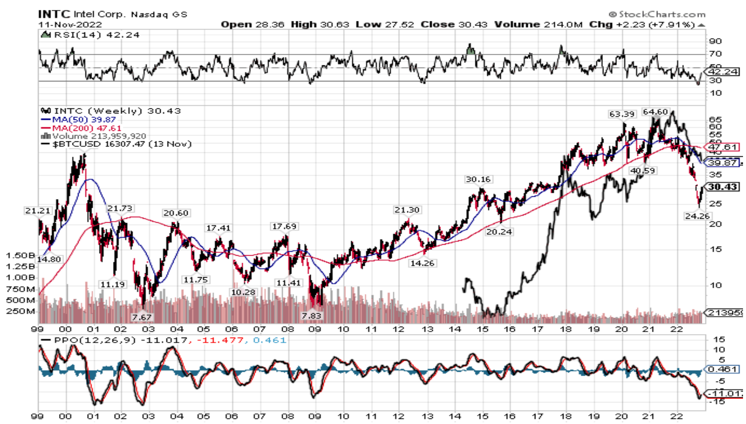

Figure 7

Price Chart of Intel Corporation with Logarithmic Chart of Bitcoin (Chart Courtesy of StockCharts.com)

AMD (Advanced Micro Devices) was founded in 1969, and its stock market history begins on March 21, 1981 at a price of $8.685. The first high after that was $20.2445, reached by the company on August 21, 1984. From there it fell to $1.8745 in a multi-year downtrend with large swings on November 5, 1990. In the 90s, higher and higher peaks followed (10-15-23 USD) every year or two, but from these high values the exchange price always fell back to 5-10 USD. In 1999, the exchange price also fell below USD 10, from where it "spiked" to its peak value of USD 47.5 on June 21, 2000.

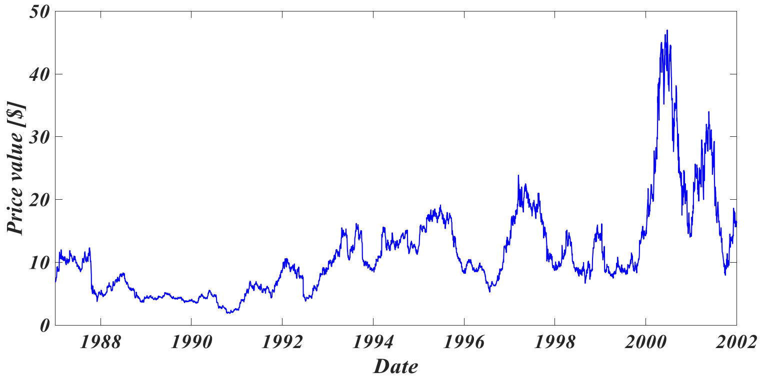

Figure 8

Price Chart of AMD Corporation (Data source: Macrotrends.net)

AMD's exchange price developed similarly in the period 2000-2022. Here, too, we can observe "spikes" on the price chart, but until 2018, the share price always fell well below $10. The increase in the price of cryptocurrencies (bitcoin and others) has made the mass procurement of target hardware, including video cards (Graphics Processing Unit – GPU) worthwhile for cryptomining purposes. The growing demand for the products of GPU companies (primarily AMD and Nvidia in the American market). A very good detailing of the evolution of haredware of cryptocurrency „mining" has been written by Taylor in IEEE's Computer periodical [4]. The increase in product price and volume legally increased the profitability of the companies concerned and also the stock exchange price. This, and the appearance of the successful Ryzen product line on the processor market, explains the price increase after 2018, AMD's new stock market peak price, which was three to four times the previous peaks. peaks.

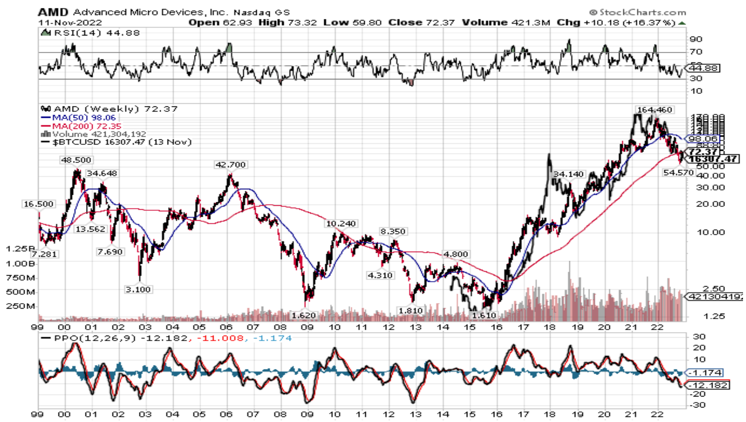

Figure 9

Price Chart of Intel Corporation with Logarithmic Chart of Bitcoin (Chart Courtesy of StockCharts.com)

The price history of Nvidia (stock abbreviation: NVDA) begins on January 22, 1999, around USD 0.4, it reached its all-time low on June 18 of the same year, at the level of USD 0.3136, from where it reached USD 5.55 on January 4, 2002. rose to It was a stormy period for listed companies and, within that, for the IT sector (this is the period of the "dot-com bubble burst"), so NVIDIA was able to "produce significant growth against headwinds. On October 8, 2002, the stock weakened to 0.575, then - as a result of the generally unexciting 2004-2007 rally for technology stocks - it rose to close to $9 by October 22, 2007. In the crisis of 2007-8, far ahead of the market average in time, it hit its lowest point at 1.3556 USD on November 20, 2008, from where it shot up to a peak of 4.338 on January 6, 2010, more than a year later. After that, huge swings between USD 2 and USD 6 followed, and then the "construction" (slow recovery of the new exchange price rise) began in April 2013 from the exchange price stabilizing around the USD 3 level. The logarithmic price chart showed a slower (until July 2015 - $5.6) followed by a faster rise to almost $70 (September 28, 2018). Let us note in parentheses that from 2015, the gradual integration of cryptocurrencies ("digital gold" - bitcoin and other little-known names) into the public consciousness began, and more and more people turned to "cryptomining", in which Nvidia's flagship product, the for video cards (Graphical Processing Unit - GPU) optimized for a large number of parallel integer operations. The exchange price therefore fell from the aforementioned peak of USD 70 to approximately USD 31 on December 26, 2018, from where it started another upward phase on May 31, 2019, after forming a triple bottom. The new rise took Nvidia's price to close to $350 by the end of 2021, which is currently the authoritative maximum (Figure 10).

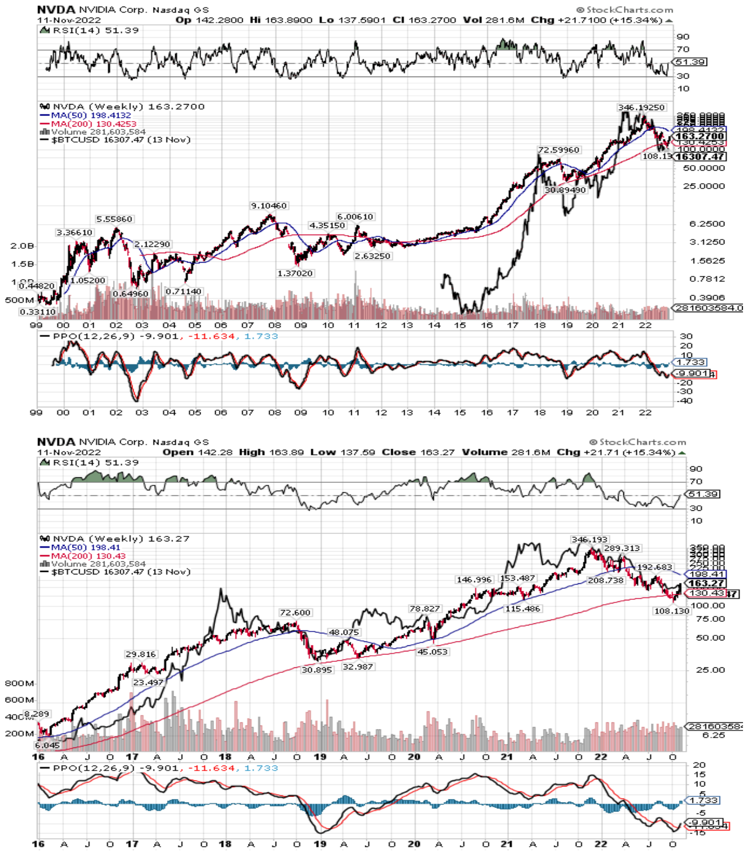

Figure 10

Price Chart of Nvidia Corporation with Logarithmic Chart of Bitcoin (Chart Courtesy of StockCharts.com)

Conclusion

Of the three semiconductor companies discussed in this study Intel had an exponential rise in the 90's and fluctuated thereafter. AMD had price positive spikes througout the examined period, it is to be answered at this moment if the present relatively high price is just another major „spike" or a buildup of a consistently higher price. The exchange price of Nvidia grew roughly exponentially during the examined period.

Of the three company examined, the price action of only AMD was in accord with price dynamics of bitcoin. The Hungarian text was translated into English with the support of Translate.Google.com.

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