

Comparing Growth Models with Other Investment Methods

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Abstract

This article introduces five growth models as an investment method. These are conventional logistic growth, Gompertz growth, generalized charged capacitor growth, combined logistic and charged capacitor growth, and combined Gompertz and charged capacitor growth. This article demonstrates how to apply the growth models in investing while taking oscillation and lengthening cycles into consideration. The growth models applied as an investment method are compared with 15 other common investment methods. The growth models can be used to predict the prices of various types of assets, including derivatives, stocks, bonds, real estate, and cryptocurrencies. Other phenomena involving growth and fluctuations can also be analyzed. This article provides insights for researchers and investors for how to predict when investing.

JEL classification numbers: C5, G11.

Keywords: Growth models, Investment methods, Price prediction, Oscillatory growth, Lengthening cycle, Differential equation.

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1. Introduction

1.1 Background

On January 3, 2009, at 18:15:05 UTC, the Bitcoin Genesis Block was generated. Although the Bitcoin price has been quite volatile, the Bitcoin marketcap reached \$1 trillion faster than any other asset. The need for techniques to comprehend Bitcoin's evolutionary history and forecast its future evolution has grown as a result of this extraordinary trajectory. Various investors looking to enter the cryptocurrency market commonly choose Bitcoin. Some institutions, including publicly traded firms like MicroStrategy, Tesla, Coinbase, Global, and Galaxy Digital Holdings, have purchased Bitcoin to some extent (Wallabit Media, 2022). Grayscale Bitcoin Trust, Purpose Bitcoin ETF, and ETC Group Bitcoin ETP are some examples of exchange-traded funds (ETFs) that hold Bitcoin. Some nations, including Ukraine, El Salvador, Finland, and Georgia, also hold Bitcoin.

Many investors wonder whether Bitcoin and other cryptocurrencies should play a role in investment portfolios in upcoming years. Investor Kevin O'Leary expects that blockchain and cryptocurrency will eventually become the 12th sector of the S&P 500 (Standard and Poor's 500), and that the blockchain and cryptocurrency industry requires more regulation (Smith, 2022). If so, investment methods and strategies for applying cryptocurrencies are needed. Additionally, investors require methods to answer questions such as how much Bitcoin one should have in one's portfolio, how the portfolio should be rebalanced over time, and which risk attitudes are appropriate.

Five growth models, which account for oscillatory growth and lengthening cycles, differ from the investment methods traditionally used for other asset classes such as real estate, derivatives, and physical assets. The most common investment methods are buying and holding, dollar cost averaging, no method, active vs passive, momentum trading, long/short method, indexing, developed markets vs emerging markets, pairs trading, value vs growth, dividend growth investing, contrarian investment, small marketcap investment, ESG (environmental, social, and governance) investment, and factor investment. One common investment principle applied by O'Leary and others is to invest a maximum of 20% in any one S&P 500 sector and a maximum of 5% in any one asset (Port, 2022).

1.2 Contribution

The growth models are especially useful for predicting phenomena involving fluctuations and growth. The article introduces growth models, accounting for oscillation and lengthening cycles, as a new investment method. The ways to combine growth models with oscillation and lengthening cycles are presented. The article shows how to make predictions through growth models assuming oscillation and lengthening cycles. The technique can be applied in academic research, business analysis and industrial practice. Bitcoin price prediction is presented as an example applying growth models. The growth models can be adopted as an investment method. This article illustrates how to apply growth models as an investment method. The article compares the growth models investment method with 15 other common investment methods.

1.3 Literature

The unique idea of Bitcoin, a peer-to-peer electronic cash system, was conceived by Nakamoto (2008). The literature commonly examines the evolution of the Bitcoin marketcap (Chen et al., 2020; Faghih Mohammadi Jalali & Heidari, 2020; Jana et al., 2021; Wang & Hausken, 2022). The incorporation of oscillation and lengthening cycles in five growth models by Wang and Hausken (2022) is noteworthy. The five generalized growth models can be applied more broadly, e.g. as a tool for predicting and investing.

1.4 Literature

Section 2 introduces Bitcoin price's evolution and the five growth models. Section 3 illustrates how to use the growth models as an investment method and compares the growth models with other common investment methods. Section 4 concludes.

2. Bitcoin price's evolution and the five growth models

2.1 The features of Bitcoin's price evolution

The first few years after the Bitcoin Genesis Block's introduction on January 3, 2009 involved mainly blockchain enthusiasts. Thereafter, since 2015, blockchain enthusiasts became interested in Ethereum, decentralized finance, the metaverse, web3, etc. In recent years, more users realized a burgeoning asset class: Cryptocurrencies. Initially, only a small group of people paid attention to Bitcoin. The Bitcoin price in 2009 hovered just above zero. In July 2010, Bitcoin began trading for less than \$0.10. About one year later, the US Electronic Frontier Foundation accepted Bitcoin for donations, which was the first Bitcoin adoption. The price of Bitcoin climbed to \$1 in February 2011 and reached the \$10 range within a few months. In April 2013, the Bitcoin price spiked to \$250 (Nibley, 2022). On December 17, 2017, a \$20,000 blow-off top attracted attention, as did the subsequent bear market bottom on December 14, 2018, at \$3200.

New asset classes like cryptocurrencies are often characterized by volatility, as are financial derivatives, e.g. futures, options, and forwards, swaps, etc. Despite the

volatility of cryptocurrencies, some institutional investors trade with cryptocurrencies. Several institutional investors entered the Bitcoin realm, most notably Michael Saylor's MicroStrategy, Elon Musk's Tesla, Square, etc. In addition, universities, e.g. Harvard, Yale, and Brown, purchase Bitcoin. Moreover, various universities, e.g. MIT, Harvard, and Oxford, have included courses on cryptocurrencies in their curricula (Pessarlay, 2022). El Salvador and the Central African Republic made Bitcoin legal tender in September 2021 and April 2022, respectively. Pension funds, sovereign wealth funds, central banks, endowments, etc. have entered Bitcoin to a limited degree.

2.2 The five growth models

Differential time equations are suitable for predicting the Bitcoin price because of its dynamic nature. Thus, Wang and Hausken (2022) develop the five growth models with oscillation and lengthening cycles to capture the evolution of the Bitcoin price. They introduce four new parameters and *Sin* function to the growth models common in the literature, e.g. as expressed by Richards (1959). The *Sin* function ranges from -1 to 1. A positive *Sin* function denotes a bull market. A negative *Sin* function denotes a bear market. The sine oscillations' start time, the degree of lengthening of each cycle, the strength of the Bitcoin market, and the sine oscillations' inverse cycle length are expressed by the four additional parameters. Generalized charged capacitor growth is generalized by incorporating damped oscillation and lengthening cycles with a growth rate. Additionally, combined logistic with charged capacitor growth, and combined Gompertz with charged capacitor growth are introduced by defining the adjustment parameter.

The five growth models, i.e. conventional logistic growth, Gompertz growth, generalized charged capacitor growth, combined logistic and charged capacitor growth, and combined Gompertz and charged capacitor growth. The oscillation and lengthening cycles are incorporated into all the five growth models. The five growth models are suitable for capturing phenomena with growth and fluctuations. Predicting future bull market maxima and bear market minima is one of the growth models' most attractive characteristics. Thus, it is feasible to apply the growth models as an investment method.

2.3 Application of the growth models for investment and prediction

The section presents seven practical steps for applying the growth models as an investment are presented. The first step is to understand and determine the growth models mentioned in the previous section to create the basis for making predictions and to adopt the growth models as an investment method.

The second step is to identify research questions for the relevant phenomena and collect the relevant data.

The third step is to determine the historical bull market local maxima and bear market local minima. This can be a challenge in practice. The goal is to evaluate and specify the parameters for sine oscillations and lengthening cycles, such as the

sine oscillations' inverse cycle length and the strength of each cycle's lengthening. For example, three bull market maxima and three bear market minima are identified by Wang and Hausken (2022). Thereafter, the parameters for the sine oscillations and lengthening cycles are estimated.

The fourth step is to evaluate the potential future market carrying capacity. That is also challenging. The market carrying capacity of the asset may be estimated from past experience, professional judgment, assumptions, theory, expectations, etc. Two Bitcoin carrying capacities are proposed by Wang and Hausken (2022), representing potential upper bounds in the next decades.

The fifth step is to estimate the parameters of the growth models with their assumed carrying capacities. This can be accomplished using a number of estimation techniques, including the least squares approach, the two stage least squares method, the weighted least squares method, the maximum likelihood method, the generalized moments method, etc. Wang and Hausken (2022) adopt both the least squares method and the weighted least squares method to estimate the parameters for the growth models.

The sixth step is to use the estimated growth models to predict and identify future bull market local price maxima and future bear market local price minima. For example, Wang and Hausken (2022) estimate five bull market local maxima and five bear market local minima.

The seventh step is to analyze the predicted results. The results should be checked to ensure that they are produced correctly before investing. The results may beneficially be compared with those obtained via other common investment methods. Additionally, the results should be updated as new data emerge, e.g. the occurrences of new bull market local maxima and new bear market local minima.

3. The growth models as an investment method

3.1 Bitcoin price prediction using the growth models

This article applies the growth models in the Bitcoin price prediction. Several tools are helpful for conducting estimations and predictions, e.g. Mathematica, Python, R, MATLAB. The Bitcoin data can e.g. be collected from the crypto database Messari (2022).

Wang and Hausken (2022) consider two Bitcoin carrying capacities. Assuming that the Bitcoin marketcap can reach that of gold at \$10 trillion gives the Bitcoin carrying capacity \$476,000. Bitcoin's marketcap has never traded above \$1.3 trillion (November 9, 2022), which is approximately 10% of gold's marketcap. Alternatively, if Bitcoin eventually reaches a 50 times higher price, by overtaking and potentially absorbing many digital assets, the Bitcoin carrying capacity would reach \$23,809,000.

The adjustment parameter for combined generalized logistic and charged capacitor growth, the adjustment parameter for combined generalized logistic and charged capacitor growth, the growth rate, the oscillation amplitude, and the start time adjustment parameter are estimated via the least squares and the weighted least

squares methods. The average time between bull market maxima and bear market minima is used to estimate the scaling of the inverse of the sine oscillations' cycle length and the scaling of the inverse of the degree of lengthening of each cycle. The growth models estimate five bear market local minima and five bull market local maxima for Bitcoin until 2050. These are estimates since precisely timing maxima and minima, and specifying their values in advance, is impossible. One investment strategy is to purchase some assets near the estimated bear market minima, and sell some assets near the estimated bull market maxima.

3.2 Comparing the growth models with other investment methods

Traders and speculators may buy assets near predicted market minima and sell assets near predicted market maxima. For long-term holders, the growth models are useful for determining the proper time to enter the industry.

Table 1 compares the growth model investment method with 15 common alternative investment methods.

Table 1: Comparison between the growth models investment method and 15 common alternative investment methods.

Number	Investment method name	Approach
1	Buying and holding	Buying the asset and holding it for a long period. This is the simplest long-term investment method. It is based on the idea that keeping the asset gives the holder good returns in the long run.
2	Dollar-cost averaging	This method is called unit-cost averaging, i.e. buying more assets when the market is down. The method aims at reducing the average cost of the asset over time.
3	No method	The investment decision is based on random choice, i.e. throwing darts at a page like a blind monkey.
4	Passive and active method	The passive method means buying benchmark asset indexes passively based on the idea that it is impossible to outperform the market. The active method means making investments proactively based on the idea that the investor can do better than the market benchmark.
5	Momentum trading	This method considers the asset's price momentum based on the idea that better or top-performance assets tend to continue to do well in the following period.
6	Long/short method	This approach shorts the low-performance assets and longs the high-performance assets. Combining long and short positions lowers the portfolio risk.
7	Indexing	This method follows and buys the assets in a market index such as the S&P 500 or ETFs.
8	Developed markets vs emerging markets	Investments are made based on the idea that the developed market is safe and well-regulated, while the emerging market is less regulated but has more potential.
9	Pairs trading	This method identifies similar pairs of assets and invests in the combination of the assets.
10	Value and growth method	The value method considers the intrinsic value of an asset and invests in undervalued assets. The growth method considers the growth potential of an asset and invests in the asset with a high growth potential.
11	Dividend growth investing	This method recommends investing in assets with high dividends based on the idea that firms that pay dividends are typically profitable.
12	Contrarian investment	This method chooses assets assessed to be good when the market is down and holds them for long-term profit.
13	Small marketcap investment	This method invests in low marketcap assets and firms based on the idea that low marketcap assets may have high returns.
14	ESG investment	This method considers environmental, social, and governance factors to be beneficial in some sense in the long run.
15	Factor investment	This method selects assets based on widely used factors, e.g. growth market value, quality, momentum, and volatility.
16	The growth models investment	This method makes investments based on growth models that account for oscillation and lengthening cycles. The models capture and predict asset price evolution, how to buy assets around the cycle minima, and selectively sell assets around the cycle maxima.

4. Conclusion

This article presents five growth models accounting for oscillations and lengthening cycles as a new investment method. These models are labeled conventional logistic growth, Gompertz growth, generalized charged capacitor growth, combined logistic and charged capacitor growth, and combined Gompertz and charged capacitor growth. The growth models are especially useful for predicting asset prices involving growth and fluctuations.

The Bitcoin price is volatile. It increases, with fluctuations, from \$0.1 to a maximum of \$67,500 November 9, 2021, and thereafter decreases to \$15,700 November 21, 2022. Bitcoin is a new type of asset with different characteristics compared with traditional assets, e.g. bonds, stocks, and physical assets. The growth models with oscillations and lengthening cycles are applicable for predicting the Bitcoin price and the price of other assets expected to involve oscillatory growth. Growth models are generally assumed to be applicable as an investment method.

The seven practical steps for applying the growth models as an investment are presented. This article uses the price of Bitcoin as an example of how to apply growth models for prediction. The simple investment method for using the growth models is to buy assets around the predicted market minima and sell assets around the predicted market maxima. The growth models are also useful to determine the proper entry point for investing in an industry. The growth models are compared with 15 other common investment methods. The growth models can be used in combination with other investment methods to assist investors to make informed investment decisions.

The growth models as a new investment method are useful for price prediction associated with growth and fluctuations. The article provides insights for traders and investors. Future research may apply the growth models for price prediction of other assets, e.g. stocks, bonds, and real estate. Future research may also explore approaches for identifying assets' carrying capacities. Further extensions of the growth models can incorporate other investment methods, e.g. dollar cost averaging, contrarian investment, momentum trading. Growth models can also be combined with various investment principles, e.g. invest a maximum of 20% in any one S&P 500 (Standard and Poor's 500), sector and a maximum of 5% in any one asset.

ACKNOWLEDGEMENTS

Competing Interests: On behalf of all authors, the corresponding author states that no conflict of interest exists.

Declarations of Interest: None.

Funding: No funding was received.

Data availability: The article contains no associated data. All data generated or analyzed during this study are included in this published article.

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