

AlloyCoin: A Crypto-Currency with a Guaranteed Minimum Value

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Abstract. AlloyCoin is a new crypto-currency designed to work alongside a Reserve that guarantees value for each AlloyCoin. The Reserve will always buy-back AlloyCoins for a fair, pre-determined price. Hence, AlloyCoin will enable individuals to feel more secure about the value of their AlloyCoin. In addition, the Reserve provides a number of other services. Most importantly, the Reserve will distribute its value across a variety of currencies and assets. The total value of the Reserve is expected to grow over time, from both interest on assets and income from business services. As the Reserve value grows over time, the value of each AlloyCoin will slowly gain in value. AlloyCoin is a more financially safe crypto-currency which is valuable by design as opposed to purely by demand.

Keywords: crypto-currency, crypto-commodity, price floor, market predictability

1 Introduction

With crypto-commodities becoming evermore popular, their challenges are becoming increasingly clear. From flash crashes related to Ethereum and drops as seen in Bitcoin, one issue that remains a constant theme for these commodities is price volatility. Currently, the vast majority of coins have unquestioningly adopted a number of assumptions put forth by Satoshi Nakamoto[1]. Due to the overwhelming popularity of Bitcoin¹, few have even thought to question these assumptions. This has created a 'Bitcoin Box' that the industry finds hard to think outside of. Alternatives to Bitcoin have appeared that either improve upon the design of the blockchain or use blockchain technology in innovative ways (e.g. cloud storage via FileCoin², smart contracts with Ethereum³, and a member voting protocol for new updates with Dash⁴ just to name a few). However, no

¹ As of July 16th, 2017, Bitcoin continues to have the highest market cap of any crypto currency at approximately \$32 billion USD with Ethereum in second place with approximately \$15 billion USD market cap, according to <http://coinmarketcap.com/>

² <https://filecoin.io/>

³ <https://www.ethereum.org/>

⁴ <https://www.dash.org/>

alternatives to Bitcoin have addressed the issue of price security. Thus, we introduce AlloyCoin as the first crypto-currency with a price floor by leveraging distributed assets. Just like a metal alloy is stronger because of its comprising metals, so AlloyCoin is a more secure crypto-currency because it is backed by an amalgam of crypto-commodities.

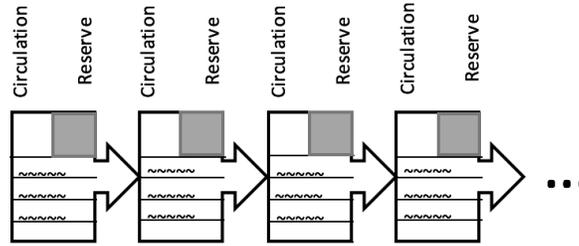


Fig. 1. Alloy's Block-chain implementation.

AlloyCoin proposes a solution to the issue of price volatility by building blockchain technology around a Reserve node. In essence, the Reserve is a large reservoir of AlloyCoins not in public circulation. The Reserve sells these coins to the market and uses the proceeds to acquire assets. These assets are used for the purpose of guaranteeing buying⁵ AlloyCoins at a minimum price paid out in USD or other crypto-currencies/commodities. The Reserve always buys back AlloyCoins at a daily established price $\$X$, which is a function of the value of Reserve assets and the coins in circulation. In this way the Reserve establishes a price floor because the Reserve will always buy any AlloyCoin for that price or its equivalent in other currencies.

For example, every day the Reserve will publish the new base price and thereby a new buyback price for a single AlloyCoin. The Reserve also sets aside a portion of its assets to guarantee coins that have yet to be mined within a window of time extending from each day to a point of time in the future. If someone would like to sell their AlloyCoin on that future date, the base and buyback prices may have changed, but they still have a guarantee from the Reserve that they can exchange their AlloyCoin for the resulting buyback price.

Figure 2 gives an overview of the AlloyCoin Reserve system and is composed of the following components: Assets, Reserve, Working Capital, Circulation, Business Services, and Business Expenses. Assets are what composes the value of the Reserve, most likely crypto-commodities, currencies and financial securities. Reserve is the entity that manages all liquid Assets which enable payment in exchange into/for Alloycoin. Working Capital are the funds that the

⁵ The Reserve will also sell AlloyCoins, but does not make a guarantee AlloyCoins will always be available to sell, since at any point in time there is a finite number of AlloyCoins in the Reserve

Reserve uses to pay for Business Expenses (things such as marketing, developers, rent of office space, etc.) Circulation refers to all Alloycoins that are held outside of the Reserve. These Alloycoins are held by individuals using Alloycoin as a currency. Business Services refers to extra services the Reserve will offer in exchange for some fees.

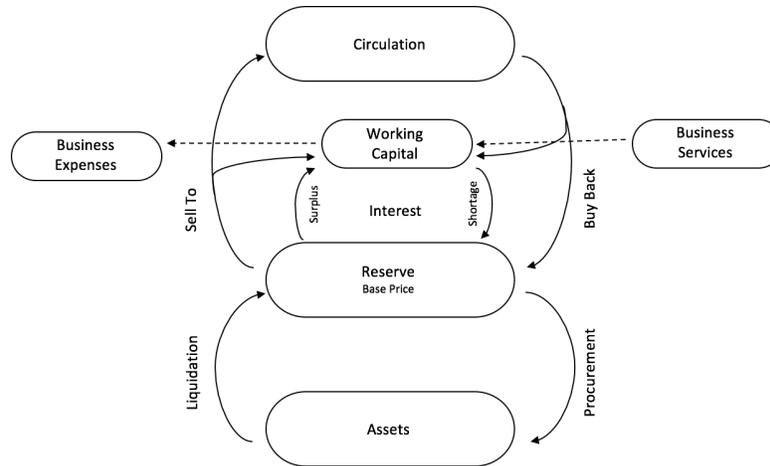


Fig. 2. AlloyCoin's Flowchart of Reserve System.

2 AlloyCoin's Blockchain

Nodes in the AlloyCoin network comprise the distributed system by broadcasting and updating the blockchain. Nodes are computer programs that run AlloyCoin software and may also contain one or more wallets, and/or the capability to mine new blocks. Nodes maintain the most up to date version of the blockchain and when they receive notification of new blocks from other nodes on the network, they update their own blockchain. Unlike traditional blockchains, each block in AlloyCoin's blockchain contains a unique coinbase⁶ transaction which sends a percentage of newly mined AlloyCoins to the Reserve⁷. In this network, the Reserve is a special node in that it has its own wallet(s) but differs since it establishes the reserve rate and the reserve address(es). AlloyCoin's network implementation is shown in Figure 3.

The Reserve not only stores AlloyCoins, but maintains assets in the form of other (crypto)currencies, index funds, bonds, and other securities. Part of

⁶ A coinbase transaction is one that generates new currency; in other words it is a transaction that has no sender, only one or more receivers

⁷ The miner still receives a reward for mining the block

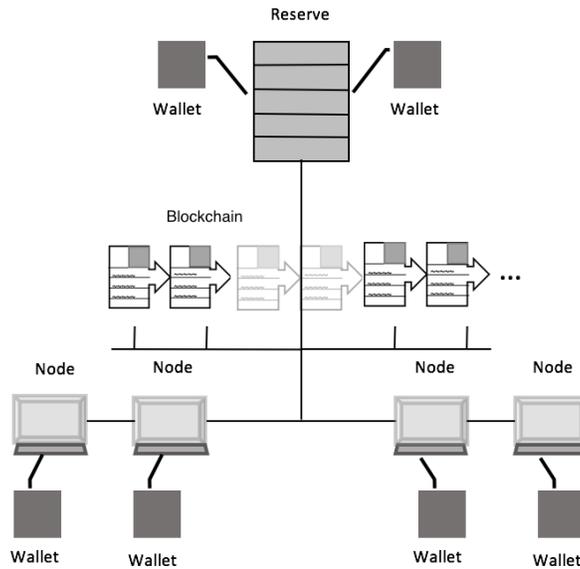


Fig. 3. Alloy's partially centralized Reserve based network.

the success of AlloyCoin relies on the guarantees of the Reserve. The Reserve will guarantee that an AlloyCoin can always be sold back to the Reserve for a buyback price, β , thus ensuring a price floor. The Reserve is not meant to replace other cryptocurrencies, but to instead offer a new alternative to the industry.

The Reserve supports the AlloyCoin blockchain in a number of ways: by employing a dedicated team of developers, consistently marketing AlloyCoin worldwide, investing portions of the Reserve to earn interest, etc. More specific business services such as a mixing service⁸ and an anonymous escrow service⁹ (which would be the first of its kind) will also be possible.

⁸ A mixing service is a mechanism where users can ensure an untraceable transaction. Instead of sending AlloyCoin to the destination, it is first sent to an intermediary (the mixing service) which splits up the transactions and 'mixes' them by sending them to other accounts, etc, until eventually the money winds up at the intended final destination

⁹ Our anonymous escrow service would enable two or more parties to exchange AlloyCoin for goods anonymously by using the Reserve as an intermediary. The Reserve will ensure both the AlloyCoins and goods are received, before dispensing the final funds and goods to the other party.

3 Alloy's Reserve

The Reserve can be implemented as any business, nonprofit entity or as a trust. Ownership of the Reserve could be held publicly¹⁰ or privately. Through mining, the Reserve automatically collects a percentage of all newly mined AlloyCoins as determined by the *reserve rate*. The Reserve then sells these coins to the market at a *target price* and uses the proceeds to purchase assets. The Reserve then uses the total value of these Reserve assets and the number of AlloyCoins in circulation, or the AlloyCoins not in the Reserve, as well as a portion of future coins to establish a *base-price*. If the market price for AlloyCoins should ever drop below the *base-price*, the Reserve will begin to liquidate assets using a *liquidation schedule* and buy back circulating coins from the market at a percentage of the base-price called the *buyback rate*. This effectively means that the market price for AlloyCoins will not permanently remain below the base-price except in the case of *Reserve failure*. Reserve failure would occur should the Reserve assets become completely depleted while circulating coins still exist. A number of precautions have been taken to avoid this situation which will be described in further detail in Section 5 *Preventing Reserve Failure*.

3.1 Reserve Rate

Mining of Alloycoins follows a similar process to traditional crypto-commodity mining. Each block is created using a distributed consensus algorithm including but not limited to proof of work and/or proof of stake. When these blocks are added to the ledger however, they will include a new special transaction for the Reserve. Using a value between 0 and 1, the reserve rate will establish the percentage of newly mined coins to be transferred to the Reserve.

3.2 Base Price

To determine the base price of one AlloyCoin, the Reserve determines the current circulating volume or c as the total number of circulating AlloyCoins. However, since the Reserve also guarantees the value of a number of future coins the number of future coins must be included in our calculation as well. The total number of coins present and future, whose value is guaranteed by the Reserve is denoted by C . This total number of coins or C is calculated by multiplying the number of days in the future the Reserve guarantees n by the product of the total reward per block R and blocks per day m . This value is then multiplied by $(1 - A)$ where A is the Reserve Rate. We then add in the number of presently circulating coins c to get:

$$C = c + [(1 - A)(nRm)] \tag{1}$$

¹⁰ Ownership could be through AlloyCoin holders (i.e. each person who holds AlloyCoin has ownership relative to their percentage of all AlloyCoins in circulation) or shareholders through a publicly traded company

We then divide the total value of Reserve assets ω by C to get the base price b . The final expression for the base price is:

$$b = \frac{\omega}{C} \quad (2)$$

Should every single holder of an AlloyCoin decide to sell back to the Reserve, the base price will serve as a template for the buyback price. Table 1 summarizes the main points of this section.

Table 1. Quick Reference for Variables relating to Reserve Calculations

Variable	Description
c	The total number of presently circulating AlloyCoins.
C	The total number of circulating coins present and future.
b	Base price for a single AlloyCoin, an estimate of the value of Reserve assets per AlloyCoin.
n	Number of days in the future for which the Reserve guarantees buying AlloyCoins.
R	Total reward per block.
m	Average number of blocks mined per day.
A	Reserve-rate, which is the percentage of newly mined coins, per block, to be transferred to the Reserve.
ω	Total value of Reserve assets
λ	The payout rate, which is a percentage to be multiplied by the base price to determine how much to pay for a single AlloyCoin.
β	Buyback price; the amount paid for a single AlloyCoin.

3.3 Payout Rate and Buyback Price

The Reserve will guarantee to buy back all AlloyCoins from any seller who wishes to sell to the Reserve. The Reserve does so by paying at a percentage of the base price called the payout rate. The reason the Reserve buys back at a percentage of the base price is to prevent Reserve failure and also provides income. The payout rate λ is a value between 0 and 1 that when multiplied by the base price yields the buyback price β . This is the value the Reserve guarantees to sellers for their coins and is expressed as follows:

$$\beta = b\lambda \quad (3)$$

4 Evaluation

Simulations were carried out to better understand the performance of AlloyCoin's base price under expected market conditions and to determine whether

or not to adopt a deflationary or inflationary based model for block rewards. A number of reasonable and conservative assumptions were made to create a market as closely related to reality as possible. Four scenarios were created for each of the possible combinations of the following parameters: interest growth for Reserve assets in one year and halving of AlloyCoin's block reward. Since we did not have data regarding the rate at which coins are sold back to the Reserve we held this value at 0 for all scenarios.

4.1 Expected Market Conditions

If AlloyCoin's assets earned interest during the simulation, then the interest rate was arbitrarily set to 5% and was calculated at the end of the simulated year. The simulations assumed the Reserve sold 10 million coins per year at a target price of 10\$ per coin for annual revenue of 100 million dollars. The simulation iterated through each of the 365 days in a year and for a total of 10 years. There was a block rate of 1 per every 10 minutes and a reward of 12,000 coins per block. The reserve rate was set to 0.9975 leaving 11,970 for the Reserve and 30 for the miner.

The simulation assumed no coins were sold back to the Reserve as this was purely to test the theoretical performance of the base price and no data exists for the rate at which coins are sold to the Reserve. Note that while 30 coins may not seem significant, with a target of 10 dollars each, this equates to 300 dollars as a reward per block. Also, it is in the miner's best interest that the Reserve be able to sell as many coins as possible to strengthen the base price.

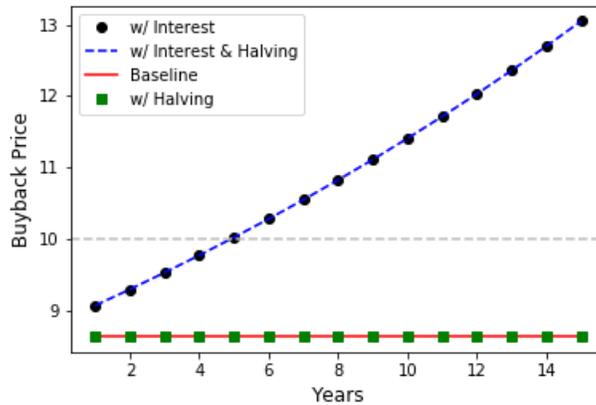


Fig. 4. Green Squares: No interest growth and reward halving. Red Line: No interest growth and no reward halving. Blue Dash: 5% interest growth with reward halving. Black Circles: 5% interest growth and no reward halving.

The blue and black trajectories that grew the fastest were the best cases. These both assumed that the Reserve's value earned an average of 5% interest each year. The difference was that the trajectory shown by the black circles showed an inflationary trajectory where the reward for miners never halved. The blue dashed line showed a trajectory where the mining rate did halve after 840,000 blocks and where the total number of coins is capped. This evaluation showed that Alloy's base price would reach its target value in approx. 5 years. This was due to the decreasing logarithmic function for circulation inflation.

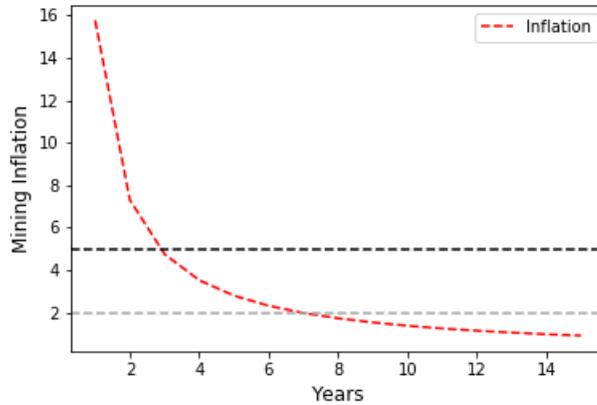


Fig. 5. Inflation of circulating supply over time.

4.2 Inflation Evaluation

Circulation inflation occurs since a percentage of new coins do not pass through the Reserve before entering into circulation. This inflation of circulating coins can have a negative impact on the base price, but as the number of circulating coins grows from sales, this inflation effect becomes diminished. Figure 5 shows the inflation of circulating supply as a percentage of existing coins in circulation over 15 years. Maintaining a level of inflation at about 2% would allow Alloy to increase the mining reward such that it would scale with increased growth and demand without affecting the base price and overall price security.

The evaluation showed that there was a critical point where the interest earned by the Reserve's assets equaled the percentage of inflation to the circulating supply. This translates into an interesting phenomenon where so long as the Reserve can earn at least the rate of interest that is equal to that of the inflation percentage of circulating coins, the base price will at least remain constant regardless of how many coins the Reserve can sell. When the interest earned by

Reserve assets passed the rate of inflation and reached a safer level of about 2% per year as denoted by the gray line, a number of options were available.

These options would be to increase the payout rate or the base price. Other options include the ability to increase the window of future coins whose value is guaranteed by the Reserve. Alloy could also use the difference to invest in business development, marketing and services. The reward rate per block for miners could be increased to pass some of the profit onto coin holders and users. A similar option would be to increase the number of blocks per day which translates into faster confirmation times. Lastly, Alloy could increase the reward per block which would translate into a model where the rewards would grow over time without affecting the price. This would make mining more attractive and lucrative with time and further help secure the network.

4.3 Worst Case Conditions

It is also important to consider the performance under sub-optimal conditions. A final evaluation was performed that assumed the only coins the Reserve ever sold were from AlloyCoin's initial coin offering or ICO. Figure 6 shows the results of this evaluation.

For this evaluation, we assumed 10 million coins were sold at the target price and evaluated the effect of circulation inflation on the base price over 25 years during which time, the Reserve never sold anymore coins. The final assumption was that no coins were sold back to the Reserve during this time as this was to test the theoretical performance of the base price over time under sub-optimal conditions and no data exists for buyback rates.

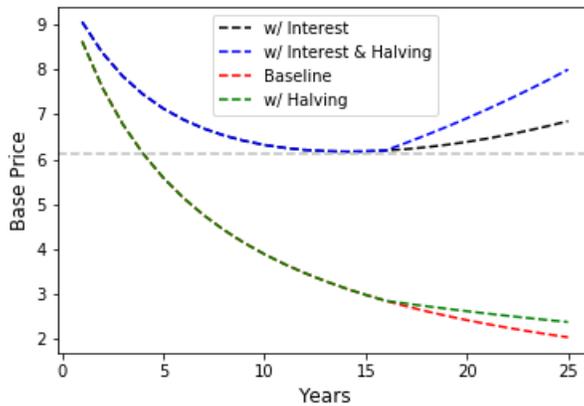


Fig. 6. Base price over time when affected solely by inflation. Assumes the Reserve made no further sales after the initial coin offering (ICO).

The blue and black lines show the performance when the Reserve earned 5% interest on its investments but the blue trajectory assumed the mining reward halved while the black assumed that the reward rate was continuous. The red and green assumed no interest was earned on investments but the green showed reward halving while the red did not. Both of these trajectories plot base prices that eventually reach 0 and result in failure.

It was observed that the base price experienced an initial decline over the course of about 15 years. The rate at which coins were added to circulation had a diminishing effect and eventually the interest earned on investments overcame the inflation of circulation supply and the base price began to recover. This showed that even under grossly sub-optimal conditions the base price dropped from a target of \$10 by about 40% to a price that was just over \$6 as denoted by the gray line. Nevertheless, the base price still recovered after about 15 years demonstrating that AlloyCoin maintained some level of security so long as investment returns could overcome inflation. AlloyCoin's base price also did not drop to 0 which is something crypto-commodities cannot guarantee as their value is governed solely by demand and lack any guaranteed minimum value.

5 Preventing Reserve Failure

Reserve failure would occur if the total value of Reserve assets equaled 0 while AlloyCoins were still in circulation. This would produce a base price of 0 and effectively render Alloy as no longer a crypto-currency but rather as another crypto-commodity. To prevent this, parameters were introduced to allow the Reserve to influence mining, buying and selling of AlloyCoins. The Reserve Rate influences circulation inflation, the Payout Rate influences the buying and the Base Plus X Rule influences the selling of AlloyCoins.

5.1 Base Plus X Rule

When selling coins into circulation, the Reserve will sell for the higher of either the target price or the base price plus a percentage. This allows the Reserve to profit from the difference between the sales price and the base price. Ensuring that the Reserve can sell for at least the base price, enables the Reserve to maintain price security. If the Reserve cannot sell for at least the base price, the Reserve will create a new liquidation schedule and begin buying back coins.

6 Conclusion

AlloyCoin is a cutting-edge reliably stable crypto-currency. AlloyCoin's network is built around a Reserve which guarantees a price floor. This is done by maintaining assets that serve to back the AlloyCoin currency. At any point in time, consumers can sell their AlloyCoin to the Reserve for its buyback price. This price is reflective of the value of the Reserve's assets divided by the number of

AlloyCoins in circulation. The total value of the Reserve is expected to grow over time, from both interest on assets and income from business services. As the Reserve value grows over time, the value of each AlloyCoin will slowly gain in value. Since AlloyCoin is more financially safe and stable, it acts like a true crypto-currency as opposed to a crypto-commodity making AlloyCoin valuable by design not by demand.

References

1. Satoshi Nakamoto. Bitcoin: A peer-to-peer electronic cash system, 2008.