Bitcoin or Ethereum?

The Million Dollar Question

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Introduction

They said, “Technology is the wave of the future” and in 2016, the future is here. The financial crisis of 2008 created a lack of confidence in the financial services industry: nothing was safe, not even traditional money, and especially not banks. Cryptocurrency, or digital currency, was a solution, and Bitcoin was the forefather. This new instrument was designed to be a hybrid of virtual money, digital asset, and technology; something the world had never encountered before now. It is now 2016 and much has changed, Bitcoin’s value has skyrocketed and its popularity and open-source format has led to many similar entrants into the market. It is not only Bitcoin that has experienced significant success, the overall cryptocurrency market has also had a similar experience, with the addition of new coins and creation of entire trading platforms.

Objective

Over the past few years, many have tried to challenge Bitcoin’s leadership in the cryptocurrency market, but none has come close, until Ethereum entered the scene. On one hand, Bitcoin, as the first mover, got to set the path of rapid growth, and has been stabilizing its volatility and price over time. Ether, the internal network currency of Ethereum, has experienced a surge in popularity unlike any other coin in the cryptocurrency market; Ethereum is not just another blockchain technology, it has found a whole new application for cryptocurrency. The purpose of this report is to compare these two blockchain technologies, and create a portfolio, consisting of Bitcoin and Ether, that will yield highest return with optimal risk on a million-dollar investment over five years.

Process

The report introduces a Two-Step Model assessing risks and returns of Bitcoin and Ether to propose three portfolio allocation mix. More specifically, Step One estimates price of Bitcoin and Ether in five years using two approaches – Trend Analysis and Cryptocurrency Demand-Supply Model. Step Two undertakes a qualitative assessment of their risks as a virtual currency, digital asset, and a technology. Taking into consideration cryptocurrency environment and potential of both cryptocurrencies, the model recommends a portfolio consisting of equal portion of Ether and Bitcoin, resulting an expected return of 115.5 percent over the next 5 years.

Cryptic World of Cryptocurrency

Since its inception in 2009 with the creation of Bitcoin, the cryptocurrency market has grown significantly with over 600 cryptocurrencies currently in the market. Over the years, experts have boldly attempted to predict the price of cryptocurrencies, with limited success. Some believe that the cryptocurrencies are undervalued, whereas others predict stagnation or even a decline. Research on this industry is also scarce, the primary reason, of course, being its age, in addition to the inherent randomness associated with such a nascent market. Moreover, it becomes difficult to individually assess each coin because they all originally stem from the same blockchain technology and they have little variation in terms of functionality. Given the weight that Bitcoin carries in the market, most of the research available study this cryptocurrency specifically.

An assessment of the literature that exists on cryptocurrency shows that there are three primary factors that affect cryptocurrency prices. Although these factors are specific to Bitcoin,

they can be extrapolated to also influence the cryptocurrency market as a whole. The three key factors that affect Bitcoin pricing are:

- ❑ Market forces of supply and demand (Buchholz et al. 2012; Bouoiyour and Selmi 2015)
- ❑ Attractiveness to investors (Kristoufek 2013; Bouoiyour and Selmi 2015); and
- ❑ Global macro-financial development (Van Wijk 2013; Ciaian et al. (2014)).

An important determinant of Bitcoin price, as well as price of any regular currency, is the equilibrium between demand and supply. There are three types of uses for cryptocurrencies: as a method of payment, as an asset or commodity, and as payment for miners – and it is extremely difficult to model the estimated demand. Bucholz et al. (2012) show that supply-demand interaction can be used to determine Bitcoin prices while Bouoiyour and Selmi (2015) argue that Bitcoin is largely detached from macroeconomic fundamentals and behaves as if in a 'speculative bubble.' The key takeaway from previous studies is that it is difficult to study the impact on cryptocurrency prices as there are many immeasurable factors that affect it, with the key driving factors yet to be identified.

Two-Step Model

The proposed Two-Step model allows us to compare return and risk profile of Bitcoin and Ether. More specifically, Step One estimates the price of Bitcoin and Ether over five years using two different approaches – Trend Analysis and Cryptocurrency Demand/Supply Model, whereas Step Two undertakes a qualitative assessment of their inherent risks in performing as a virtual currency, digital asset, and a technology

Step One: Calculating the Price Change in Bitcoin and Ether

Trend Analysis

The first approach involves a time-series regression analysis using price data over the period between 28th April 2013 until 2nd October 2016. To conduct this simple regression, the Coinmarketcap.com database is used to obtain the Weekly Price in US Dollars (*price*) of all available coins, including Bitcoin and Ether. Figure 1 and Figure 2 provides the trend for both cryptocurrencies.

Figure 1: Price Trend of Bitcoin (April 2013 - October 2016)

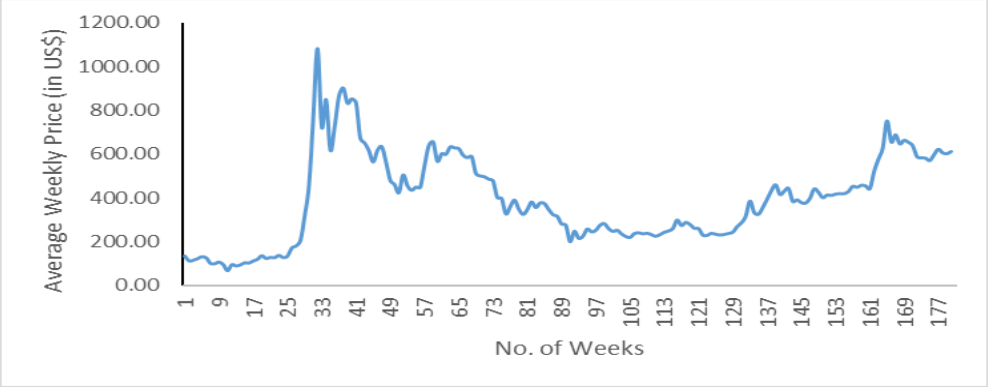
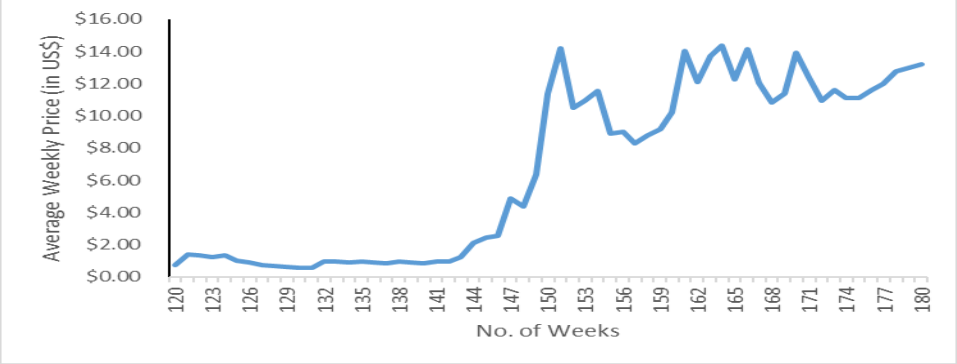


Figure 2: Price Trend of Ether (August 2015 - October 2016)



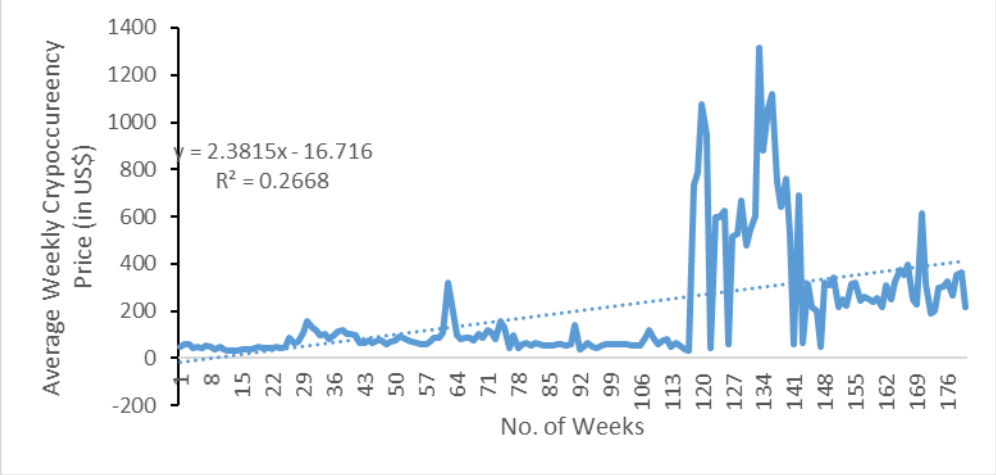
Preliminary statistical analysis indicated that the presence of substantial noise in the data, making it difficult to accurately deduce trends in the market. Since the benefits of including every coin in the database are outweighed by the imprecisions introduced to the model, trend

analysis was conducted on a subset of the database – this subset only comprised of coins that had accumulated enough value and liquidity. More specifically, only coins worth over US$ 2, with a market capitalization over US$ 1 million, were considered. The regression, following the equation given below, measures average weekly change in cryptocurrency market price over a period of 178 weeks to estimate the future weekly price changes.

$$\text{Weekly Price}_i = \beta_0 + \beta_1 \times \text{Period}_i + \varepsilon_i$$

Using Stata, regression of weekly average price over time was run and corresponding results indicated a positive trend in price - each week the average price is expected to increase by US$ 2.38 as shown in Figure 3. The coefficient was highly significant with a t-statistic of 6.75. The adjusted R-Squared of 26.6 percent shows that a good portion of the variability in the model is explained through the passage of time.

Figure 3: Price Trend of Average Cryptocurrency Market Price (April 2013 - October 2016)



Taking into account current price of Bitcoin (at US$638.04 as of October 11th, 2016) and Ethereum (at US$11.95 as of October 11th, 2016), weekly price growth is normalized to adjust the values for each coin so that they can be compared to each other, as shown in Table 1.

Table 1: Normalizing the Price of Bitcoin and Ether based on Market Price Trend

	Change in Weekly Average Market Price	Normalizing Ratio (Price of Each Coin/ Cumulative Price of Both Coins)	Weekly Price Growth (Change in Weekly Market Price * Normalizing Ratio)
Bitcoin	2.38	0.98	2.33
Ether	2.38	0.02	0.05

It is expected that, on average, Bitcoin grows at US$ 2.33 per week whereas Ether at $0.05 per week. Consequently, in 5 years, or 260 weeks, one would expect each coin to be traded as shown below in Table 2.

Table 2: Estimating the Future Price of Bitcoin and Ether

	Current Price (in US$)	Change in Price (in US$)	Final Price (in US$) [Current Price + Change in Price]
Bitcoin	638.04	605.80 (=260*2.33)	1,243.84
Ether	11.95	13 (=260*0.05)	24.95

This approach makes a few bold assumptions worthy of discussion. The most significant assumption is that past growth in the trading value of these coins is indicative of their future trajectory. There are more detailed models that contain other driving factors, such as market change, risk appetite, investor sentiment, and supply and demand, which also introduce errors and require a deeper analysis. To be specific, several factors that affect Bitcoin and the cryptocurrency market cannot be quantified, such as investors' sentiment, and the advancement of technology, etc. Secondly, looking at the price trends for each coin below, one may very well see their prices do not follow linear patterns. However, the choice to fit the data to a linear regression was deliberate and predominantly due to conservatism. The relatively long period of dataset, the accelerated growth of Bitcoin and Ether leading to a conservative measure of growth for the cryptocurrency market.

Cryptocurrency Demand and Supply Model

The second approach is based on a model introduced by Needham and Company LLC for the valuation of Bitcoin's price. This approach was used to predict Bitcoin price using its future demand and supply, but was expanded to also estimate the price of Ether.

Estimating Future Demand of Bitcoin & Ether

The primary demand for cryptocurrencies, such as Bitcoin and Ether, in the future will stem from its utility as an alternative payment channel and as a digital asset.

To estimate the future usage of Bitcoin and Ether in transactions, data from the Boston Consulting Group's "Global Payments 2015" report was used. Both Bitcoin and Ether have great potential in penetrating the retail market as they provide a more convenient and affordable solution for both domestic and cross-border transactions. In this model, the assumption is made that Bitcoin and Ether will be used in 3 percent of all cross-border retail payment and 0.04 percent of all domestic retail payments. Ether is expected to capture one-third of the market whereas in domestic transactions both currencies are likely to capture equal market share. Consequently, the estimated demand for the retail market for Bitcoin and Ether is calculated in Table 3:

Table 3: Monetary Base 1 for Demand Generated from Payment Utility

	Total Retail Payment Market Size (US$ Billion)	Market Penetration (%)	Bitcoin's Retail Payment Values (US$ Billion)
Bitcoin			
Cross-Border	2,950	2.00%	59
Domestic	6,4587	0.02%	129
Retail Payment			188
Approximate Velocity			12

Monetary Base 1			16
Ether			
Cross-Border	2,950	1.00%	30
Domestic	6,4587	0.02%	13
Retail Payment			43
Approximate Velocity			12
Monetary Base 1[1]			3.58

To assess their future demand as digital assets, we take into consideration its competition with gold held in exchange-trade-funds. According to the estimate by Needham and Company LLC, the proportion of Bitcoin currently held as investment is about 6 percent of the gold ETF market and they estimate it to increase to 25 percent by 2020. However, in our opinion this is a significant jump and may not be witnessed over the next few years. As a result, a more conservative measure of 15 percent market share is assumed for Bitcoin and consequently, 0.15 percent for Ether as shown in Table 4.

Table 4: Monetary Base 2 for Demand Generated as Digital Asset

Cryptocurrency	Gold ETF Market Size by 2020 (in US$ Billion)	Digital Asset as Percentage of Gold ETF Market (%)	Digital Asset Monetary Base 2 (in US$ Billion)
Bitcoin	74	15.00%	11.10
Ether	74	0.15%	1.11

The two sources of demand for Bitcoin and Ether are aggregated to estimate the required monetary base of US$27.10 billion and US$ 4.69 billion respectively as shown in Table 5.

Table 5: Expected Aggregate Demand for Bitcoin and Ether in Year 2020

Cryptocurrency	Payment Utility Monetary Base 1 (in US$ Billion)	Digital Gold Monetary Base 2 (in US$ Billion)	Total Monetary Base (in US$ Billion)
Bitcoin	16.00	11.10	27.10
Ether	3.58	1.11	4.69

Estimating Future Supply of Bitcoin & Ether

The number of bitcoins generated per block is set to decrease geometrically, with a 50% reduction every 210,000 blocks and it is estimated that by 2020 the supply will reach 18.37 million. On the other hand, according to the terms agreed by all parties on the 2014 presale, issuance of Ether is capped at 18 million per year with approximately 90 million Ethers expected to be in the market in 5 years as shown in Table 6.

Table 6: Expected Aggregate Supply for Bitcoin and Ether in Year 2020

Cryptocurrency	Current Supply Level (in units)	Increase in Supply in 5 years (in units)	Total Monetary Supply by 2020 (in units)
Bitcoin	15,750,000	2,625,000	18,375,000
Ether	85,008,785	90,000,000	175,008,785

Calculating Future Price

Given the estimated supply in Year 2020, the required prices are calculated to support their respective demand as shown in Table 7:

Table 7: Estimated Price of Bitcoin and Ether in Year 2020

Cryptocurrency	Estimated Demand in Year 2020 (in US$ Billion)	Estimated Supply in Year 2020 (in units)	Estimated Price in Year 2020 (in US$)
Bitcoin	27.100	18.375	1475
Ether	4.690	175.008	27

Then, to ensure a balanced estimate, the average of the calculated price from two approaches are taken as shown in Table 8:

Table 8: Average Estimated Price of Bitcoin and Ether

	Estimated Price using Trend Analysis (in US$)	Estimated Price using Cryptocurrency Demand Supply Model (in US$)	Average Price (in US$)
Bitcoin	1,244	1,475	1,360
Ether	25	27	26

Step Two: Estimating the Risks Associated with Bitcoin and Ether

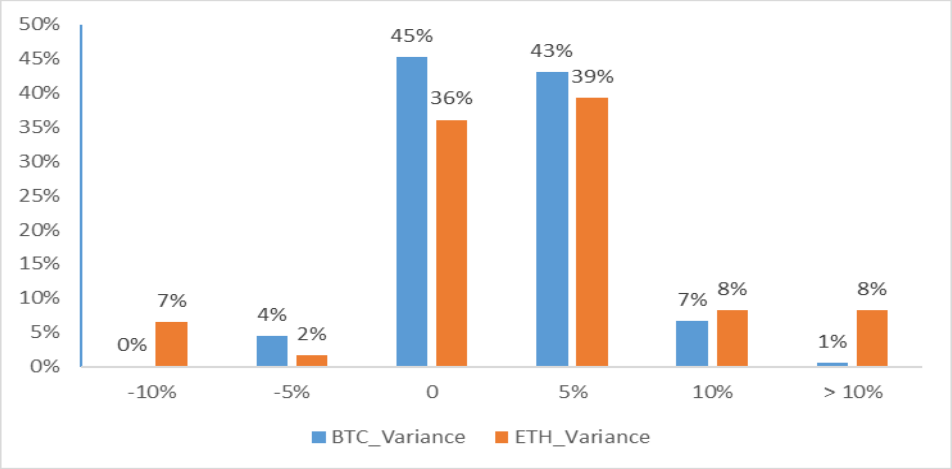
The performance of each of these coins in the market will be determined by its ability hold up to its value proposition. In order to gauge their performance over the next 5 years, it is important to distinguish the two coins' potential as a virtual money, digital asset, and technology, and in the process gauge their long term risk.

Virtual Money

Increasing acceptance of cryptocurrencies at brick and mortar stores, online retailers, and continued adoption of smart contract systems have helped increase usability along with reducing its volatility as shown in Figure 4. Low transaction costs, international reach, and speed-of-transfer, has been making Bitcoin the preferred choice of currency among selected segments in

the market. The use of Ether, in contrast, is limited to the realm of Ethereum where it is not only used as a currency, but also used to pay for the network power needed to execute scripts and contracts on the Ethereum network. Ethereum's blockchain allows blocks to be mined extremely quickly with a block time of 14 seconds, compared to Bitcoin's block time of 10 minutes, which ensures greater transactional velocity. Finally, the capping of Bitcoin's supply at 21 million provides a controlled supply which enhances its predictability compared to Ether, which has no hard limit. A measure of their volatility has shown that the standard deviation of 24-hour variances for Bitcoin was 3 percent, compared to Ether's 11 percent.

Figure 4: 24 Hour Variance of Price of Bitcoin and Ether



Digital Asset

Bitcoins have seen a significant growth in its market capitalization in the last five years of its whereas Ether's price has appreciated 10 times more than Bitcoin over the last year alone, making it the second largest cryptocurrency by market capitalization. Ether is slowly being introduced into cryptocurrency exchanges, and is expected to achieve a common ground with Bitcoin in the near future. However, Bitcoin has the advantage in regards to greater acceptance and awareness, and infrastructural presence, leading to greater liquidity and lower volatility.

Technology

Bitcoin is the original blockchain entity that primarily facilitates cash transactions, whereas Ethereum exploits the full potential of the blockchain, and goes beyond the book-keeping of financial transactions. In recent times, Ethereum has continued to attract the attention from giants in the finance and technology industry alike, such as JPMorgan Chase, Microsoft, and IBM, which have described it as Bitcoin 2.0: a superior technology, with many real world applications.

One of the principal problems that Bitcoin has faced over the years revolves around cybersecurity, with a few significant breaches and hacks which have resulted in the losses of significant coins for the users. Nevertheless, these security breaches have very little to do with the protocol itself, and more to do with the people and services handling and storing these coins.

A customized risk rating matrix (See Table 9) is constructed to compare the risks association with the two coins in regards to eight sub-categories - the superior coin is awarded a point, which is then tallied. The currency with the highest score is expected to have lower risk.

Table 9: Customized Rating Matrix to Assess Risk of Bitcoin and Ethereum

	BITCOIN	ETHEREUM	RATING
Virtual Money			
Store of Value	Reduced volatility Supply capped at 21 million	Yet to be stabilized No supply limit	Bitcoin 1 Ethereum 0
Medium of Exchange	Globally accepted form of payments with growing recognition Block time of 10 minutes	Limited to the realm of Ethereum Block time of 14 seconds	Bitcoin 1 Ethereum 0
Digital Asset			
Growth in Size And Correlation with Traditional Assets	Market cap at 10x of Ethereum Low correlation with other asset classes	Price appreciated over 10x compared to about 3x for bitcoins Market cap at around 5x that of any other digital asset besides Bitcoin	Bitcoin 0 Ethereum 1
Liquidity	Greater presence in a wide variety of exchanges Increased infrastructural presence	Yet to be a mainstream in cryptocurrency exchanges	Bitcoin 1 Ethereum 0
Technology			
Application	Original Block chain entity facilitating cash transactions Could also incorporate Smart Contracts	Puts block chain to work for purposes beyond the bookkeeping of financial transactions. Not dedicated to moving and validating money	Bitcoin 0 Ethereum 1
Adoption	First movers advantage Commands a greater acceptance and awareness level	Technology is largely unproven Increased collaboration with leaders from the finance and tech industry	Bitcoin 1 Ethereum 0
Security	Significant number of cyber attacks Protocols not responsible for security breaches but rather people and services handling it	Greater software complexity makes it prone to more security issues Scalability may expose it to more security threats	Bitcoin 1 Ethereum 0

The matrix shows that Bitcoin (Score = 5) has a higher total score compared to Ethereum (Score = 2) indicating that it has lower associated risks in the three criteria stated above.

Investment Decision

Prior to investment recommendatoin, it is important to highlight the key challenges often faced by investors prior to making such an investment. Firstly, given the relatively short track-record of these assets, there is not a standard valuation tool that is currently widely accepted to

predict the trading prices of Bitcoin and Ether, and there has yet to be a consensus on the best method to estimate the price trend. Secondly, although the world is shifting towards a more digital ecosystem, there is no guarantee that technology is going to advance at the rate it has been, and how the world economy is going to change, therefore making it difficult to quantify their risk profiles. Finally, the cryptocurrency market is exposed to serious speculations, and new players enter the market every day, making the application of any single valuation method problematic.

Nevertheless, the Two-Step Model gives confidence in making an investment decision given the robustness of its data as well as its comprehensiveness. The results from Step One provide the expected the return for Bitcoin and Ether as shown in Table 10:

Table 10: Percentage Change in Price of Ether and Bitcoin

	Current Price (in US$)	Estimated Price in Year 2020 (in US$)	Percentage Change in Price (%)
Bitcoin	638.04	1,360.00	+113%
Ether	11.95	26.00	+118%

Step Two indicates Bitcoin is likely to maintain its dominant position in the market, while Ether is in a growth trajectory which is highly dependent on the success of the technology behind it. More importantly, it concludes that Ether is prone to face greater risks compared to Bitcoin.

The scoring obtained in Step Two can be used as a proxy for our portfolio allocation. The rationale behind this is that the risk rating also indicates the relative potential of each coin. Thereby, we would allocate greater portion to the one with the most potential and this allocation can be estimated from the ratio in the scoring i.e. Bitcoin: Ether = 70:30. Thereby, we suggest

three portfolio combinations and these portfolios can be categorized into three distinct risk levels:

- ❏ Low Risk - More investment in the less risky cryptocurrency i.e. Ether
- ❏ Moderate Risk - Contains a balanced share of both Bitcoin and Ether
- ❏ High Risk - More investment in the riskier cryptocurrency i.e. Bitcoin

Based on individual risk appetites, the investor may choose one of three combinations and expect the corresponding returns summarized in Table 11:

Table 11: Portfolio Allocation Option Based on Risk Level

Return for Bitcoin	113%			
Return for Ether	118%			
Risk Appetite	Total Investment (in US$)	Percentage of Portfolio Allocated to Bitcoin (%)	Percentage of Portfolio Allocated to Ether (%)	Total Return (in US$)
Low	1,000,000	70	30	114,500,000
Moderate	1,000,000	50	50	115,500,000
High	1,000,000	30	70	116,500,000

From the above analysis, it is clear that return from both Bitcoin and Ether are comparable. That said there is a significant difference between their potential and corresponding riskiness. The above portfolio returns indicate that the total returns are comparable with the lowest being US$ 1.145 million and the highest being US$ 1.165 million. However, Bitcoin is expected to remain the dominant currency, whereas Ethereum has greater opportunity for growth due to its applicability. It is unlikely, however, for Ether to experience a higher price trajectory in the near future as its technology is largely unproven and has yet to improve significantly before it achieves stability and mainstream adoption. If Ether does manage to bring out a revolution in the

adoption of smart contracts, then price trend is expected to increase significantly. Thereby, this analysis recommends for a portfolio consisting of equal portion of Ether and Bitcoin, resulting in an expected return of 115.5% over the next 5 years.

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