Attention Based Currency and Universal Basic Income

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Abstract

Cryptocurrencies from Ethereum to Bitcoin to UCoin have often been proposed as a decentralized, secure, and efficient way to deliver the benefits of Universal Basic Income (UBI) to a global community. Attention Based Currency (ABC) is a cryptocurrency generated by the interaction of Internet users with streaming media. Listening records are secure and encrypted, but the algorithm rewards listeners who seek out and share new content as "early adopters." ABC is a market-based approach that can be used independently or in tandem with more traditional government-funded or philanthropic UBI programs.

Our economy is shifting from a model of extraction and industrial production to a post-capitalist system ordered by the weightless transfer of information. ABC's application of blockchain distributed database technology to the consumption of content represents a new way to quantify this source of wealth in real time and reinvest it to achieve a more vibrant and dynamic global information culture.

Our paper will present analysis of the economic impact generated by two proposed pilot models:

- ABC only
- State-funded UBI only

We present a new hypothesis, ABC launched in partnership with a cryptocurrency-based UBI delivery system that is driven by the results of this analysis as a viable option.

As jobs disappear and the price of online goods and services approaches zero, neither advertising revenue nor stock market speculation can sustain the global Internet economy indefinitely. ABC protects users' privacy, while providing direct rewards for their role in the information economy. **Attention Based Currency, when deployed in combination with Universal Basic Income, reduces the tax burden of UBI while seeding a new and vibrant attention-driven economy.**

Introduction

Universal Basic Income as a concept dates back at least as far as Thomas Paine in the 18th century[1]; however, UBI's most recent advocates have been motivated in large part by the consequences of encroaching automation. To give just one example, advocates of the "sharing economy" may tout the benefits of Uber and similar technological advances—but with the advent of self-driving cars, those newly created Uber jobs will disappear.

Conversely, **Attention Based Currency provides a new model for rewarding and building value around those activities and forms of production that are uniquely human: storytelling, songwriting, musical**

[1] https://www.ssa.gov/history/paine4.html

performance, making movies, playing games, and telling jokes. ABC creates a system that assigns immediate value to the viewer's attention and recognizes that communication is a collaborative act.

ABC thrives under conditions of surplus leisure. Artists, listeners, and hosts all benefit from ABC. It provides a creative and dynamic counterpart to Universal Basic Income, celebrating the values and traits that define our humanity and ultimately transferring an increasing share of the world's wealth to creators.

ABC pays users a *variable* amount, rewarding Internet users based on their consumption of online content. UBI provides all participants with a *fixed* base of income regardless of salary or means testing.

UBI and ABC complement each other well, since both are at an early stage of development with pragmatic implementations easily within reach.

Combining UBI with ABC has some concrete, practical, and pragmatic advantages for both systems, including:

- Secure, unique identifier for participants reduces the risk of fraud and "Sibyl Attacks" for a new cryptocurrency.
- Easy to track and monitor outcomes for participants of both programs over time.
- Combining a fixed "safety net" with a variable rewards system creates new incentives and economic opportunity within the system.

In this paper, we will endeavor to outline the early stages of the model connecting the two systems. Our work is heavily influenced by the work of Fabre[2]. While Attention Based Currency is not intended as a tool for speculation, our analysis draws upon the practical, real-world successes of cryptocurrencies from Bitcoin to Ethereum emerging as a new medium of exchange able to hold their value and fill a niche heretofore left vacant by government-issued fiat currency.

Universal Basic Income

Universal basic income (UBI) is defined as a policy in which citizens would receive a minimal allowance that would allow everyone the means basic for necessities. UBI is income that is granted to a citizen unconditionally, as opposed to unemployment insurance. In general, UBI programs are simpler to manage than means-tested programs such as welfare, food stamps, or disability payments. UBI does not by definition replace traditional social benefits such as welfare, health care, or food stamps; however many libertarians and social conservatives endorse the idea of a simple cash payment (or "negative taxation") in lieu of the administrative and bureaucratic costs of the traditional welfare state. Various taxation schemes have been proposed to pay for Universal Basic Income; however it is important to note that UBI does not require government funding to be implemented, and in fact can be implemented across borders.

[2] Fabre, Alice, et. al Universal Basic Income versus Unemployment Insurance

Attention Based Currency

Attention Based Currency (ABC) is a proof-of-work cryptocurrency generated by the interaction of Internet users with streaming media. Listening records are secure and encrypted, but the algorithm rewards listeners who seek out and share new content as "early adopters."

ABC differs from other forms of cryptocurrency in that the initial "mining" activity to generate the currency requires interaction with some form of online content. *The user's attention is the commodity that is being measured and assigned value.* ABC's initial implementation uses streaming audio, but the same technology may be applied to other forms of content such as online video or games.

Background

Since the time of antiquity, money, in its various forms, has been used to carry out transactions of the exchange of goods and services. Traditional forms of money such as commodity based or fiat currency derives value from two sources. In the case of the commodity based currency, it comes from some intrinsic value (like gold or silver) or in the instance of fiat currency it is by the rule of law. The preceding examples are essential examples of inherited states of value. Commodity based currency will fluctuate according to the backing product, just as a fiat based currency will fluctuate as the strength of the government that is backing it. Regardless of this inherited value, the true use and value of any form of currency is through its transactional utility and through the strength of an economy in which the transactions are occurring. This fact is even true in the emergent markets of cryptocurrencies such as Bitcoin and Attention Based Currency (ABC).

The quantitative tie of the value of currency to the transactional volume that occurs within a given economy has formalized the framework of the Equation of Exchange[3]. In essence, the equation of exchange indicates that the value that a currency has is directly proportional to amount of transactions occurring for a range of time. The nature of cryptocurrency (of this type) is one that fosters a decentralized characteristic. A decentralized economy is one that is based on person-to-person interactions, instead of one that ultimately is tied to a centralizing element such as a single federal reserve. A familiar decentralized market is the foreign exchange market.

While the actual valuation of the ABC is beyond the scope of this current paper, it is crucial that the currency has a value that is dependent on a micro-economy. The usage of ABC would be akin to the model used by Alaska, in which citizens receive a dividend from the natural resources such as oil. ABC is earned based on an agent's time spent listening to online music, thus increasing the amount of assets the agent possesses.

Attention is treated as an asset with economic value. While other currencies may be backed by gold, guns, or raw processing power, ABC is backed by units of human attention. **For marketplace confirmation of the direct monetary value of Internet users' attention, look no further than services like Outbrain and Taboola, which charge up to $.20 to $.90 per visitor to redirect traffic directly to their customers' websites[4]—no ad views required.**

ABC is the only currency in the world that relies on the human brain as its final intermediary of value. Because production of the currency does not scale in the same fashion as Bitcoin mining on server farms or extractive mineral mining operations, ABC can remain more decentralized than any other form of

[3] Mill, John Stuart; *Principles of Political Economy* (1848)
[4] http://www.bloomberg.com/features/2015-click-fraud/

currency mining. The solo student listening to streaming music with headphones on a bus is no more or less efficient in mining currency than a worker listening to music in a warehouse full of cubicles. The lack of incentive to scale means that *unlike* Bitcoin, ABC is less vulnerable to cartel-ization and economic pressures that exclude all but the largest mining outfits.

Model Description

We have chosen to explore the framework of a dynamic equilibrium model with savings calibrated to the United States between 1948 to 2015, with an economy with major labor shocks to employment, both to the employed and unemployed. This theoretical laboratory to probe that will be used to provide comparison between ABC, UBI and both models implemented in tandem.

Time is discrete and indexed by t=0,…,∞. The Agents are assorted with respect to employment. At any given time t, they may or may not have a job opportunity and they may have accumulated different amounts of saving, to soften the effect against employment shocks. Employment opportunities are subject of a stochastic process. Let $l_t \in \{0,1\}$ denote the sample state of an agents employment lottery at the beginning of a period t, with 1 representing the state of being offered a job (or the continuation of the job) and 0 otherwise. This process is a 2 state Markov (memoryless) process with transition probabilities$p(l_t|l_{t-1})$. The income afforded by the agents is normalized to ½. This model will not include a moral component of accepting a job. If the job is offered then the Agent is obliged to take the job.

Agents that live in this economy have infinite lives and they have the technology that allows them to store assets over time. They face a borrowing constraint, which can be formulated for a given time period t by the following:

$$m_{t+1} + c_t = m_t + y_t^d$$

where $c_t$is the consumption, $m_{t+1}$is the future asset and y_t^d is the disposable income. The (with the normalized income) the disposable asset can be written as the following:

$$y_t^d = \begin{cases} (1-\tau)(1+\alpha+u) \text{ ABC , UBI, employment} \\ (1-\tau)(u+\alpha) \text{ ABC, UBI unemployment} \end{cases}$$

where τ is a proportional income tax, α is the ABC and u is the UBI. The tax rate is such that the government balances its budget. UBI is finance with a proportional income tax.

A representative household (of two agents) derives lifetime utility[5] according to:

$$U(c_t, L_t) = \left[\frac{c_t^{1-\sigma} - 1}{1-\sigma}\right]$$

where $\sigma \in \mathbb{R}^+$is degree of elasticity of substitution, respectively, Utility is a measure of preference over some set of goods and service.

[5] J Hansen, G. D.: 1985, Indivisible labor and the business cycle, Journal of Monetary Economics, 16(3), 309-327.

A value function is the maximized utility subject to constraints. Infinitely live agents will maximize the value function subject to the budgeting constraints

$$\mathrm{V}(\mathrm{m}_t, \mathrm{s}_t) = \max \mathbb{E}\left[\sum_{t=0}^{\infty} \beta^t U(c_t, L_t)\right]$$

where $\beta^t \in [0,1)$ is the discount factor and $\mathbb{E}$ is the expectation value operator, m_t is the asset of the agent and s_t is the state of employment (employed or unemployed).

The maximization problem can be solved recursively and can be written in terms of the Bellman equation.

$$V(m_t, s_t) = \max_{\{m_{t+1}, c_t, L_t\}} \left\{ \frac{c_t^{1-\sigma} - 1}{1-\sigma} - + \beta \mathbb{E} V(m_{t+1}, s_{t+1}) \right\}$$

For an agent with assets m_t and job offer outcomes , s_t:

$$V(m_t, s_t) = \max_{\{m_{t+1}, c_t, L_t\}} \left\{ \frac{\left(m_t - m_{t+1} + y_t^d\right)^{1-\sigma} - 1}{1-\sigma} + \beta \sum_{s_{t+1}} p(s_{t+1}|s_t) V(m_{t+1}, s_{t+1}) \right\}$$

The government's budget constraint can be written as:

$$\tau(L + \alpha + u) = u$$

where L is the total number of employed.

The solution of the Bellman equations will rely on the application of the Banach fixed point theorem. The elasticity of substitution will be set to 0.67[6] the discount factor will be set to .995.

Model Calibration

The model will use the actual year (January-January) average of the unemployment risk in the United States from 1948 until 2015. In the following two figures, the unemployment rate and duration of unemployment are presented in below:

[6] Kydland, F. E. & Prescott, E. C. (1982). Time to build and aggregate uctuations. Econometrica, 50(6), 1345{1370.

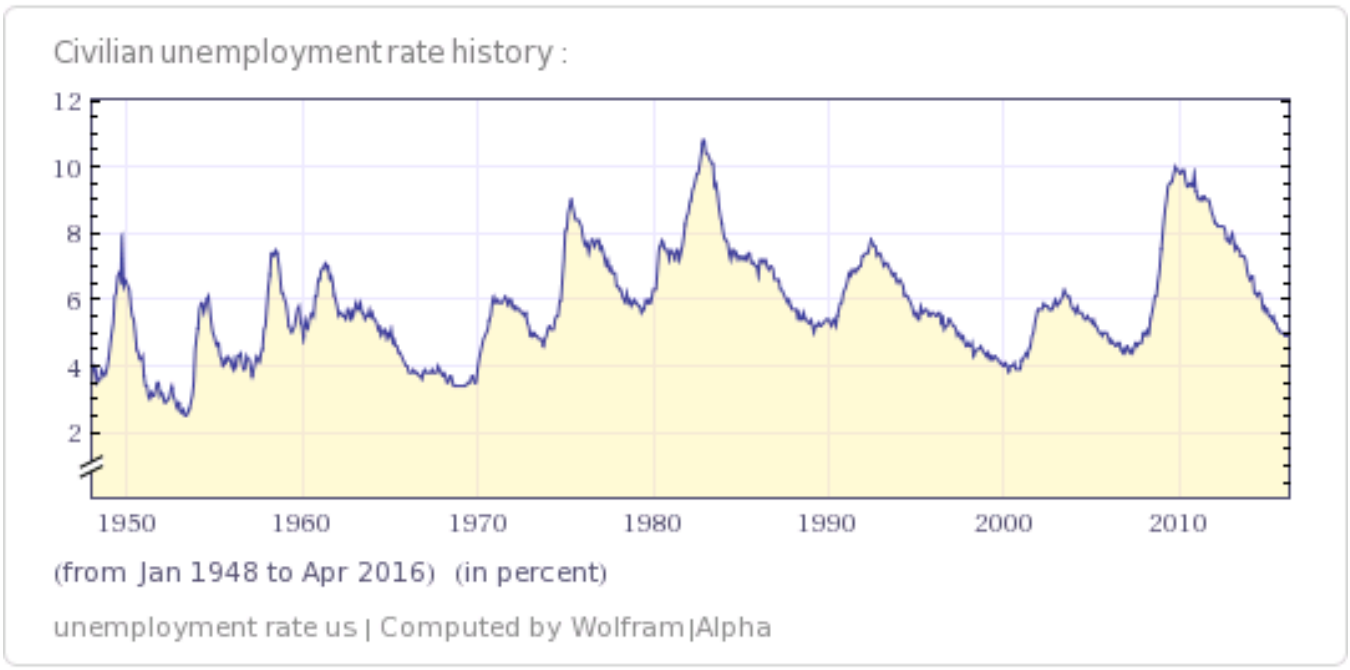

Figure 1: Unemployment rate US: 1948-2015 [Wolfram|Alpha]

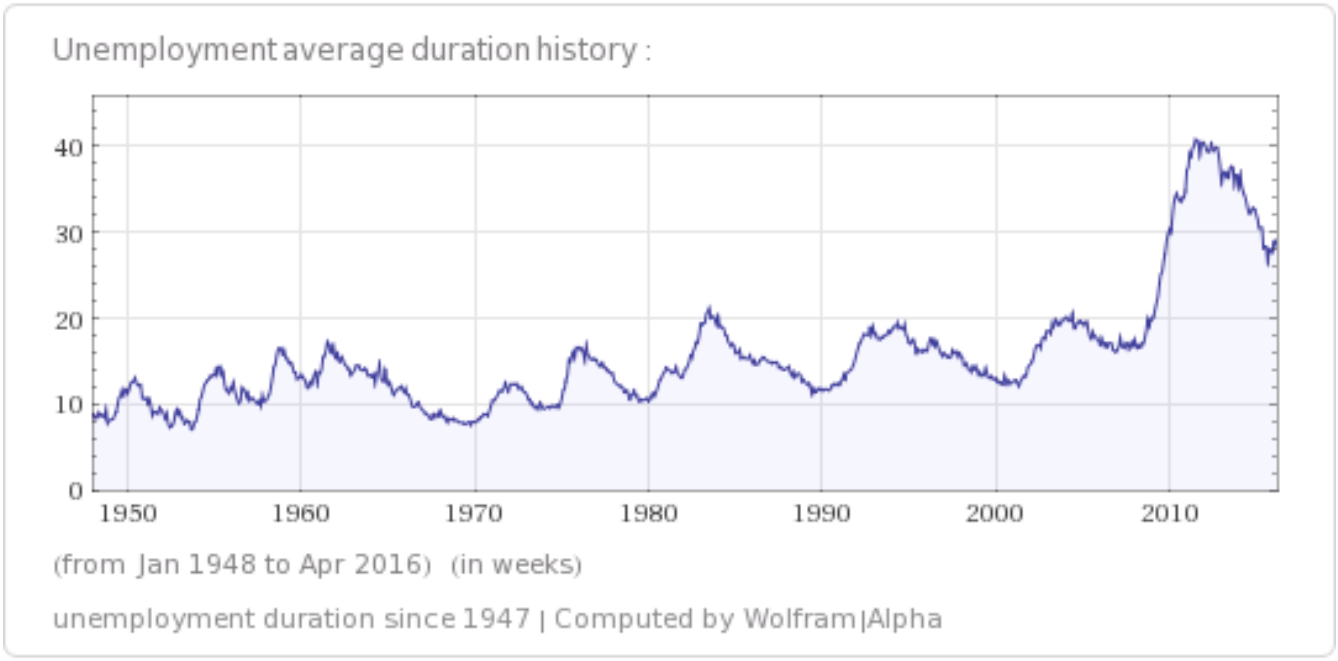

Figure 2: Unemployment rate US: 1948-2015 [Wolfram|Alpha]

The model simulation will be set to a period of six weeks. Stated previously, the employment lottery is a two state Markov system. The diagram of the employment state can be seen in the figure below:

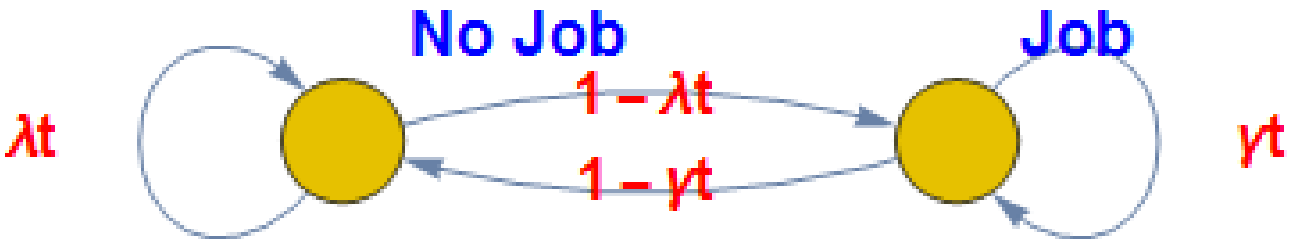

Figure 3: Employment Lottery Markov Chain

The transition probabilities can be calculated using the data from the unemployment data. The probability $p(1|0)$ to exit unemployment (the probability to receive an offer when previously unemployed is the inverse of the average unemployment duration.) The probability to transition to a state of unemployment if previous previously employed is given by Bayes' Theorem:

$$p(0|1) = \frac{p(1|0)p(0)}{p(1)}$$

where $p(0)$ is the unemployment rate, and p(1) is the employment rate. The aforementioned transition probabilities are given in the figures below:

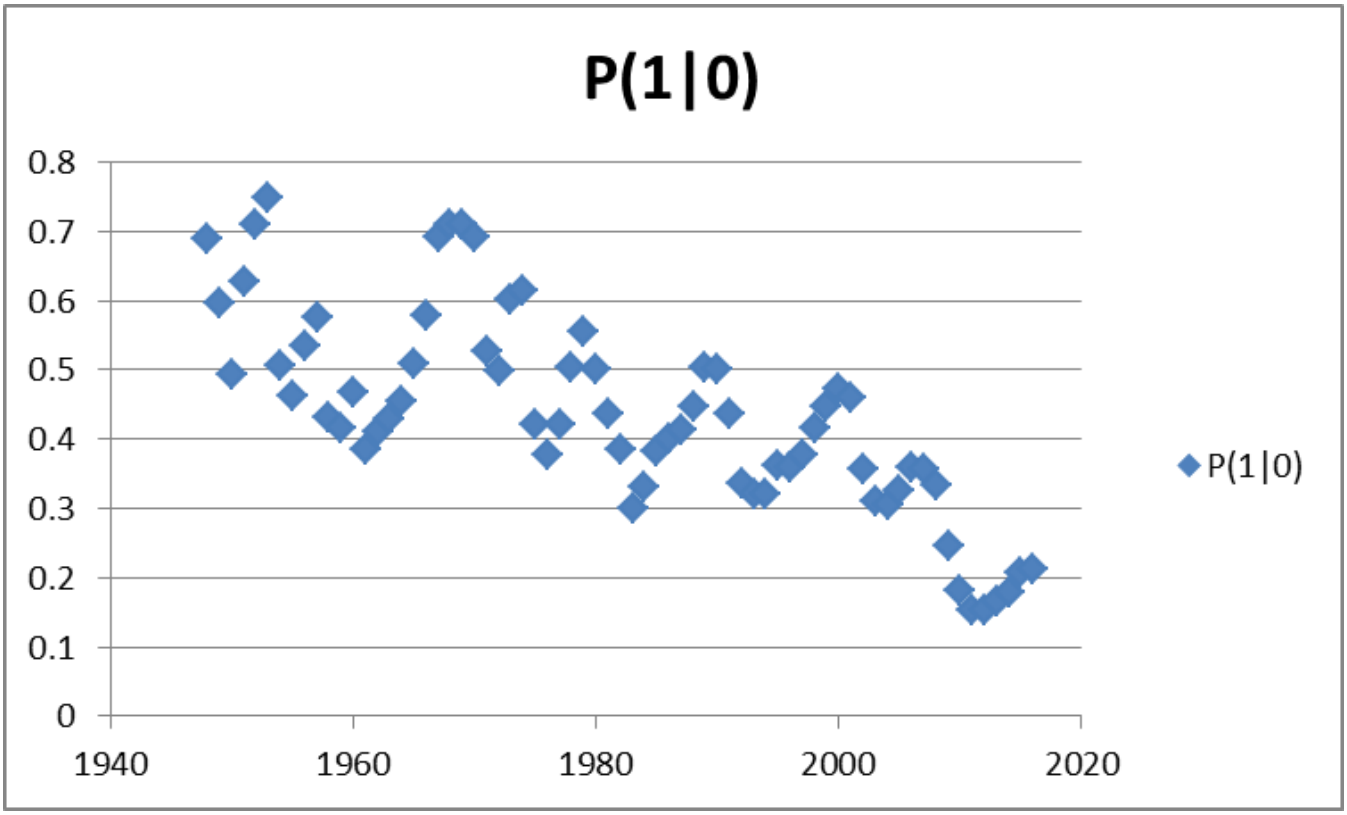

Figure 4: Transition probability to and from unemployment to employment

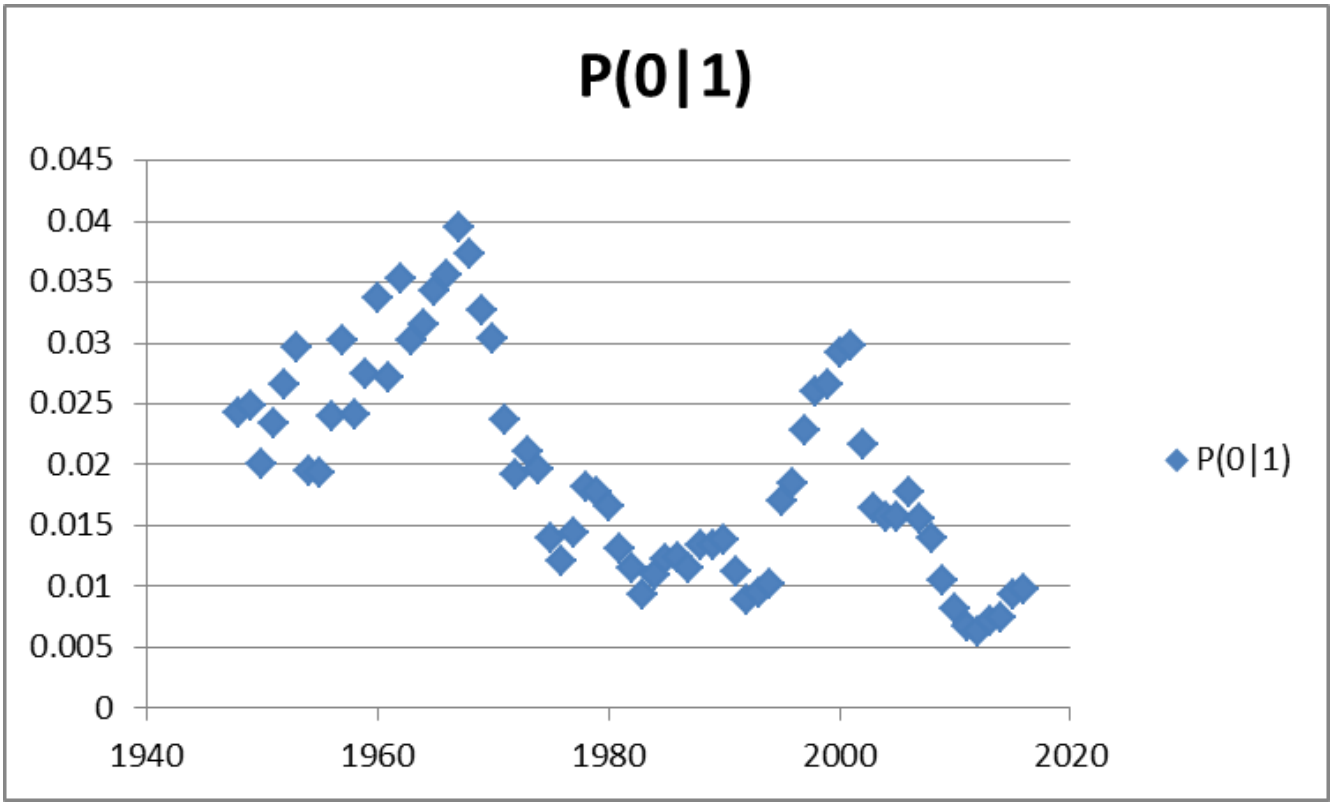

Figure 5: Transition probability to from employment to unemployment

As one can see, there is a negative trend in each transition probabilities.

The stationary probability distribution for this Markov process is given by the following two- state system:

$$v_{\infty} = \begin{pmatrix} P(1) \\ P(0) \end{pmatrix}$$

which implies that total number of workers $L = NP(1)$, where N is the total population. This is of course assuming that there is a moral obligation of accepting a job if it is offered

Model Results

From the government's budget condition, when $u = 0$ then the tax rate is minimized. In Figure 6, the increase of the tax rate with respect to increased UBI benefits for the individual agent for 1948 and 2016. The amount of ABC was randomly generated. If ABC was not used by the agent then tax burden on the individual worker is greater to receive UBI alone.

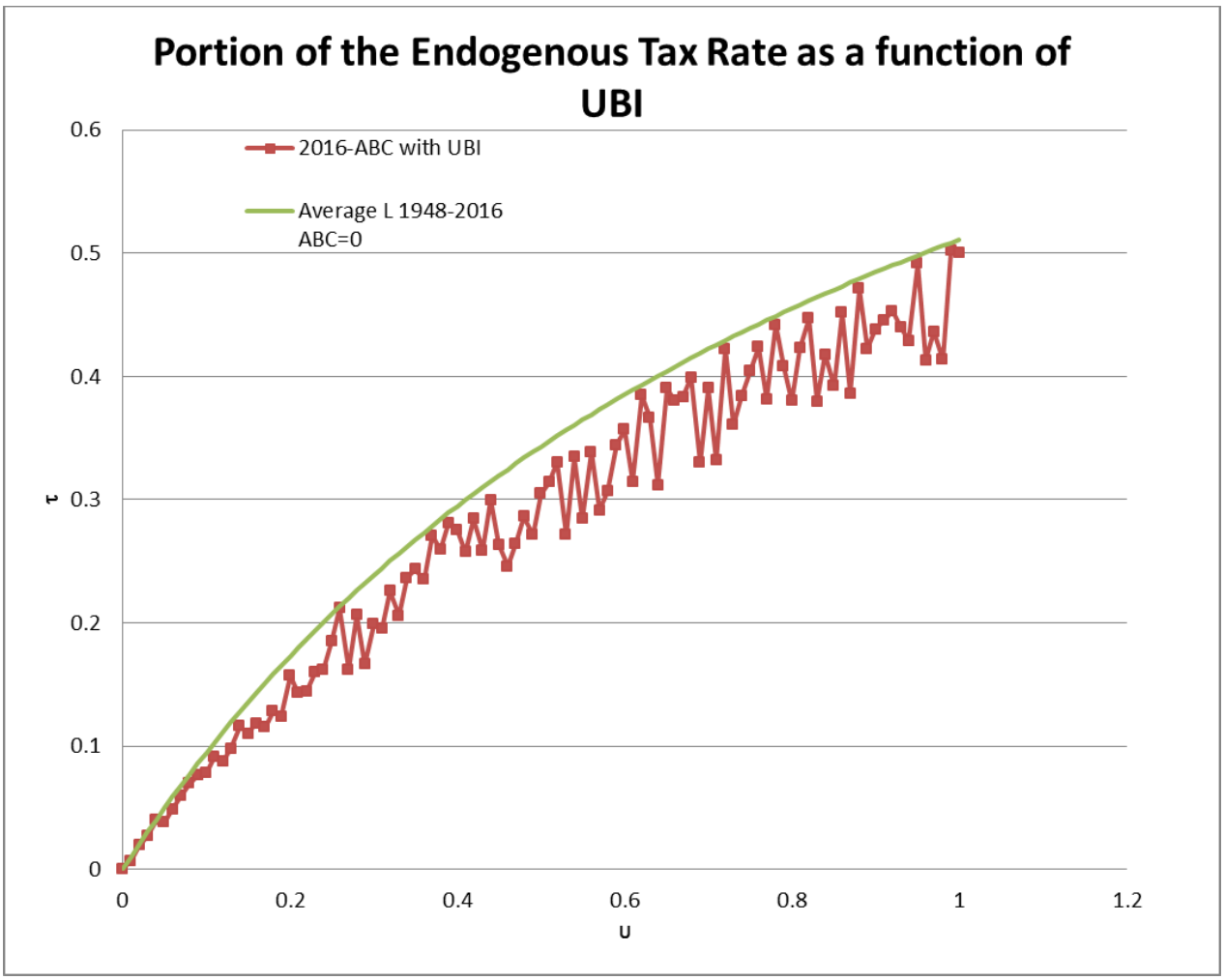

Figure 6: Increases in Tax Rate with increased UBI

Since ABC is not generated by the government, there are no additional tax increases required to fund the endeavor. In fact, it is a source of revenue for the government to use for other programs. In this simple model, ABC could be used as a source of UBI without additional government support.

From solution of the Bellman equation the agent maximizes his value if it ABC is utilized. ABC is also immune to the effects of idiosyncratic shock of unemployment (no matter the how large the unemployment rate increased). Therefore, if $\alpha \neq 0$, then the agent could maintain some level, for a small amount of time (with initial asset m_o) [Figure 7].

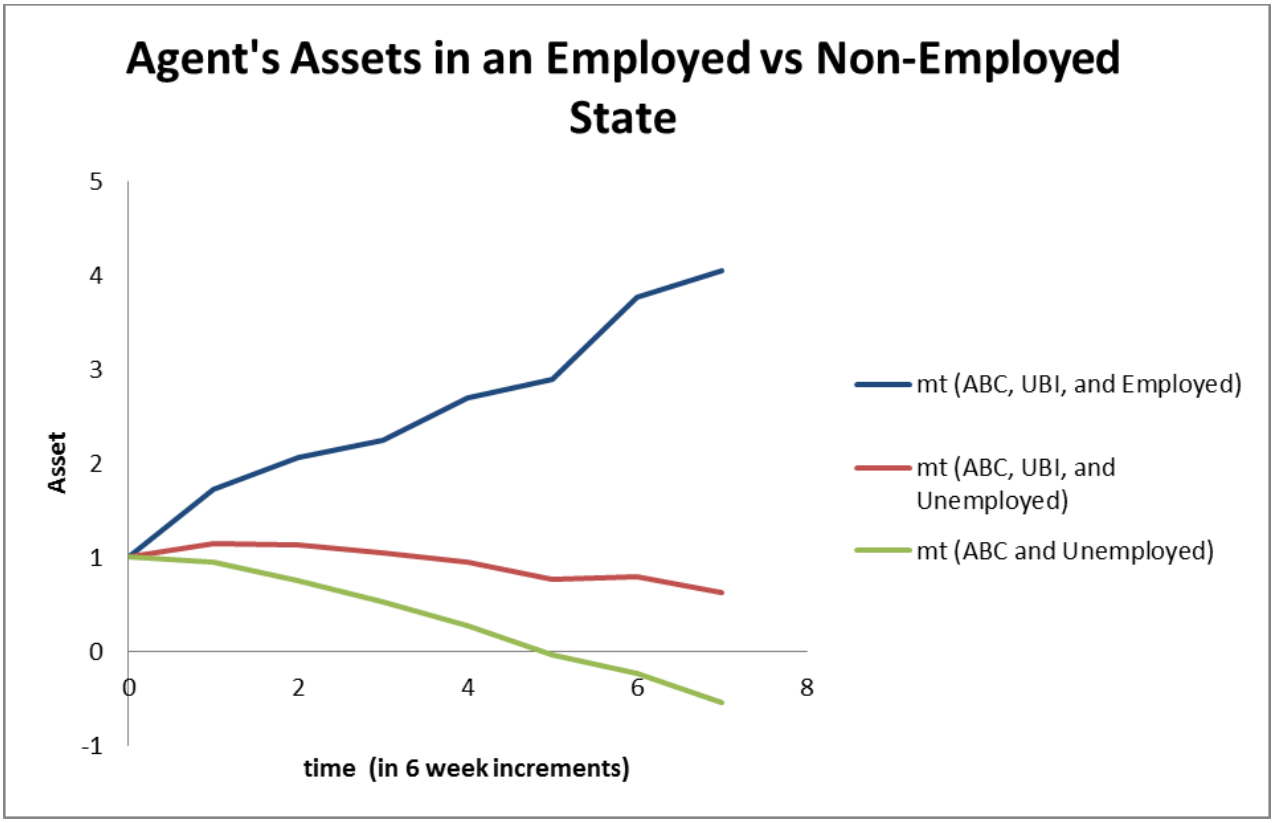

Figure 7: Asset as a function of time for 3 scenarios

This plot was generated assuming that the autonomous consumption (rate of spending when the income is 0, basic living expenses) was 33%. The marginal propensity to consume was a random variable (with a range of 66%).

Conclusion

As is the case with the Alaskan dividends, ABC could be used as a form of UBI without additional tax burden of the agent. ABC like UBI is immune to the effect of idiosyncratic shocks of unemployment. When used in conjunction with UBI, ABC reduces the overall tax burden required while in fact providing a new form of tax revenue.