CARBON RENAISSANCE WHITEPAPER 1.0

A PREPRINT

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ABSTRACT

We propose a Carbon offset design that creates natural economic incentives through business processes tied to NFT tokens issued from enterprise to participating companies which connect to Carbon offsetting processes. Upon audits of work, a fungible token (Green token) is issued to companies involved based on a pre-negotiated ratio of tokens dispersed based on the quality of the work and quality of the credit-worthiness of the companies involved. Green token supply represents a collection and aggregation of all pollution prevention value that has happened thus far.

Keywords Carbon Sequestration · Carbon Offsetting · Social Credit · NFT

1 Executive Summary

1.1 Mission and Vision

1.2 Problem Statement and Strategy

2 Solutions

3 Proposed Design

4 Overview

4.1 Tokenized Company Shares

4.2 Tokenomics

Assume we are given the following stochastic (Markov) matrix:

$$P = \begin{bmatrix} p_{g,g} & p_{g,r} & p_{g,b} \\ p_{r,g} & p_{r,r} & p_{r,b} \\ p_{b,g} & p_{b,r} & p_{b,b} \end{bmatrix}$$

where each element is non-negative and each row sums to one. Each row of P can be regarded as a probability mass function over n possible outcomes. For instance, element $p_{g,b}$ represents the probability of a green token transitioning to a black token between states. For our problem we setup the following transition matrix representing our business targets:

$$P_\mu = \begin{bmatrix} 0.95 & 0 & 0.05 \\ 0.05 & 0.9 & 0.05 \\ 0.01 & 0 & 0.99 \end{bmatrix} \quad (1)$$

where the frequency is monthly, and the states are represented as green, NFT, burned respectively. In Fig **??**, we represent this Markov process as a directed graph with edges labelled by the transition probabilities in (1).

Let's assume $\{X_t\}$ is a Markov chain with stochastic matrix P, and the distribution of X_t to be ψ_t. Hence, if we let the initial distribution of $\psi_0 = [1, 0, 0]$, the probability distribution of X_t can be determined via:

$$X_t \sim \psi_0 P^t \quad (2)$$

Hence, the estimated token supply at time t is given by:

$$\hat{S}_t = (S_0 + \alpha N_t)\psi_0 P^t \quad (3)$$

where S_0 is the initial token supply (ie, 100M Green, 0 NFT and 0 Black tokens), N_t represents the NFT IOU rate, and $\alpha \in [0, 1)$ represents the global quality factor (eg, 0.9).

4.2.1 Token Model Simulation

To simulate transition probabilities in $\mathbf{P}_t$, we use the Beta distribution:

$$\mathbf{p}_{m,n,t} \sim Beta(\alpha_{m,n}, \beta_{m,n}) \quad (4)$$

where m is the current state, n is the previous state and $\beta_{m,n} = 1 - \alpha_{m,n}$. The parameters $\alpha_{m,n}$ and $\beta_{m,n}$ are selected such that $E\{\mathbf{P}_t\} = P_\mu$. It is important to keep in mind that this is a stationary model, hence the expected values are invariant to time. We ensure that the rows of the simulations of $\mathbf{P}_t$ sum to one by applying the following normalization:

$$P'_{m,n,t} = \frac{P_{m,n,t}}{\sum_n P_{m,n,t}}. \quad (5)$$

where $P_{m,n,t}$ represents the an element of $\mathbf{P}_t$ at time t. The simulated token supply at time t is defined as:

$$\hat{\mathbf{S}}_t = (S_0 + \alpha N_t)\psi_0 \mathbf{P}_t^t \quad (6)$$

		Next State		
		Green	NFT	Burned
Current State	Green	$P(X_{n+1} = g \vert X_n = g)$	$P(X_{n+1} = r \vert X_n = g)$	$P(X_{n+1} = b \vert X_n = g)$
	NFT	$P(X_{n+1} = g \vert X_n = r)$	$P(X_{n+1} = r \vert X_n = r)$	$P(X_{n+1} = b \vert X_n = r)$
	Burned	$P(X_{n+1} = g \vert X_n = b)$	$P(X_{n+1} = r \vert X_n = b)$	$P(X_{n+1} = b \vert X_n = b)$

Table 1: Transition state matrix for token model detailing probabilities of transitioning from current to next state over a unit of time. The token states are denoted by Green $\rightarrow$ g, NFT $\rightarrow$ r, and Burred $\rightarrow$ b.

4.3 Revenue Model

4.4 Token Architecture

5 Open Issues

5.1 Jurisdictional Requirements

5.2 Competition

5.3 Speculative vs Stable

6 Summary

References

[1] Ian Alison, *Blockchain Coalition Launches Tradable Carbon Credit Token*, Accessed on: Jul 2021. [Online]. https://www.coindesk.com/blockchain-coalition-launches-tradable-carbon-credit-token

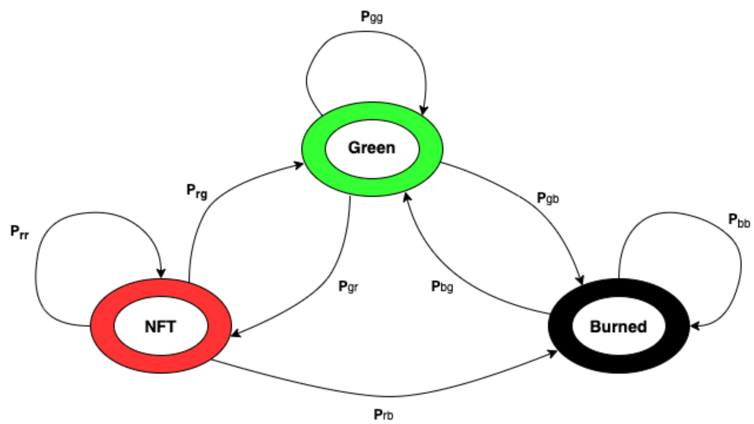

Figure 1: State transition diagram for Markov chain token model illustrating the probability of a token transitioning between states (ie, Green, NFT, and Burned) over a unit of time.

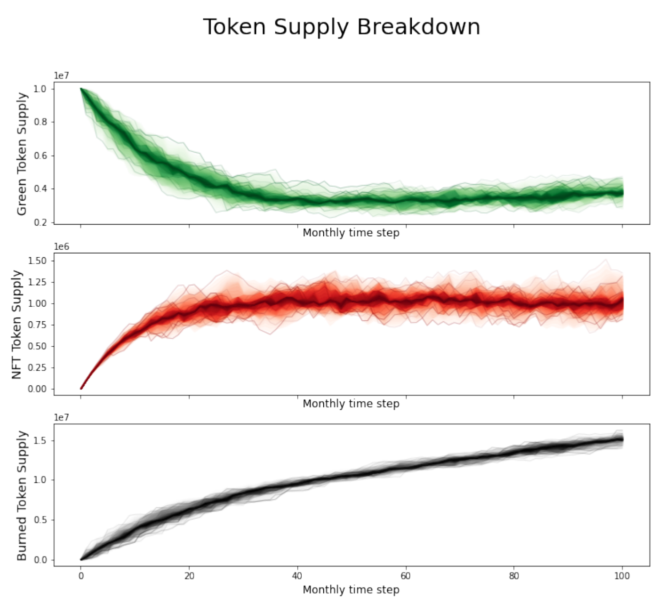

Figure 2: Markov Chain Token model simulations assuming stationary transition probabilities applying the Beta distribution at each time point at a monthly frequency. The expectations of the transition probability matrix was selected based on business targets. The simulation begins with 100M Green tokens, the bulk of which will transition to red and black tokens over time and eventually reach a state of equilibrium. When the system reaches steady-state the expected supply of each of the three tokens will remain constant.

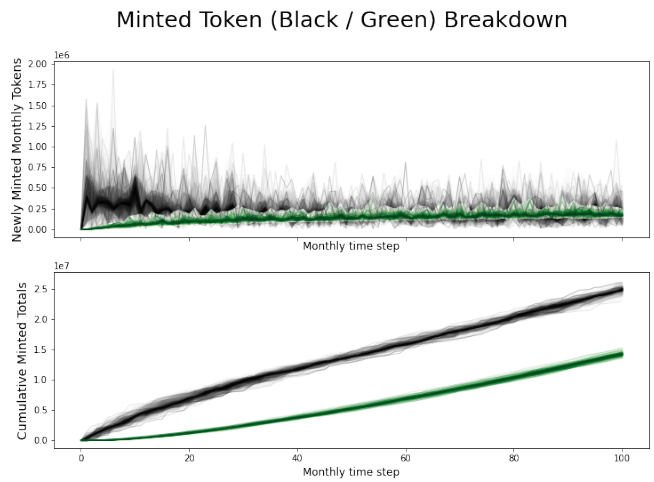

Figure 3: Newly minted green and burned tokens resulting from simulation model (6). Simulations of: (TOP) number of daily minted tokens; and (BOTTOM) cumulative number of daily minted tokens.

[2] *SolarCoin is a cryptocurrency that incentivizes a solar-powered planet*, Accessed on: Jul 2021. [Online]. https://solarcoin.org/

[3] *A digital exchange focused on eliminating market friction in a carbon constrained economy.*, Accessed on: Jul 2021. [Online]. https://www.aircarbon.co/

[4] *APersonal Carbon Trading Inc.*, Accessed on: Jul 2021. [Online]. hhttps://www.carbonx.ca/

[5] *The Nori Carbon Removal Marketplace*, Accessed on: Jul 2021. [Online]. https://nori.com/

[6] *Microsoft Bought Carbon Credits Through Cosmos Blockchain*, Accessed on: Jul 2021. [Online]. https://thecoinshark.net/blockchain-news/microsoft-bought-carbon-credits-through-cosmos-blockchain

[7] Y. Pan, X. Zhanga, Y. Wanga, J. Yan, S. Zhou, G. Li, J. Bao, *Application of Blockchain in Carbon Trading*, *Energy Procedia.*, vol. 1588, no. 7, Feb. 2019.