ON THE ESTIMATION OF THE ECONOMIC VALUE OF A DASH PROPOSAL

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ABSTRACT

This paper is concerned with the derivation of a consistent formal method to allow for estimating the economic value of a Dash proposal. Standing on the *Currency Fair Value* [1] theory as rational financial pricing model of a currency, the paper will arrive at a straightforward and objective calculation tool, in the form of several simple equations. These will allow *Masternode* owners and individuals who submit proposals to the *Dash* treasury to estimate the expected value return of the *economic proposals* and thus, enable them to make more rational decisions. Development of this new model will require differential analysis of the *fair value* equation, as a basis for the analytical expressions expected by the main target audience. This analysis goes beyond the scope of *Dash* and many other currency research efforts may also drawn upon it.

***K*eywords** Dash · Proposal · Quantitative Finance · Asset Pricing · Currency Fair Value · Investing

1 Introduction

Calculating the economic value of a *Dash* proposal, in terms of the increase/decrease of the value of the native currency—DASH —has been an unsolved problem since the creation of the *Dash Governance system* [2]. Approximately every month, *Dash* Masternode owners (those holding a *Dash Masternode*, who are approximately equivalent to a board of directors) face the question of whether to approve or reject various economic proposals, based on the expected return the proposals may exert on the value of *Dash*. To date, to the best of my knowledge, there are no objective financial tools to help the *Masternodes* make better decisions regarding any given proposal. This often generates unwanted conflict.

The need for a —rationally derived— financial pricing model to solve the problem is recognisable, for no other means would produce objective and unbiased expected prices and price changes. The choice of the *Currency Fair Value* [1] model is not arbitrary. It has the fundamental property that when its variables are instantaneous measurements, it converges to the price of the currency. This property makes it an *unbiased* model with respect to the market. On the contrary, the design of a *biased* model is unavoidably a subjective exercise. The data produced by such a model could never be objective and as a result, it would be of limited use in evaluating proposals.

Along this paper I will refer to *users* —of the currency— in a way that may give the impression that a user is actually counted as an individual. I am, nonetheless, employing a more practical definition of *user*. As far as this paper is concerned, there will be one user per *differential amount* of the currency and, thus, a continuous distribution of users. It goes without saying that an actual individual is still represented in this definition as the integral of a slice of the currency supply; an aggregation of users holding differential amounts of the currency.

This paper is structured so that it starts with the theory of the analysis of changes in the *fair value* of a currency (sections 2 and 3). It continues with an analysis of the *Dash* population of users (section 4), followed by the theoretical application of the theory to *Dash* proposals (section 5), to proceed with numerical examples of specific proposals (section 5.4). The last part is an implementation guide for *Masternode* owners and people submitting proposals. The guide is self

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contained, allowing the reader to skip the underlying theory and immediately use the quick reference to calculate the predicted value of any given *Dash* proposal. Therefore, readers with no interest in the theory should proceed straight to section 6.

2 Definition of *user*

As it was stated in the introduction (1), a *user* is defined as an individual —with a human behaviour— holding a differential amount dM of the currency's *Total Discounted Supply* (M). A single real individual will be thus, represented by an infinite amount of currency *users*, as by the definition given in this paper. According to this definition, the distribution of users based on their behaviour will be characterized by a continuous —instead of a discrete— probability density function.

3 Equation of currency *fair value* change

Let A be a currency. Its *intrinsic value* or *fair value* with respect to a currency B is obtained, according to CFV [1] model as:

$$FV_{AB} = \frac{T_A}{T_B}\frac{M_B V_B}{M_A V_A}\frac{B_A}{B_B}, \tag{1}$$

where:

T_X = *Transactions Count* or number of transactions per unit of time of the currency X.
M_X = *Total Discounted Supply* of the currency X.
V_X = *Total Discounted Velocity* of the currency X, or current users' willingness to trade their discounted savings.
B_X = *Basket Average Value* of the currency X or average value of the transactions of its users.

Given that, by definition:

$$Q_X = B_X \cdot T_X \tag{2}$$

is the *Volume Transacted* per unit of time in a currency X, the *fair value* equation can be rewritten in the *Q form* as:

$$FV_{AB} = \frac{M_B V_B}{M_A V_A}\frac{Q_A}{Q_B}. \tag{3}$$

Q form and *T form* are the two ways of expressing the fair value equation. The *T form* (equation 1) is the most complete version and the preferable one, for it breaks the *Volume Transacted* variable down to its primary components. Sometimes, when no *Basket Average Value* and not *Transactions Count* information is available, the *Q form* is necessary.

3.1 General *action* differential equation

Let us define an action γ as any sort of intentional activity with the capacity of changing the constituent variables of a currency. A differential action $d\gamma$ would then be an action with the capacity of provoking differential changes on the constituent variables of the currency. If $FV_{AB|d\gamma}$ is defined as the *fair value* of currency A with respect to currency B, conditioned to the occurrence of a differential action $d\gamma$, so that:

$$FV_{AB|d\gamma} = FV_{AB} + dFV_{AB}, \tag{4}$$

dFV_{AB} is thus, the change in the *fair value* as a result of the differential action.

Let us refine the definition of the action γ so that the change on the *Total Discounted Supply* always takes place before the change in the rest of the variables —which is consistent with the mechanics of a *Dash* proposal—. This allows one to isolate the change of M_X directly associated with the action γ, from the change of M_X associated with other external phenomena, such as the programmed issuing of new supply. Formally, a new variable M'_X can be defined so that, if all variables are time (t) dependent, and γ starts at time t_γ:

$$\frac{dM'_X}{dt} := \int_{t-\epsilon}^{t+\epsilon} \delta(z-t)\frac{dM_X}{dt}dz \tag{5}$$

Which implies:

$$\frac{dM'}{M} = \begin{cases} \frac{dM}{M}, & \text{if } t = t_\lambda. \\ \\ 0, & \text{otherwise.} \end{cases} \tag{6}$$

In order to study the sensitivity of the *fair value* to changes in its constituent variables as a result of $d\gamma$, one can make use of the *total derivative* of a function $u := f(\boldsymbol{z})$:

$$du = \nabla u \cdot \boldsymbol{z} = \sum_i \frac{\partial u}{\partial z^i} \cdot dz^i. \tag{7}$$

Restricting the problem to differential actions $d\gamma$ on A affecting only $\{M_A, V_A, Q_A\}$ —Q form— or $\{M_A, V_A, T_A, B_A\}$ —T form—, one has:

$$\begin{aligned} dFV_{AB} &= \nabla_{Q_A, M_A, V_A} FV_{AB} \cdot (dQ_A, dM'_A, dV_A) \\ &= \frac{\partial FV_{AB}}{\partial Q_A} dQ_A + \frac{\partial FV_{AB}}{\partial M_A} dM'_A + \frac{\partial FV_{AB}}{\partial V_A} dV_A \\ &= FV_{AB} \cdot (\frac{dQ_A}{Q_A} - \frac{dM'_A}{M_A} - \frac{dV_A}{V_A}), \end{aligned} \tag{8}$$

and

$$\begin{aligned} dFV_{AB} &= \nabla_{T_A, B_A, M_A, V_A} FV_{AB} \cdot (dT_A, dB_A, dM'_A, dV_A) \\ &= \frac{\partial FV_{AB}}{\partial T_A} dT_A + \frac{\partial FV_{AB}}{\partial B_A} dB_A + \frac{\partial FV_{AB}}{\partial M_A} dM'_A + \frac{\partial FV_{AB}}{\partial V_A} dV_A \\ &= FV_{AB} \cdot \left(\frac{dT_A}{T_A} + \frac{dB_A}{B_A} - \frac{dM'_A}{M_A} - \frac{dV_A}{V_A} \right). \end{aligned} \tag{9}$$

respectively.

Equations 8 and 9's being independent of any constituent variables of currency B allows for simplifying the notation, and arriving to the *General Differential Equation* for the two forms, Q and T:

$$\frac{dFV}{FV} = \frac{dQ}{Q} - \frac{dM'}{M} - \frac{dV}{V}. \tag{10}$$

$$\frac{dFV}{FV} = \frac{dT}{T} + \frac{dB}{B} - \frac{dM'}{M} - \frac{dV}{V}. \tag{11}$$

The behavioural variables of the whole population of users of the currency A, the *Average Transaction Value* and the *Total Discounted Velocity* are respectively, by definition:

$$B = \frac{Q}{T}, \tag{12}$$

and

$$V = \frac{Q}{M}. \tag{13}$$

3.2 Users transfer *action* differential equation

An *action* can have the nature of users adopting a different —either new or existing— behaviour. Let us consider this rearrangement as a *de facto* transfer of users from one user group to another. These groups of users, exhibiting a measurable different behaviour, will be henceforth know as *behavioral sets* —of users—.

Let Λ be the whole population of users and let λ_i be one of a total of N_λ *behavioral sets* within Λ so that:

$$\Lambda := \bigcup_{i}^{N_\lambda} \lambda_i, \tag{14}$$

and

$$\lambda_i \cap \lambda_j := \emptyset, \forall i, j \in \{1...N_\lambda\} \mid i \neq j. \tag{15}$$

By using the notion of *behavioral sets*, one can express the constituent variables of the *fair value* in terms of an aggregation of set variables as follows:

$$T = \sum_i T_i. \tag{16}$$

$$Q = \sum_i Q_i. \tag{17}$$

$$M = \sum_i S_i. \tag{18}$$

$$b_i = \frac{Q_i}{T_i} \tag{19}$$

$$v_i = \frac{Q_i}{S_i} \tag{20}$$

$$V = \frac{\sum_i Q_i}{\sum_i S_i} = \frac{\sum_i v_i S_i}{\sum_i S_i}. \tag{21}$$

$$B = \frac{\sum_i Q_i}{\sum_i T_i} = \frac{\sum_i b_i T_i}{\sum_i T_i}. \tag{22}$$

Where:

T_i = *Transactions Count* or number of transactions per unit of time, initiated or received —either convention is valid—, by members of the set λ_i.
Q_i = *Volume Transacted* or amounts transacted per unit of time, sent or received —either convention is valid—, by members of the set λ_i.
S_i = *Total Discounted Savings* of the set λ_i.
v_i = *Total Discounted Velocity* or willingness to trade their discounted savings of the users of set λ_i.
b_i = *Basket Average Value* or average value of the transactions of the users of set λ_i.

Calculating the total derivative of the behavioral variables 21 and 22, one arrives at:

$$dV = \frac{\partial V}{\partial S_i} dS_i = \frac{1}{\sum_i S_i} \left(\sum_i v_i dS_i - V \sum_i dS_i \right), \tag{23}$$

and

$$dB = \frac{\partial B}{\partial T_i} dT_i = \frac{1}{\sum_i T_i} \left(\sum_i b_i dT_i - B \sum_i dT_i \right). \tag{24}$$

When equations 23 and 24 are combined with the *General Differential Equation* (10, and 11), one arrives at the *Users Transfer Differential Equation* for the two forms, Q and T:

$$\frac{dFV}{FV} = \frac{\sum_i dQ_i}{\sum_i Q_i} - \frac{1}{V} \frac{\sum_i (v_i - V) dS_i}{\sum_i S_i} - \frac{dM'}{M}. \tag{25}$$

$$\frac{dFV}{FV} = \frac{1}{B} \frac{\sum_i b_i dT_i}{\sum_i T_i} - \frac{1}{V} \frac{\sum_i (v_i - V) dS_i}{\sum_i S_i} - \frac{dM'}{M}. \tag{26}$$

It shall be noticed that the steps towards this equation have not introduced any loss of generality. Indeed, this equation is as generic as the *General Differential Equation* (11 and 10).

Big holder sell-off

One interesting particular case to which the former differential equation can be particularized is that of the big holder selling all their holdings. This case is essentially, a transfer of savings from one *behavioral set* with a very low velocity to another. Let us set the following assumptions:

- The currency is divided into two *behavioral sets*, one representing the big holder and the other one representing the rest of the users.
- The big holder was doing a negligible amount of transaction volume per unit of time before the *sell-off*.
- The willingness to trade savings of the big holder was negligible with respect to that of the rest of the population (the other *behavioral set*).
- After the sell-off, the rest of the population does not change the amount of transactions per unit of time they usually do.
- The action has no cost in terms of an additional increasing of the supply.

The differential equation of the *big holder sell-off* becomes:

$$\frac{dFV}{FV} = -\left(\frac{dS}{M - \Delta S} \right) \tag{27}$$

Where:

$\Delta S =$ Total expected sell-off of the big holder.

When the former differential equation is integrated for the total expected sell-off of the big holder, one obtains the expected loss of value of the currency:

$$r_{FV} = e^{-\Delta S/(M - \Delta S)} - 1 \approx -\left(\frac{\Delta S}{M - \Delta S} \right) \tag{28}$$

3.3 User base *action* differential equation

Using the *general differential equation* 10 and 11 requires that actions γ are directly defined over the aforementioned sets of variables $\{M, V, Q\}$ —Q form— or $\{M, V, T, B\}$ —T form—. In most practical cases it is impossible to isolate V and B from Q, M and T, for it would require that the action changed the behaviour the whole population of users with respect to their average transaction values and with respect to their inclination to spend instead of save. The typical action is concerned with increasing the users base, and this is the one that is going to be studied in this section.

Let us define new behavioral variables b and v restricted to the new users, considering that the differential action $d\gamma$ adds to the population a new differential set of users. The behaviour of the new users —in terms of the behavioural variables— may differ with respect to that of the previous population. Formally b and v can be defined as:

$$b := \frac{dQ}{dT}, \tag{29}$$

$$v := \frac{dQ}{dS}, \tag{30}$$

where:

b = *Average transaction size* of the new users. b == B if new users do transactions with a size equal to the average transaction size of the population.
v = *Willingness to trade savings* of the new users. v == V if new users have the same willingness to trade the population has. Consumerist users have a v higher than the average user, whereas thrifty users have a v lower than the average user.

Without loss of generality, one can divide the population into two *behavioral sets*, one being the whole population prior to the entry of the new users, and the other one being the set of new users. Using equations 25 and 26, considering that the former population had a velocity V, and applying the behavioral variables of the new set as defined in equations 29 and 30, one obtains the *User Base Differential Equation* for the two forms, Q and T:

$$\frac{dFV}{FV} = \frac{V}{v}\frac{dQ}{Q} - \frac{dM'}{M}. \tag{31}$$

and

$$\frac{dFV}{FV} = \frac{V}{v}\frac{b}{B}\frac{dT}{T} - \frac{dM'}{M}. \tag{32}$$

3.4 Behavioral *action* differential equation

Certain kind of actions γ, can change the behaviour of the whole population. For instance, an action tailored as an intrinsic incentive to hold savings could result in a decrease of the *Total Discounted Velocity* of the whole population, without it necessarily increasing the user base. The changing of currency A internal fees, or the provision of an overall service targeted to current population, could result in a change of the *Average Transaction Value*. From equations 10 and 11, simply by removing the changes in Q or T, and assuming that the behavioral action does not change the user base, one arrives to the *Behavioral Differential Equation*:

$$\frac{dFV}{FV} = \frac{dB}{B} - \frac{dV}{V} - \frac{dM'}{M}. \tag{33}$$

When an action changes both, the behavioral and the user base variables, and the new users follow the population behaviour, one shall use the *General Differential Equation* (10 and 11).

4 Understanding *Dash* population of users

Dash population of users is special in the sense that it is divided into four measurable sets of users. Whereas other *cryptocurrencies* only have two measurable sets. These four sets are:

- Masternode owners.
- Miners.
- Users submitting proposals.
- General users.

Each of the sets is characterized by different average values of their behavioral variables. The understanding of this matter will help the investor in their estimation of the economic value of a *Dash* proposal. *Total Discounted Velocity* depends upon the period Δt chosen in the analysis. In order to avoid a loss of generality, the period will be left undefined. As for the average basket value, the current price of around 80$ per coin will be used.

Recall the term *user*, as by its definition in section 2, is tied to the use case of a differential amount of currency rather than to a specific individual.

4.1 Masternode owners

Masternode owners are a specific set of users (λ_{Ma}) economically characterized by their requirement to keep their balances in audited addresses. There is one address per Masternode and it shall contain $1,000$ DASH. For such a requirement, they are compensated, as a whole, with a 45% of the newly created coins (*block* reward) and the transaction fees. Given that, as of today, *blocks* are created every 157.2 seconds and are generating an approximate reward of 3 DASH, and given that there are approximately $5,000$ *Masternodes* outstanding, the set can be typified as exhibiting the following parameters —using the *transactions received* convention—:

$$T_{\text{Ma}} \approx \frac{\Delta t}{157.2} = 0.00636 \times \Delta t, \text{ (550 daily)}. \tag{34}$$

$$Q_{\text{Ma}} \approx \frac{\Delta t}{157.2} \times 0.45 \times 3 = 0.00859 \times \Delta t \text{ DASH (741 DASH daily)}. \tag{35}$$

$$S_{\text{Ma}} \approx 5,000 \times 1,000 = 5,000,000 \text{ DASH}. \tag{36}$$

$$b_{\text{Ma}} \approx 80 \times 0.45 \times 3 = \$108. \tag{37}$$

$$v_{\text{Ma}} \approx \frac{\Delta t}{157.2} \times \frac{0.45 \times 3}{5,000,000} = \Delta t \times 1.718e^{-9}, \text{ (0.0000148 daily)}. \tag{38}$$

Indeed, Masternodes are a *behavioral set* with the special characteristic of exhibiting a negligible velocity.

4.2 Miners

Miners are another specific set of users (λ_{Mi}) economically characterized by their obtaining a payment by *mining* new *blocks*. The payment is a 45% of the sum of the *block* reward and the transaction fees carried by the transactions included into the *block*. Given that, as of today, *blocks* are created every 157.2 seconds, and are generating an approximate reward of 3 DASH, the set can be typified as exhibiting the following behavioral parameters —using the *transactions received* convention—:

$$T_{\text{Mi}} \approx \frac{\Delta t}{157.2} = 0.00636 \times \Delta t, \text{ (550 daily)}. \tag{39}$$

$$Q_{\text{Ma}} \approx \frac{\Delta t}{157.2} \times 0.4 \times 3 = 0.00859 \times \Delta t \text{ DASH (741 DASH daily)}. \tag{40}$$

$$S_{\text{Mi}} := Q_{\text{Mi}} \approx 0.00859 \times \Delta t \text{ DASH (741 DASH daily)}. \tag{41}$$

$$b_{\text{Mi}} \approx 80 \times 0.45 \times 3 = \$108. \tag{42}$$

$$v_{\text{Mi}} = 1. \tag{43}$$

4.3 Users submitting proposals

Users submitting proposals are the last directly measurable specific set of users (λ_{Pr}). They are characterized, as a whole, by obtaining a payment of as much as the 10% of the sum of the *block* reward and the transaction fees occurred in $16,616$ blocks. Given that, as of today, *blocks* are generating an approximate reward of 3 DASH, and given that there are 24 passing proposals, the set can be typified as exhibiting the following behavioral parameters —using the *transactions received* convention—:

$$T_{\text{Pr}} \approx \Delta t \times \frac{24}{16,616 \times 157.2} = 9.188^{-6} \times \Delta t, \text{(0.793 daily)}. \tag{44}$$

$$Q_{\text{Pr}} \approx \frac{0.1 \times 3}{157.2} = 0.0019 \times \Delta t \text{ DASH, (165 DASH daily)}. \tag{45}$$

$$S_{\text{Pr}} := Q_{\text{Mi}} \approx 0.0019 \times \Delta t \text{ DASH (165 DASH daily)}. \tag{46}$$

$$b_{\text{Pr}} \approx 80 \times \frac{0.1 \times 3 \times 16616}{24} = \$16,616. \tag{47}$$

$$v_{\text{Pr}} = 1. \tag{48}$$

4.4 General users

The rest of the users, or the *general users*, (λ_{G}) —those not in λ_{Ma}, λ_{Mi}, or λ_{Pr}— do not exhibit a directly measurable behaviour. Nonetheless, their behavioral variables can still be indirectly calculated. Given that, as of today, *Dash* is making around 17,000 transactions per day, that it has a *Total Discounted Supply* of $13,600,000$ DASH, an average transaction value of $\sim \$1,135$, a daily transacted volume of $\sim 241,187$ DASH, and a daily velocity of 0.018, by using equations 21 and 22 and isolating b_G and v_G, one gets:

$$T_{\text{G}} = 17,000 - 550 - 550 - 0.793 = 15,900. \tag{49}$$

$$S_{\text{G}} = 13,600,000 - 5,000,000 - 660 - 165 = 8,599,175 \text{ DASH}. \tag{50}$$

$$\begin{aligned} b_{\text{G}} =& \frac{BT - b_{\text{Ma}}T_{\text{Ma}} - b_{\text{Mi}}T_{\text{Mi}} - b_{\text{Pr}}T_{\text{Pr}}}{T_{\text{G}}} \\ =& \frac{1,135 \times 17,000 - 108 \times 550 - 108 \times 550 - 16,616 \times 0.793}{15,900} \\ =& \frac{19,163,023}{15,900} = \$1,205 = 1.06 \times B. \end{aligned} \tag{51}$$

$$\begin{aligned} v_{\text{G}} =& \frac{VM - v_{\text{Ma}}S_{\text{Ma}} - v_{\text{Mi}}S_{\text{Mi}} - v_{\text{Pr}}S_{\text{Pr}}}{S_{\text{G}}} \\ =& \frac{0,0177 \times 13,600,000 - 0.0000148 \times 5,000,000 - 1 \times 741 - 1 \times 165}{8,599,175} \\ =& \frac{239,740}{8,599,175} = 0,0279 = 1.58 \times V. \end{aligned} \tag{52}$$

$$Q_{\text{G}} = \frac{b_{\text{G}} \times T_{\text{G}}}{80} = \frac{1,205 \times 15,900}{80} = 239,692 \text{ DASH}. \tag{53}$$

5 Rational estimation of the value of a *Dash* proposal

One way of looking at a *Dash* proposal, abstracting from its technical definition, is to think of it as a commitment to increasing the utility of the users of the currency. Utility shall not be confused with a mere investment return —economic utility—. For instance, investors may find utility in being informed by news, without their necessarily obtaining any additional economic return. This study will focus on proposals whose purpose is to increase their economic utility. Those proposals will hereinafter be called *economic proposals*. As such commitments, they promise actions that, ultimately, should modify the constituent variables of the currency in a way that its value increases. Specifically, they seek to obtain an absolute return on the value of the units of DASH.

For an *economic proposal* Π aiming to change both, the user base variables and the behavioral variables, where the new users are expected to follow the population behaviour, the total action γ_Π caused, obtained by integrating the differential action $d\gamma_\Pi$ (10 and 11) over the whole domain of the changes $\{\Delta M', \Delta V, \Delta Q\}$ —Q form— or $\{\Delta M', \Delta V, \Delta T, \Delta B\}$ —T form—:

$$\exp\,(\int_{FV}^{FV+\Delta FV} \frac{dFV}{FV}) = \exp\,(\int_{Q}^{Q+\Delta Q} \frac{dQ}{Q} - \int_{M}^{M+\Delta M'} \frac{dM'}{M} - \int_{V}^{V+\Delta V} \frac{dV}{V}), \tag{54}$$

and

$$\exp\,(\int_{FV}^{FV+\Delta FV} \frac{dFV}{FV}) = \exp\,(\int_{T}^{T+\Delta T} \frac{dT}{T} + \int_{B}^{B+\Delta B} \frac{dB}{B} - \int_{M}^{M+\Delta M'} \frac{dM'}{M} - \int_{V}^{V+\Delta V} \frac{dV}{V}), \tag{55}$$

produces a *total change* ΔFV of the value of the currency, yielding a total return r_{FV}:

$$r_{FV} = \frac{\Delta FV}{FV} - 1 = \left(\frac{Q+\Delta Q}{Q}\right)\left(\frac{M}{M+\Delta M'}\right)\left(\frac{V}{V+\Delta V}\right) - 1, \tag{56}$$

and

$$r_{FV} = \frac{\Delta FV}{FV} - 1 = \left(\frac{T+\Delta T}{T}\right)\left(\frac{B+\Delta B}{B}\right)\left(\frac{M}{M+\Delta M'}\right)\left(\frac{V}{V+\Delta V}\right) - 1. \tag{57}$$

It shall be noticed that the change in the *Total Discounted Supply* $\Delta M'$ must equal the change of the *outstanding supply* after the action γ. As a result, $\Delta M'$ can be replaced by the capital cost C_Π of the proposal —the total amount of DASH requested by the proposal[2]—, giving:

$$r_{FV} = \left(\frac{Q+\Delta Q}{Q}\right)\left(\frac{M}{M+C_\Pi}\right)\left(\frac{V}{V+\Delta V}\right) - 1, \tag{58}$$

and

$$r_{FV} = \left(\frac{T+\Delta T}{T}\right)\left(\frac{B+\Delta B}{B}\right)\left(\frac{M}{M+C_\Pi}\right)\left(\frac{V}{V+\Delta V}\right) - 1. \tag{59}$$

For small actions γ:

$$r_{FV} \approx \frac{\Delta Q}{Q} - \frac{C_\Pi}{M} - \frac{\Delta V}{V}, \tag{60}$$

and

$$r_{FV} \approx \frac{\Delta T}{T} + \frac{\Delta B}{B} - \frac{C_\Pi}{M} - \frac{\Delta V}{V}. \tag{61}$$

[2]Care must be taken that the present value of *all* expected recurrent payments are included as the cost of capital C_Π. Typically, if the payments do not extend long into the future, the present value can be replaced by the sum of the payments, and the error will be negligible.

An *economic proposal* is profitable and should be financed when:

$$r_{FV} > 0. \tag{62}$$

5.1 User transfer proposal

Let us analyse the case of the most general *economic proposal* Π. Suppose that a certain economic proposal is created with the following three purposes:

1. changing the behavior of one or several sets of users,
2. transferring existing users from one set to another, and
3. bringing new external users.

All of the purposes can be modeled by means of a transfer of users. (1) is the transfer of all members of a set to an empty set, (2) is the transfer of some members of a set to another set, and (3) is the external transfer (without removing members from any other set) of members to a new or existing set.

Integrating equations 25 and 26 one arrives at the return equation of such a proposal in *Q form* and *T form*:

$$r_{FV} = \left(\frac{M}{M+C_\Pi}\right)\prod_i\left[\left(\frac{Q+\Delta Qi}{Q}\right)\left(\frac{M+C_\Pi}{M+C_\Pi+\Delta S_i}\right)^{(v_i-V)/V}\right]-1. \tag{63}$$

$$r_{FV} = \left(\frac{M}{M+C_\Pi}\right)\prod_i\left[\left(\frac{T+\Delta Ti}{T}\right)^{b_i/B}\left(\frac{M+C_\Pi}{M+C_\Pi+\Delta S_i}\right)^{(v_i-V)/V}\right]-1. \tag{64}$$

Which approximates to the following equations when the changes are small:

$$r_{FV} \approx \frac{\sum_i \Delta Q_i}{Q} - \frac{1}{V}\frac{\sum_i (v_i - V)\Delta S_i}{M+C_\Pi} - \frac{C_\Pi}{M}. \tag{65}$$

$$r_{FV} \approx \frac{1}{B}\frac{\sum_i b_i \Delta T_i}{T} - \frac{1}{V}\frac{\sum_i (v_i - V)\Delta S_i}{M+C_\Pi} - \frac{C_\Pi}{M}. \tag{66}$$

5.2 User base proposal

Only for those economic proposals restricted to increasing the usage of *Dash* one can make use of the differential equations obtained in 3.3, to arrive at a —much simpler— form of the return equation:

$$r_{FV} = \left(\frac{M}{M+C_\Pi}\right)\left(\frac{Q+\Delta Q}{Q}\right)^{V/v} - 1 \approx \frac{V}{v}\frac{\Delta Q}{Q} - \frac{C_\Pi}{M}, \tag{67}$$

and

$$r_{FV} = \left(\frac{M}{M+C_\Pi}\right)\left(\frac{T+\Delta T}{T}\right)^{(b/B)(V/v)} - 1 \approx \frac{V}{v}\frac{b}{B}\frac{\Delta T}{T} - \frac{C_\Pi}{M}. \tag{68}$$

It is important to notice that, when new users are assumed to be characterized by a behaviour equal to that of the population, equations 67 and 68 are further simplified to:

$$r_{FV} = \left(\frac{M}{M+C_\Pi}\right)\left(\frac{Q+\Delta Q}{Q}\right) - 1 \approx \frac{\Delta Q}{Q} - \frac{C_\Pi}{M}, \tag{69}$$

and

$$r_{FV} = \left(\frac{M}{M+C_\Pi}\right)\left(\frac{T+\Delta T}{T}\right) - 1 \approx \frac{\Delta T}{T} - \frac{C_\Pi}{M}. \tag{70}$$

One useful analysis is that of finding the *minimum average transaction size* b of the new users, such that the *economic proposal* would be profitable. By solving for b in 68, one gets:

$$b > B\frac{v}{V} \cdot \frac{\ln\left[\left(M + C_{\Pi}\right)/M\right]}{\ln\left[\left(T + \Delta T\right)/T\right]} \approx B\frac{v}{V}\frac{T}{\Delta T}\frac{C_{\Pi}}{M}. \tag{71}$$

which when subjected to the simplification that the behaviour regarding v equals that of the population (V), becomes:

$$b > B \cdot \frac{\ln\left[\left(M + C_{\Pi}\right)/M\right]}{\ln\left[\left(T + \Delta T\right)/T\right]} \approx B\frac{T}{\Delta T}\frac{C_{\Pi}}{M}. \tag{72}$$

One can perform a reciprocal analysis, where b is given and the problem is to find the *maximum* v such that the *economic proposal* would be profitable. By solving for v in 67 and 68, one gets:

$$v < V \cdot \frac{\ln\left[\left(Q + \Delta Q\right)/Q\right]}{\ln\left[\left(M + C_{\Pi}\right)/M\right]} \approx V\frac{\Delta Q}{Q}\frac{M}{C_{\Pi}}. \tag{73}$$

and

$$v < V\frac{b}{B} \cdot \frac{\ln\left[\left(T + \Delta T\right)/T\right]}{\ln\left[\left(M + C_{\Pi}\right)/M\right]} \approx V\frac{b}{B}\frac{\Delta T}{T}\frac{M}{C_{\Pi}}. \tag{74}$$

When equation 74 is simplified under the assumption that the new users make or will make economic transactions with an average value equal to the one of the population (B), it becomes:

$$v < V \cdot \frac{\ln\left[\left(T + \Delta T\right)/T\right]}{\ln\left[\left(M + C_{\Pi}\right)/M\right]} \approx V\frac{\Delta T}{T}\frac{M}{C_{\Pi}}. \tag{75}$$

5.3 Behavioral proposal

Let's analyse an economic proposal Π seeking to change the behaviour of the users of a currency. Following the approach used in section 5, but replacing the differential equation with 33, one arrives at the return equation of such a proposal:

$$r_{FV} = \left(\frac{B + \Delta B}{B}\right)\left(\frac{V}{V + \Delta V}\right)\left(\frac{M}{M + C_{\Pi}}\right) - 1 \approx \frac{\Delta B}{B} - \frac{\Delta V}{V} - \frac{C_{\Pi}}{M}. \tag{76}$$

Recall that this type of *action* does not increase the number of users but rather, changes the way the population of users behave with respect to the currency. Typically modifying the behaviour of a set of users.

5.4 Proposal examples

Dash mall and parking (2019-08-17)

- Source: `https://www.dashcentral.org/p/DASHMALLANDPARKING`
- Type: Real *economic proposal*.
- Sub-type: *user base* proposal.
- Target public: users of the car parks of the shopping centers in the Mérida area, Venezuela.
- Duration: 2 months.
- Cost/month: 69 DASH.
- Should deliver: 80 transactions per day.
- Dash data at the time of the proposal[3]:
  - Dash price: 80$.

[3]Source: `https://www.coinfairvalue.com`

- Transactions per day: $\sim 17,000$.
- Total Discounted Supply: $\sim 13,600,000$ DASH.
- Avg. Transaction Value (Basket Avg. Value): $\sim \$1,135$.

This proposal does not state anything about the expected average transaction value (b) the users will be making. Therefore, one useful approach for the investor is to calculate the minimum value that b would need to have in order to produce a profitable proposal. Nothing is also stated about the distribution of the specific investment profiles of the users, despite detailing that they will be users of the shopping malls in the Mérida area. That distribution, if existed, could be used for doing better critical guesses on v. If the group of users targeted by this proposal behaved more like consumers than the average user, v would be higher than V (see 3.3 for more information.) At this point, an assumption other than $v == V$ cannot be justified without performing further research on the profile of the users.

Using equation 72 and plugging the numerical values:

$$b > \$1,135 \times \frac{\ln\left[(13,600,000 + 2 \times 69)/13,600,000\right]}{\ln\left[(17,000+80)/17,000\right]} = \$1,135 \times \frac{0.0000101}{0.00469} = \$2.45. \tag{77}$$

If the approximate version —for small changes— of 72 is used instead, the following result is obtained:

$$b > \$1,135 \times \frac{17,000}{80}\frac{2 \times 69}{13,600,000} = \$2.45. \tag{78}$$

Which, when rounded to two decimal places, matches the exact value in this particular case.

A quick analysis is signaling that, in order for this proposal to be profitable, the users of the two malls' car parks will have to make approximately 80 transactions per day carrying an average value higher than $\$2.45$. This does seem feasible for an average mall parking fee, although there is not much room for profit. Should the average parking fee be lower than $\$2.45$, or the users brought in by this proposal exhibit a behaviour more biased towards consuming rather than saving, the proposal would not be profitable.

Masternode shares service

- Type: Fictitious *economic proposal*.
- Sub-type: *behavioral* proposal.
- Target public: all Dash users.
- Duration: 1 month.
- Cost/month: 200 DASH.
- Should deliver: 50 additional Dash Masternodes.
- Dash data at the time of the proposal[4]:
  - Dash price: 80$
  - Transactions per day: $\sim 17,000$
  - Total Discounted Supply: $\sim 13,600,000$ DASH
  - Avg. Transaction Value (Basket Avg. Value): $\sim \$1,135$

This fictitious proposal is aimed at changing the behaviour of Dash users in such a way that they "lock" more DASH into *Masternode's* collateral. It is, indeed, an example of a user transfer proposal. Let us as assume there will be a conversion, or a transfer of users from the group of *general users* to the group of *masternode owners* (see section 4). As the proposal states, it aims at creating 50 *masternodes*, equivalent to a collateral of 50,000 DASH. The expected return of the proposal is obtained by plugging the previous values into equation 64:

$$r_{FV} = \frac{13,600,000}{13,600,200} \times \left[\left(\frac{13,600,200}{13,600,200-50,000}\right)^{\frac{0.0279-0.018}{0.018}}\left(\frac{13,600,200}{13,600,200+50,000}\right)^{\frac{0-0.018}{0.018}}\right] - 1 \tag{79}$$

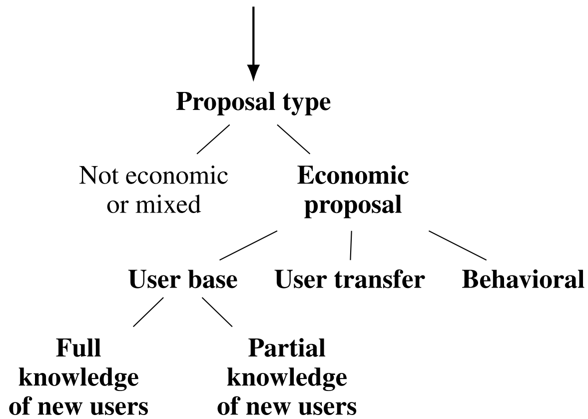
$$= 1 \times (1.002 \times 1.004) - 1 = 0.006 = 0.6\%$$

[4]Source: `https://www.coinfairvalue.com`

Creating 50 new *Masternodes* at the cost of 200 DASH inflation yields a positive return of 0.6%. Such a proposal, if existed, should be thus, funded.

6 Guide to *Masternode* owners and proposal submitters

This guide is intended to serve as a quick reference for *Masternode* owners and individuals submitting proposals who seek to apply an unbiased pricing model into their assessing the financial return of a *Dash* proposal. I will intentionally repeat —instead of reference— the relevant equations derived in previous sections for ease of understanding. The guide is organised like a a decision tree starting with the process of understanding the economic nature of the proposal.



6.1 Proposal type

Recall that the purpose of a *Dash* proposal of any kind is to increase the *utility* of the *Dash* network. Increasing one's *utility* (or reducing one's *uneasiness*) is the ultimate reason that impels individuals to set goals, find means and act. By no means shall *utility* be restricted to an economic return.

Not every proposal's solely purpose is to increase the economic value of DASH. There are proposals such as, for instance, *Dash News*[5], that seek to provide *utility* of a different nature. Network supporters can find usefulness in having a place where they can be updated with the latest news. Some proposals contain potential *utility* of several kinds. Those can be classified as *mixed*. An interesting *mixed* proposal is the one funding the *Dash Core Group* —the organisation who develops the main *Dash* node—. Their produce is without doubt one of the most important drivers of the economic value of *Dash*. And in addition, they are maintaining the tools that enable *Masternodes* to exert their vote and receive the compensations. These provide utility that may or may not be linked to the increasing of the usage of the currency, but the exact answer seems hard to find by pure reasoning.

A *Dash* proposal should be considered an *economic proposal* when a significant percentage of its commitment be that of increasing the value of *Dash*; either by increasing the usage of the currency —increasing the number of transactions or amounts transacted per unit of time—, or by modifying the way it is used —increasing the willingness to hold or the average value of the transactions—. Proposals not fitting the previous requirements should be classified as *not economic* or *mixed*. Unfortunately no rational means of estimating the value of these exist. Choosing them is an act of personal preference.

6.2 Economic proposal

Once a proposal has been identified to belong to the *economic* category, one can start thinking about rationalising its value. The step at this point is to understand what will be the main driver of the increasing of the value of *Dash* by the action exerted by the proposal. Choosing to fund a proposal comes at an opportunity cost. There are two opportunity costs which are very important to have in mind:

1. Choosing another proposal which, potentially, could have increased *utility* even more.
2. Avoiding the inflation (change on the *Total Discounted Supply*) needed for funding a proposal.

[5]`https://dashnews.org/`

The key to choosing to vote on funding a proposal is to come to the conclusion that the opportunity costs are smaller than the value created by the proposal. As for what this paper concerns, all the equations incorporate the inflation opportunity cost. Nonetheless, the opportunity cost against the rest of the proposals needs be evaluated one by one. The obvious technique is to evaluate the expected return (r_{FV}) of each of the *economic proposals* and then choose from the most valuable to the less one, leaving behind all proposals with a negative expected return and those for which there are no more funds available. *Masternodes* should never fund a proposal with a negative expected return: $r_{FV} < 0$.

There are three ways in that an *economic proposal* can change the value of the currency. The most typical one and the easiest to asses is the one that changes the value of *Dash* by incorporating additional users. This paper names such a proposal a *user base proposal*. Most of the time *Masternodes* will be dealing with an *economic proposal* of this nature.

There could be other —very rare— type of proposals where the value driver is a transfer of users from one behavioral group to another. Behavioral groups are groups of users characterised by exhibiting a specific behavior. For instance, *Masternode* owners use the currency in a way different to that of the general user. This paper names these proposal *user transfer proposals*. It is interesting to point out that the other two types of proposals can be expressed in the terms of a *user transfer proposal*.

One last —also rare— type of proposal is the one where the value of *Dash* is changed by changing the way the population of users use the currency. For instance, adding new incentives to hold (save) the currency. This paper names these proposals *behavioral proposals*.

Before proceeding to the analysis of the specific cases, recall that the general variables of the currency, including the cost of the proposal are[6]:

T = *Transactions Count* or number of transactions per unit of time before the proposal.
M = *Total Discounted Supply* before the proposal.
V = *Total Discounted Velocity*, or whole population's willingness to trade their discounted savings.
B = *Basket Average Value*, or average value of the transactions of the whole population.
C_Π = *Capital Cost* of the proposal.

6.3 User base proposal

At this point, the *economic proposal* has been identified to pertain to the category of a commitment to increase the user base. Such a proposal will be estimating one or several of the following outcomes:

1. ΔT — An increase in the transactions count per day, month, year, or any other period.
2. ΔQ — An increase in the amounts transacted per day, month, year, or any other period.
3. b — An average transaction value for the new users.
4. v — A velocity of money per day, month, year, or any other period for the new users.

Proposals estimating all the former outcomes are *overdeterminate proposals*, proposals promising $\{\Delta T, \Delta Q, v\}$, $\{\Delta T, b, v\}$, $\{\Delta Q, v\}$, or $\{\Delta Q, b, v\}$ are *determinate proposals*, and proposals estimating $\{\Delta T, \Delta Q\}$, $\{\Delta T, b\}$, $\{\Delta T, v\}$, $\{\Delta Q, b\}$, $\{b, v\}$, $\{\Delta T\}$, or $\{\Delta Q\}$ are *undeterminate proposals*.

I will ignore case $\{b, v\}$ because, although it can be studied using the math available throughout the paper, it is very unlikely to occur. For an *overdeterminate proposal*, one should choose ΔT over ΔQ, which transforms it into the *determinate proposal* $\{\Delta T, b, v\}$. If a proposal estimates ΔT and ΔQ, but lacks b ($\{\Delta T, \Delta Q, v\}$, or $\{\Delta T, \Delta Q\}$), one should make use of the integral of equation 29 to calculate b (in DASH units) as:

$$b = \frac{\Delta Q}{\Delta T} \tag{80}$$

When an *undeterminate proposal* lacks v, a possibly reasonable assumption is to consider that the new users will exhibit a saving/consuming behaviour similar to that of the whole population of users. Under this assumption, $v = V$.

After analysing the *estimated* knowledge scenario, two possibilities remain:

1. Having a full *estimated* knowledge of the new users.
2. Having a partial *estimated* knowledge of the new users.

[6] All population variables can be retrieved from `https://www.coinfairvalue.com`

That is without saying that no analysis of the economic return of a proposal is possible if no *estimated* knowledge is available at all.

6.3.1 Full knowledge of new users

Having full *estimated* knowledge of the new users paves the way to calculating the expected economic return of a proposal. Recall the expected return must be multiplied by 100 to get a percentage value. The following equations and their simplified version for small changes allow one to obtain the return r_{FV}. Either of the two can be used depending on the variables available.

$$r_{FV} = \left(\frac{M}{M + C_\Pi}\right)\left(\frac{Q + \Delta Q}{Q}\right)^{V/v} - 1 \approx \frac{V}{v}\frac{\Delta Q}{Q} - \frac{C_\Pi}{M}, \tag{81}$$

and

$$r_{FV} = \left(\frac{M}{M + C_\Pi}\right)\left(\frac{T + \Delta T}{T}\right)^{(b/B)(V/v)} - 1 \approx \frac{V}{v}\frac{b}{B}\frac{\Delta T}{T} - \frac{C_\Pi}{M}. \tag{82}$$

6.3.2 Partial knowledge of new users

Having a partial *estimated* knowledge of the new users is a limitation to yielding an estimated return of a proposal. Nevertheless, there still room for analysis. An interesting approach is calculating the break-even point with respect to the behavioral variables b or v. In other words, determining what the value of the behavioral variables should be in order for the proposal to be profitable. Then, by intuition, concluding whether the value of the behavioral variable may or may not be justified. For instance, if the use case is a bakery and the break-even point is at an average transaction value of 1000\$, it is hard to believe that the proposal will provide positive value. Recall that when dealing with the velocity v, the smaller its value, the higher the inclination of the users towards saving rather than consuming. Smaller velocities provoke higher values. *Masternode* collateral is an example of a mechanism with the consequence of lowering the velocity of *Dash*, thus keeping its value higher.

Depending on the availability of variables, one can use the following equations to calculate the break-even point in terms of the behavioral variables. It may be reasonable in some cases that any of the two, b or v, are set equal to their corresponding value for the population: B or V respectively.

$$b > B\frac{v}{V} \cdot \frac{\ln\left[(M + C_\Pi)/M\right]}{\ln\left[(T + \Delta T)/T\right]} \approx B\frac{v}{V}\frac{T}{\Delta T}\frac{C_\Pi}{M}, \tag{83}$$

$$v < V \cdot \frac{\ln\left[(Q + \Delta Q)/Q\right]}{\ln\left[(M + C_\Pi)/M\right]} \approx V\frac{\Delta Q}{Q}\frac{M}{C_\Pi}. \tag{84}$$

and

$$v < V\frac{b}{B} \cdot \frac{\ln\left[(T + \Delta T)/T\right]}{\ln\left[(M + C_\Pi)/M\right]} \approx V\frac{b}{B}\frac{\Delta T}{T}\frac{M}{C_\Pi}. \tag{85}$$

6.4 User transfer proposal

Only in special cases will the analyst be confronting the case of a *user transfer proposal*. The analysis of this case is more general and uses a different approach than that of the *user base proposal*. The idea is to first divide the population into the necessary groups or set of users (λ) —the initially empty group being also valid—, and then imagine a transfer of users from one group or set to another. This transfer is a restructuring of the users that yields a change in the value of the currency.

Before introducing the equations it is important to understand the variables being "transferred". A transfer is defined as a movement of savings and/or transactional activity from one *behavioral set* to another. After the implementation of the proposal, several groups will be subjected to a change in in their volumes transacted per unit of time, in their transaction count per unit of time, or in their savings.

The return r_{FV} of a *user transfer proposal* can be calculated (multiply by 100 to get a percentage value) as follows:

$$r_{FV} = \left(\frac{M}{M + C_\Pi}\right) \prod_i \left[\left(\frac{Q + \Delta Qi}{Q}\right) \left(\frac{M + C_\Pi}{M + C_\Pi + \Delta S_i}\right)^{(v_i - V)/V} \right] - 1. \tag{86}$$

$$r_{FV} = \left(\frac{M}{M + C_\Pi}\right) \prod_i \left[\left(\frac{T + \Delta Ti}{T}\right)^{b_i/B} \left(\frac{M + C_\Pi}{M + C_\Pi + \Delta S_i}\right)^{(v_i - V)/V} \right] - 1. \tag{87}$$

Which approximates to the following equations when the changes are small:

$$r_{FV} \approx \frac{\sum_i \Delta Q_i}{Q} - \frac{1}{V} \frac{\sum_i (v_i - V)\Delta S_i}{M + C_\Pi} - \frac{C_\Pi}{M}. \tag{88}$$

$$r_{FV} \approx \frac{1}{B} \frac{\sum_i b_i \Delta T_i}{T} - \frac{1}{V} \frac{\sum_i (v_i - V)\Delta S_i}{M + C_\Pi} - \frac{C_\Pi}{M}. \tag{89}$$

Where:

ΔT_i = Change in the *Transactions Count* or number of transactions per unit of time, initiated or received —either convention is valid—, by members of the set λ_i.
ΔQ_i = Change in the *Volume Transacted* or amounts transacted per unit of time, sent or received —either convention is valid—, by members of the set λ_i.
ΔS_i = Change in the *Savings* of the set λ_i.
v_i = *Total Discounted Velocity* or willingness to trade their discounted savings of the users of set λ_i.
b_i = *Basket Average Value* or average value of the transactions of the users of set λ_i.

6.5 Behavioral proposal

Any proposal whose solely purpose is to change the behavior of the users of *Dash* is a *behavioral proposal*. Although a group analysis is possible for behavioral proposals (i.e. changing the behavior of just one group of users), I have restricted the study of these to population aggregates. Should the need of the analyst be that of studying a change occurring in individual groups, they could leverage on the use of a **user transfer** analysis. The trick would be to create a new empty *behavioral set* with the new values of the behavioral variables. Then simulate the behavioral change as a transfer from one group to the other.

Let us suppose that an overall change of the behavioral variables can be inferred from the *economic proposal*. The return r_{FV} of *behavioral proposal* would be:

$$r_{FV} = \left(\frac{B + \Delta B}{B}\right) \left(\frac{V}{V + \Delta V}\right) \left(\frac{M}{M + C_\Pi}\right) - 1 \approx \frac{\Delta B}{B} - \frac{\Delta V}{V} - \frac{C_\Pi}{M}. \tag{90}$$

Where:

ΔV = Change in the *Total Discounted Velocity* of the population.
ΔB = Change in the *Basket Average Value* of the population.

References

[1] Cryptocurrencies - What is the fair value of a currency? `https://steemit.com/bitcoin/@pablomp/cryptocurrencies-what-is-the-fair-value-of-a-currency` `https://keybase.pub/pablompa/Whatisthefairvalueofacurrency.pdf`

[2] Understanding Dash Governance. `https://docs.dash.org/en/stable/governance/understanding.html`