Cryptocoin Valuation Procedure

Grisafi Finance Rheology Learning Center
Steven J. Grisafi, PhD

Consider a means by which to set the value of a cryptocurrency as a replacement for a central bank supported fiat currency. One particular case to consider would be the valuation of the Basecoin to replace the Euro Dollar. This evaluation is to be determined with respect to the proper correspondence of the cryptocurrency relative to a pair of selected central bank supported currencies, such as the Pound Sterling and the U.S. Dollar. All fiat currency prices are exchange rates measured relative to some basis. Concerning this example, we choose the price of the Basecoin, $\mathfrak{B}$, the Euro Dollar, €, the Pound Sterling, $\pounds$, and the U.S. Dollar, \$, all measured per unit Bitcoin, $\mathbb{B}$.

Our target is the time series trajectory formed of the arithmetic mean ratio $< \pounds/\mathbb{B} > / < \$/\mathbb{B} >$. We generate two other time series trajectories formed by the locus of points for the optimum values of the currency ratios predicted by price diffusion. The first trajectory is for the two currency system composed of the Pound Sterling and the U.S. Dollar, measured relative to the Bitcoin, assuming that there exist no other alternatives to these central bank currencies. This trajectory is marked by the time average ratio $||\pounds/\$||$. The second trajectory is that of the two currency system embedded within a mean field formed by the inclusion of two alternative currencies, the Basecoin and the Euro Dollar. This mean field trajectory is marked by the time series ratio $<||\pounds/\$||>$. The two diffusion model generated trajectories are extrema. That is, they can be either maxima, minima, or saddle points. It is the nature of all currency exchange rates that they can be both maxima and minima depending upon the direction of trade.

When the two diffusion predicted trajectories converge upon the arithmetic mean trajectory we consider the market to have achieved equilibrium. The market is determined by the action of traders. This does not necessarily guarantee that equilibrium will always be achieved. When convergence of the three trajectories is achieved to within some acceptable tolerance, the following procedure can be used to fix the value of the cryptocurrency to that of the central bank mean field currency. For the computation of the diffusion model trajectories one may choose either linear or quasi-quadratic isosurfaces. Quasi-quadratic isosurfaces expressed in the terms of our current systems of interest take the form:

$$\mathfrak{B} = a(\pounds - \pounds_0)^2 + b(\$ - \$_0)^2 + c_0 € \tag{1}$$

for the mean field system. The subscript zero on the $\pounds$ and the \$ indicate that the variable is to take the instantaneous value of its arithmetic mean. The independent two central bank currencies isosurface has the form:

$$0 = a(\pounds - \pounds_0)^2 + b(\$ - \$_0)^2 + c \tag{2}$$

Our objective is to replace the Euro Dollar with the Basecoin. Thus, we set $\mathfrak{B} = €$ in equation (1). The two trajectories $||\pounds/\$||$ and $<||\pounds/\$||>$ are presumed to have converged upon one another to within some acceptable tolerance. We evaluate the three constants for the two quasi-quadratic isosurfaces using some ordinary least squares method applied to empirical time series data. For the $<||\pounds/\$||>$ isosurface the constant c_0 is evaluated using the least square technique, then $c = c_0€ - \mathfrak{B}$, where arithmetic average values are used for € and $\mathfrak{B}$. This casts the governing equation for the two isosurfaces into identical form. When solving for $\mathfrak{B}$, the two equations for the isosurfaces are combined. After having set $\mathfrak{B} = €$, one finds:

$$\mathfrak{B} = \frac{c}{c_0 - 1} \tag{3}$$

Equation (3) gives the amount of € obtained for each $\mathfrak{B}$. Since $\mathfrak{B}$ represents the value of a real currency, one must have $\mathfrak{B} > 0$. This imposes the constraints $c \neq 0$ and $c_0 \neq 1$. If the empirical data causes $\mathfrak{B} < 0$ the absolute value can be considered. Since optimum points can be both maxima and minima, one also should consider the multiplicative inverse.