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Perspective

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Interdependence of Trend and Volatility in Stochastic Asset Flow Equations

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The sparse decomposition methodology is a novel method for extracting non stationary signals in the presence of noise. The bat algorithm combined with Orthogonal Matching Pursuits (BatOMP) was proposed to improve sparse decomposition, which can realise adaptive recognition and extraction of nonstationary signals containing random noise, to solve the problem of accuracy and efficiency exclusive in sparse decomposition. For typical signals, two general atoms were created, and a dictionary training approach based on correlation detection and the Hilbert transform was established. By incorporating a bat algorithm with an optimised fitness function, the sparse decomposition was made into an optimal issue. BatOMP, in contrast to several other similar methods, has been shown to improve convergence speed and extraction accuracy while reducing hardware requirements, which is cost effective and beneficial.

Nature is replete of complicated systems whose actions may be represented using mathematical techniques, such as the shape-shifting clouds of starling birds, neural network organisation, or the structure of an anthill. The ocellated lizard's green or black scales create labyrinthine patterns in the same way. The complexity of the system that generates these patterns is explained by a diverse team using a relatively basic mathematical equation. This finding contributes to a better understanding of the evolution of skin colour patterns: the method allows for a wide range of green and black scale placements while always resulting in an ideal pattern for the animal's survival.

In science and mathematics numbers like π, e, and φ appear frequently in unexpected areas. The Fibonacci sequence and Pascal's triangle appear to be oddly common in nature as well. The Riemann zeta function, a deceptively simple function that has puzzled mathematicians since the 19th century, is another example. The Riemann hypothesis, possibly the most famous unsolved problem in mathematics, has a $1 million prize for a correct proof offered by the Clay Mathematics Institute.

The complicated interplay between price trend and volatility is investigated. With unpredictability occurring directly from supply and demand, we describe stochastic asset prices using the asset flow model. We show that at the extremes of the predicted logarithm of the price, volatility is the smallest. We get an accurate relationship for the auto covariance function by linearizing the stochastic differential equation (SDE) around equilibrium and relating it to the linearized SDE's (3 by 3) Jacobian. The conditions under which a pair of complex conjugate eigenvalues of the Jacobian results in oscillations are found in particular. The imaginary component of the complex pair determines the frequency of the oscillations, whereas the real eigenvalue and the real parts of the complex pair determine the decay rate. Typically, oscillations in a deterministic system dissipate quickly. Randomness, on the other hand, causes oscillations to repeat indefinitely with a frequency that is dependent on the deterministic system's parameters. The calculations and analysis presented here show that when traders focus more emphasis on trend, volatility rises, validating a widely held opinion among practitioners.

Over an algebraically closed field k, we look at the generic tropical initial ideals of a positively graded Cohen-Macaulay algebra R. We present a formula for each initial ideal, and the corresponding quasivaluations are expressed in terms of specific I-adic filtrations, based on Römer and Schmitz's work. We show as a consequence that when R is a domain, every initial ideal derived from the tropical variety's codimension 1 skeleton is prime, implying that "generic presentations of Cohen-Macaulay domains are well-poised in codimension 1."

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