# ABSTRACT

Some Mathematical Models for Investment

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The global financial crisis, which eventually led to an economic recession in 2008, caused stock market downturns and the collapse of financial institutions such as banks. Although many financial and economic models existed, there was no clear forewarning of the impending crash. Subsequently, there was a need for a detection system to indicate financial stability and encourage policy implementation in cases where parameter thresholds may be breached. Hence, this work attempts to implement a novel mathematical approach using biological ideas, to attempt to assist a financial investor in different scenarios. The importance of these models is to predict, analyse and interpret complex financial events, which continues to be of global interest. The main objective is to study the dynamics of different complex, non-linear systems. Prey – predator and epidemic models have been used to represent the interactions among financial entities in investment. Four models have been proposed for the stock market, Venture capital investment (deterministic and stochastic) and financial predation with infection respectively. Each model employs the use of a different functional response to capture the dynamics of the system. Stability and Hopf Bifurcation analysis have been discussed analytically for each model. These bifurcations indicate the points at which the model stability changes with respect to different parameters. The model dynamics has been investigated numerically using simulated datasets. The effect of parameter variation on the system has been recorded in terms of stability intervals. Time series and phase portrait plots for particular stable and unstable scenarios are shown graphically. This attempt to model financial entities interacting like species provides guidance to investors in different scenarios to minimise financial losses. Hence, Mathematics is useful in policy formulation, population control and forecasting.

Keywords: Letetia Addison; Mathematical models for investment; prey predator model; investment model; stability; financial infection.