

This thesis studies the stability of fixed points for various discrete mathematical models describing the interaction between prey and predators (modified Leslie-Gower models), as well as a financial market model which simulates the behavior of financial markets and the risks involved. Each model is discretized using standard and non-standard finite-difference schemes, and the stability of their respective fixed points is investigated. It has been shown that each system exhibits bifurcations under specific parametric conditions. Most notably, the existence of Neimark-Sacker and period-doubling bifurcations has been proved using the center manifold theorem and other methods. The chaos generated by these bifurcations is controlled using feedback control schemes. All mathematical results are verified through numerical examples and graphical representations of bifurcations, phase portraits, and maximum Lyapunov exponents. The modified Leslie-Gower type discrete model in the second chapter uses Michaelis-Menten type harvesting for prey, while another harvesting method is used with a modified Leslie-Gower model that is discretized using the standard finite-difference scheme. Later, a non-standard finite-difference scheme is proposed for this method, which is shown to be the best scheme for this system. Third chapter studies modified Leslie-Gower model with double Allee effect. In chapter five, a three-dimensional financial system depicting the dynamics of risk analysis is analyzed and shown to have chaotic tendencies that are controlled using different feedback strategies. The final chapter introduces several research directions that are still open to prospective researchers.