## Inverted Anharmonic Oscillator Model for Distribution of Financial Returns

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We construct a quantum-mechanical model to explain the distribution of financial returns in a stock market. By combining a critical phenomenon effect in the form of a power law and the Schrodinger equation, we derive that an appropriate potential of the financial returns is given by a time-dependent inverted anharmonic oscillator, whose coefficients depend on the critical time and critical exponent, which are empirically obtained from the Stock Exchange of Thailand (SET) from 1992 to 1994, during the critical phase of the Asian Financial Crisis. With the derived potential, we simulate the dynamics of returns as a function of time by employing the time-dependent variational method and the fourth-order Runge-Kutta method. Then we compute key characteristics of the return distribution such as variance, skewness, and kurtosis and compare them with real financial data from SET. The results are found that the mean return is higher than that from SET data, but the variance, skewness and the kurtosis show good agreement. The positive skewness indicates financial returns are not symmetric during that time, and that traders are more likely to lose their money on the investment. The kurtosis fluctuates around the value of 3, implying that the distribution is not normal.

**Author:** Mr JAROONCHOKANAN, Nawee (Optical and Quantum Physics Laboratory, Department of Physics, Faculty of Science, Mahidol University)

**Co-author:** Dr SUWANNA, Sujin (Optical and Quantum Physics Laboratory, Department of Physics, Faculty of Science, Mahidol University, Bangkok, 10400 Thailand)

**Presenter:** Mr JAROONCHOKANAN, Nawee (Optical and Quantum Physics Laboratory, Department of Physics, Faculty of Science, Mahidol University)

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