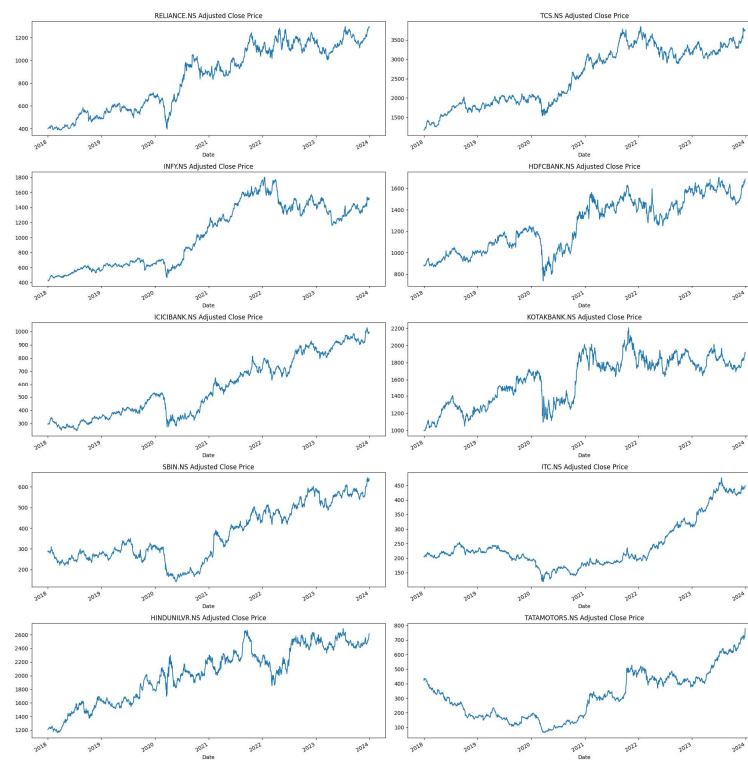**Annuity IITGN Capstone Winter Projects**

Algorithmic Trading Strategy Development
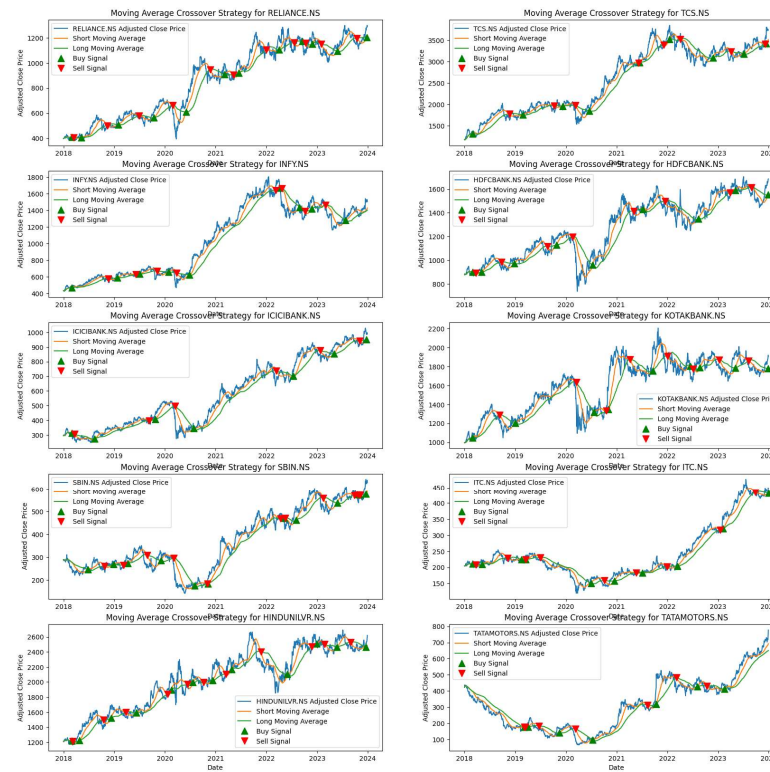
Jaidev Sanjay Khalane

Step 1: Market Data Analysis

Step 2: Strategy Development

1. Simple Moving Average (SMA) crossover strategy: In this strategy, traders look for the crossover of two different SMA periods, for example, a 50-day SMA and a 200-day SMA. When the 50-day SMA crosses above the 200-day SMA, it signals a bullish trend and traders may consider buying the stock. Conversely, when the 50-day SMA crosses below the 200-day SMA, it signals a bearish trend and traders may consider selling the stock.

2. Exponential Moving Average (EMA) crossover strategy: This strategy is similar to the SMA crossover strategy, but instead of using simple moving averages, traders use exponential moving averages. EMAs give more weight to recent price movements, making them more responsive to changes in trend.

3. Moving Average Divergence-Convergence (MACD) strategy: This strategy uses the MACD indicator, which is derived from two exponential moving averages. Traders look for the crossover of the MACD line and the signal line, which is a 9-day EMA of the MACD line. When the MACD line crosses above the signal line, it signals a bullish trend, and when it crosses below the signal line, it signals a bearish trend
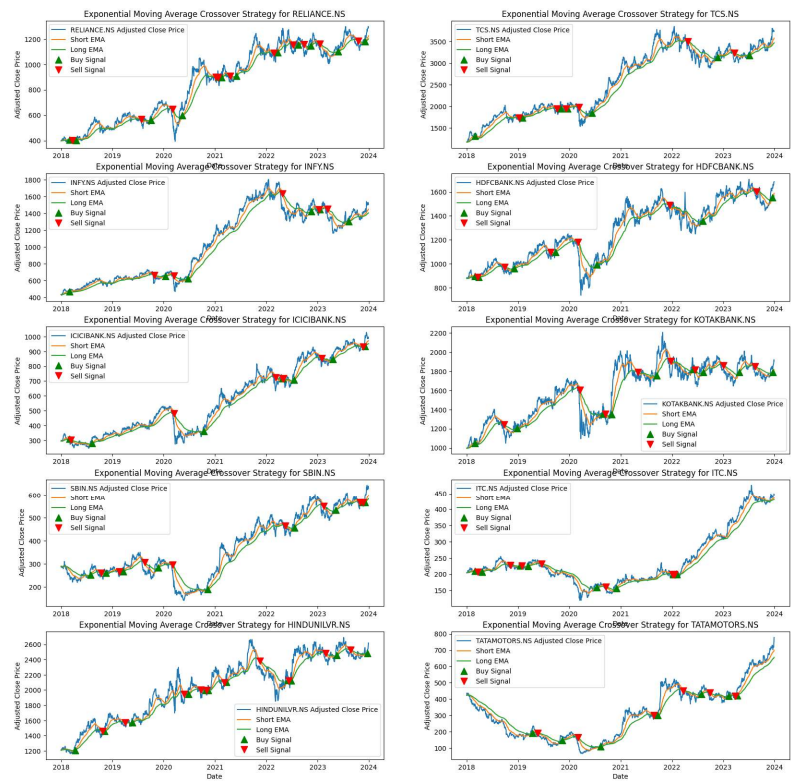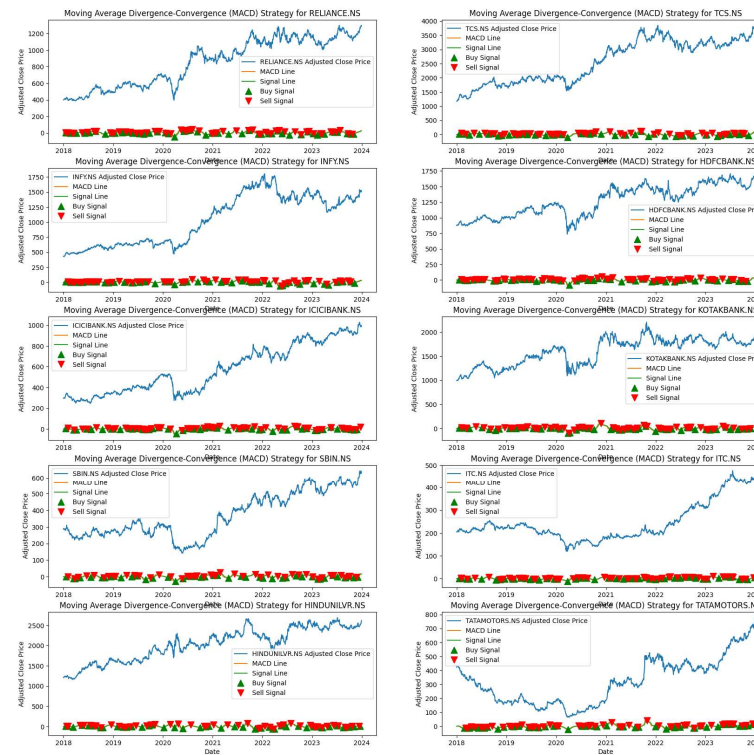
Moving Average Crossover Strategy

Exponential Moving Average Crossover Strategy

Backtested Portfolio Value for Exponential Average Crossover Strategy

Moving Average Divergence-Convergence (MACD) Strategy

Moving Average Divergence-Convergence (MACD) Strategy

Step 3: Backtesting

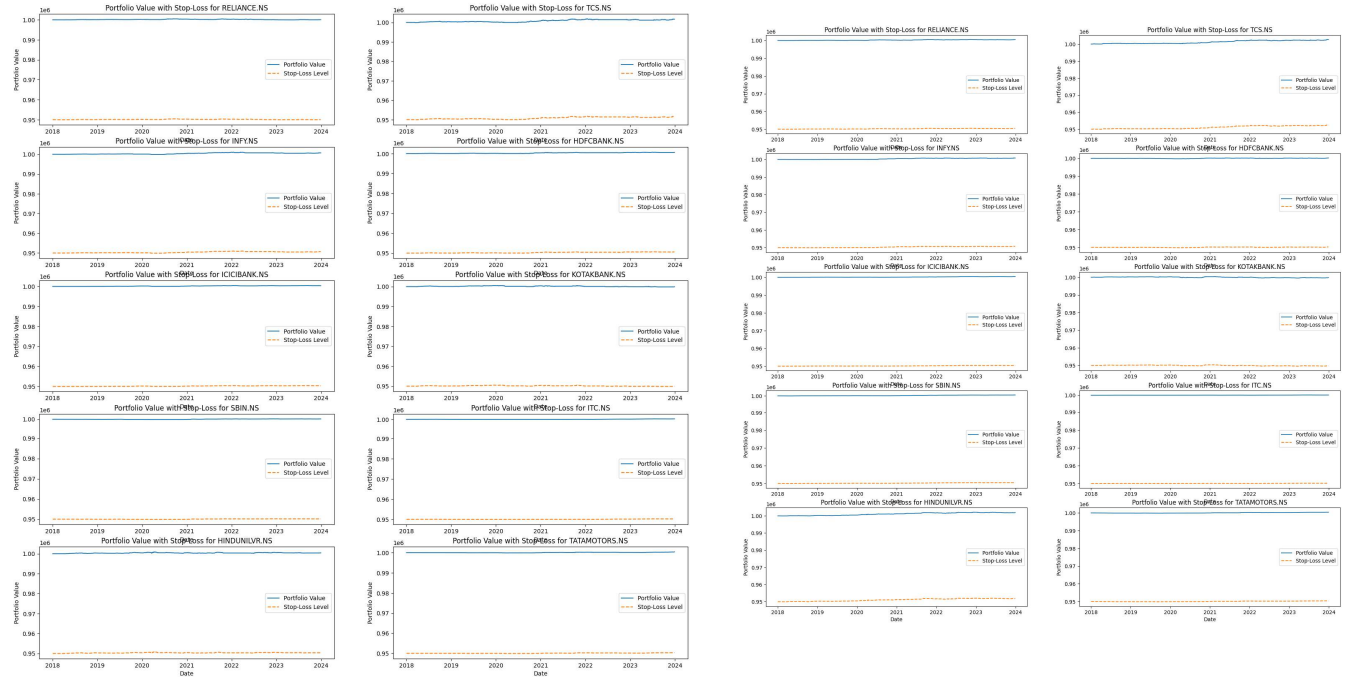# Step 4: Risk Management by Implementing Stop-Loss

Stop-Loss Application for Moving Average Crossover Strategy

Stop-Loss Application for Exponential Moving Average Crossover Strategy
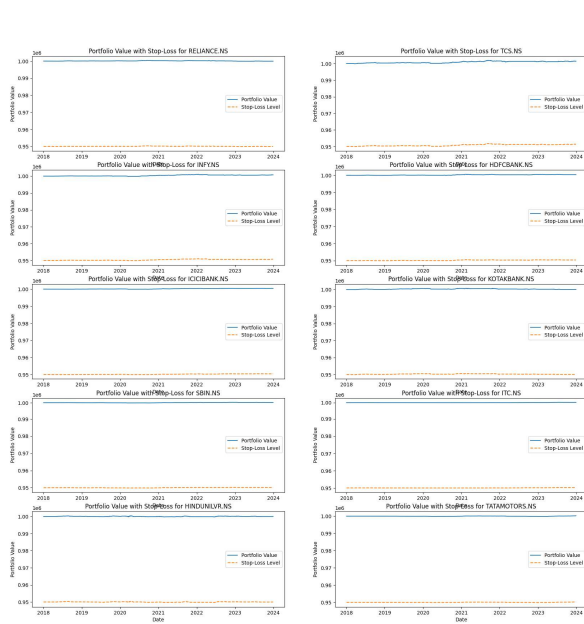
Stop-Loss Application for Moving Average Divergence-Convergence (MACD) Strategy

Step 5: Evaluation and Refinement - MACS

Evaulating Moving Average Crossover Strategy

	RELIANCE.NS	TCS.NS	INFY.NS	HDFCBANK.NS	ICICIBANK.NS	KOTAKBANK.NS	SBIN.NS	ITC.NS	HINDUNILVR.NS	TATAMOTORS.NS
Start	1000000.000000	1.000000e+06	1.000000e+06	1.000000e+06	1.000000e+06	1.000000e+06	1.000000e+06	1.000000e+06	1.000000e+06	1.000000e+06
End	999927.700958	1.001432e+06	1.000745e+06	1.000378e+06	1.000415e+06	1.000097e+06	1.000168e+06	1.000160e+06	1.000046e+06	1.000234e+06
Absolute Return Ratio	0.999928	1.001432e+00	1.000745e+00	1.000378e+00	1.000415e+00	1.000097e+00	1.000168e+00	1.000160e+00	1.000046e+00	1.000234e+00
Total Return	-0.000072	1.431890e-03	7.447878e-04	3.777735e-04	4.150867e-04	9.661133e-05	1.675035e-04	1.597875e-04	4.588452e-05	2.343749e-04
Annualized Return	-0.000012	2.434991e-04	1.266904e-04	6.427009e-05	7.061705e-05	1.643827e-05	2.849963e-05	2.718689e-05	7.807346e-06	3.987626e-05
Annualized Volatility	0.000180	4.859095e-04	2.294495e-04	2.085572e-04	1.284267e-04	3.003778e-04	8.951222e-05	4.255904e-05	3.866158e-04	9.658808e-05
Sharpe Ratio	-0.068323	5.011203e-01	5.521495e-01	3.081653e-01	5.498625e-01	5.472532e-02	3.183881e-01	6.388043e-01	2.019407e-02	4.128486e-01
Max Drawdown	-0.000546	-9.772008e-04	-5.433772e-04	-3.494775e-04	-1.980934e-04	-6.541176e-04	-1.817458e-04	-6.811428e-05	-7.166976e-04	-2.747570e-04

Step 5: Evaluation and Refinement - EACS

Evaulating Exponential Moving Average Crossover Strategy

	RELIANCE.NS	TCS.NS	INFY.NS	HDFCBANK.NS	ICICIBANK.NS	KOTAKBANK.NS	SBIN.NS	ITC.NS	HINDUNILVR.NS	TATAMOTORS.NS
Start	1.000000e+06	1.000000e+06	1.000000e+06	1.000000e+06	1.000000e+06	1000000.000000	1.000000e+06	1.000000e+06	1.000000e+06	1.000000e+06
End	1.000054e+06	1.001701e+06	1.000695e+06	1.000640e+06	1.000361e+06	999894.289917	1.000158e+06	1.000223e+06	1.000441e+06	1.000405e+06
Absolute Return Ratio	1.000054e+00	1.001701e+00	1.000695e+00	1.000640e+00	1.000361e+00	0.999894	1.000158e+00	1.000223e+00	1.000441e+00	1.000405e+00
Total Return	5.423248e-05	1.701107e-03	6.948783e-04	6.399530e-04	3.605156e-04	-0.000106	1.581435e-04	2.225981e-04	4.414104e-04	4.050645e-04
Annualized Return	9.227737e-06	2.892483e-04	1.182032e-04	1.088625e-04	6.133447e-05	-0.000018	2.690719e-05	3.787274e-05	7.509457e-05	6.891229e-05
Annualized Volatility	1.971673e-04	5.133650e-04	2.278461e-04	2.248009e-04	1.317251e-04	0.000307	9.155048e-05	4.663714e-05	4.113821e-04	1.050012e-04
Sharpe Ratio	4.680155e-02	5.634360e-01	5.187852e-01	4.842617e-01	4.656249e-01	-0.058592	2.939055e-01	8.120725e-01	1.825421e-01	6.563003e-01
Max Drawdown	-5.337758e-04	-7.423003e-04	-5.720880e-04	-2.636427e-04	-2.075691e-04	-0.000746	-1.351126e-04	-7.374994e-05	-7.509748e-04	-1.847524e-04

Step 5: Evaluation and Refinement - MACD

Evaulating Moving Average Divergence-Convergence (MACD) Strategy

	RELIANCE.NS	TCS.NS	INFY.NS	HDFCBANK.NS	ICICIBANK.NS	KOTAKBANK.NS	SBIN.NS	ITC.NS	HINDUNILVR.NS	TATAMOTORS.NS
Start	1.000000e+06	1.000000e+06	1.000000e+06	1.000000e+06	1.000000e+06	1000000.000000	1.000000e+06	1.000000e+06	1.000000e+06	1.000000e+06
End	1.000503e+06	1.002624e+06	1.000787e+06	1.000262e+06	1.000477e+06	999774.090759	1.000506e+06	1.000144e+06	1.001937e+06	1.000413e+06
Absolute Return Ratio	1.000503e+00	1.002624e+00	1.000787e+00	1.000262e+00	1.000477e+00	0.999774	1.000506e+00	1.000144e+00	1.001937e+00	1.000413e+00
Total Return	5.033929e-04	2.624320e-03	7.872229e-04	2.623027e-04	4.767618e-04	-0.000226	5.062572e-04	1.440424e-04	1.937122e-03	4.128001e-04
Annualized Return	8.563709e-05	4.460566e-04	1.339064e-04	4.462733e-05	8.110750e-05	-0.000038	8.612425e-05	2.450811e-05	3.293469e-04	7.022810e-05
Annualized Volatility	1.584025e-04	4.373298e-04	2.090437e-04	2.073427e-04	1.056584e-04	0.000310	7.704371e-05	3.877634e-05	3.387574e-04	9.131076e-05
Sharpe Ratio	5.406297e-01	1.019955e+00	6.405667e-01	2.152346e-01	7.676392e-01	-0.123850	1.117862e+00	6.320377e-01	9.722207e-01	7.691109e-01
Max Drawdown	-2.625828e-04	-5.225589e-04	-2.690818e-04	-2.884481e-04	-1.325764e-04	-0.000927	-6.769402e-05	-5.629912e-05	-4.607512e-04	-1.425643e-04

Overall Mean Returns

```
Moving Average Crossover Strategy                          0.000061
Exponential Moving Average Crossover Strategy              0.000078
Moving Average Divergence-Convergence (MACD) Strategy     0.000126
```

Step 6: Final Implementation

```
Company: TCS.NS          Profit/Loss:    2624.3203125
Company: INFY.NS         Profit/Loss: 787.2228698730469
Company: RELIANCE.NS     Profit/Loss: 503.3929138183594
Company: HDFCBANK.NS     Profit/Loss: 262.30267333984375
Company: ICICIBANK.NS    Profit/Loss: 476.76177978515625
Company: KOTAKBANK.NS    Profit/Loss: -225.90924072265625
Company: SBIN.NS         Profit/Loss: 506.25718688964844
Company: ITC.NS          Profit/Loss: 144.0423583984375
Company: HINDUNILVR.NS   Profit/Loss: 1937.121826171875
Company: TATAMOTORS.NS   Profit/Loss: 412.80013275146484

Total Profit/Loss: 7428.312812805176
```