Trading Analysis Report

Asset Statistics

This section provides a statistical summary of the asset prices, including measures of central tendency, dispersion, and distribution.

	count	mean	std	min	25%	50%	75%	max
EPT	252.0	4705.341269841269	416.18029081794987	3402.0	4423.25	4823.0	5040.0	5294.0
DLO	252.0	4951.623015873016	288.06316529060564	4146.0	4748.25	4926.5	5154.0	5692.0
MKU	252.0	4987.138888888889	501.82124140202205	4189.0	4609.25	4847.0	5329.0	6340.0
IGM	252.0	5691.936507936508	728.4465952750666	4673.0	5092.0	5555.5	6175.0	8482.0
BRV	252.0	5153.1984126984125	777.3863250174675	3767.0	4588.5	4968.5	5607.5	7558.0

Price Series

This section visualizes the price series of each asset over time, allowing for the identification of trends, patterns, and potential anomalies.

Distributions

This section presents the distribution of asset prices using histograms and density plots, providing insights into the shape, central tendency, and potential outliers in the price data.

Correlation Matrix

This section displays the correlation matrix heatmap of the asset prices, illustrating the pairwise correlations between different assets and highlighting potential relationships or dependencies.

Augmented Dickey-Fuller Test

The Augmented Dickey-Fuller (ADF) test is used to determine if a time series is stationary or not. A stationary series has no trend or seasonal effects and has constant statistical properties over time. The ADF test checks for the presence of a unit root in the series. If the p-value is less than the significance

level (e.g., 0.05), we reject the null hypothesis of a unit root and conclude that the series is stationary.

Asset	ADF Statistic	p-value	Stationary	
0	EPT	-7.851893522722521	5.572592380682657e-12	Yes
1	DLO	-16.663245075066392	1.567566634525886e-29	Yes
2	MKU	-15.772944473727156	1.1551711911832044e-28	Yes
3	IGM	-15.568353240953387	2.0014151077994866e-28	Yes
4	BRV	-15.859284315213147	9.252444370068505e-29	Yes

Hurst Exponent

The Hurst Exponent is a measure of long-term memory and fractality of a time series. It quantifies the degree of persistence or anti-persistence in the series. A Hurst Exponent between 0 and 0.5 indicates anti-persistence or mean-reversion, meaning that past trends are likely to reverse in the future. A Hurst Exponent between 0.5 and 1 indicates persistence or trend-following behavior, suggesting that past trends are likely to continue. A value close to 0.5 indicates a random walk or a series with no memory.

Asset	Hurst Exponent	Behavior	
0	EPT	0.13916067212798686	Mean Reversion
1	DLO	0.16519771810614048	Mean Reversion
2	MKU	0.1101028201790881	Mean Reversion
3	IGM	0.1772151173580428	Mean Reversion
4	BRV	0.13516282806825455	Mean Reversion

Cointegration Test

Cointegration tests are used to determine if there is a long-term equilibrium relationship between two or more non-stationary time series. If two series are cointegrated, it suggests that they share a common stochastic trend and have a stationary linear combination. Cointegration can be useful for pairs trading strategies or identifying long-term relationships between assets. If the p-value is less than the significance level (e.g., 0.05), we reject the null hypothesis of no cointegration and conclude that the series are cointegrated.

Asset 1	Asset 2	Cointegration	p-value	
0	EPT	DLO	Yes	1.2210944722364674e-10
1	EPT	MKU	Yes	6.365827512170193e-11
2	EPT	IGM	Yes	9.885360984292813e-13

3	EPT	BRV	Yes	5.6590499878303844e-11
4	DLO	MKU	Yes	8.1971892197639245e-19
5	DLO	IGM	Yes	2.3406925078728252e-28
6	DLO	BRV	Yes	1.8645270390893522e-28
7	MKU	IGM	Yes	9.356523945219492e-28
8	MKU	BRV	Yes	1.4154689344181896e-11
9	IGM	BRV	Yes	1.5510494253385756e-11

Granger Causality Test

The Granger Causality test assesses whether one time series is useful in predicting another. It determines if past values of one series contain information that helps predict future values of another series. Granger causality does not imply true causality but rather a statistical pattern of lagged correlation. If the p-value is less than the significance level (e.g., 0.05), we reject the null hypothesis of no Granger causality and conclude that one series Granger-causes the other.

Cause	Effect	Granger Causality	Min p-value	
0	DLO	EPT	No	0.17719051855906293
1	MKU	EPT	No	0.11286547849459537
2	IGM	EPT	No	0.3321457600734814
3	BRV	EPT	No	0.11565754663342516
4	EPT	DLO	Yes	0.04216788424975077
5	MKU	DLO	No	0.1501002892474646
6	IGM	DLO	Yes	0.049243382282821394
7	BRV	DLO	No	0.6316020606718338
8	EPT	MKU	No	0.05134271659853858
9	DLO	MKU	No	0.25362144386139046
10	IGM	MKU	No	0.11294380112933207
11	BRV	MKU	Yes	0.03231300684193627
12	EPT	IGM	No	0.38071671419123365
13	DLO	IGM	No	0.10442261004085539
14	MKU	IGM	No	0.20213693047700618
15	BRV	IGM	No	0.2626562645390783
16	EPT	BRV	No	0.051875820617634544
17	DLO	BRV	No	0.5683062864218041
18	MKU	BRV	Yes	0.04761976398307926

19	IGM	BRV	No	0.08312059005115902

Principal Component Analysis

Principal Component Analysis (PCA) is a dimensionality reduction technique that identifies the principal components or dominant patterns in a dataset. It helps to understand the underlying structure and relationships among variables. The explained variance ratios indicate the proportion of total variance in the data explained by each principal component. The principal component loadings represent the weights or contributions of each original variable to the principal components. PCA can be used for data visualization, feature extraction, and identifying the main drivers of variability in asset returns.

Explained Variance Ratios:

22874923386824	0.25984375969699	0.036730647423925546	0.009271226701203233	0.0018668738391988

PC1	PC2	PC3	PC4	PC5	
EPT	-0.24993260652421365	0.6030966331720229	0.6631402010509594	-0.04066335103652276	0.36386770794501233
DLO	0.25108054190885876	0.1738693536974309	0.12261537365036407	0.9140613400989894	-0.23703448272479882
MKU	0.3903808467211348	0.4452921851682534	0.10217154758003077	-0.38699912451972474	-0.6993642232967311
IGM	0.4609994731095993	-0.5749672187462566	0.6677763783692064	-0.09597353922398189	0.0419043126753783
BRV	0.7138448949013565	0.2777975271608536	-0.2980708426731518	-0.06212178207931207	0.5661701659978156

Predictive Modeling

This section presents the results of predictive modeling using various machine learning algorithms. The performance of each model is evaluated using metrics such as accuracy, precision, recall, and F1-score. The results are organized by stock and then by model.

EPT

LogisticRegression

Metric	Value
Accuracy	0.6600
Precision	0.6897
Recall	0.5085

F1-score	0.5854

Actual \ Predicted	Positive	Negative
Positive	60	58
Negative	27	105

LinearDiscriminantAnalysis

Metric	Value
Accuracy	0.6600
Precision	0.6571
Recall	0.5847
F1-score	0.6188

Actual \ Predicted	Positive	Negative
Positive	69	49
Negative	36	96

QuadraticDiscriminantAnalysis

Metric	Value
Accuracy	0.6920
Precision	0.7204
Recall	0.5678
F1-score	0.6351

Actual \ Predicted	Positive	Negative
Positive	67	51
Negative	26	106

SVC_linear

Metric	Value
Accuracy	0.6640
Precision	0.7237

Recall	0.4661
F1-score	0.5670

Actual \ Predicted	Positive	Negative
Positive	55	63
Negative	21	111

SVC_rbf

Metric	Value
Accuracy	0.6800
Precision	0.7375
Recall	0.5000
F1-score	0.5960

Actual \ Predicted	Positive	Negative
Positive	59	59
Negative	21	111

DecisionTreeClassifier

Metric	Value
Accuracy	1.0000
Precision	1.0000
Recall	1.0000
F1-score	1.0000

Actual \ Predicted	Positive	Negative
Positive	118	0
Negative	0	132

RandomForestClassifier

Metric	Value
Accuracy	1.0000

Precision	1.0000
Recall	1.0000
F1-score	1.0000

Actual \ Predicted	Positive	Negative
Positive	118	0
Negative	0	132

DLO

LogisticRegression

Metric	Value
Accuracy	0.6400
Precision	0.6220
Recall	0.6529
F1-score	0.6371

Actual \ Predicted	Positive	Negative
Positive	79	42
Negative	48	81

LinearDiscriminantAnalysis

Metric	Value
Accuracy	0.6600
Precision	0.6286
Recall	0.7273
F1-score	0.6743

Actual \ Predicted	Positive	Negative
Positive	88	33
Negative	52	77

QuadraticDiscriminantAnalysis

Metric	Value
Accuracy	0.6360
Precision	0.6056
Recall	0.7107
F1-score	0.6540

Actual \ Predicted	Positive	Negative
Positive	86	35
Negative	56	73

SVC_linear

Metric	Value
Accuracy	0.6440
Precision	0.6067
Recall	0.7521
F1-score	0.6716

Actual \ Predicted	Positive	Negative
Positive	91	30
Negative	59	70

SVC_rbf

Metric	Value
Accuracy	0.6600
Precision	0.6084
Recall	0.8347
F1-score	0.7038

Actual \ Predicted	Positive	Negative
Positive	101	20
Negative	65	64

DecisionTreeClassifier

Metric	Value
Accuracy	1.0000
Precision	1.0000
Recall	1.0000
F1-score	1.0000

Actual \ Predicted	Positive	Negative
Positive	121	0
Negative	0	129

RandomForestClassifier

Metric	Value
Accuracy	1.0000
Precision	1.0000
Recall	1.0000
F1-score	1.0000

Actual \ Predicted	Positive	Negative
Positive	121	0
Negative	0	129

MKU

LogisticRegression

Metric	Value
Accuracy	0.6600
Precision	0.6519
Recall	0.7744

F1-score	0.7079

Actual \ Predicted	Positive	Negative
Positive	103	30
Negative	55	62

LinearDiscriminantAnalysis

Metric	Value
Accuracy	0.6720
Precision	0.6689
Recall	0.7594
F1-score	0.7113

Actual \ Predicted	Positive	Negative
Positive	101	32
Negative	50	67

QuadraticDiscriminantAnalysis

Metric	Value
Accuracy	0.7360
Precision	0.6982
Recall	0.8872
F1-score	0.7815

Actual \ Predicted	Positive	Negative
Positive	118	15
Negative	51	66

SVC_linear

Metric	Value
Accuracy	0.6720
Precision	0.6474

Recall	0.8421
F1-score	0.7320

Actual \ Predicted	Positive	Negative
Positive	112	21
Negative	61	56

SVC_rbf

Metric	Value
Accuracy	0.6960
Precision	0.6686
Recall	0.8496
F1-score	0.7483

Actual \ Predicted	Positive	Negative
Positive	113	20
Negative	56	61

DecisionTreeClassifier

Metric	Value
Accuracy	1.0000
Precision	1.0000
Recall	1.0000
F1-score	1.0000

Actual \ Predicted	Positive	Negative
Positive	133	0
Negative	0	117

RandomForestClassifier

Metric	Value
Accuracy	1.0000

Precision	1.0000
Recall	1.0000
F1-score	1.0000

Actual \ Predicted	Positive	Negative
Positive	133	0
Negative	0	117

IGM

LogisticRegression

Metric	Value
Accuracy	0.6120
Precision	0.6142
Recall	0.6190
F1-score	0.6166

Actual \ Predicted	Positive	Negative
Positive	78	48
Negative	49	75

LinearDiscriminantAnalysis

Metric	Value
Accuracy	0.6520
Precision	0.6512
Recall	0.6667
F1-score	0.6588

Actual \ Predicted	Positive	Negative
Positive	84	42
Negative	45	79

QuadraticDiscriminantAnalysis

Metric	Value
Accuracy	0.6560
Precision	0.6429
Recall	0.7143
F1-score	0.6767

Actual \ Predicted	Positive	Negative
Positive	90	36
Negative	50	74

SVC_linear

Metric	Value
Accuracy	0.6320
Precision	0.6288
Recall	0.6587
F1-score	0.6434

Actual \ Predicted	Positive	Negative
Positive	83	43
Negative	49	75

SVC_rbf

Metric	Value
Accuracy	0.6920
Precision	0.6623
Recall	0.7937
F1-score	0.7220

Actual \ Predicted	Positive	Negative
Positive	100	26
Negative	51	73

DecisionTreeClassifier

Metric	Value
Accuracy	1.0000
Precision	1.0000
Recall	1.0000
F1-score	1.0000

Actual \ Predicted	Positive	Negative
Positive	126	0
Negative	0	124

RandomForestClassifier

Metric	Value
Accuracy	1.0000
Precision	1.0000
Recall	1.0000
F1-score	1.0000

Actual \ Predicted	Positive	Negative
Positive	126	0
Negative	0	124

BRV

LogisticRegression

Metric	Value
Accuracy	0.6240
Precision	0.6116
Recall	0.6116

F1-score	0.6116

Actual \ Predicted	Positive	Negative
Positive	74	47
Negative	47	82

LinearDiscriminantAnalysis

Metric	Value
Accuracy	0.6760
Precision	0.6639
Recall	0.6694
F1-score	0.6667

Actual \ Predicted	Positive	Negative
Positive	81	40
Negative	41	88

QuadraticDiscriminantAnalysis

Metric	Value
Accuracy	0.6880
Precision	0.6617
Recall	0.7273
F1-score	0.6929

Actual \ Predicted	Positive	Negative
Positive	88	33
Negative	45	84

SVC_linear

Metric	Value
Accuracy	0.6360
Precision	0.6154

Recall	0.6612
F1-score	0.6375

Actual \ Predicted	Positive	Negative
Positive	80	41
Negative	50	79

SVC_rbf

Metric	Value
Accuracy	0.7040
Precision	0.6460
Recall	0.8595
F1-score	0.7376

Actual \ Predicted	Positive	Negative
Positive	104	17
Negative	57	72

DecisionTreeClassifier

Metric	Value
Accuracy	1.0000
Precision	1.0000
Recall	1.0000
F1-score	1.0000

Actual \ Predicted	Positive	Negative
Positive	121	0
Negative	0	129

RandomForestClassifier

Metric	Value
Accuracy	1.0000

Precision	1.0000
Recall	1.0000
F1-score	1.0000

Actual \ Predicted	Positive	Negative
Positive	121	0
Negative	0	129