

TREND OF THE PERFORMANCE OF EQUITY MUTUAL FUNDS IN INDIA

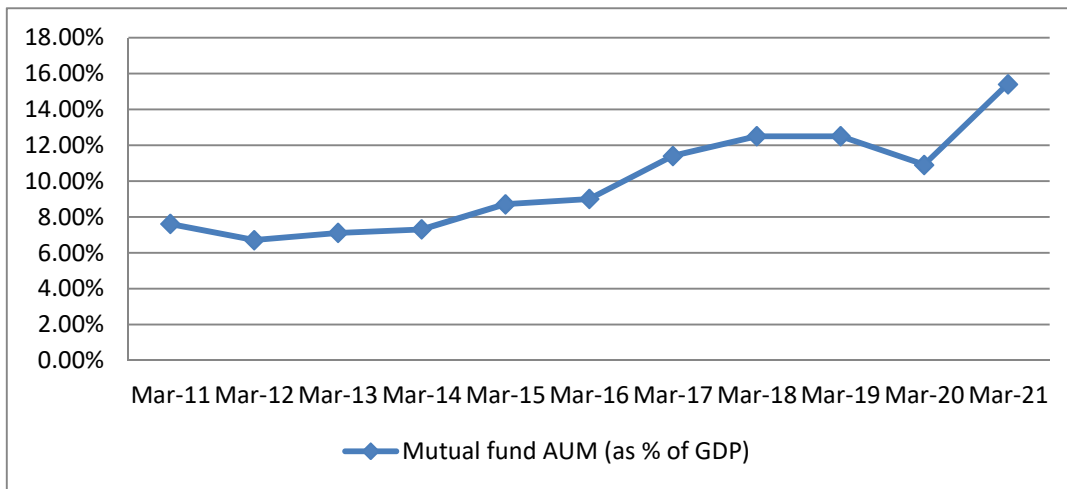
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5.1 Introduction

Mutual funds have emerged as an attractive investment option for investors seeking huge returns. Capital market growth and financial system orientation are the major factors driving the growth of mutual funds all over the world (Klapper, Sulla, & Vittas, 2004). Despite being subjected to market risks, mutual funds are the most suitable investment avenue for cautious investors, as they offer an opportunity to invest in diversified and professionally managed securities. Mutual funds offer a variety of investment products at a reasonable cost, enabling households to participate in the long-term growth prospects of our country. The Indian mutual fund industry has witnessed dramatic improvements in quantity as well as quality of product and service offerings in recent years. Furthermore, technological advancement, professional expertise and investors' participation over time enhanced the growth of the mutual fund industry in India. The Indian mutual fund industry's AUM stood at Rs. 37.72 trillion as of December 31, 2021 (AMFI, 2021).

The value of assets held by individual investors in mutual funds increased to Rs. 20.86 trillion in December 2021 from Rs. 16.17 trillion in December 2020, marking a growth of 29.04 percent. The value of assets held by institutions increased by 15.28%, from Rs. 14.80 trillion to Rs. 17.06 trillion in December 2021 (AMFI, 2021). Fig. 5.1 represents mutual fund AUM as a percentage of the nation's GDP from 2010–11 to 2020–21.

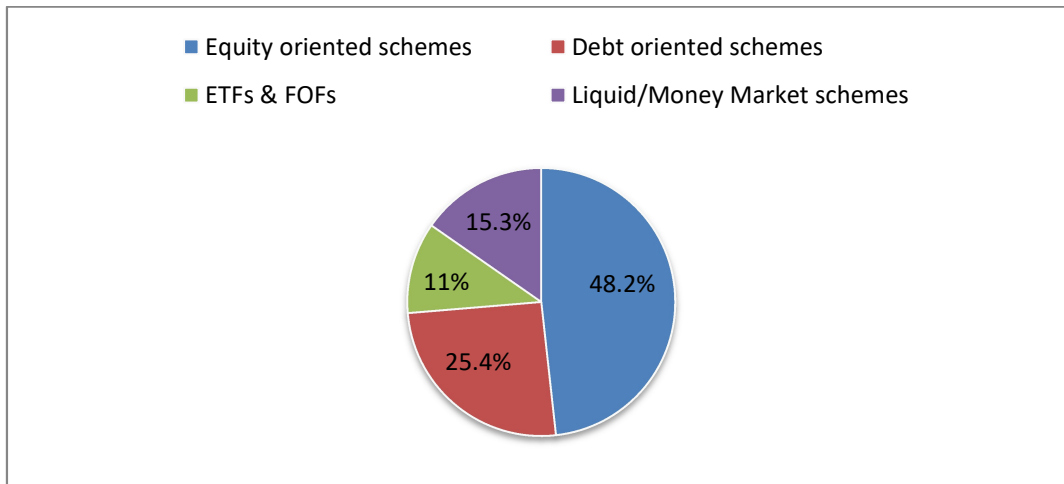
Figure 5.1
Mutual fund AUM (as % of GDP)



Source: AMFI

The mutual fund AUM as a percentage of GDP rises to 15.40% in the F.Y. 2020-21 (Fig. 5.1).

Fig 5.2
Scheme-wise composition of Assets



Source: AMFI

Equity-oriented schemes constitute the highest percentage (48.2%) among the different schemes offered by mutual funds (Fig. 5.2). The AUM held by equity-oriented schemes alone stood at Rs. 13.06 trillion as of December 31, 2021 (SEBI, 2021). The increased percentage of investment in equity-oriented schemes would be due to the high rate of return offered by such schemes.

Equity shares have offered higher returns when compared to other investment avenues in the long run. Selecting the right shares to invest in would be a difficult task for a common man who lacks knowledge regarding the financial market. Equity mutual funds are managed by fund managers who make asset allocations and continuously monitor the portfolio in order to make better returns. Being handled by professional experts, it becomes a safe haven, thus enabling the common people to participate in economic growth.

The role of mutual funds in transforming the Indian economy makes it imperative to understand the trend and pattern of the performance of mutual funds in India. High returns offered by equity mutual funds make them the most attractive investment option for investors who lack professional knowledge and are interested to participate in the stock market in order to earn better returns.

5.2 Data and Methodology

Equity mutual funds are classified into different categories as per SEBI guidelines (AMFI, 2021). On the basis of market cap mix, Equity mutual funds are classified into the following categories:

- i. Large-cap funds – The funds which make at least 80% investment in large-cap stocks.
- ii. Large and Mid-cap funds - The funds which make at least 35% investment in large-cap stocks and 35% in mid-cap stocks.
- iii. Mid-cap funds - The funds which make at least 65% investment in mid-cap stocks.
- iv. Small-cap funds - The funds which make at least 65% investment in small-cap stocks.
- v. Multi-cap funds - The funds which make 65% investment in equity and equity-related instruments.

As the multi-cap funds invest in stocks across market capitalization, only the first four categories of equity mutual funds are considered for the study.

Trend analysis and the Box-Jenkins ARIMA model have been used to analyse the trend and pattern of equity funds in India.

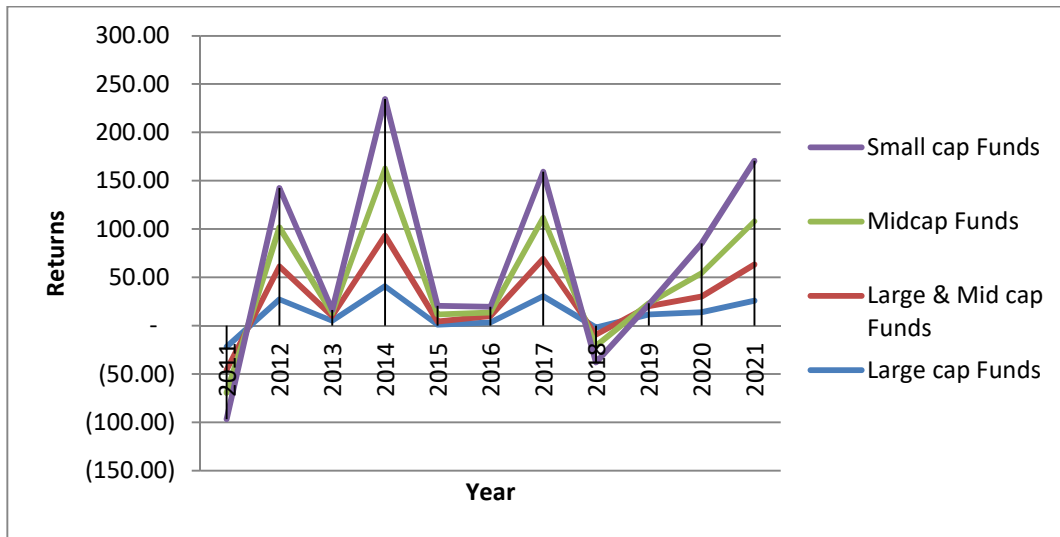
5.3 Analysis, Results and Discussion

5.3.1 Trend Analysis

Trend analysis was done to explore the performance of equity mutual funds in India. The average annual returns of large-cap funds, large and mid-cap funds, mid-cap funds and small-cap funds for the period 2011–2021 have been taken for the study. Data were gathered from the Association of Mutual Funds in India (AMFI) and Morningstar websites. The annual returns of all the funds in these categories are taken into account while calculating the average annual return.

Figure 5.3

Performance of Equity Mutual Funds during 2011-2021



Source: AMFI

The performance of large-cap funds, large and mid-cap funds, mid-cap funds and small-cap funds for the years 2011–2021 are depicted in Figure 5.3. Mutual fund NAVs move in tandem with the prices of the securities in which they are invested. As the study examines the trend of equity fund performance, the reasons for their performance can be related to the stock market movements in the corresponding years.

Figure 5.3 implies that all the fund categories delivered negative returns in 2011, of which the returns of the small-cap funds were the lowest. The economic

downturn in the year was mainly due to the downfall of the Indian currency. A weak rupee would have a negative impact on FII inflows.

In 2012, the returns of all the funds increased, and the small-cap funds performed the best while the large-cap funds provided the least returns.

In 2013, all the funds provided slightly positive returns, while the average return of all the categories was 4.05%, with large-cap funds providing the highest returns (5%) and small-cap funds providing the lowest returns (3.07%).

All the funds exhibited their highest performance in 2014, giving an average return of 58.69% due to the rise of the National Democratic Alliance (NDA) government. The small-cap funds provided exceptionally good returns (71.98%). The lowest returns were provided by large-cap funds (40.96%).

In 2015, the market went down, providing considerably lower returns. Large-cap funds provided the lowest returns (1.01%), whereas small-cap funds provided the highest returns (8.89%). The major cause of the year's economic downturn was the depreciation of the Chinese Yuan, which caused currency rates in other countries to fall.

In 2016, the returns of large-cap funds and large and mid-cap funds went up slightly, while mid-cap funds and small-cap funds provided lower returns compared to the previous year. The increase in non-performing assets (NPAs) and the government's "demonetization drive" caused the stock market to crash.

2017 was another great year for mutual funds, showing remarkable returns after 2014. Small-cap funds provided the highest returns (47.52%) and large-cap funds provided the lowest returns (30.63%). The funds went down considerably, providing negative returns in 2018. The introduction of a 10% long-term capital gain tax on equity shares was a major reason for the downtrend of the economy. Small-cap funds performed the least, providing -17.27% returns, while large-cap funds provided slightly negative returns (-1.91%).

In 2019, the industry witnessed an optimistic sentiment as the majority of the funds bounced back and all the fund categories except small-cap funds provided positive returns. It is evident from figure 5.3 that the equity funds went through a slowdown during the first half of 2020, which eventually advanced, giving higher returns in the second half. The COVID-19 outbreak was an unprecedented shock to the Indian economy. The lockdown declared on March 24th had a negative impact on the economy, particularly on the stock market. However, equity funds provided positive returns during the year. Small-cap funds have shown the best performance providing (30.66%) returns, whereas, the lowest returns were provided by the large-cap funds (14%).

The equity funds continued to provide high returns in 2021. Small-cap funds delivered the highest returns (62.8%), while large-cap funds provided the lowest returns (25.9%). Figure 5.3 makes it evident that small-cap funds are the most volatile category, as they were the best performers during the ups and worst performers during the downs in the market.

5.3.2 Application of Auto Regressive Integrated Moving Average (ARIMA) Modelling in the Performance of Equity Mutual Funds in India

The Box-Jenkins method, also known as Auto-Regressive Integrated Moving Average (ARIMA) is a statistical model for analysing and forecasting time series data. The method was first introduced by the famous mathematicians George Box and Gwilym Jenkins. The 'AR' portion of ARIMA stands for Auto-Regressive, 'I' for Integrated and 'MA' stands for Moving Average. Auto-regression refers to the number of lag orders included in the model. Integration refers to the number of times the observations are differenced. The moving average indicates that the forecast error is a linear combination of the respective past errors.

Guha and Bandyopadhyay (2016) have used the ARIMA model to forecast the future value of gold prices in India. The ARMA methodology was used to model the Fund of Mutual Funds in India (Gowri & Deo, 2015). In this study, the trend and pattern of large-cap funds, large and mid-cap funds, mid-cap funds and

small-cap funds are studied for the period from January 1, 2011, to December 31, 2021. The funds which have provided higher returns in the most number of years out of 11 years have been taken as a sample from each of these categories.

The following funds are taken as samples:

Large-cap fund	- Canara Robeco Bluechip Equity Fund
Large and Mid-cap fund	- Mirae Asset Emerging Bluechip Fund
Mid-cap fund	- UTI Mid Cap Fund
Small-cap fund	- Nippon India Small Cap Fund

The Net Asset Value (NAV) of a fund represents its price and is used to compute the returns generated from them. The return from a fund is calculated by deducting the NAV on the date of purchase from the NAV on the date of sale and then converting it into percentage.

The net asset values of these funds for the period 1 January 2011 to 31 December 2021 have been taken from the website of AMFI and ARIMA modelling is applied to forecast their NAVs for the period 1 January 2022 to 31 December 2023. The results of ARIMA modeling are as follows:

5.3.2.1 Unit Root Test

Stationarity means that the statistical properties of a process generating a time series do not change over time. Checking stationarity is imperative for time series analysis. Unit root test helps to check whether a time series data is non-stationary and possesses a unit root. Unit root tests help to avoid spurious results (Havi, Enu, Gyimah, Obeng, & Opoku, 2013). The commonly used test to examine the presence of unit roots is the Augmented Dickey Fuller test (Dickey & Fuller, 1981). In this study, the ADF test is used to check whether the data taken for the study is stationary or not.

Table 5.1

ADF Test Results of Performance of Equity Mutual Funds in India

Variables	Level						1 ST DIFFERENCE						INTEGRATION ORDER
	Intercept		Trend and Intercept		None		Intercept		Trend and Intercept		None		
	t-stat	p-value	t-stat	p-value	t-stat	p-value	t-stat	p-value	t-stat	p-value	t-stat	p-value	
Large-cap funds	1.35	1.00	-1.11	0.93	2.96	1.00	-14.29	0.00	-14.41	0.00	-14.03	0.00	I(1)
Large and Mid- cap funds	1.77	1.00	-0.76	0.97	3.55	1.00	-11.95	0.00	-12.14	0.00	-11.53	0.00	I(1)
Mid-cap funds	1.28	1.00	-0.74	0.97	2.92	1.00	-10.97	0.00	-11.11	0.00	-10.64	0.00	I(1)
Small-cap funds	2.44	1.00	0.36	1.00	3.74	1.00	-12.56	0.00	-12.82	0.00	-10.14	0.00	I(1)

Source: EViews Output

Table 5.1 shows the ADF test results of the performance of equity mutual funds. The results indicated the presence of unit root in their levels. Hence, the first differencing of the variables is done. As the p-values surpass its expected values at a 95% level of confidence, the data becomes stationary after the 1st difference. The null hypothesis that the data is not stationary, gets rejected since the probability values of the four variables are less than 5% level of significance. Hence, the test reveals that the order of integration of all four variables is 1.

5.3.2.2 ARMA Model Specification

As all the variables became stationery at the first difference, the order of integration is found to be I(1). The next step is to find out the values of AR and MA in ARIMA, for which the following steps are to be followed.

Large-cap funds

The ARMA modelling of large-cap funds is discussed in this section. Table 5.2 presents the ARMA models of the large-cap funds and their corresponding

values of the selection criteria. Many criteria can be used for ARMA model selection, such as the Akaike Information Criterion (AIC), Bayesian Information Criterion (AIC) and Hannan-Quinn Information Criterion (HQ). Hurvich and Tsai (1989) inferred AIC as the best model selection criterion. Akaike Information Criterion (AIC) is used to estimate the amount of information lost by a given model. The quality of the model increases when information lost by the model decreases. In this study, AIC has been used for the selection of the ARMA model. The model corresponding to the lowest value of AIC is chosen as the ARMA model.

Table 5.2

ARMA Model Selection Criteria of Performance of Large-cap funds

Model	LogL	AIC*	BIC	HQ
(4,4)	8666.264054	-6.400195	-6.378373	-6.392304
(4,3)	8665.055757	-6.400041	-6.380401	-6.392940
(3,4)	8665.022429	-6.400017	-6.380377	-6.392915
(3,3)	8663.885025	-6.399915	-6.382457	-6.393602
(2,4)	8663.547753	-6.399666	-6.382208	-6.393353
(4,2)	8661.900692	-6.398448	-6.380990	-6.392135
(2,3)	8656.143331	-6.394930	-6.379655	-6.389407
(3,2)	8655.146644	-6.394193	-6.378918	-6.388670
(2,2)	8647.813482	-6.389511	-6.376418	-6.384776
(4,1)	8639.905314	-6.382924	-6.367649	-6.377401
(1,4)	8638.713916	-6.382044	-6.366768	-6.376520
(1,1)	8634.707158	-6.381299	-6.372570	-6.378143
(2,1)	8634.962820	-6.380749	-6.369838	-6.376803
(3,1)	8635.863861	-6.380676	-6.367582	-6.375941
(1,3)	8635.620123	-6.380495	-6.367402	-6.375761
(0,0)	8630.925331	-6.379982	-6.375617	-6.378404
(1,2)	8633.476661	-6.379650	-6.368739	-6.375705
(0,1)	8631.202685	-6.379447	-6.372901	-6.377080
(1,0)	8631.198961	-6.379445	-6.372898	-6.377077
(2,0)	8631.263223	-6.378753	-6.370024	-6.375597
(0,2)	8631.262487	-6.378752	-6.370023	-6.375596
(3,0)	8631.304458	-6.378044	-6.367133	-6.374099
(0,3)	8631.293716	-6.378036	-6.367125	-6.374091
(0,4)	8631.652051	-6.377562	-6.364468	-6.372827
(4,0)	8631.548857	-6.377485	-6.364392	-6.372751

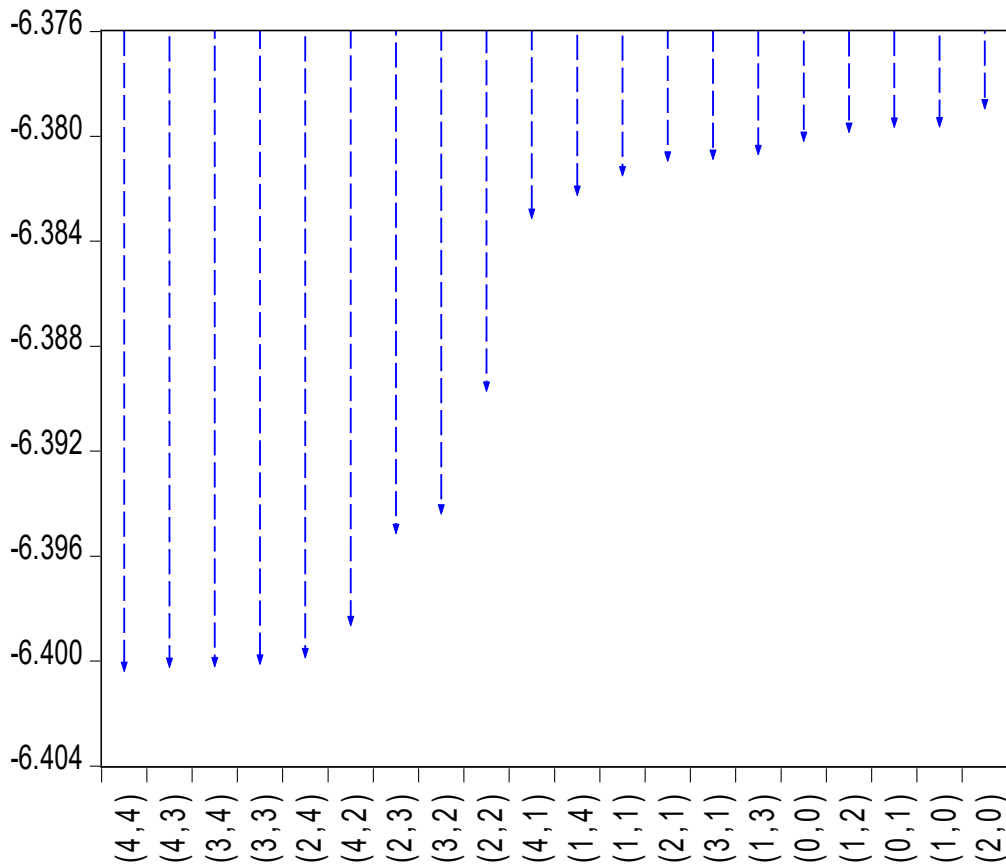
Source: EViews Output

Table 5.2 shows the ARMA models of the performance of the large-cap funds, which indicates that the ARMA (4,4) is the best model that can be used to forecast the future values of the large-cap funds.

Figure 5.4

ARMA Model of Performance of Large-cap funds

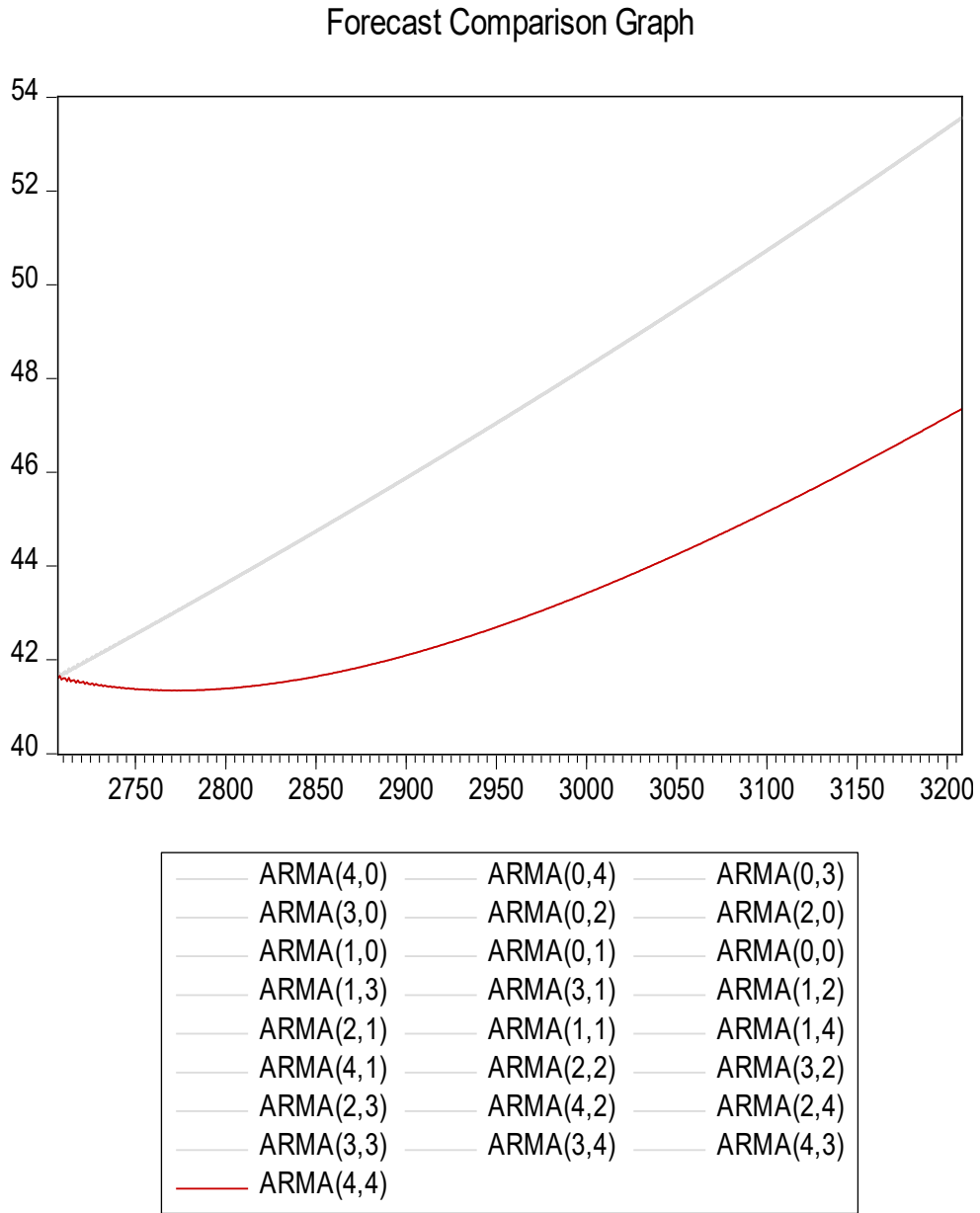
Akaike Information Criteria (top 20 models)



Source: EViews Output

Figure 5.4 represents the top 20 models generated by ARMA forecasting with their respective AIC values. The model with the lowest AIC should be selected as the best model. The model corresponding to the lowest AIC value, i.e., -6.40, is (4,4). Hence, ARMA (4,4) is selected as the best model.

Figure 5.5
Forecast Comparison Graph of Performance of Large-cap funds



Source: EViews Output

Figure 5.5 shows the forecast comparison graph of performance of large-cap funds using AIC criteria. It can be confirmed that, ARMA (4,4) is the best model.

Table 5.3
ARMA Maximum Likelihood Estimation of Performance of
Large-cap funds

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000503	7.12E-05	7.071821	0.0000
AR(1)	-1.079506	0.073091	-14.76937	0.0000
AR(2)	0.292951	0.048054	6.096293	0.0000
AR(3)	1.234819	0.047713	25.88016	0.0000
AR(4)	0.522459	0.072050	7.251371	0.0000
MA(1)	1.120226	0.254150	4.407745	0.0000
MA(2)	-0.246892	0.059124	-4.175848	0.0000
MA(3)	-1.262082	0.509017	-2.479450	0.0132
MA(4)	-0.611249	0.371286	-1.646304	0.0998
SIGMASQ	9.65E-05	5.93E-06	16.27578	0.0000
R-squared	0.026646	Mean dependent var		0.000502
Adjusted R-squared	0.023396	S.D. dependent var		0.009957
S.E. of regression	0.009840	Akaike info criterion		-6.400195
Sum squared resid	0.260934	Schwarz criterion		-6.378373
Log likelihood	8666.264	Hannan-Quinn criter.		-6.392304
F-statistic	8.197455	Durbin-Watson stat		2.017731
Prob(F-statistic)	0.000000			
Inverted AR Roots	.99	-.58	-.75+.59i	-.75-.59i
Inverted MA Roots	1.00	-.69	-.72+.61i	-.72-.61i

Source: EViews Output

Table 5.3 shows the maximum likelihood estimation of performance of large-cap funds. From the table, it is evident that the model has met all the necessary criteria. Hence, ARMA (4,4) can be selected as the best model indicating the performance of large-cap funds in India. As the integration order is found to be 1, the ARIMA model can be represented as ARIMA (4,1,4).

Large and Mid-cap funds

Table 5.4 shows the ARMA models of Large and Mid-cap funds and their corresponding values of the selection criteria. The model corresponding to the lowest value of AIC is chosen as the ARMA model.

Table 5.4

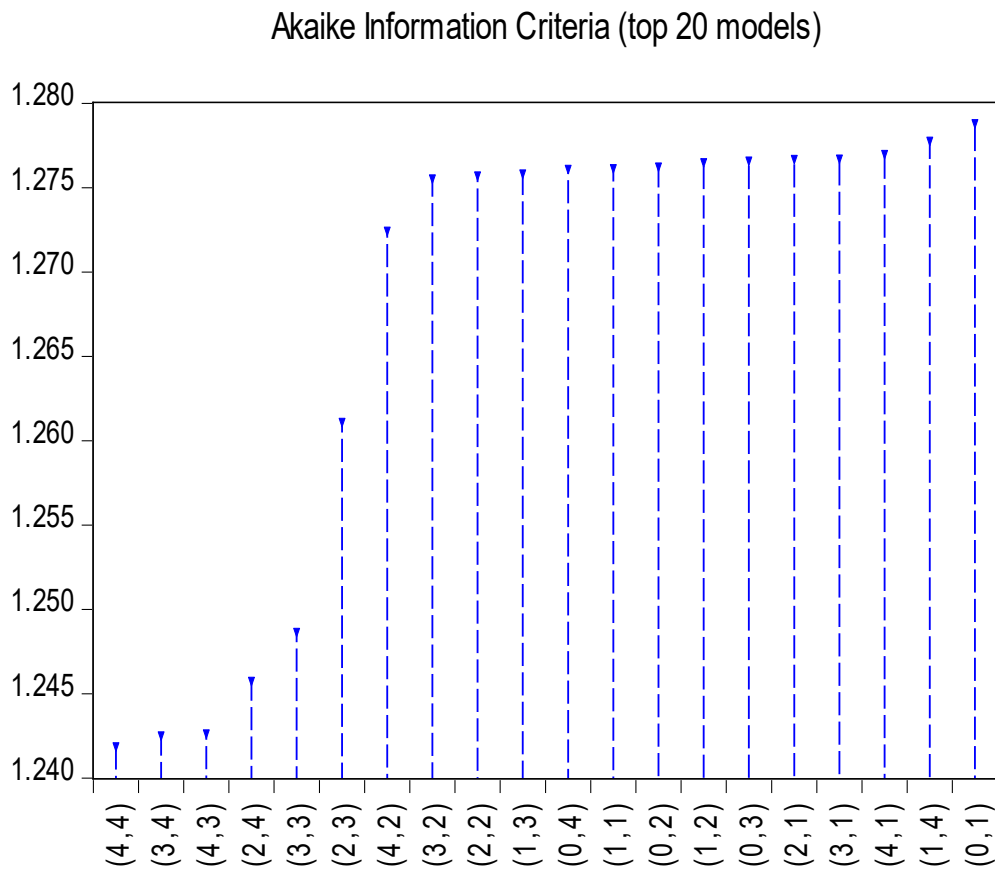
ARMA Model Selection Criteria of Performance of Large and Mid-cap funds

Model	LogL	AIC*	BIC	HQ
(4,4)	-1669.003915	1.241867	1.263696	1.249760
(3,4)	-1670.887852	1.242521	1.262166	1.249625
(4,3)	-1671.047689	1.242639	1.262285	1.249743
(2,4)	-1676.265526	1.245759	1.263222	1.252073
(3,3)	-1680.193534	1.248664	1.266127	1.254979
(2,3)	-1698.005730	1.261099	1.276379	1.266624
(4,2)	-1712.353044	1.272450	1.289913	1.278765
(3,2)	-1717.516266	1.275530	1.290810	1.281055
(2,2)	-1718.768338	1.275716	1.288813	1.280452
(1,3)	-1718.914016	1.275824	1.288921	1.280560
(0,4)	-1719.287050	1.276100	1.289197	1.280836
(1,1)	-1721.344818	1.276143	1.284874	1.279300
(0,2)	-1721.492420	1.276252	1.284983	1.279409
(1,2)	-1720.822687	1.276496	1.287410	1.280443
(0,3)	-1720.964926	1.276601	1.287516	1.280548
(2,1)	-1721.103680	1.276704	1.287618	1.280651
(3,1)	-1720.111132	1.276709	1.289807	1.281445
(4,1)	-1719.478836	1.276981	1.292261	1.282507
(1,4)	-1720.558750	1.277780	1.293060	1.283305
(0,1)	-1725.946100	1.278806	1.285355	1.281174
(4,0)	-1902.287832	1.411455	1.424553	1.416191
(3,0)	-2005.095446	1.486757	1.497671	1.490704
(2,0)	-2103.966642	1.559147	1.567878	1.562304
(1,0)	-2227.451584	1.649742	1.656291	1.652110
(0,0)	-2577.587761	1.907979	1.912345	1.909558

Source: EViews Output

Table 5.4 indicates that the ARMA (4,4) is the best model of the performance of large and mid-cap funds, which can be used to forecast the future values of the large and mid-cap funds.

Figure 5.6
ARMA Model of Performance of Large and Mid-cap funds



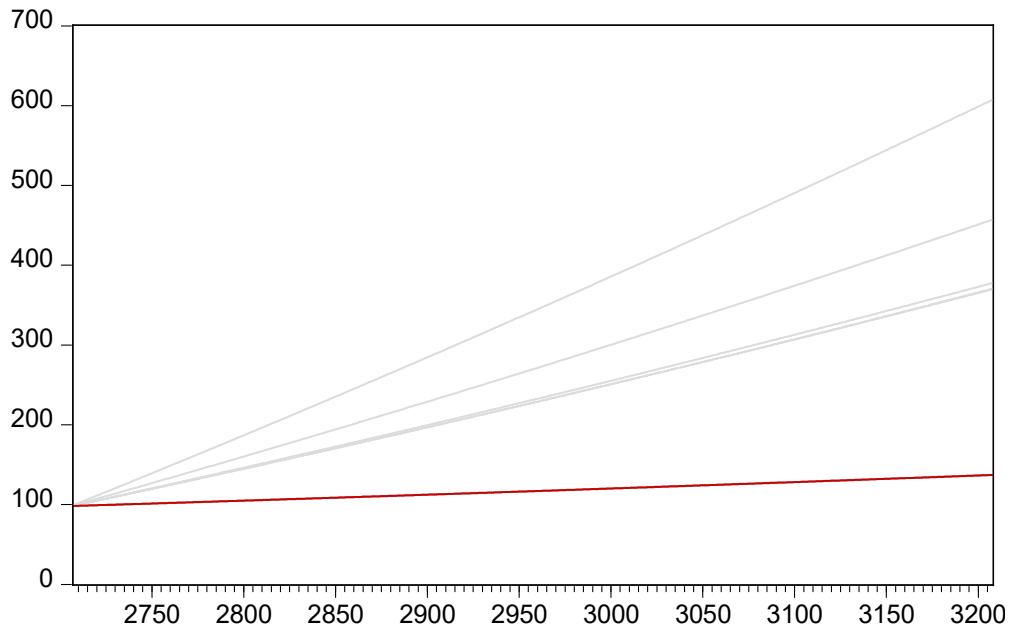
Source: E Views Output

The model corresponding to the lowest AIC value i.e., 1.241867 is (4,4). Hence, ARMA (4,4) is selected as the best model.

Figure 5.7

Forecast Comparison Graph of Performance of Large and Mid-cap funds

Forecast Comparison Graph



ARMA(0,0)	ARMA(1,0)	ARMA(2,0)
ARMA(3,0)	ARMA(4,0)	ARMA(0,1)
ARMA(1,4)	ARMA(4,1)	ARMA(3,1)
ARMA(2,1)	ARMA(0,3)	ARMA(1,2)
ARMA(0,2)	ARMA(1,1)	ARMA(0,4)
ARMA(1,3)	ARMA(2,2)	ARMA(3,2)
ARMA(4,2)	ARMA(2,3)	ARMA(3,3)
ARMA(2,4)	ARMA(4,3)	ARMA(3,4)
ARMA(4,4)		

Source: EViews Output

Fig 5.7 shows the forecast comparison graph of performance of large and mid-cap funds. The graph confirms ARMA (4,4) as the best model.

Table 5.5
ARMA Maximum Likelihood Estimation of Performance of Large and
Mid-cap funds

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.84E-05	1.12E-05	2.533732	0.0113
AR(1)	-1.583119	0.103542	-15.28968	0.0000
AR(2)	-1.101532	0.143897	-7.654981	0.0000
AR(3)	-0.213363	0.072729	-2.933660	0.0034
AR(4)	-0.066472	0.019946	-3.332619	0.0009
MA(1)	0.668458	0.101211	6.604590	0.0000
MA(2)	-0.417853	0.070702	-5.910061	0.0000
MA(3)	-0.982457	0.298807	-3.287930	0.0010
MA(4)	-0.268104	0.159986	-1.675794	0.0939
SIGMASQ	0.200609	0.008238	24.35021	0.0000
R-squared	0.490854	Mean dependent var		0.000354
Adjusted R-squared	0.489153	S.D. dependent var		0.627819
S.E. of regression	0.448724	Akaike info criterion		1.241866
Sum squared resid	542.4463	Schwarz criterion		1.263695
Log likelihood	-1669.003	Hannan-Quinn criter.		1.249760
F-statistic	288.5796			
Prob (F-statistic)	0.000000	Durbin-Watson stat		1.997560
Inverted AR Roots	-.06+.27i	-.06-.27i	-.73+.56i	-.73-.56i
Inverted MA Roots	1.00	-.33	-.67+.60i	-.67-.60i

Source: EViews Output

From table 5.5, it is evident that the model has met all the necessary criteria. Hence, ARMA (4,4) can be selected as the best model indicating the performance of large and mid-cap funds in India. As the integration order is found to be 1, the ARIMA model can be represented as ARIMA (4,1,4).

Mid-cap funds

Table 5.6 shows the ARMA models of mid-cap funds and their corresponding values of the selection criteria. The model corresponding to the lowest value of AIC is chosen as the ARMA model.

Table 5.6

ARMA Model Selection Criteria of Performance of Mid-cap funds

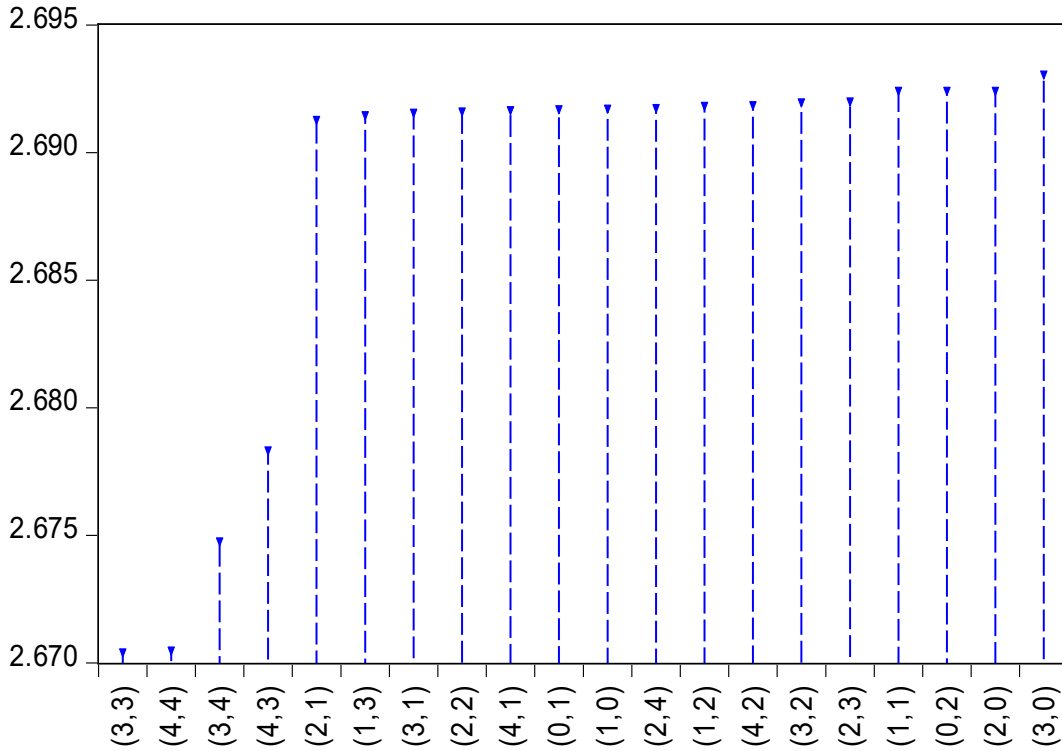
Model	LogL	AIC*	BIC	HQ
(3,3)	-3603.730108	2.670410	2.687868	2.676723
(4,4)	-3601.829100	2.670484	2.692306	2.678374
(3,4)	-3608.606662	2.674755	2.694395	2.681857
(4,3)	-3613.434945	2.678325	2.697965	2.685427
(2,1)	-3634.961265	2.691284	2.702195	2.695229
(1,3)	-3634.197853	2.691459	2.704552	2.696193
(3,1)	-3634.331984	2.691558	2.704651	2.696292
(2,2)	-3634.412430	2.691617	2.704711	2.696352
(4,1)	-3633.466444	2.691657	2.706933	2.697181
(0,1)	-3637.522929	2.691699	2.698246	2.694066
(1,0)	-3637.558673	2.691725	2.698272	2.694093
(2,4)	-3632.584419	2.691744	2.709202	2.698057
(1,2)	-3635.694771	2.691826	2.702737	2.695771
(4,2)	-3632.744181	2.691863	2.709320	2.698175
(3,2)	-3633.890691	2.691971	2.707246	2.697494
(2,3)	-3633.930003	2.692000	2.707275	2.697524
(1,1)	-3637.492555	2.692416	2.701145	2.695572
(0,2)	-3637.496785	2.692419	2.701148	2.695575
(2,0)	-3637.503084	2.692424	2.701153	2.695580
(3,0)	-3637.365787	2.693062	2.703973	2.697007
(0,3)	-3637.404489	2.693090	2.704001	2.697036
(4,0)	-3636.929572	2.693478	2.706572	2.698213
(1,4)	-3636.104360	2.693608	2.708883	2.699131
(0,4)	-3637.397393	2.693824	2.706918	2.698559
(0,0)	-3654.620907	2.703601	2.707966	2.705180

Source: EViews Output

Table 5.6 shows that the ARMA (3,3) is the best model of the performance of mid-cap funds.

Figure 5.8
ARMA Model of Performance of Mid-cap funds

Akaike Information Criteria (top 20 models)

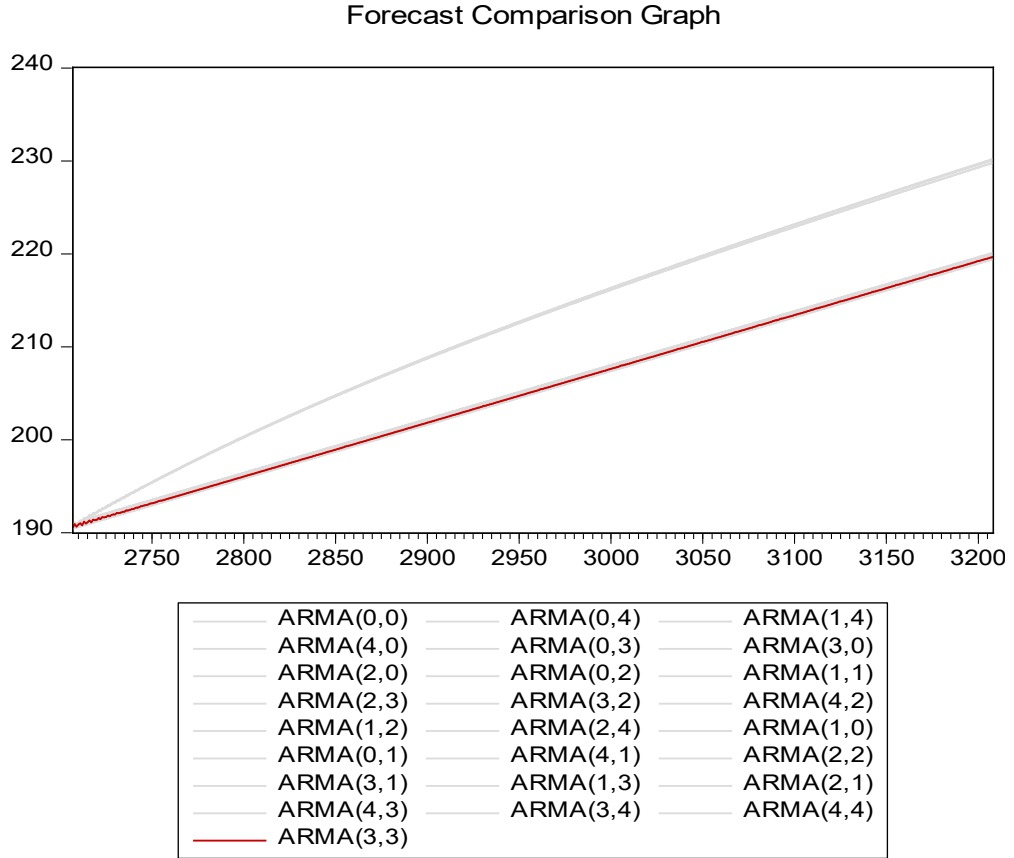


Source: EViews Output

The model corresponding to the lowest AIC value i.e., 2.670410 is (3,3). Hence, ARMA (3,3) is selected as the best model.

Figure 5.9

Forecast Comparison Graph of Performance of Mid-cap funds



Source: EViews Output

Figure 5.9 shows the forecast comparison graph of performance of mid-cap funds. The graph confirms ARMA (3,3) as the best model.

Table 5.7
ARMA Maximum Likelihood Estimation of Performance of
Mid-cap funds

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.057932	0.021581	2.684447	0.0073
AR(1)	-1.829314	0.052146	-35.08046	0.0000
AR(2)	-1.417846	0.084589	-16.76168	0.0000
AR(3)	-0.320311	0.054642	-5.862016	0.0000
MA(1)	1.962988	0.048831	40.19925	0.0000
MA(2)	1.664976	0.077651	21.44184	0.0000
MA(3)	0.492376	0.049827	9.881772	0.0000
SIGMASQ	0.840728	0.011240	74.79468	0.0000
R-squared	0.037029	Mean dependent var		0.057848
Adjusted R-squared	0.034530	S.D. dependent var		0.934548
S.E. of regression	0.918271	Akaike info criterion		2.670410
Sum squared resid	2274.170	Schwarz criterion		2.687868
Log likelihood	-3603.730	Hannan-Quinn criter.		2.676723
F-statistic	14.81554			
Prob(F-statistic)	0.000000	Durbin-Watson stat		2.000344
Inverted AR Roots	-.36	-.73+.59i	-.73-.59i	
Inverted MA Roots	-.56	-.70-.62i	-.70+.62i	

Source: EViews Output

From table 5.7, it is evident that the model has met all the necessary criteria. Hence, ARMA (3,3) can be selected as the best model indicating the performance of mid-cap funds in India. As the integration order is found to be 1, the ARIMA model can be represented as ARIMA (3,1,3).

Small-cap funds

Table 5.8 shows the ARMA models of small-cap funds and their corresponding values of the selection criteria. The model corresponding to the lowest value of AIC is chosen as the ARMA model.

Table 5.8
ARMA Model Selection Criteria of Performance of Small-cap funds

Model	LogL	AIC*	BIC	HQ
(3,4)	-1165.704244	0.868864	0.888510	0.875968
(4,4)	-1168.436290	0.871624	0.893453	0.879518
(2,4)	-1171.495748	0.872408	0.889871	0.878723
(4,3)	-1170.570374	0.872463	0.892109	0.879567
(3,3)	-1178.663916	0.877710	0.895173	0.884025
(1,4)	-1190.959800	0.886065	0.901345	0.891590
(2,2)	-1191.996510	0.886092	0.899189	0.890828
(3,2)	-1191.241285	0.886273	0.901553	0.891798
(2,3)	-1191.295713	0.886313	0.901594	0.891839
(4,2)	-1190.568305	0.886515	0.903978	0.892830
(1,3)	-1193.231616	0.887006	0.900103	0.891742
(0,2)	-1196.371885	0.887849	0.896581	0.891006
(1,1)	-1196.563250	0.887991	0.896722	0.891148
(1,2)	-1196.234932	0.888487	0.899402	0.892434
(0,3)	-1196.261523	0.888507	0.899421	0.892454
(2,1)	-1196.304688	0.888539	0.899453	0.892486
(3,1)	-1195.746900	0.888866	0.901963	0.893602
(0,4)	-1195.845752	0.888939	0.902036	0.893675
(4,1)	-1194.906434	0.888984	0.904264	0.894509
(0,1)	-1234.615578	0.915396	0.921945	0.917764
(4,0)	-1367.800801	1.016125	1.029222	1.020861
(3,0)	-1445.828536	1.073098	1.084012	1.077045
(2,0)	-1528.341528	1.133389	1.142120	1.136546
(1,0)	-1668.349835	1.236205	1.242754	1.238573
(0,0)	-1914.117137	1.417246	1.421612	1.418825

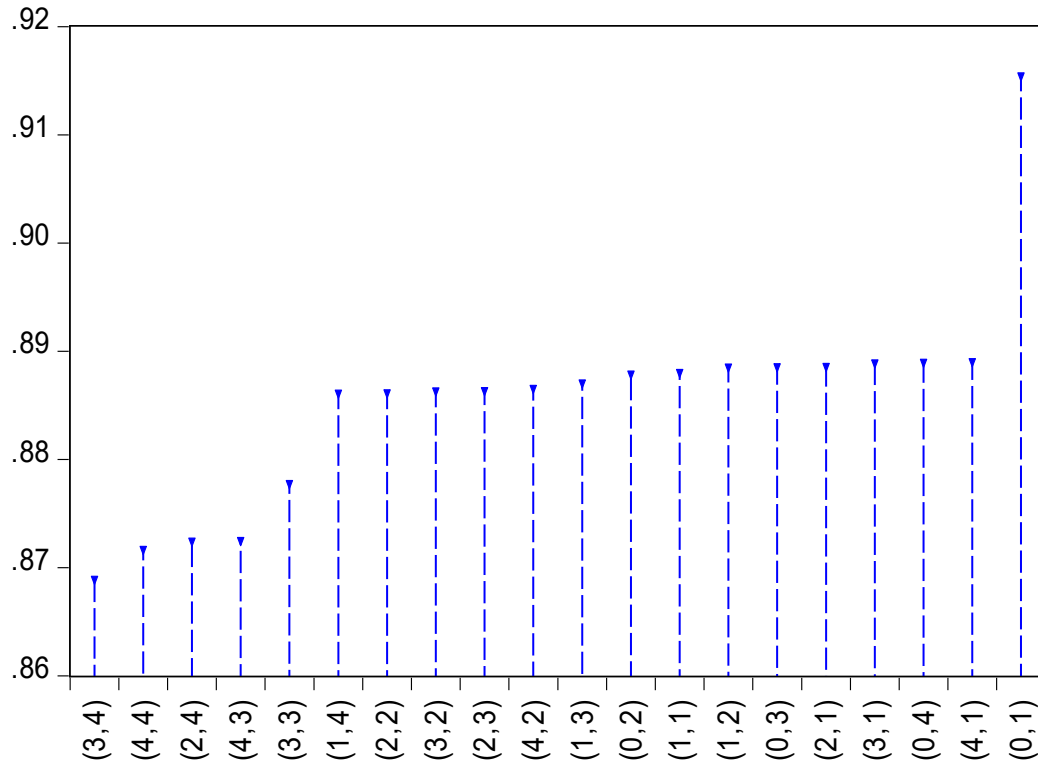
Source: EViews Output

According to Table 5.8, the ARMA (3,4) is the best model of small-cap funds' performance that can be used to predict the future values of the small-cap funds.

Figure 5.10

ARMA Model of Performance of Small-cap funds

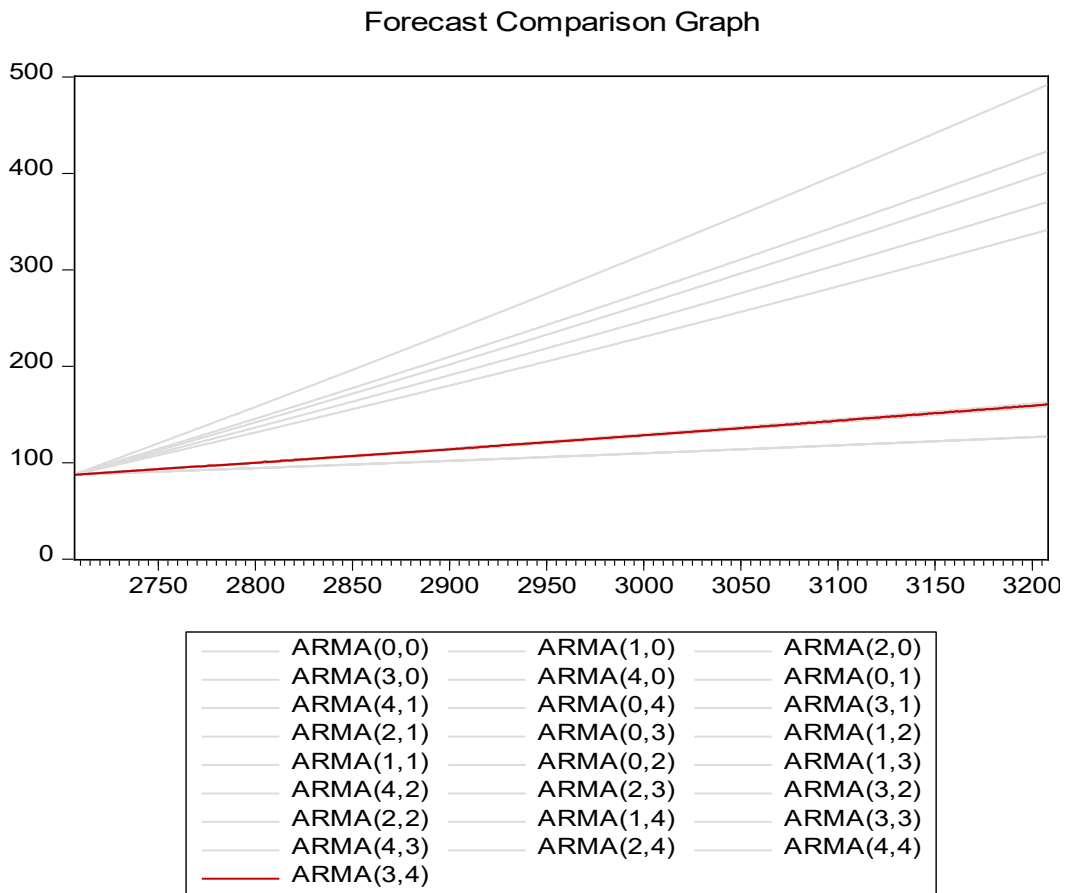
Akaike Information Criteria (top 20 models)



Source: EViews Output

The model corresponding to the lowest AIC value i.e., 0.868864 is (3,4). Hence, ARMA (3,4) is selected as the best model.

Figure 5.11
Forecast Comparison Graph of Performance of Small-cap funds



Source: EViews Output

Figure 5.11 shows the forecast comparison graph of performance of small-cap funds. The graph confirms ARMA (3,4) as the best model.

Table 5.12
ARMA Maximum Likelihood Estimation of Performance of
Small-cap funds

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.38E-05	5.66E-05	0.950591	0.3419
AR(1)	-1.724588	0.041109	-41.95147	0.0000
AR(2)	-1.223432	0.070222	-17.42222	0.0000
AR(3)	-0.213628	0.044473	-4.803586	0.0000
MA(1)	0.919257	0.038253	24.03092	0.0000
MA(2)	-0.348705	0.031483	-11.07612	0.0000
MA(3)	-1.107559	0.028588	-38.74273	0.0000
MA(4)	-0.434001	0.040712	-10.66035	0.0000
SIGMASQ	0.138446	0.001712	80.86730	0.0000
R-squared	0.426022	Mean dependent var		0.000277
Adjusted R-squared	0.424318	S.D. dependent var		0.491217
S.E. of regression	0.372704	Akaike info criterion		0.868864
Sum squared resid	374.3583	Schwarz criterion		0.888510
Log likelihood	-1165.704	Hannan-Quinn criter.		0.875968
F-statistic	250.0377			
Prob(F-statistic)	0.000000	Durbin-Watson stat		1.999106
Inverted AR Roots	-.25	-.74+.56i	-.74-.56i	
Inverted MA Roots	.99	-.54	-.69+.58i	-.69-.58i

Source: EViews Output

Table 5.12, makes it evident that the model has met all the necessary criteria. Hence, ARMA (3,4) can be selected as the best model indicating the performance of small-cap funds in India. As the integration order is found to be 1, the ARIMA model can be represented as ARIMA (3,1,4).

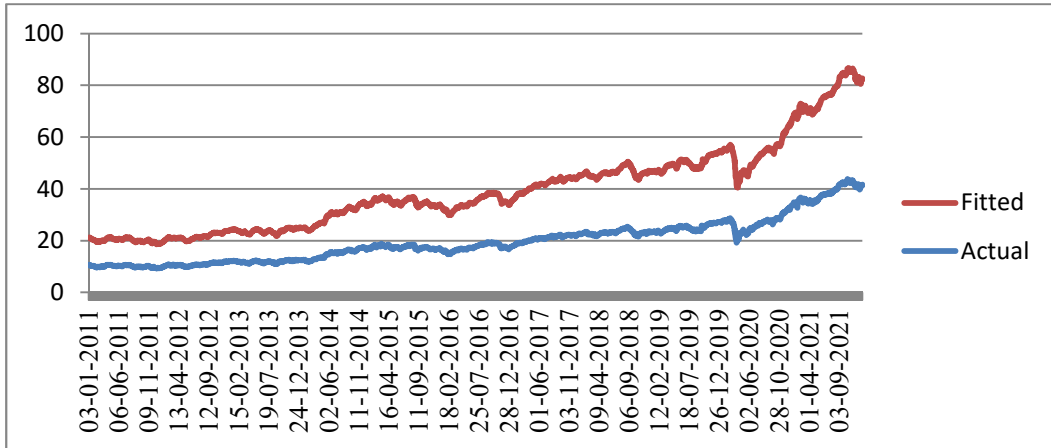
5.3.2.3 Analysis of Actual, Fitted and Residual Values of ARIMA Models

The nature of the performance of equity funds can be identified by analysing the actual, fitted and residual values of the variables using ARIMA modelling. Actual values are those that are already available in the dataset, whereas fitted values are those generated by the system by applying ARIMA modeling. Residual values are the deviation of actual values from the fitted ones.

Large-cap funds

Figure 5.12

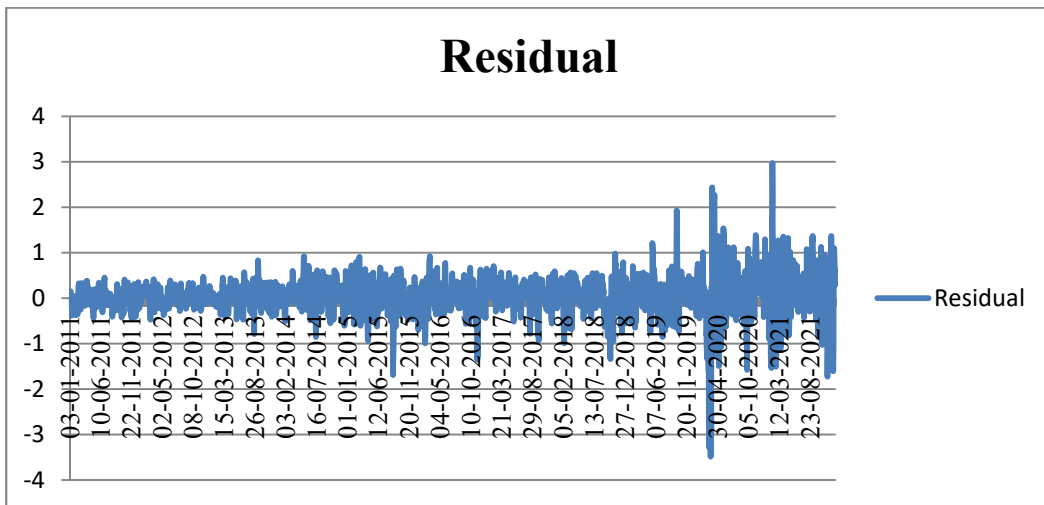
Actual and Fitted Comparison graph of Large-cap funds



Source: EViews Output

Figure 5.13

Residual Plot of Large-cap funds



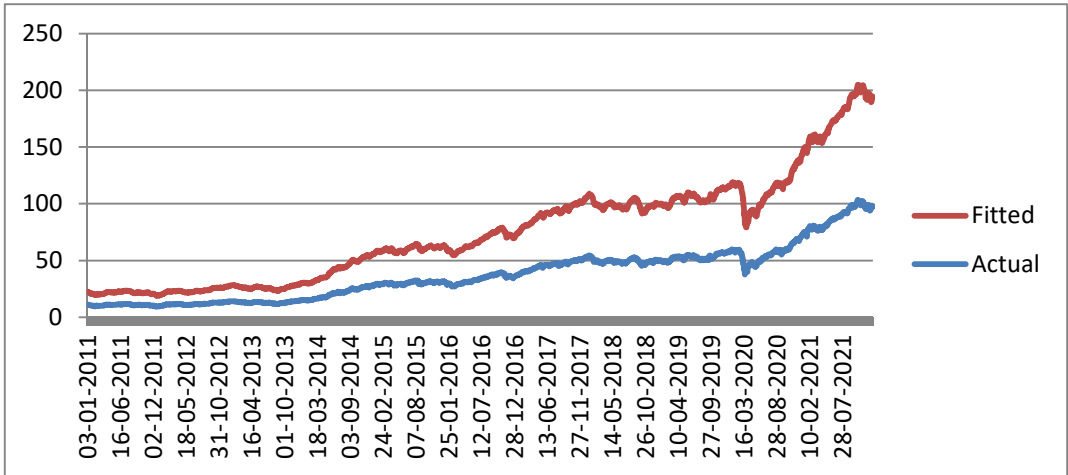
Source: EViews Output

Figure 5.12 presents the actual and fitted comparison graph of large-cap funds for the period 2011-2021 and figure 5.13 presents the residual plot of large-cap funds for the same period.

Large and Mid-cap funds

Figure 5.14

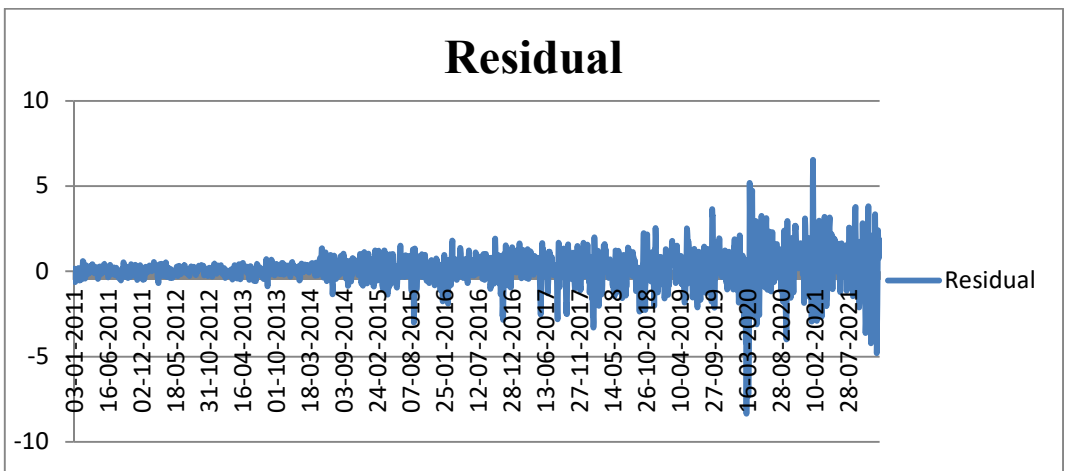
Actual and Fitted Comparison graph of Large and Mid-cap funds



Source: EViews Output

Figure 5.15

Residual Plot of Large and Mid-cap funds



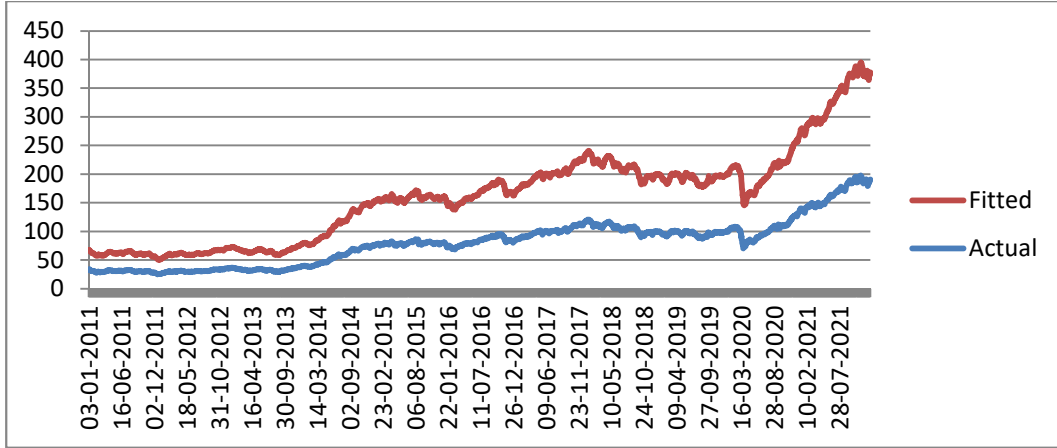
Source: EViews Output

Figure 5.14 demonstrates the actual and fitted comparison graph of large and mid-cap funds and figure 5.15 shows the residual plot of large and mid-cap funds in India for the period 2011–2021.

Mid-cap funds

Figure 5.16

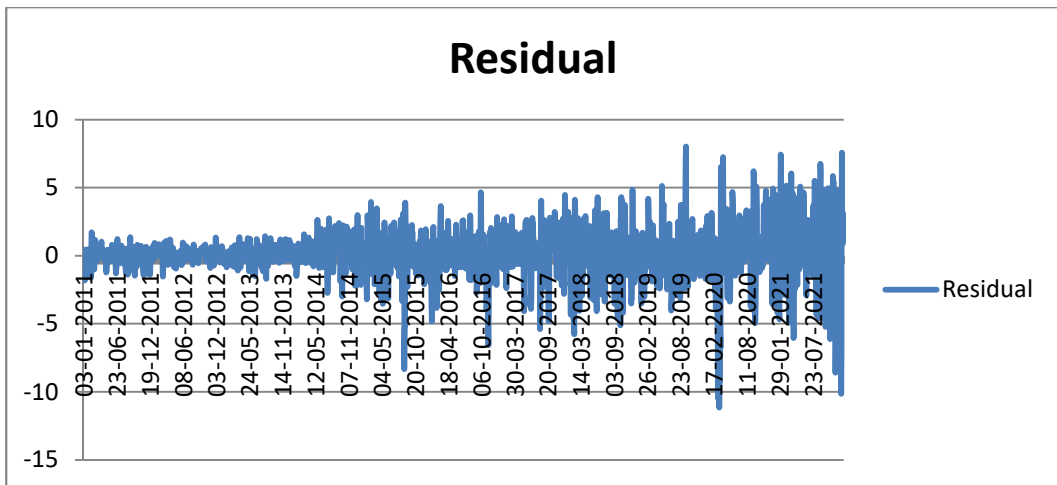
Actual and Fitted Comparison graph of Mid-cap funds



Source: EViews Output

Figure 5.17

Residual Plot of Mid-cap funds



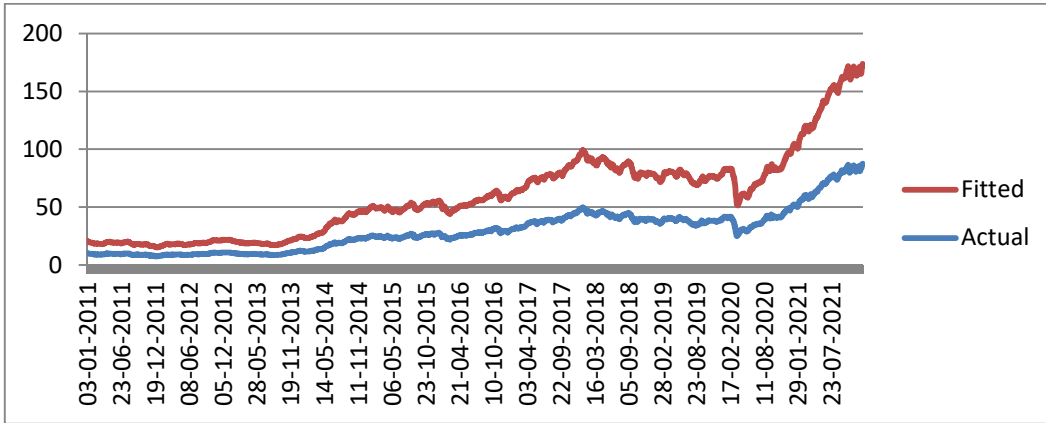
Source: EViews Output

Figure 5.16 shows the actual and fitted comparison graph of mid-cap funds and figure 5.17 shows the residual plot of mid-cap funds in India for the period 2011-2021.

Small-cap funds

Figure 5.18

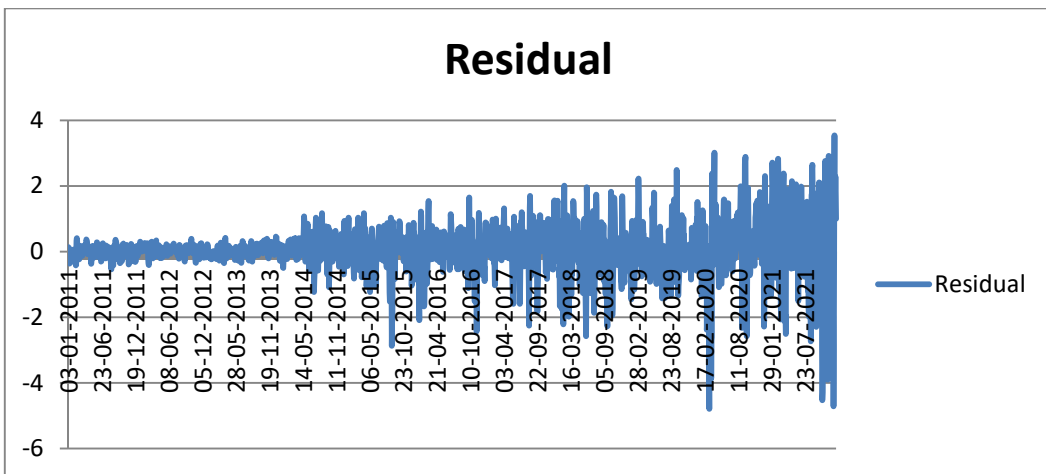
Actual and Fitted Comparison graph of Small-cap funds



Source: EViews Output

Figure 5.19

Residual Plot of Small-cap funds



Source: EViews Output

Figure 5.18 displays the actual and fitted comparison graph of small-cap funds and figure 5.19 presents the residual plot of small-cap funds in India for the period 2011-2021.

While analysing the actual, fitted and residual values, it is obvious that all the categories of funds exhibit negative deviations from their fitted values. Negative deviation occurs when the actual values fall below the fitted values. In

the initial years (2011–2013), large-cap funds showed more variations from the fitted values compared to other categories of funds, whereas the actual values of large and mid-cap funds showed slighter variations from their fitted values in those years.

In 2014-15, mid-cap funds experienced a wider range of deviations, followed by large-cap funds, while a narrow range was exhibited by large and mid-cap funds. In 2016, the deviations between actual and fitted values of all the funds have been showing an increasing trend. In 2017, the actual and fitted values of large and mid-cap funds exhibited tremendous variation compared to their performance in the previous years. Also, a sharp rise can be seen in the performance of all the funds in the same year.

Large-cap funds and large and mid-cap funds continue to grow, whereas mid-cap funds and small-cap funds began to show negative returns in 2018 and 2019. The range of residuals of small-cap funds seems to be wider compared to others. A steep decline occurs in the performance of all the funds in the 1st half of 2020, making the residuals wider. By the second half of the year, all of the funds had grown dramatically, with the deviations between actual and fitted values becoming nearly identical. By the end of 2021, the residuals of mid-cap funds and small-cap funds had again increased. While analysing the residuals, the small-cap funds have shown more fluctuations, making them the most volatile category of funds, whereas large-cap funds are the least volatile funds. Small-cap funds are those that invest at least 65% of their assets in small-cap companies. Small-cap companies are in their nascent stages of growth and they have a long way to go before they deliver growth consistently. Small-cap stocks are riskier investments. However, these funds have a high potential for long-term outperformance. While analysing the trend of yearly returns as well, it is clear that, in peak times, small-cap funds are the ones that provide the highest returns. But if the market is going through a bearish phase, these funds deliver the lowest returns. Large-cap funds invest a large portion of their corpus in companies with large market capitalisations. Hence, these funds offer stability and sustainable returns.

5.3.2.4 Forecasting of NAVs of Equity Mutual Funds using ARIMA Model

Application of the ARIMA model facilitates forecasting the future NAVs of equity mutual funds, enabling investors to know the growth of the funds. The NAVs of the funds for the years 2011–2021 were taken as samples for the study, and forecasts were made for the years 2022 and 2023.

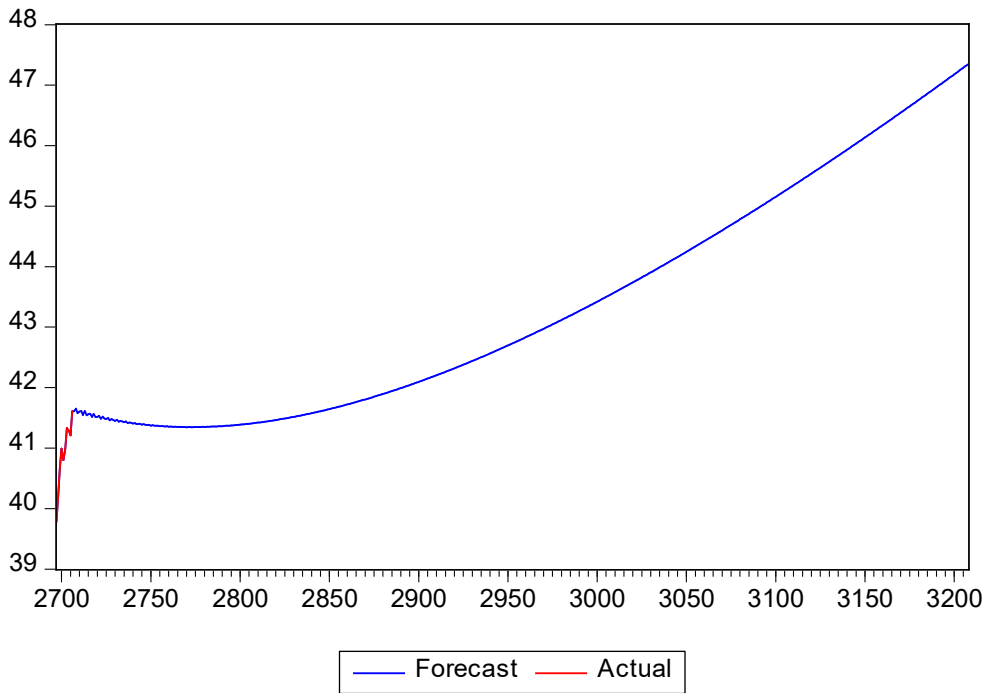
Large-cap funds

The actual and forecast graph of large-cap funds is presented in figure 5.20.

Figure 5.20

Actual and Forecast graph of Large-cap funds

Actual and Forecast



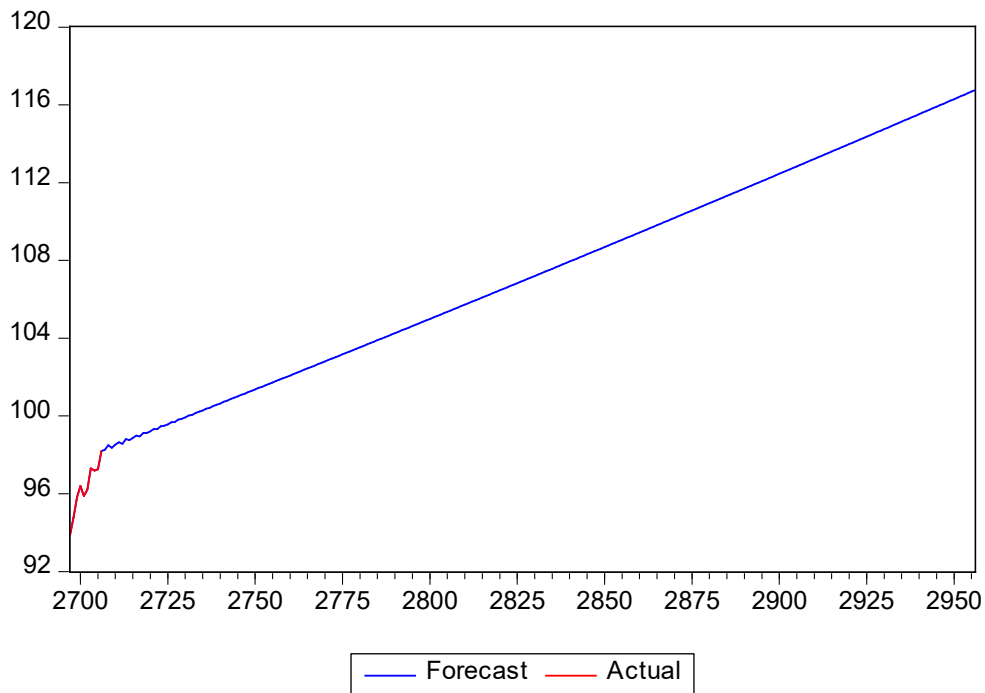
Source: EViews Output

Figure 5.20 makes it evident that the NAVs of the large-cap funds would decline during the first half of 2022 and further rise at a slow pace in the second half. It would be due to the corrections that would take place in the stock market, leading to a fall in the share prices of large-cap companies. Moreover, the returns are expected to grow considerably in 2023.

Large and Mid-cap funds

The actual and forecast graph of large and mid-cap funds is presented in figure 5.21.

Figure 5.21
Actual and Forecast graph of Large and Mid-cap funds
Actual and Forecast



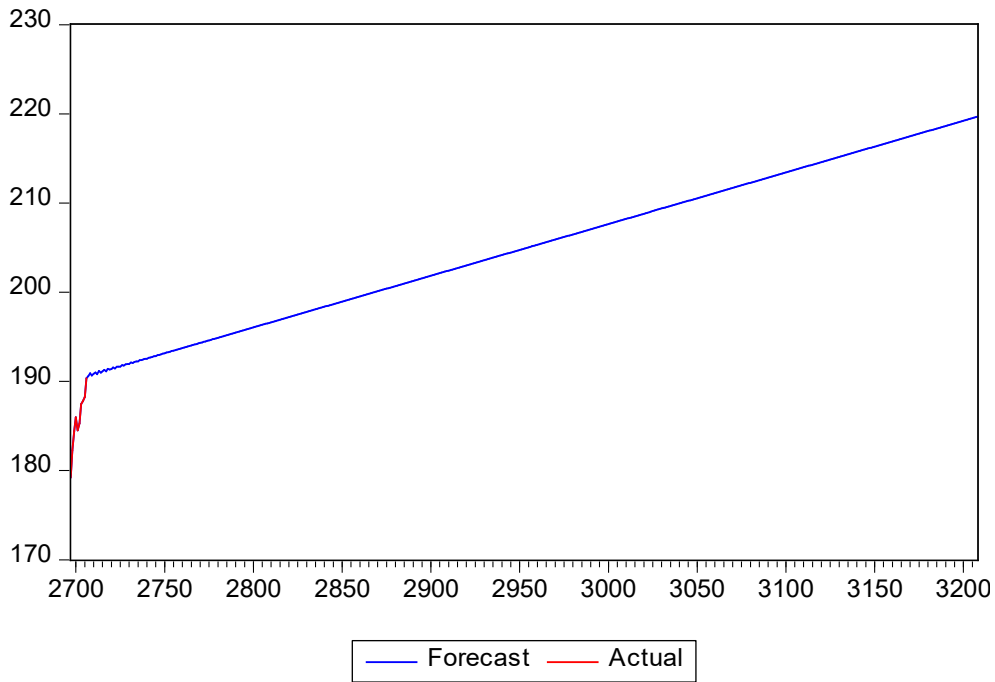
Source: EViews Output

By analysing Fig. 5.21, it is evident that the performance of large and mid-cap funds would increase constantly during the years 2022 and 2023.

Mid-cap funds

The actual and forecast graph of mid-cap funds is presented in figure 5.22.

Figure 5.22
Actual and Forecast graph of Mid-cap funds
Actual and Forecast



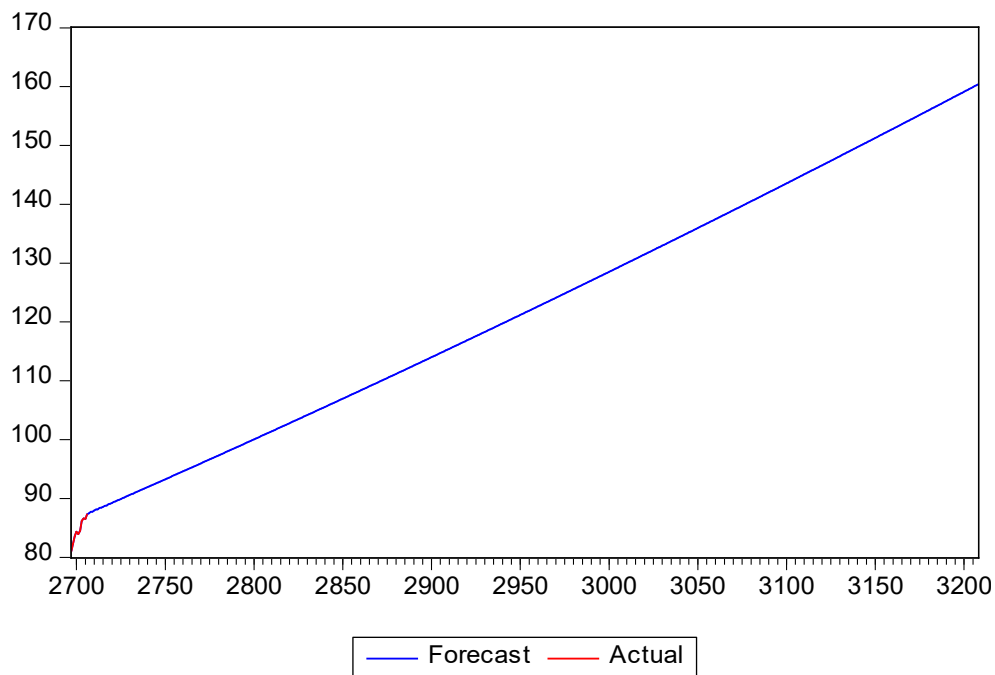
Source: EViews Output

Figure 5.22 indicates the actual and forecast graph of mid-cap funds. The forecasts imply that the mid-cap funds would perform positively during 2022 and 2023.

Small cap funds

The actual and forecast graph of small-cap funds is presented in figure 5.23.

Figure 5.23
Actual and Forecast graph of Small-cap funds
Actual and Forecast



Source: EViews Output

By analysing Figure 5.23, it is obvious that the small-cap funds would continue to prosper during 2022 and 2023 by providing higher returns.

Small-cap funds would outperform the other categories of equity mutual funds in terms of returns in 2022. The NAVs of large-cap funds would decline during the initial phase of 2022 and bounce back further, providing continuous growth during the subsequent phase. Even with a slow rate of growth, large and mid-cap funds and mid-cap funds would perform well in 2022. However, as per the forecasts, 2023 would be a positive year for all the categories of mutual funds.

5.4 Conclusion

The findings imply that equity mutual funds have gone through hikes and dips in the past. Despite the high returns provided by small-cap funds during the booms in the economy, it has been the most volatile category compared to others. Since large-cap funds invest in companies that have a good track record in the market, investing in those funds makes the investment less risky. Large-cap funds proved to be less volatile followed by large and mid-cap funds and mid-cap funds. Small-cap funds are found to be the most volatile category of equity mutual funds, which invest at least 65% of their assets in small-cap companies with high risk and huge growth potential.

According to the forecasts, all of the funds would provide positive returns in 2022 and 2023. However, the forecasts indicate that small-cap funds would be the best performers in 2022. The performance of large-cap funds would decline in the initial phase but increase eventually. The large and mid-cap funds and mid-cap funds would continue to grow in 2022, albeit at a slow pace. Furthermore, all of the funds are expected to deliver positive returns in 2023. Due to the highly volatile nature of small-cap funds, it would be suitable for aggressive investors to invest in them. Large-cap funds would be advisable for conservative investors since the risk is low.