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Fama Decomposition Analysis of Selected Companies of Bombay Stock Exchange in India

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Abstract

This main purpose of the research is to examine the selectivity and diversification component in generating the superior return for the study period i.e. April 2010 to March 2015. To achieve the major objective of the study, Fama (1972) Decomposition model is applied on a sample size of 30 companies. In the sample size, all the top 30 companies are taken which constitute the S&P BSE Sensex. The research also characterized the results on the basis of risk and return related performance measure. The study confirms that diversification and selection has significant role in providing additional value in the investment within the study period.

JEL classification numbers: G10
Keywords: Selectivity, Diversification, Risk and Return, Fama Decomposition Model and BSE

1 Introduction

The Indian stock exchanges are the most prominence exchanges not only in Asia but also at the international phenomena. The Bombay Stock Exchange (BSE) is one of the oldest exchanges across the world, established in 1875 which was earlier known as The Native Share and Stock Brokers' Association.BSE is a

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corporatized and demutualised entity, with a broad shareholder-base which includes two leading global exchanges, Deutsche Bourse and Singapore Exchange as strategic partners.BSE is Asia's first & the Fastest Stock Exchange in world with the speed of 6 micro seconds and one of India's leading exchange groups. Over the past 140 years, BSE has facilitated the growth of the Indian corporate sector by providing it an efficient capital-raising platform. BSE provides an efficient and transparent market for trading in equity, debt instruments, derivatives, mutual funds. It also has a platform for trading in equities of small-and-medium enterprises (SME).

World Federation of Exchanges revealed that BSE is one of the world's leading exchanges for Index options trading. It is also one of the best exchanges in terms of listed members as more than 5500 companies are listed on BSE.

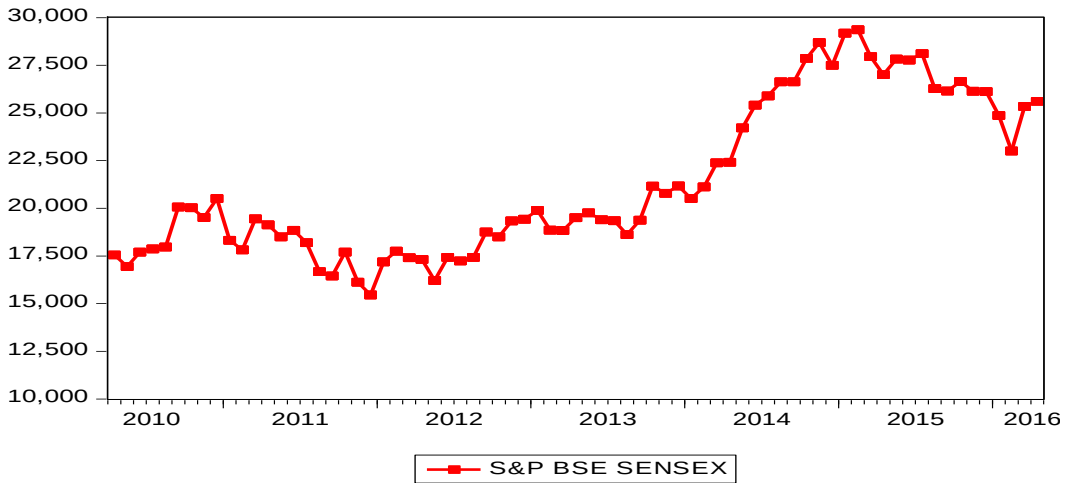

Figure 1: Movement in S&P BSE Sensex from April 2015 to March 2016
Source – Historical database of BSE Ltd.

The Chart-1 shows the movement of S&P BSE Sensex for the study period i.e. from April 2010 to March 2016. It can be clearly observed that index achieve remarkable growth in the study period. The Compound Annual Growth Rate (CAGR) of S&P BSE Sensex was 7.61 per cent return during the last six years. The index was 29361.5 which was highest figure achieved in February 2015 and lowest figure was 15454.92 in December 2011. It registered a positive annual growth rate in all years except in 2010-11.

This Chart-2 represents the shareholding pattern of the major shareholders other than promoters of BSE Ltd. Since BSE Ltd. is a corporatized and demutualised entity, with a broad shareholder-base, Deutsche Bourse and Singapore Exchange are the major shareholders having the equal contribution of 4.91 per cent in the share capital of BSE Ltd. Life insurance Corporation of India is third largest shareholder of BSE Ltd having the share of 4.83 per cent followed by State Bank

of India (4.83 per cent), GKFF Ventures (4.73 per cent), Acacia Banyan Partners Limited (3.87 per cent), Atticus Mauritius Ltd (3.87 per cent), Caldwell India Holdings Inc (3.87 per cent), Quantum (M) Limited (3.87 per cent) and Bajaj Holding and Investment limited with a share of 2.90 per cent.

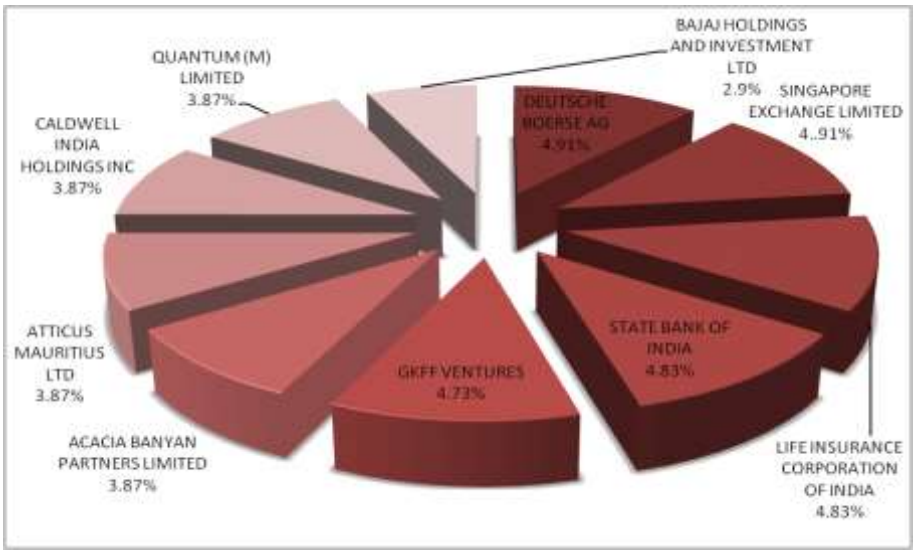

Figure 2: Shareholding pattern of top 10 shareholders in S&P BSE Sensex
Source – Annual Report of BSE Ltd as on March 2015.

The popularity of investment in share market has grown dramatically over the last few decades. The evaluation of the performance of listed companies has the prominent importance for the academicians and investors. A continuous research based on risk and return analysis is needed to find out whether the companies are able to add the value in the investment with respect to risk bear by the investors. The study contributes in providing an analytical framework to assess the different components of return specifically related with the systematic risk, inadequate diversification and selectivity by using the Fama Decomposition model.
This research paper consists of five sections which starts with introduction and followed by brief review of relevant existing studies. The next section provides the methodology followed by empirical result of the research based on models developed by Fama (1972). The final section presents conclusion of the research paper.

2 Literature Review

2.1 International Studies

Fama [3] suggested fund performance in terms of excess returns over expected returns based on premium for total risk. In other words, the excess returns are computed based on capital market line (CML). He suggested that overall portfolio performance has two components. First, performance due to stock selection ability (realized return minus expected portfolio return) of the fund manager and second performance due to expected portfolio risk -return assumed by the fund manager. Almakrami [5] investigated what variables from a firm's financial statement significantly predict an individual firm's vulnerability to a financial crisis? He had applied structural equation modeling (SEM), multivariable fractional polynomials (MFP) algorithm technique in his study. Result provides two useful early warning indicators including financial leverage and a balance between current assets and current liabilities. Ayentimi, Mensah & Francis [2] in their study investigated the weak-form efficiency on the Ghana Stock Exchange (GSE). The result of the study indicated the inefficiency in the GSE. This implies a sizeable amount of stock prices on the GSE are either undervalued or overvalued as the market is generally inefficient. It also showed that financial stock return series do not follow normal distribution when Normality of the return series and random walk assumptions were tested. Potocki and Świst [9] in their study made attempted to verify the strong-form efficiency of the market on the basis of recommendations issued by 63 financial institutions. The strong form efficiency hypothesis of the Polish capital market was verified with the use of statistical and econometric methods. Guidi & Gupta [4] investigated that whether the selected ASEAN countries are following the Random Walk Hypothesis or not? The result of these test shows that among the selected six ASEAN countries Indonesia, Malaysia, Philippines and Vietnam are not following EMH and the stock market of Singapore and Thailand are weak form efficient.

2.2 Indian Studies

Ramachandran [6] in his study aimed at examining the efficiency of Indian Stock market by studying stock price and trading volume reaction resultant upon the corporate action information. The result showed that the bonus information release will not influence the stock price. The analysis reveal that the information release of dividend, bonus issue, stock split and merger do not influence the security returns in any significant manner. Singh [7] tried to study whether the capital market reforms has increased the efficiency of stock market. In this study Indian stock market has been examined for the time period of 1991-2002.Adjusted closing prices were mainly extracted from the CMIE database Prowess, and supplemented by data from the BSE site. Mukherjee [1] captured the trends, similarities and patterns in the activities and movements of the Indian Stock Market in comparison to its international counterparts. For the comparative analysis of the different stock exchanges, the period chosen is from 1st January 1995 to 31st July, 2006. The result of the study showed that Indian stock exchange has the governance system and an efficient mechanism in place to be a world class institute. Varma and Jayanth [8] examined the relationship between index futures

and index options prices in India. The result shows that some overpricing of deep-in-the-money calls and some inconclusive evidence of violation of put-call-parity. It also shows that the observed prices are rather close to the average of the intrinsic value of the option and its Black-Scholes value (disregarding the smile).

On the basis of above review of earlier studies it can be observe that various studies are conducted on the efficiency of listed companies but very few studies are there which mainly focused on risk and return market performance of these companies. Selectivity and diversification is the untouched part in the various researches specifically in the context of India.

3. Research Methodology

3.1 Objectives of the study

This study is carried out to achieve the following objectives-

- To evaluate the risk and return relationship of the selected sample companies the S&P BSE Sensex during the study period.
- To examine the role of selectivity and diversification in the value creation of investment.

3.2 Hypothesis of the study

- Selected sample stocks of the companies are not able to beat the benchmark index.
- Selectivity and diversification do not have any significant role in the value creation of investment.

3.3 Tools and Techniques

Following are the statistical tools and techniques used in evaluation of market performance of the sample companies:

Return

The average return on the shares of sample companies has been worked out using the weekly return series by the following.

$$Return = (Closing\ Value\ of\ Share_{t} - Closing\ Value\ of\ Share_{t-1}) / Closing\ Value\ of\ Share_{t-1}$$

Similarly, the weekly returns for the benchmark index have been computed. For the benchmark index, the return of S&P BSE Sensex is calculated as:

$$Return = (Index_{t} - Index_{t-1}) / Index_{t-1}$$

The weekly yield on 91 days US treasury bills are already in the return form which is converted into weekly return.

Risk

The risk is calculated on the basis of weekly-end stock return. The following measures of risks associated with mutual funds have been for the study:

Standard Deviation- The total risk is measured by the standard deviation of the weekly returns which was calculated using the following formula:

$$\sigma = \sqrt{\frac{1}{n-1}\sum_{t=1}^{n}(R_t - \overline{R})^2}$$

where,

σ = Standard Deviation, n= number of weekly returns

R_t = weekly returns of the stock $\bar{R}$ = mean return of the stock.

Beta

Beta estimate the systematic risk, is the fund's volatility as regard market index measuring the extent of co movement of fund with that of the benchmark index.

$$\beta = \frac{Covariance\ between\ mutual\ fund\ return\ and\ market\ return}{Varianceofmarketreturn}$$

Higher the values of beta indicate a high sensitivity of fund returns against market return and the lower the value indicate lower sensitivity.

Fama measures

Risk adjusted performance measures discussed earlier primarily judge the overall performance of a fund. However it is useful to breakdown the performance into the different components of performance. Thus, in addition to using the explicit risk- return trade off measures for performance evaluation of mutual funds, It may also evaluate the portfolio on the basis of decomposition of portfolio performance by using components of investment performance such as proposed by Eugene F. Fama.

Fama (1972) measures breaks down the observed return into four components:

i. Risk free return R_f

ii. Compensation for systematicrisk $\beta(R_m - R_f)$

iii. Compensation for inadequate diversification $(R_m - R_f)\{(\sigma_t/ \sigma_m)-\beta)\}$

iv. Net superior returns due to selectivity $(R_t - R_f)-\{(\sigma_t/ \sigma_m)(R_m - R_f)\}$

Fama argues that the difference between return on an active bet and return on a passive bet which is obtained from the security market line may arise due to selectivity skills of the fund manager. This difference is analogous to the alpha of Jensen measure. However Fama goes a step further and decomposes selectivity into diversification return and net diversifiable risk to which active bet is exposed of the fund manager. It may be noted that positive net selectivity and selectivity are not likely to be significantly different from each other. Thus, in sum it is advisable to test either selectivity or net selectivity for performance evaluation in case of well diversified portfolios since both measures would provide the same result. However, Net selectivity is a more appropriate measure in case of diversified portfolio.

$$F_t = \text{Portfolio Return} - \text{Risk free return} - \text{Returns due to all risks}$$
$$= (R_t - R_f)-\{(\sigma_t/ \sigma_m)(R_m - R_f)\}$$

A positive value for F_t indicates that the fund earned returns higher than expected returns and lies above CML and a negative value indicates that the fund earned return less than expected returns and lies below CML.

3.4 Sample selection and Sources of data

The study employed the secondary sources of data. The samples of companies are selected on the basis of stock listed in BSE and constituted the S&P BSE Sensex. S&P BSE Sensex is based on free float market capitalization of top 30 companies. All these companies are taken as a sample. For evaluating the market performance of sample companies, the weekly closing value of stock prices is taken into consideration. Therefore,weekly closing values of shares have been used for all the sample companies for the period from April, 2010 to March 31, 2015. The data have been collected from the database of BSE Ltd. In order to have a meaningful evaluation, the stock performance of the companiesis comparing with their respected benchmark portfolios. For this purpose, S&P BSE Sensex is taken as proxy of benchmark index for all the companies. The closing value of respected benchmark indexes is also used to calculate the weekly market return for the above mention period.

Table 1: List of Top 30 companies constituted the S&P BSE SENSEX

S. No.	Company Name	Code
1	Asian Paints	A1
2	Axis Bank	A2
3	Bajaj Auto	A3
4	Bharat Petroleum	A4
5	BhartiAirtel	A5
6	Bosch	A6
7	HCL Technologies	A7
8	HDFC Bank	A8
9	Hindustan Unilever	A9
10	Hindustan Zinc	A10
11	HDFC	A11
12	ICICI Bank	A12
13	Indian Oil	A13
14	Infosys	A14
15	ITC	A15
16	Kotak Mahindra Bank	A16
17	Larsen &Tubro	A17
18	Lupin	A18
19	Mahindra and Mahindra	A19
20	Maruti Suzuki India	A20
21	NTPC	A21
22	ONGC	A22
23	Power Grid Corporation Of India	A23
24	Reliance Industries	A24
25	SBI	A25
26	Sun Pharmaceutical	A26
27	Tata Consultancy & Services	A27
28	Tata Motors	A28
29	Ultra Tech Cement	A29
30	Wipro	A30

Source- Database of BSE

The weekly change in the stock prices was observed for the sample companies, market index and 91 days T- bills for the study period. There has been a controversy as to what constitutes risk free assets. Generally treasury bills of different durations have been used as a surrogate for risk free assets in earlier studies conducted. In this study, the weekly yields on 91-day U.S. treasury bills

(T- bills) have been used to surrogate for risk free rate of return as has been done by most of the researchers.

4 Analysis and Interpretation

Empirical analysis is mainly divided into two parts. First section deals with the risk and return analysis and test the statement whether selected sample stock of the companies are able to beat the benchmark index.

Table 2: Risk and Return analysis of sample companies

Code	R_t	σ_t	R_m	σ_m	B	R_f
A1	0.60826	3.34621	0.20589	2.28796	0.1530	0.00540
A2	0.45561	4.87486	0.20589	2.28796	0.1360	0.00540
A3	0.34746	3.56936	0.20589	2.28796	-0.7000	0.00540
A4	0.55672	4.78110	0.20589	2.28796	0.1510	0.00540
A5	0.20471	4.19927	0.20589	2.28796	0.0280	0.00540
A6	0.69558	3.18597	0.20589	2.28796	0.0830	0.00540
A7	0.72442	3.87962	0.20589	2.28796	-0.8000	0.00540
A8	0.42808	3.17105	0.20589	2.28796	-0.0500	0.00540
A9	0.59544	3.58193	0.20589	2.28796	0.1310	0.00540
A10	0.21398	4.17057	0.20589	2.28796	0.0170	0.00540
A11	0.11845	9.04763	0.20589	2.28796	0.5510	0.00540
A12	0.28826	4.33463	0.20589	2.28796	-0.1460	0.00540
A13	0.18898	4.56217	0.20589	2.28796	0.0760	0.00540
A14	0.07417	4.82121	0.20589	2.28796	-0.2710	0.00540
A15	0.41467	3.05657	0.20589	2.28796	-0.0200	0.00540
A16	0.39439	4.94443	0.20589	2.28796	-0.4600	0.00540
A17	0.27967	4.47368	0.20589	2.28796	-0.1560	0.00540
A18	0.73844	3.07424	0.20589	2.28796	-0.0850	0.00540
A19	0.41531	4.01389	0.20589	2.28796	-0.2280	0.00540
A20	0.44936	3.99535	0.20589	2.28796	0.2540	0.00540
A21	-0.04785	3.56110	0.20589	2.28796	0.0780	0.00540
A22	0.12680	4.04984	0.20589	2.28796	-0.0390	0.00540
A23	0.18043	2.93448	0.20589	2.28796	-0.1860	0.00540
A24	-0.01248	3.48658	0.20589	2.28796	-0.0020	0.00540
A25	0.22503	4.66474	0.20589	2.28796	-0.4730	0.00540
A26	0.75894	3.48267	0.20589	2.28796	0.366	0.00540
A27	0.51934	3.44098	0.20589	2.28796	-0.1800	0.00540

A28	0.62162	5.03034	0.20589	2.28796	-0.5800	0.00540
A29	0.43443	3.76228	0.20589	2.28796	0.0060	0.00540
A30	0.24613	3.49471	0.20589	2.28796	-0.1200	0.00540
Average	0.37481	4.09972	0.20589	2.28796	-0.0822	0.00540
Standard Deviation	0.22550	1.12544	0.00000	0.00000	0.2975	0.00000
Maximum	0.75894	9.04763	0.20589	2.28796	0.5510	0.00540
Minimum	-0.04785	2.93448	0.20589	2.28796	-0.8000	0.00540

Source- Compiled by Author

Table-2 shows the average risk and return of various sample companies and benchmark index. In terms of average return, share ofSun Pharmaceutical (Sample No. 26) gave the highest return and the NTPC (Sample No.21)gave the lowest return in all the samples. HDFC (Sample No. 11) is the most risky and Power Grid Corporation of India (Sample No.23)is the less risky in the entire sample.

Table also shows that average return of 8 samples companiesis greater than the average of benchmark index and average return of 22 sample companies is less than the average return of benchmark index. The cross sectional average return of sample companies is 0.0.37481, more than average return of benchmark index which is 0.20589. Risk free rate is 0.00540 which is taken from average weekly yield of 91 days Treasury bills. The result shows that out of 30 sample companies, 22 companies (73 per cent) are able to beat the benchmark index which means these companies provided the better return as compare to S&P BSE Sensex and 8 (27 per cent) companies are not able to beat the benchmark.

This section mainly deals with the test of second hypothesis of this research i.e. Selectivity and diversification do not have any significant role in the value creation of investment. For testing of statement, Fama decomposition model is used to examine the selectivity and diversification skills. Result of this model is discussed as below:

Table 3: Result of Fama Decomposition Model

Code	Fama Measure			
	R_f	R_β	R_{id}	F_t
A1	0.0054	0.0305	0.2628	0.3096
A2	0.0054	0.0271	0.4001	0.023
A3	0.0054	-0.0141	0.3268	0.0293
A4	0.0054	0.0301	0.3888	0.1324
A5	0.0054	0.0055	0.3625	-0.1687
A6	0.0054	0.0166	0.2626	0.411
A7	0.0054	-0.0159	0.3559	0.3791
A8	0.0054	-0.01	0.2879	0.1448
A9	0.0054	0.0262	0.2877	0.2762
A10	0.0054	0.0033	0.3621	-0.1569
A11	0.0054	0.11	0.6829	-0.6798
A12	0.0054	-0.0293	0.4091	-0.097
A13	0.0054	0.0153	0.3845	-0.2162
A14	0.0054	-0.0011	0.4236	-0.3537
A15	0.0054	0.0086	0.2593	0.1414
A16	0.0054	-0.0058	0.4391	-0.0443
A17	0.0054	0.0312	0.3608	-0.1178
A18	0.0054	0.0022	0.2672	0.4636
A19	0.0054	-0.001	0.3527	0.0582
A20	0.0054	0.0594	0.2907	0.0939
A21	0.0054	0.015	0.2971	-0.3653
A22	0.0054	-0.0068	0.3616	-0.2335
A23	0.0054	-0.0092	0.2663	-0.0821
A24	0.0054	0.0116	0.2939	-0.3234
A25	0.0054	0.0152	0.3936	-0.1891
A26	0.0054	0.0166	0.2886	0.4484
A27	0.0054	-0.0146	0.3161	0.2124
A28	0.0054	-0.0333	0.4741	0.1754
A29	0.0054	0.0232	0.3065	0.0993
A30	0.0054	-0.0061	0.3124	-0.0655
Average	0.0054	0.01	0.3492	0.0102
Standard Deviation	0.0054	0.0274	0.0859	0.2696
Maximum	0	0.11	0.6829	0.4636
Minimum	0.0054	-0.0333	0.2593	-0.6798

Source- Compiled by Author.

Table 1.3 gives the information pertaining to Fama measure for the sample companies constituted the S&P BSE Sensex. The component wise result of Fama Decomposition model are discussed below-

4.1 Performance of Risk

Performance of the risk assesses the return being generated due to their decision to take the risk. They assume risk in the hope of generating the extra returns on their stock. An examination of the Fama measure result shows that except for 12 stocks, the other 18 stock return exhibit positive performance on account of risk bearing activity of investor. The HDFC (0.1100) has the highest positive performance and the lowest is of Tata Motors (-0.0333) among the sample companies.

4.2 Performance of Diversification

Performance can be attributed to diversification and net selectivity. The diversification measures the additional returns that compensate the investors for bearing diversifiable risk. Therefore an attempt has been made to examine investment performance on diversification. Table 1.3 showed that all the sample mutual fund schemes were earned positive return for its diversification activities. Again the stock of HDFC has the highest positive performance among the sample companies. The majority of positive incidence of return on risk premium and diversification imply that return of sample stock return was more than the risk free rate during the study period.

4.3 Performance of Net Selectivity

After accounting for diversification, the residual return performance on selectivity is attributed to net selectivity. A positive net selectivity value will indicate superior performance and in case of negative value implies that investor have taken diversifiable risk that has not been compensated by extra returns. Table 1.3 exhibited, on the total net selectivity front 14 stocks (46.66%) have shown negative return and the rest 16stock (53.34%) have reported positive net selectivity indicating superior stock selection. The average net selectivity is negative for all sample mutual fund schemes (0.0102), this would imply that stock of 16companies were able to get some additional compensation for their diversification activities.

5 Conclusion

This study tried to attempt the investment performance of selected listed companies of Bombay Stock Exchange in India. All those companies which constituted the S&P BSE Sensex are taken as a sample of the study. To analyze the investment performance, risk, return, standard deviation, Beta and Fama Decomposition model is used for the study period of five years i.e. April 2010 to

March 2015. The data is collected from the database of BSE website and inference is drawn on weekly basis secondary data. S&P BSE Sensex is taken as a proxy variable of benchmark index. It is found that average return of selected sample companies is superior to benchmark return and investment in these companies is also risky in nature as compare to benchmark. Only 8 Companies are not able to beat the benchmark index. The results of the Fama Decomposition model showed that majority of selected companies have reported positive net selectivity indicating superior stock selection. This would imply that these companies were able to get some additional compensation for their diversification and selectivity activities.

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