Relationship between global stock fluctuations and Indian capital market – An empirical testing

By Dr. A. Satya Nandini and R.Ganesh Kumar

Abstract

In the current era of globalization of financial markets, it is of utmost importance to understand the relationship between various global markets. An investor has to correlate his risk return profile to the global scenario. The stock market performance is one of the prime indicators which can be used to judge the performance of the economy of any country. The world's major stock market indicators are of that of New York Stock Exchange's (NYSE) indicator S&P 100, National Stock Dealer's Automated Quotations (NASDAQ), Tokyo Stock Exchange's (TSE) indicator NIKKEI 225, London Stock Exchange's (LSE) Indicator FTSE 100 and Hong Kong Stock Exchange's (HKSE) indicator HANG SENG. In the era of financial globalization the performance of businesses in various countries are inter linked due to which recession in a major economy can impact other economies. This in turn affects the performances of stock markets indicated by various prominent indices.

This paper tries to test the relationship between the fluctuations in the global indices and its impact on the performance of the Indian stock market. For this purpose the study tries to correlate the performance of Bombay Stock Exchange (BSE) using its indicator BSE SENSEX with 5 important Indices viz., FTSE 100 , NIKKEI , HANG SENG , S&P 100 and NASDAQ. The study has collected data from January 2011 – May 2012 related to the above indicators and calculated the monthly holding period returns. The monthly returns of BSE have been compared with each of the returns of the other markets and the correlation between them was established. To confirm the significance of correlation between the indices, T- test was employed. The study finds that there is a significant impact of global markets on Indian markets.

Key words:

Stock Exchange, BSE, NASDAQ, NYSE, FTSE 100, NIKKEI, HANG SENG, Fluctuations, Market Indices.

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Introduction

The year 2008 has seen a financial tsunami across the worldwide capital markets. There was a spread of panic and fear among the investors everywhere. Experts have traced the origin to the US sub-prime crisis resulting in the shrinking of liquidity in the inter-bank markets. Wall Street blue chip companies went bust. The impact spread to the other markets. The stock market is no exception. In spite of India having a minuscule role in the international financial crisis the Indian capital market is one of the badly affected victims. In a period of 10 months the indicators in the Indian capital markets have dipped more than 50%. The same phenomenon repeated in the year 2011 owing to the European Economic crisis and the US recession. Do we deserve such a great fall with investors wealth depleting so greatly. Such incidents led to the curiosity of the researchers to understand to what extent Indian markets are correlated to global markets during volatile and chaotic times. For this reason, this study has tried to relate the performance of Indian Capital Market with prominent global stock markets during the time period January 2011 to May 2012, which coincided with the recession in major world economies.

For understanding Global Stock markets there are various indicators namely FTSE 100, NIKKEI, HANG SENG, S&P 100, NASDAQ etc. This study attempts to establish a relationship between Indian stock markets and global stock markets. For this purpose, BSE SENSEX, the prominent indicator of Indian Stock Market has been correlated with prominent global indices.

BSE SENSEX commenced in 1986 with 1978-79 as the base year is the indicator of the oldest stock exchange in India, the BSE. It is an indicator of 30 stocks drawn from group A companies. FTSE 100 in the indicator of the fourth largest stock exchange of the world, The London Stock Exchange. The main indicator of the Tokyo Stock Exchange, the third largest in the world is NIKKEI 225. The HANG SENG index is the indicator of Hong Kong Stock Exchange, the sixth largest in the world. The S&P 100 index is the indicator of New York Stock Exchange, the largest stock exchange of the world. The NASDAQ is the index of the second largest stock exchange of the world.

Previous studies comparing Indian Stock Markets with international Markets are quoted. "It was clearly found that stock markets do impact each other more so in post 2000 era, due to increase in cross holdings dissolving the geographical barriers with respect to portfolio investments. (Debjiban Mukherjee, 2007).

"The daily performance of BSE and NSE was compared with NASDAQ and NYSE and it was found to have a relationship. The relationship holds good for technology stocks of NYSE and BSE / NSE. However, domestic prices of technology stocks and overall domestic share prices were found to be independent of each other. (Sanjay K Hansda, Partha Ray, 2002).

"Research documented the presence of stochastic trend between US and Asian stock market movements post October 1987. The results indicated Asian equity markets are less integrated with Japan's equity markets than the USA market. (Bala Arshanapalli, John Doukas, Larry H.P. Lang, 1995)

"There is evidence that India's international integration has strengthened in the recent period beginning 2003. However, the integration of India's stock market with the global markets, such as the US and the UK, is much higher than with the regional markets." (Janak Raj and Sarat Chandra Dhal, 2009)

"Research tried to find out whether the Indian market, during the time of financial crisis and the meltdown across the world adjusts to the new information or not. It was concluded that no market in the world is insulated from externalities". (D Joseph Anbarasu and S Srinivasan, 2009)

"A Study examined the nature and extent of linkage between the US and the Indian stock markets. The results are in support of the intuitive hypothesis that the Indian stock market was not interrelated to the US markets for the entire sample period. It should be noted that stock markets of many countries became increasingly interdependent with the US stock markets during the same time period. India was late in effecting liberalization policies and when it implanted these policies it did so in a careful and slow manner. However, as the effects of economic liberalizations started to take place, the BSE became more integrated with the Nasdaq and the NYSE, particularly after 1998. It must be noted that though BSE is integrated with the US stock markets, it does not influence the NASDAQ and NYSE markets. This result is to be expected, given the relatively small valuation of the BSE. (Bala Arshanapalli and Mukund S. Kulkarni, 2001)

The above stated studies motivated the researchers to correlate the performance of BSE SENSEX with 5 important Indices viz., NASDAQ, NIKKEI, S&P 100, FTSE 100 and HANG SENG.

Objective

The purpose of the study is to understand the relationship between Indian Stock Market's performance and performances of various global markets.

Methodology

Research Design and Hypothesis

The study uses a Causal Research Design where the objective is to identify variables and analyze whether any cause and effect relationship exists among them, and if so, to quantify the extent of the relationship. A causal relationship can be interpreted if some external factor, (an independent variable) produces a change in the dependent variable. The independent variables in this study are the fluctuations in NASDAQ, NIKKEI, S&P 100, FTSE 100 and HANG SENG. The dependent factor is the fluctuations in Indian Capital Market indicated by BSE. In this study causal analysis is done to establish relationship between Indian Capital Markets using BSE and global market indicators.

The Approach used for hypothesis testing is the classical or sampling theory approach. In this approach the hypothesis is accepted or rejected on the basis of sampling information alone. Any sample might vary from its population and so it is important to judge whether the result from the sample is statistically significant or not. To test the significance null (H0) and alternate hypotheses (H1) are used.

The Hypotheses for the study are:

a) To test the relationship between BSE and NASDAQ:

H0: The performance of BSE is independent of the performance of NASDAQ. $r = 0$

H1: The performance of BSE is not independent of the performance of NASDAQ. $r \neq 0$

b) To test the relationship between BSE and NIKKEI:

H0: The performance of BSE is independent of the performance of NIKKEI. $r = 0$

H1: The performance of BSE is not independent of the performance of NIKKEI. $r \neq 0$

c) To test the relationship between BSE and S&P 100:

H0: The performance of BSE is independent of the performance of S&P 100. r = 0

H1: The performance of BSE is not independent of the performance of S&P 100. r≠0

d) To test the relationship between BSE and FTSE 100:

H0: The performance of BSE is independent of the performance of FTSE 100. r = 0

H1: The performance of BSE is not independent of the performance of FTSE 100. r≠0

e) To test the relationship between BSE and HANG SENG:

H0: The performance of BSE is independent of the performance of HANG SENG. r = 0

H1: The performance of BSE is not independent of the performance of HANG SENG. r≠0

Sampling design

International stock indicators.From the population of Indian stock indicators, purposive judgment sampling technique was adopted to select BSE SENSEX as the sample. BSE SENSEX is the second largest in India in terms of market capitalization being the indicator of the oldest stock exchange.

From the populations of International stock indicators, purposive judgment sampling technique was adopted to select NASDAQ, NIKKEI, S&P 100, FTSE 100 and HANG SENG as sampling unit being indicators of world's top 10 stock exchanges in terms of market capitalization.

Data used

The study relies mainly on secondary data. The secondary data used for the purpose of study are the opening and closing prices of the BSE SENSEX for each month for the period January 2011 to May 2012. These values are used to calculate the average monthly returns which are correlated with the returns of other global stock market indicators.

Data analysis techniques

The following techniques are used for data analysis:

For Indian Capital Market's performance:

BSE SENSEX is the indicator of the Indian Capital market considered in the study. The opening and closing prices for each month is used to calculate the monthly returns.

For International Indicator's performances:

The global indicators NASDAQ, NIKKEI, S&P 100, FTSE 100 and HANG SENG were used to study their impact on BSE SENSEX. The opening and closing values for each month for each of the indices were used to calculate their monthly returns and compare it with the returns of BSE SENSEX.

$$\text{Monthly return (\%)} = \frac{\text{End of month price} - \text{Beginning of month price}}{\text{Beginning of month price}} \times 100$$

Statistical Techniques Used:

Pearson's product moment correlation coefficient r symbolizes the coefficient's estimate of linear association based on sampling data. This study uses correlation coefficient to express the relationship between:

- Performance of BSE SENSEX and performance of NASDAQ, NIKKEI, S&P 100, FTSE 100 and HANG SENG

The formula for calculating Pearson's r is as follows

Where N is number of cases, are the standard deviations for X and Y.

The t-test for correlation tests the significance of r assuming the population coefficient = 0, the formula for small samples (size < 30) is

The critical value of t is considered in the table for a significance level of 0.05. This research considers the level of significance for a two-tailed test. If the calculated t value is larger than the critical value, the result rejects the null hypothesis and supports the alternate hypothesis. If the critical value is larger than the calculated value then the null hypothesis is not rejected.

Limitations

- The period covered in the study is very short compared to the previous studies in the past. The reason for considering January 2011 to May 2012 is it was the period where the volatility in the Stock markets across the globe was very high.
- Only BSE SENSEX is considered as an indicator of Indian Capital market. NSE is not considered as part of this research.
- Only monthly returns are correlated not daily returns.
- One Dollar rate is assumed at Rs. 50
- One Yen rate is assumed at Rs. 0.65
- One pound rate is assumed at Rs. 80
- One HK Dollar rate is assumed at Rs. 0.16

Analysis and Interpretation

TABLE 4. 1

Comparison of performance of BSE with performance of NASDA

BSE SENSEX DATA				NASDAQ DATA				
Month	Open	Close	Monthly Returns %	Open $	Open Rs.	Close $	Close Rs.	Monthly Returns %
Jan-11	20621.61	18327.76	-11.12352527	2676.65	133832.5	2700.08	135004	0.875348
Feb-11	18425.18	17823.4	-3.266073927	2717.61	135880.5	2782.27	139113.5	2.379297
Mar-11	17982.28	19445.22	8.135453346	2791.08	139554	2781.07	139053.5	-0.35864

Continued....

Apr-11	19463.11	19135.96	-1.680872173	2796.67	139833.5	2873.54	143677	2.748626
May-11	19224.05	18503.28	-3.74931401	2881.28	144064	2835.3	141765	-1.59582
Jun-11	18527.12	18845.87	1.720450885	2829.39	141469.5	2773.52	138676	-1.97463
Jul-11	18974.96	18197.2	-4.098875571	2775.08	138754	2756.38	137819	-0.67385
Aug-11	18352.23	16676.75	-9.12957172	2791.45	139572.5	2579.46	128973	-7.59426
Sep-11	16963.67	16453.76	-3.005894361	2583.34	129167	2415.4	120770	-6.50089
Oct-11	16255.97	17705.01	8.913894403	2401.19	120059.5	2684.41	134220.5	11.79498
Nov-11	17540.55	16123.46	-8.078937091	2607.31	130365.5	2620.34	131017	0.499749
Dec-11	16555.93	15454.92	-6.650245562	2615.67	130783.5	2605.15	130257.5	-0.40219
Jan-12	15534.67	17193.55	10.67856607	2657.39	132869.5	2813.84	140692	5.887356
Feb-12	17179.64	17752.68	3.335576298	2830.1	141505	2966.89	148344.5	4.833398
Mar-12	17714.62	17404.2	-1.752337899	2979.11	148955.5	3091.57	154578.5	3.774953
Apr-12	17429.96	17318.81	-0.637695095	3119.65	155982.5	3069.2	153460	-1.61717
May-12	17370.93	16218.53	-6.634071981	3044.79	152239.5	2827.34	141367	-7.14171
Correlation coefficient 'r'	0.603721	t- test calculated	2.933036	t-test critical	2.110			

The above table indicates a correlation coefficient of 0.6037 between monthly returns of BSE SENSEX and NASDAQ for the period January 2011 to May 2012. The T test carried out to test the significance of 'r' presented a calculated value of 2.9330. The critical t value of 2.110 was found from the t distribution table for a significance level of 5% for a two tailed test. In this case the critical value is lesser than the calculated t value failing to accept the null hypothesis.

TABLE 4.2

Comparison of performance of BSE with performance of NIKKEI 225

BSE SENSEX DATA				NIKKEI DATA				
Month	Open	Close	Monthly Returns %	Open Yen	Open Rs.	Close Yen	Close Rs.	Monthly Returns %
Jan-11	20621.61	18327.76	-11.12352527	10,398.10	6758.765	10,237.92	6654.648	-1.54047
Feb-11	18425.18	17823.4	-3.266073927	10,274.50	6678.425	10,624.09	6905.659	3.402501
Mar-11	17982.28	19445.22	8.135453346	10,754.03	6990.12	9,755.10	6340.815	-9.28889
Apr-11	19463.11	19135.96	-1.680872173	9,708.39	6310.454	9,849.74	6402.331	1.455957
May-11	19224.05	18503.28	-3.74931401	10,004.20	6502.73	9,693.73	6300.925	-3.1034
Jun-11	18527.12	18845.87	1.720450885	9,719.61	6317.747	9,816.09	6380.459	0.992632
Jul-11	18974.96	18197.2	-4.098875571	9,868.07	6414.246	9,833.03	6391.47	-0.35508
Aug-11	18352.23	16676.75	-9.12957172	9,965.01	6477.257	8,955.20	5820.88	-10.1336
Sep-11	16963.67	16453.76	-3.005894361	9,060.80	5889.52	8,700.29	5655.189	-3.97879
Oct-11	16255.97	17705.01	8.913894403	8,545.48	5554.562	8,988.39	5842.454	5.182974

Continued.....

Nov-11	17540.55	16123.46	-8.078937091	8,835.52	5743.088	8,434.61	5482.497	-4.53748
Dec-11	16555.93	15454.92	-6.650245562	8,597.38	5588.297	8,455.35	5495.978	-1.65201
Jan-12	15534.67	17193.55	10.67856607	8,560.11	5564.072	8,802.51	5721.632	2.831739
Feb-12	17179.64	17752.68	3.335576298	8,809.79	5726.364	9,723.24	6320.106	10.36858
Mar-12	17714.62	17404.2	-1.752337899	9,707.37	6309.791	10,083.56	6554.314	3.875303
Apr-12	17429.96	17318.81	-0.637695095	10,109.87	6571.416	9,458.74	6148.181	-6.44054
May-12	17370.93	16218.53	-6.634071981	9,350.95	6078.118	8,542.73	5552.775	-8.64319
Correlation coefficient 'r'	0.397071023	t- test calculated	1.675604442	t-test critical	2.110			

The above table indicates a correlation coefficient of 0.3970 between monthly returns of BSE SENSEX and NIKKEI for the period January 2011 to May 2012. The T test carried out to test the significance of 'r' presented a calculated value of 1.6756. The critical t value of 2.110 was found from the t distribution table for a significance level of 5% for a two tailed test. In this case the calculated t value is lesser than the critical t value failing to reject the null hypothesis.

TABLE 4. 3

Comparison of performance of BSE with performance of S&P 100

BSE SENSEX DATA				S&P 100 DATA				
Month	Open	Close	Monthly Returns %	Open $	Open Rs.	Close $	Close Rs.	Monthly Returns %
Jan-11	20621.61	18327.76	-11.12352527	1257.62	62881	1286.12	64306	2.266185334
Feb-11	18425.18	17823.4	-3.266073927	1289.14	64457	1327.22	66361	2.953907256
Mar-11	17982.28	19445.22	8.135453346	1328.64	66432	1325.83	66291.5	-0.211494461
Apr-11	19463.11	19135.96	-1.680872173	1329.48	66474	1363.61	68180.5	2.567169119
May-11	19224.05	18503.28	-3.74931401	1365.21	68260.5	1345.2	67260	-1.465708572
Jun-11	18527.12	18845.87	1.720450885	1345.2	67260	1320.64	66032	-1.825750818
Jul-11	18974.96	18197.2	-4.098875571	1320.64	66032	1292.28	64614	-2.147443664
Aug-11	18352.23	16676.75	-9.12957172	1292.59	64629.5	1218.89	60944.5	-5.701730634
Sep-11	16963.67	16453.76	-3.005894361	1219.12	60956	1131.42	56571	-7.193713498
Oct-11	16255.97	17705.01	8.913894403	1131.21	56560.5	1253.3	62665	10.79286781
Nov-11	17540.55	16123.46	-8.078937091	1251	62550	1246.96	62348	-0.322941647
Dec-11	16555.93	15454.92	-6.650245562	1246.91	62345.5	1257.6	62880	0.857319293
Jan-12	15534.67	17193.55	10.67856607	1258.86	62943	1312.41	65620.5	4.25384872
Feb-12	17179.64	17752.68	3.335576298	1312.45	65622.5	1365.68	68284	4.055773553
Mar-12	17714.62	17404.2	-1.752337899	1365.9	68295	1408.47	70423.5	3.1166264
Apr-12	17429.96	17318.81	-0.637695095	1408.47	70423.5	1397.91	69895.5	-0.749749728
May-12	17370.93	16218.53	-6.634071981	1397.86	69893	1310.33	65516.5	-6.261714335
Correlation coefficient 'r'	0.53240952	t- test calculated	2.435965842		t-test critical		2.110	

The above table indicates a correlation coefficient of 0.5324 between monthly returns of BSE SENSEX and S&P 100 for the period January 2011 to May 2012. The T test carried out to test the significance of 'r' presented a calculated value of 2.4359. The critical t value of 2.110 was found from the t distribution table for a significance level of 5% for a two tailed test. In this case the critical value is lesser than the calculated t value failing to accept the null hypothesis.

TABLE 4.4

Comparison of performance of BSE with performance of FTSE 100

BSE SENSEX DATA					FTSE 100 DATA			
Month	Open	Close	Monthly Returns %	Open Pound	Open Rs.	Close Pound	Close Rs.	Monthly Returns %
Jan-11	20621.61	18327.76	-11.12352527	5899.9	471992	5862.9	469032	-0.627129273
Feb-11	18425.18	17823.4	-3.266073927	5862.9	469032	5994	479520	2.236094765
Mar-11	17982.28	19445.22	8.135453346	5994	479520	5908.8	472704	-1.421421421
Apr-11	19463.11	19135.96	-1.680872173	5908.8	472704	6069.9	485592	2.726441917
May-11	19224.05	18503.28	-3.74931401	6069.9	485592	5990	479200	-1.316331406
Jun-11	18527.12	18845.87	1.720450885	5990	479200	5945.7	475656	-0.739565943
Jul-11	18974.96	18197.2	-4.098875571	5945.7	475656	5815.2	465216	-2.194863515
Aug-11	18352.23	16676.75	-9.12957172	5815.2	465216	5394.5	431560	-7.234488926
Sep-11	16963.67	16453.76	-3.005894361	5394.5	431560	5128.5	410280	-4.930948188
Oct-11	16255.97	17705.01	8.913894403	5128.5	410280	5544.2	443536	8.105683923
Nov-11	17540.55	16123.46	-8.078937091	5544.2	443536	5505.4	440432	-0.699830453
Dec-11	16555.93	15454.92	-6.650245562	5505.4	440432	5572.3	445784	1.21517056
Jan-12	15534.67	17193.55	10.67856607	5572.3	445784	5681.6	454528	1.961488075
Feb-12	17179.64	17752.68	3.335576298	5681.6	454528	5871.5	469720	3.342368347
Mar-12	17714.62	17404.2	-1.752337899	5871.5	469720	5768.5	461480	-1.754236566
Apr-12	17429.96	17318.81	-0.637695095	5768.5	461480	5737.8	459024	-0.532200745
May-12	17370.93	16218.53	-6.634071981	5737.8	459024	5320.9	425672	-7.265851023
Correlation coefficient 'r'	0.55653861	t- test calculated	2.5943769		t-test critical		2.110	

The above table indicates a correlation coefficient of 0.5565 between monthly returns of BSE SENSEX and FTSE 100 for the period January 2011 to May 2012. The T test carried out to test the significance of 'r' presented a calculated value of 2.5943. The critical t value of 2.110 was found from the t distribution table for a significance level of 5% for a two tailed test. In this case the critical value is lesser than the calculated t value failing to accept the null hypothesis.

TABLE 4.5

Comparison of performance of BSE with performance of HANG SENG

BSE SENSEX DATA				HANG SENG DATA				
Month	Open	Close	Monthly Returns %	Open Dollar	Open Rs.	Close Dollar	Close Rs.	Monthly Returns %
Jan-11	20621.61	18327.76	-11.12352527	23135.64	3701.7024	23447.34	3751.5744	1.347272001
Feb-11	18425.18	17823.4	-3.266073927	23451.62	3752.2592	23338.02	3734.0832	-0.484401504
Mar-11	17982.28	19445.22	8.135453346	23317.96	3730.8736	23527.52	3764.4032	0.898706405
Apr-11	19463.11	19135.96	-1.680872173	23664.48	3786.3168	23720.81	3795.3296	0.238036078
May-11	19224.05	18503.28	-3.74931401	23720.81	3795.3296	23684.13	3789.4608	-0.154632156
Jun-11	18527.12	18845.87	1.720450885	23686.77	3789.8832	22398.1	3583.696	-5.440463178
Jul-11	18974.96	18197.2	-4.098875571	22813.25	3650.12	22440.25	3590.44	-1.635014739
Aug-11	18352.23	16676.75	-9.12957172	22739.55	3638.328	20534.85	3285.576	-9.695442522
Sep-11	16963.67	16453.76	-3.005894361	20790.22	3326.4352	17592.41	2814.7856	-15.38131872
Oct-11	16255.97	17705.01	8.913894403	17179.2	2748.672	19864.87	3178.3792	15.63326581
Nov-11	17540.55	16123.46	-8.078937091	19461.08	3113.7728	17989.35	2878.296	-7.562427162
Dec-11	16555.93	15454.92	-6.650245562	19033.96	3045.4336	18434.39	2949.5024	-3.150001366
Jan-12	15534.67	17193.55	10.67856607	18770.64	3003.3024	20390.49	3262.4784	8.629700426
Feb-12	17179.64	17752.68	3.335576298	20394.67	3263.1472	21680.08	3468.8128	6.30267614
Mar-12	17714.62	17404.2	-1.752337899	21578.19	3452.5104	20555.58	3288.8928	-4.739090721
Apr-12	17429.96	17318.81	-0.637695095	20662.97	3306.0752	21094.21	3375.0736	2.087018468
May-12	17370.93	16218.53	-6.634071981	21245.48	3399.2768	18629.52	2980.7232	-12.31301905
Correlation coefficient 'r'	0.65487595	t- test calculated	3.356095396			t-test critical		2.110

The above table indicates a correlation coefficient of 0.6548 between monthly returns of BSE SENSEX and HANG SENG for the period January 2011 to May 2012. The T test carried out to test the significance of 'r' presented a calculated value of 3.3560. The critical t value of 2.110 was found from the t distribution table for a significance level of 5% for a two tailed test. In this case the critical value is lesser than the calculated t value failing to accept the null hypothesis.

Conclusion

The study was conducted for the period January 2011 to May 2012 which was the time of very high volatility in the global stock markets. BSE Sensex fluctuated between 20,000 and 16,000 mark. Hence there was a need to correlate the performance of BSE SENSEX with the performances of global indicators to understand if there was any correlation between global fluctuations and Indian stock market. The testing revealed that the performance of BSE Sensex showed a high degree of positive correlation with NASDAQ, S&P 100, FTSE 100 and HANG SENG, whereas the degree of correlation with NIKKEI was moderate. The correlation was proved to be significant by the T test. This clearly

indicates that Indian Capital market is dependent on global capital markets to a greater extent. Hence, it is statistically established that Indian stock market's performance is influenced greatly by global fluctuations. The result supports the conclusions drawn from earlier studies. Further research may be done in this area correlating other Indian Indicators with global indicators. Hence under current situations there is a need for the portfolio managers and asset management companies to concentrate on the global markets and their impact on Indian investments in their research and decision making.

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