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# An examination of the Indian small-cap cycle in relation to the U.S. market

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**KEYWORDS**
India;
Investment;
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Risk;
Return;
Small-caps

**Abstract** The present study examines the Indian small-cap cycle between April 2011 and March 2022. The ordinary least squares (OLS) estimate shows that investors can benefit from investing in the Nifty Small-Cap 100 index by following a proper exponential moving average strategy. The study findings also highlighted that among macroeconomic factors, 'term spread' might influence the Nifty Small-Cap 100 index returns (NIFSC100R). The daily returns of the Russell 2000 index, the relative change in international crude oil prices (RCO), and the relative change in the exchange rate between USD and INR (RUSDINR) show no statistically significant impact on NIFSC100R.
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## Introduction

*Pareidolia*: the imagined perception of a pattern or meaning, whether true or not. Equity investors often base their investment decisions on such perceived patterns in market directions. In particular, technical traders and investors make their decisions based on these patterns (Marshall, Young, & Rose, 2006). This tendency to recognise recurrent patterns helps us avoid the need to reevaluate every decision, thanks to the use of mental shortcuts (Marks, 2018). Furthermore, conventional pattern recognition tools and artificial intelligence technologies often fall short of providing a more robust means of identifying clear patterns in financial markets (Elliman, 2006). For instance, volume and volatility tend to exhibit a U-shaped pattern throughout a trading day, with heightened activity and volatility at the start and end of the day (Bowen, Hutchinson, & O'Sullivan, 2010).

Firms, nations, and global markets also operate in accordance with patterns, which are often referred to as 'cycles' (King & Plosser, 1982). While these cycles may not be as regular as clock and calendar cycles due to the significant influence of human psychology and behaviour in their formation, they nonetheless offer periods of better and worse conditions for specific behaviours (Marks, 2018). Predicting when an expansion will come to an end and a new development will begin in the equity market is exceedingly difficult for market participants, let alone forecasting how it will impact the market (Banerjee & Kayal, 2022). Although history does not repeat itself precisely, it often exhibits similar patterns, making it valuable to look back in time for insights (Saffo,

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2007). If we aim to analyse past cycles, we must repeat the examination process. By harnessing these recurring patterns, we can improve our profitability and avoid being adversely affected by market downturns.

Stock markets can be broadly categorised based on various underlying parameters, including sectors and market capitalisations (Wang, Brooks, Lu, & Holzhauer, 2014). These subgroups often move together but can also exhibit significant variations in their movements (Huang, 2007). Sectoral groups are primarily influenced by technological advancements, innovation, and government decisions (Ahmed, 2016; Aravind, 2017; Altahtamouni, Masfer, & Alyousef, 2022). Previous studies have demonstrated that stocks of different market capitalisations differ in terms of returns, risks, and volatility (Eun, Huang, & Lai, 2008; Cao, Iliev, & Velthuis, 2017).

According to regulatory standards, businesses listed on the stock exchange are categorised based on their market capitalisation. In India, the top 100 corporations are classified as large-cap category, companies ranked from 101 to 250 are considered mid-cap category, and all others fall into the small-cap category.[1] This classification offers opportunities for diversified asset allocation and hedging in the market-cap style of investment over the long and short terms (Cao et al., 2017; Eun et al., 2008). Consequently, during turbulent equity market conditions, investors may turn to large-cap stocks as a short-term hedge (Jena, Tiwari, Dash, & Abakah, 2021).

Since the beginning of 2022, with surging oil prices and escalating geopolitical tensions, stock market volatility has become a major topic of discussion. However, the uncertainty caused by the pandemic has led individuals to make calculated bets on the markets (Varma, Venkataramani, Kayal, & Maiti, 2021). In India, the equity market cycles witnessed a bull run over the past 2 years, following the crash of March 2020, with benchmark indices like Sensex and Nifty 50 increasing by up to 112% and 117%, respectively. During this period, macroeconomic indicators such as inequality and real interest rates declined while unemployment rates sharply rose. Although the economy was in a recovery phase, prominent rating agencies projected a gross domestic product (GDP) growth rate of up to 9.2% for FY22, with only 15-20% of this growth expected to come from the heavily reliant informal sector, compared to 52% in 2017–2018. This is one of the reasons why 95% of listed companies are still categorised as small-cap, and the S&P BSE Small-Cap index has surged by 226% since the pandemic crash. In 2021, the small-cap mutual fund category delivered an average return of approximately 60%. So far this year (up to March 2022), the category has returned 59%, nearly double the returns of large-cap investments. However, this performance came at the cost of high volatility. The Indian small-cap cycles are illustrated in Figure 1, featuring five phases before the onset of the COVID-19 pandemic in March 2020. Phase 1, lasting 57 months, stands out as the longest among them and a prolonged bull market was observed after Phase 5, unlike the other phases.

[1] See https://www.motilaloswal.com/blog-details/what-are-small cap-midcap-and-largecap-stocks-and-what-is-the-difference/ 20364.

In the context of developed nations such as the United States, the UK, Japan, and Europe, it is evident that volatility is considerably lower in large-cap stocks when compared to small-cap stocks. Despite this, both large-cap and small-cap stocks tend to move in the same direction. In the years spanning from 1926 to 1960, large-cap stocks delivered higher returns primarily due to significant historical events like the Industrial Revolution (which gave rise to capitalism), world wars, and the Great Depression, creating an environment of uncertainty and high military expenditure. Additionally, investors during this period tended to be risk-averse.

However, from 1961 to 2010, a shift occurred as ambitious individuals redirected their focus toward innovation and technology. This shift led to the emergence of a cycle of small-cap companies that experienced exponential growth over the years. During this period, small-cap indices outpaced the growth of large-cap indices. While small-cap stocks often provide substantial returns in the year following a market trough, they frequently lag in the year preceding a peak (Switzer, 2010).

Furthermore, the advantage of investing in small-cap stocks is closely linked to the default risk in the economy. A favourable default risk premium reflects investors' willingness to hedge against unforeseen increases in the collective risk premium due to rising economic uncertainty. Financing and term structure risk may also play a role in determining small-cap premiums (Chan & Chen, 1991; Switzer, 2010; Maiti, 2018). An increasing term structure indicates greater riskiness in longer-term assets, which may necessitate a different premium for small-cap companies, given their higher vulnerability to leverage risk compared to large-cap firms. Small enterprises operate in highly competitive environments, have smaller pricing leverage than larger firms, and are therefore more susceptible to inflation risk, resulting in an inflation excess relative to larger companies (Switzer & Picard, 2020).

Numerous studies have confirmed the size effect, wherein small firms tend to have higher average returns than large firms over long horizons, both in the Indian and global contexts (Balakrishnan & Maiti, 2017; Banz, 1981; Fama & French, 1993; Maiti, 2020; Maiti & Balakrishnan, 2018, 2020). However, a recent study by Sorensen and Lancetti (2020) on the behaviour of small-cap stock return cycles highlighted a decline in small-cap premiums over the last two decades. The study also emphasised the potential influence of economic cycles on the small-cap stock return cycle.

From the above discussion, it becomes evident that market cycles have consistently held the interest of policymakers, and small-cap stocks are no exception. Lesser-known companies often face scrutiny regarding independent audit issues, making it challenging for analysts to draw accurate conclusions about their high idiosyncratic volatility. Despite the inherent risks associated with small-cap stocks in recent decades, they have garnered significant attention among investors, researchers, and policymakers. Presently, several stylised global stock indices focus on small-cap stocks. However, investing in small-cap stocks is typically considered risky, necessitating comprehensive analysis for sustainable investment. Earlier studies predominantly concentrated on large-cap stock and medium-cap stock, with

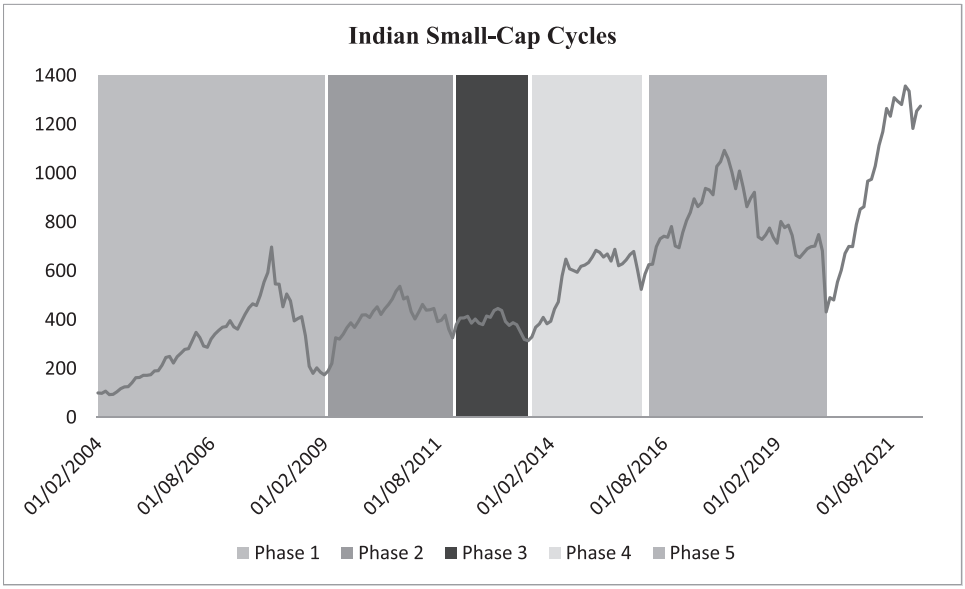



**Figure 1** The small-cap cycles in India.

limited attention given to small-cap stocks. Nevertheless, there is a growing interest in studying small-cap stocks today. With this background, the current study aims to address the following gaps in the existing literature:

- This study represents the first attempt, to the best of the authors' knowledge, to examine the behaviour of the Indian small-cap stock cycle.
- The Indian small-cap stock return cycle is compared with the United States small-cap stock cycle, offering valuable insights into cross-country comparisons.

The subsequent section (second section) focuses on the primary characteristics of small-cap equities, including returns, risk, volatility, macroeconomic factors, and idiosyncratic volatility. Third section covers data and methodology, while fourth section presents the results and discussions. Finally, the concluding section offers conclusions and outlines future research directions.

## Literature review

The literature review section delves into numerous studies that explore the fundamental traits of small-cap stocks. It culminates by examining the small-cap market cycles in the United States and introducing the research problem addressed in this study.

### Returns

Small-cap stocks exhibit the potential to deliver exceptionally high growth rates, making them an appealing avenue for wealth generation with promising wealth-building opportunities (Wyatt, 2009). Investing in small-cap stocks has been found to yield higher returns during bull markets but entail greater losses during bear markets (Arshanapalli & Nelson, 2007). This aligns with the notion that the small-cap premium serves as compensation for the inherent risk associated with these stocks. However, it is worth noting that some argue the concept of the small-cap premium is rooted in flawed intuition and is no longer supported by historical data (Damodaran, 2015). Nevertheless, there have been numerous instances where small-cap stocks outperformed their large-cap counterparts (Sorensen & Lancetti, 2020; Switzer, 2010). This phenomenon can also be explained through the lens of market efficiency theory, which posits that small-cap stocks possess greater potential for abnormal returns because the small-cap market is less efficient (Ennis & Sebastian, 2002). However, it is important to note that achieving high returns in the small-cap space is contingent on the prevailing market conditions. There is limited evidence to suggest that small-cap active managers consistently produce excess returns (Ennis & Sebastian, 2002). Furthermore, within the realm of small-cap investments, it has been observed that small-cap growth stocks tend to outperform small-cap value stocks significantly during bull markets, and the reverse is often true during bear markets (Barber, Lehavy, McNichols, & Trueman, 2003).

While there is no conclusive academic evidence of small-cap stocks universally dominating large-cap stocks or mid-cap stocks, there are instances where small-cap stocks have demonstrated remarkable returns, surpassing their peers significantly. It is important to note that small-cap stocks typically perform better during an expansionary economic cycle characterised by increasing economic growth and rising interest rates (Sorensen & Lancetti, 2020). In a favourable economic environment, the capacity of small-cap stocks to deliver exponentially higher returns compared to their large-cap counterparts is often referred to as the potential to become 'multibaggers'.

### Risk

The Capital Asset Pricing Model (CAPM) may not be the most suitable risk model for small-cap stocks, as it tends to

overstate the risk associated with small caps. Consequently, the small-cap premium highlights the CAPM's limitations in accurately capturing the true risk inherent in these stocks (Palanichamy & Kayal, 2022). Generally, small-cap stocks may carry higher levels of risk compared to larger ones, particularly in terms of downside risk, as noted in studies by Post, van Vliet, and Lansdorp (2012) and Suarez (2016). Investors, in general, are more concerned about downside risk (Saraf & Kayal, 2022). Academic literature has consistently shown that the risk associated with estimating beta for small firms is significantly greater than that for larger firms (Rompotis, 2019). The small-cap premium can be viewed as compensation for the heightened estimated risk (Allen, 2005). Additionally, due to the scarcity of data on small-cap firms, fundamental risk factors are sometimes unobservable, which can make investing in these stocks inherently risky. However, it is worth noting that stocks ignored by experts and institutional investors, often characterised as less popular small-cap stocks, have been known to outperform (Damodaran, 2020).

Small-cap stocks carry significantly higher risk compared to large-cap stocks, primarily due to their distinctive characteristics. One notable factor is the lower trading liquidity of small-cap stocks (Yan, 2008). This can pose challenges for investors who may struggle to acquire the required number of shares at the right price or encounter difficulties in selling shares promptly for a profit. Additionally, small-cap companies typically have limited access to financial resources and capital compared to their larger counterparts (Palliam, 2005). Small businesses often face difficulties securing the necessary funding to bridge cash flow gaps, support market expansion initiatives, or undertake significant capital investments. These challenges can intensify for small-cap enterprises during economic downturns (Lally & Swidler, 2008). Consequently, small-cap stocks tend to exhibit greater tail risk than large-cap stocks. Furthermore, the unsystematic risks associated with small-cap stocks are substantially higher when compared to mid-cap and large-cap funds.

## Volatility

Small-cap stocks are typically observed to exhibit significantly higher levels of volatility, both in terms of price and returns, when compared to large-cap stocks (Eun et al., 2008). Elevated stock price volatility can at times signal increased risk and potentially assist investors in anticipating future changes. The observed high volatility in small-cap stocks can be attributed to several factors, including momentum, high mortality rates, a small base, size, and high growth potential, among others. Academic literature has noted that momentum is particularly pronounced among small-cap stocks (Novy-Marx, 2015), and this can contribute to heightened volatility in the stock prices of small enterprises. Such volatility often results from sudden spikes in trading volume triggered by unexpectedly favourable or unfavourable news events.

Furthermore, small-cap stocks are known to have a high mortality rate, as small enterprises are more vulnerable to crisis events (Copeland, Copeland, & Lai, 2021). Consequently, investors tend to divest from small-cap stocks and seek refuge in safe-haven assets during periods of crisis (Janani, Kayal, & Balasubramanian, 2022), further exacerbating volatility among small-cap stocks. On the flip side, the small base of small-sized enterprises offers them the advantage of responding more swiftly to favourable market conditions (Roy & Bhattacharya, 2019), potentially leading to sharp increases in the stock prices of small-cap companies.

In a related context, there exists a strong negative correlation between firm size and volatility (Switzer, 2007). Small-cap stock prices tend to fluctuate rapidly over short timeframes, experiencing frequent peaks and valleys. However, it is important to note that volatility should not always be regarded as detrimental; it can occasionally create entry points for investors to capitalise on (Kayal & Maheshwaran, 2018). Investors who hold a positive long-term outlook for the markets may find opportunities to benefit from higher volatility. Small-cap stock prices can often swing by 5% or more in a single trading day, a level of fluctuation that many investors may find challenging to endure. Due to lower liquidity, exiting a large position at the market price can be more challenging for these stocks. Despite the significant empirical research conducted on the volatility of large-cap stock indices, small-cap stock index volatility has received comparatively less attention in the literature (Khanra & Dhir, 2017; Onyeaso & Rogers, 2004).

## Macroeconomic factors

The stock market has evolved into a pivotal market, playing a crucial role in economic development by facilitating capital formation and sustaining overall economic growth (Levine & Zervos, 1996). Stock markets transcend being mere platforms for securities trading; they serve as a bridge between savers and spenders, pooling funds, spreading risk, and redistributing wealth (Gao & Liang, 2013; Niu, Wang, Li, & Zhou, 2020). As a result, stock markets assume a vital role in economic growth by channelling resources towards the most profitable opportunities (Antonios, 2010). Investors take into account various macroeconomic factors when evaluating stocks, including interest rates, currency exchange rates, inflation, and GDP, all of which exert significant influence on stock market performance (Bhuiyan & Chowdhury, 2020). Numerous studies have previously explored the relationship between macroeconomic indicators and stock prices (Bhuiyan & Chowdhury, 2020; Parab & Reddy, 2020; Pethe & Karnik, 2000; Tripathi & Seth, 2014), with their findings consistently revealing a substantial connection between macroeconomic variables and stock prices.

Among these macroeconomic variables, inflation holds a particularly strong link with the small-cap cycle. According to Chuck Royce, small-cap stocks have consistently outperformed inflation in every decade since the 1930s. During periods of inflation, large-cap stocks, bonds, and cash tend to underperform when compared to small-cap stocks. Furthermore, small-cap companies exhibit increased activity in mergers and acquisitions during such inflationary periods, both as targets and acquirers. While both large-cap and small-cap stocks are cointegrated with the foreign currency market, only large-caps demonstrated unidirectional causation in the Granger sense from 1987 to 2005 (Alagidede, Coleman, & Cuestas, 2010). During the same period, no

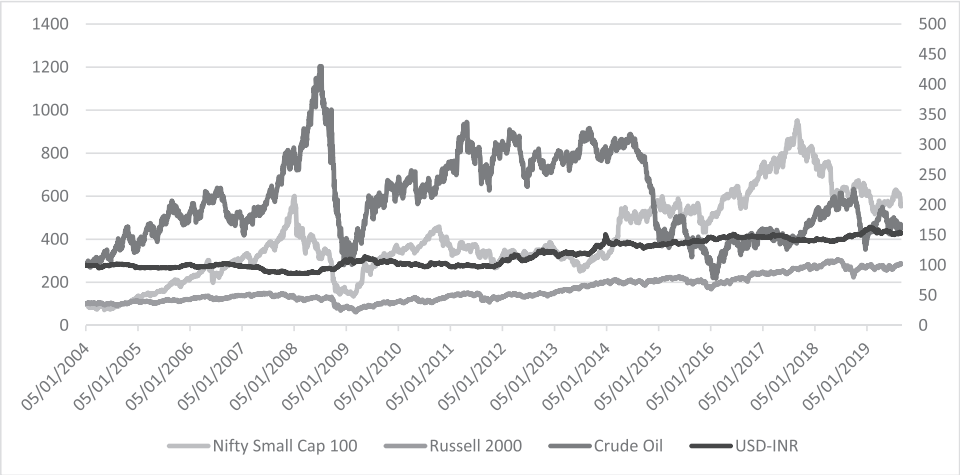



**Figure 2** Cycles in different factors.
*Data source*: CMIE Prowess and www.investing.com

significant causal relationship existed between fluctuations in small-cap stock values and exchange rates. These findings lend support to 'stock'-oriented theories, suggesting that variations in domestic economic activity, as reflected by stock returns, drive changes in the demand for local currency and, consequently, changes in exchange rates. Additionally, there is a statistically significant spillover of volatility from oil prices to mid-cap and small-cap stock markets, although this effect is not observed in the case of large-cap companies (Jena et al., 2021).

Historical data, spanning since the beginning of 2004, as illustrated in Figure 2, reveals a consistent pattern: whenever crude oil prices surpassed a certain threshold, small-cap indices underwent sustained corrections. Notably, when these indices were at higher levels, the corrections tended to be even more pronounced. Crude oil prices frequently serve as a directional indicator for the overall market, and small-cap stocks are no exception to this trend. There exists a positive correlation of 0.76 between the Nifty Small-Cap Index and the USD-INR exchange rate. It is worth noting that idiosyncratic factors often account for more than 50% of the deviation in small-cap funds yet contribute to less than 5% of the variance in large-cap funds.

## Idiosyncratic volatility

Individual stock volatility can increase even when market volatility remains stable, provided that stock correlations decrease. Individual investors may be concerned about the unique risks associated with the assets they hold, even if idiosyncratic volatility can be mitigated in a well-diversified portfolio (Panousi & Papanikolaou, 2012). However, wealth constraints can limit the availability of diversified portfolios to a wider audience. This limitation arises because any rise in idiosyncratic volatility would substantially impact the number of securities needed to achieve a reasonable level of 'complete' diversification (Campbell, Lettau, Malkiel, & Xu, 2001). Arbitrageurs and options traders, whose overall returns depend on total volatility rather than market volatility, place a value on idiosyncratic volatility (Ben-David, Glushkov, & Moussawi, 2010).

In emerging capital markets like India, investors may hold under-diversified assets due to idiosyncratic risk pricing, which is considered part of the overall risk in any given portfolio. Consequently, under-diversified portfolios demand an additional risk premium. Emerging economies are accumulating capital at a faster rate than developed markets, leading to an increase in their market capitalisation and share of global capitalisation (Gupta & Wang, 2009). However, in terms of economic growth, the number of classified stocks, foreign investments, risk levels, and liquidity, emerging economies still lag behind developed markets such as the US and European markets (Kumari, Mahakud, & Hiremath, 2017).

While each company's risk profile is unique, it can generally be categorised into several categories: business risk, financial risk, operational risk, strategic risk, and regulatory and compliance risk. Research on idiosyncratic factors cannot be generalised to an index or a broad market representation due to firm-specific issues, which are often distinctive (Maiti, 2019). This may explain why some stocks outperform the index while others underperform. Academic literature has observed that idiosyncratic volatility is highly significant for small-cap firms (Aziz & Ansari, 2017; Fama & French, 1993).

## Small-cap market cycles in the United States

If historical data and past patterns are indicative, the case for small-cap investments remains as compelling as ever. In an ideal international portfolio with a 5% allocation, approximately 41.9% should be invested in small-cap stocks, with the remaining 58.1% allocated to MSCI country indexes. This limited ideal international portfolio boasts a Sharpe ratio of 0.298, significantly surpassing the Sharpe ratio of an optimal portfolio composed solely of MSCI national indices at the 10% level (Eun et al., 2008).

A dedicated US small-cap strategy, characterised by a high active share, a focus on high-quality equities, and risk reduction, may enable investors to capitalise on the long-term potential of US small-cap stocks. US small-cap market cycles can be broadly categorised into 10 distinct cycles

**Table 1** Small-cap cycles of the United States from 1925 to 2000.

| Cycle | Name and Duration | Key study |
|---|---|---|
| 1 | A Period of Extremes (December 1925–May 1932) | White, 1990 |
| 2 | A Time to Rebuild (June 1932–February 1937) | Zelizer, 2000 |
| 3 | The Winds of War (March 1937–December 1939) | |
| 4 | The War Years (January 1940–May 1946) | |
| 5 | The Vietnam Era (December 1964–December 1968) | Pradhuman, 2000 |
| 6 | The Complex Years (January 1969–November 1973) | Herring, 1992 |
| 7 | The Ravages of Inflation (December 1973–July 1983) | |
| 8 | The Go-Go Eighties (August 1983–October 1990) | Carlson, 2007 |
| 9 | The Transition Period (November 1990–December 1993) | Pradhuman, 2000 |
| 10 | Global Franchises (January 1994–January 2000) | |

*Source*: Pradhuman (2000).

spanning the past century, with the typical cycle lasting around 5.5 years. During periods of small-cap market prosperity, investors often overlook liquidity and other company-specific concerns, emphasising growth and profitability. These cycles are summarised in Table 1. In the United States, during economic expansions, the average annual premium for small-caps is 5.44%, while during recessions, the small-cap discount is 6.23% (Switzer & Picard, 2016).

Since 1926, small-cap stocks have consistently outperformed large-cap stocks. Smaller companies tend to perform better than larger ones, as small-cap returns have shown more rapid growth than those of large corporations. This trend holds not only in the United States but also in other countries, such as the UK and Japan (Pradhuman, 2000). Recording a remarkable 94.8% return over the period of 2020–2021, ranking as the second-best performance in the history of the Russell 2000 index and following one of the worst quarters since its inception in 1984 (with a −30.6% return during the first quarter of 2020), US small-caps continue to capture the attention of global market participants. And for good reason, US small-caps, often regarded as a barometer of the US economy, are poised to benefit from a potential post-pandemic resurgence. Table 1 provides a concise overview of small-cap market cycles in the United States throughout the 20th century.

The theoretical groundwork laid in the preceding discussions forms the foundation for the current study on small-cap cycles within the Indian context. Additionally, this study conducts a detailed comparison of the Indian small-cap cycle with the US market, a facet explored comprehensively in fourth section of the present study.

## Data and methodology

### Data

Several factors can impact the daily performance of the Nifty Small-Cap 100 (NIFSC100) index. To ensure robust estimates, this study relies on the NIFSC100 as a representative measure of Indian small-cap stocks' collective performance rather than focusing on individual stocks. This approach aligns with the methodology used by Chen (2020), who employed Standard & Poor's 500 Index Prices as a dependent variable. In this study, we have developed an Indian-equivalent model. The factors under consideration are categorised into seven primary groups:

i. NIFSC100R in the current day and the three preceding days.
ii. The relative difference in the percentage of NIFSC100R (RDP5).
iii. Ten-day exponential moving averages (EMA10R) of the NIFSC100R.
iv. Bond yield, specifically the 6-month yield (6MBY).
v. Term spread (TS), representing the excess of 6MBY over the 3-month bond yield.
vi. The relative change in the exchange rate of US Dollars (RUSDINR).
vii. Crude oil fluctuations (RCO) as both a financial and economic indicator and the returns of the RUSSELL 2000, which serves as a benchmark for its Indian counterpart.

Our dataset comprises daily indexed returns of the Nifty Small-Cap 100 (NIFSC100R) from 21 April 2011 to 23 March 2022, encompassing 2056 trading days. Earlier data was not included in the analysis due to the unavailability of data for many of the independent variables. Data corresponding to the other seven factors are also provided in Table 2 for reference.

### Methodology

For our analysis, we employ a multiple linear regression model, with returns serving as the dependent variable. The independent variables, as outlined in Table 2, include RDP5, EMA10R, 6MBY, TS, RUSDINR, RRUSSELL, and RCO. This relationship is represented by Equation (1):

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n + error \quad (1)$$

where y denotes the index returns (NIFSC100R), $\beta_0$ represents the constant term, and $x_1 \ldots x_n$ correspond to the various independent variables listed in Table 2.

**Table 2** Description of variables.

| Variables | Description | Source | Calculation |
|---|---|---|---|
| NIFSC100R | Indexed returns cumulated daily of the Nifty small-cap 100 | CMIE Prowess | p(t)/p(0) |
| RDP5 | The 5-day relative difference in percentage of NIFSC100 | CMIE Prowess | p(t)−p(t−5)/p(t−5) |
| EMA10R | The 10-day exponential moving average of the NIFSC100 price | CMIE Prowess | p(t) (2/(10+1)) + EMA10(t−1) (1−2/(10+1)) |
| 6MBY | 6-month bond yield in India | www.investing.com | (As given) |
| TS | Excess of 6-month bond yield over 3 months bond yield | www.investing.com | TS = 6MBY−3MBY |
| RUSDINR | Relative change in exchange rate between USD and INR | www.yahoofinance.in | USDINR(t)/USDINR(t−1) |
| RRUSSELL | Daily Returns of the Russell 2000 index | www.yahoofinance.in | p(t)/p(t−1) |
| RCO | Relative Change in International Crude Oil Prices | www.investing.com | Crude Oil(t)/Crude Oil(t−1) |

## Results and discussions

### Preliminary analysis

Tables 3 and 4 present descriptive statistics and correlation estimates for the variables under consideration. Notably, RDP5 shows a high standard deviation, whereas the remaining study variables have values less than 1. All the study variables exhibit high kurtosis values. Additionally, 6MBY, TS, and RCO display high skewness values. Notably, the pair EMA10R and RDP5 demonstrate a strong correlation with a coefficient of 0.9083, as they represent the RDP5 and the EMA10R of the NIFSC100 price.

### Regression analysis

To assess the potential impact of all the independent variables on the average NIFSC100R, an ordinary least squares (OLS) regression is employed. Table 5 displays the estimates derived from the OLS regression. Notably, only two variables, RDP5 and EMA10R, exhibit statistical significance at the 1% level. The regression results indicate that among the macroeconomic variables, TS is statistically significant but only at the higher threshold of the 15% level. Furthermore, the overall loading of the TS factor is also low, with a value of 0.0017. It is worth noting that the standard error (0.0108) and intercept value (−0.0002) of the regression are significantly lower than unity.

## Findings and discussions

The correlation estimates, as presented in Table 4, indicate that the daily average NIFSC100R exhibits weak relationships with all the macroeconomic variables used in this study, as evidenced by the low correlation coefficient values. Turning to the regression estimates (Table 5), we observe that the coefficients for RDP5 and EMA10R are statistically significant at the 1% level. RDP5 exerts a marginally negative impact (−0.0008) on the daily average NIFSC100R, while EMA10R has a substantial direct impact (1.9959) on these returns. This suggests that investors may potentially benefit from investing in the NIFSC100 index by implementing an appropriate exponential moving average strategy based on relative percentage differences.

Furthermore, the OLS estimates reveal that the 6MBY in India does not have a statistically significant impact on explaining the daily average NIFSC100R index. In contrast, the findings suggest that the TS, denoting the percentage change in the spread between the 6MBY and 3-month bond yield, could boost the daily NIFSC100R index by 0.17 points per percentage return. TS exhibits a relatively weak positive impact (0.0017 at the 15% level) on the daily NIFSC100R index, indicating that TS could be one of the key macroeconomic factors influencing these returns. These findings align with previous research by Pal and Garg (2019) highlighting the sensitivity of the NIFSC100 index's daily average returns to monetary and macroeconomic policies.

**Table 3** Descriptive statistics.

| | NIFSC100R | RDP5 | EMA10R | 6MBY | TS | RUSDINR | RRUSSELL | RCO |
|---|---|---|---|---|---|---|---|---|
| Mean | 0.0005 | 0.2444 | 0.0004 | −0.0002 | 0.0756 | 0.0002 | 0.0004 | −0.0012 |
| Std. error | 0.0003 | 0.0675 | 0.0001 | 0.0001 | 0.0036 | 0.0001 | 0.0003 | 0.0013 |
| Median | 0.0020 | 0.5191 | 0.0011 | 0.0000 | 0.0900 | 0.0000 | 0.0009 | 0.0007 |
| Std. dev. | 0.0133 | 3.5125 | 0.0052 | 0.0050 | 0.1895 | 0.0045 | 0.0142 | 0.0691 |
| Variance | 0.0002 | 12.3375 | 0.0000 | 0.0000 | 0.0359 | 0.0000 | 0.0002 | 0.0048 |
| Kurtosis | 7.6405 | 3.8704 | 7.6389 | 123.8647 | 36.3764 | 7.3522 | 10.9380 | 1461.2494 |
| Skewness | −1.2174 | −0.7601 | −1.3773 | 3.8337 | -3.7833 | 0.3490 | −0.7082 | −34.2449 |
| Range | 0.1982 | 41.3532 | 0.0678 | 0.1630 | 3.1400 | 0.0703 | 0.2366 | 3.4363 |
| Minimum | −0.1319 | −23.6767 | −0.0448 | −0.0623 | −2.2000 | -0.0327 | −0.1427 | −3.0597 |
| Maximum | 0.0662 | 17.6765 | 0.0230 | 0.1007 | 0.9400 | 0.0376 | 0.0939 | 0.3766 |
| Sum | 1.2264 | 661.2157 | 1.0122 | -0.4763 | 204.5990 | 0.5206 | 1.2099 | −3.1872 |
| Count | 2706 | 2706 | 2706 | 2706 | 2706 | 2706 | 2706 | 2706 |

**Table 4** Correlation matrix.

| | NIFSC100R | RDP5 | EMA10R | 6MBY | TS | RUSDINR | RRUSSELL | RCO |
|---|---|---|---|---|---|---|---|---|
| NIFSC100R | 1 | | | | | | | |
| RDP5 | 0.4888 | 1 | | | | | | |
| EMA10R | 0.5793 | 0.9083 | 1 | | | | | |
| 6MBY | 0.0310 | 0.0330 | 0.0348 | 1 | | | | |
| TS | −0.0306 | −0.0555 | −0.0827 | 0.0427 | 1 | | | |
| RUSDINR | −0.0258 | −0.0130 | −0.0231 | −0.0140 | 0.0654 | 1 | | |
| RRUSSELL | 0.0549 | 0.0581 | 0.0630 | 0.0002 | −0.0356 | 0.0138 | 1 | |
| RCO | 0.0091 | −0.0030 | −0.0089 | −0.0604 | −0.0677 | −0.0245 | 0.0188 | 1 |

Additionally, the OLS estimates indicate that the daily returns of the Russell 2000 index (RRUSSELL), the relative change in international crude oil prices (RCO), and the relative change in the exchange rate between USD and INR (RUSDINR) do not exert a statistically significant impact on the daily NIFSC100R index. One plausible explanation may be that many firms constituting the NIFSC100 index primarily operate in the domestic market, particularly in service sectors such as finance and IT. Consequently, small-cap companies might be less susceptible to market volatility (Khanra & Dhir, 2017), with idiosyncratic volatility factors playing a more prominent role in elucidating the average returns of firms listed in the NIFSC100 index.

## Comparison of small-cap market cycles in India and the US

To compare small-cap market cycles in India and the United States, this study employs the NIFSC100 and Russell 2000 indices as proxies. Figure 3 displays the daily index movements of the NIFSC100 and Russell 2000 between 4 May 2011 and 22 March 2022.

Please refer to the secondary axis of Figure 3 for the Russell 2000 index. From 2011 until the end of 2012, both the NIFSC100 and Russell 2000 indices displayed weakness. Subsequently, the Russell 2000 index in the United States experienced a sharp rally. One possible reason for this could be the significant influence of economic cycles and technological developments on small-cap stocks.

**Table 5** Regression estimates.

| | Coefficients | Std. error | *P*-value |
|---|---|---|---|
| Intercept | −0.0002 | 0.0002 | 0.3488 |
| RDP5 | −0.0008 | 0.0001 | 0.0000* |
| EMA10R | 1.9959 | 0.0962 | 0.0000* |
| 6MBY | 0.0292 | 0.0416 | 0.4832 |
| TS | 0.0017 | 0.0011 | 0.1323 |
| RUSDINR | −0.0356 | 0.0468 | 0.4476 |
| RRUSSELL | 0.0181 | 0.0147 | 0.2189 |
| RCO | 0.0033 | 0.0030 | 0.2790 |
| Multiple R | 0.5873 | | |
| R square | 0.3450 | | |
| Adjusted R square | 0.3433 | | |
| Std. error | 0.0108 | | |

In contrast, India's NIFSC100 index began to surge from 2014 until January 2018, followed by a continuous decline until March 2020. This variation could be attributed to new governmental policies and robust economic factors. The NIFSC100 index in India witnessed a sharp decline in the last week of February 2020, continuing until the end of March 2020, coinciding with global concerns related to the COVID-19 lockdown. Thereafter, a substantial rally was observed in the NIFSC100 index.

On the other hand, the Russell 2000 index in the United States experienced a sharp decline between 20 April 2020 and 19 May 2020, which corresponds to the period following the imposition of COVID-19 lockdown measures in the United States. Subsequently, it began to rise again.

The above discussion highlights a generally similar pattern of movement between the two indices, namely the NIFSC100 and Russell 2000. However, it is important to note that the macroeconomic factors influencing small-cap cycles in India and the United States may differ.

## Conclusion

The initial premise of this study is to conduct a comprehensive examination of the Indian small-cap cycle, spanning from April 2011 to March 2022, and its implications for investment decision-making. The study utilised OLS regression to identify the key factors influencing the average NIFSC100R. OLS estimates suggest that investors can benefit from investing in the NIFSC100 index by implementing an appropriate exponential moving average (EMA10R) strategy. The results of the study also emphasise that among the macroeconomic factors, the 'TS' can influence NIFSC100R. However, the daily RRUSSELL do not have a statistically significant impact on NIFSC100R, suggesting the possibility of portfolio diversification by investing in both countries' small-cap indices.

Similarly, the study finds that the relative change in international crude oil prices (RCO) and the relative change in the exchange rate between USD and INR (RUSDINR) do not significantly impact NIFSC100R. This outcome may be attributed to the fact that most companies representing the NIFSC100 index are service-oriented (finance, IT, and others) and primarily operate in the domestic market. Additionally, individual small-cap companies differ in terms of their economic and technological development cycles.

Subsequently, the study plotted a graph to compare the daily index movement of the NIFSC100 and Russell 2000

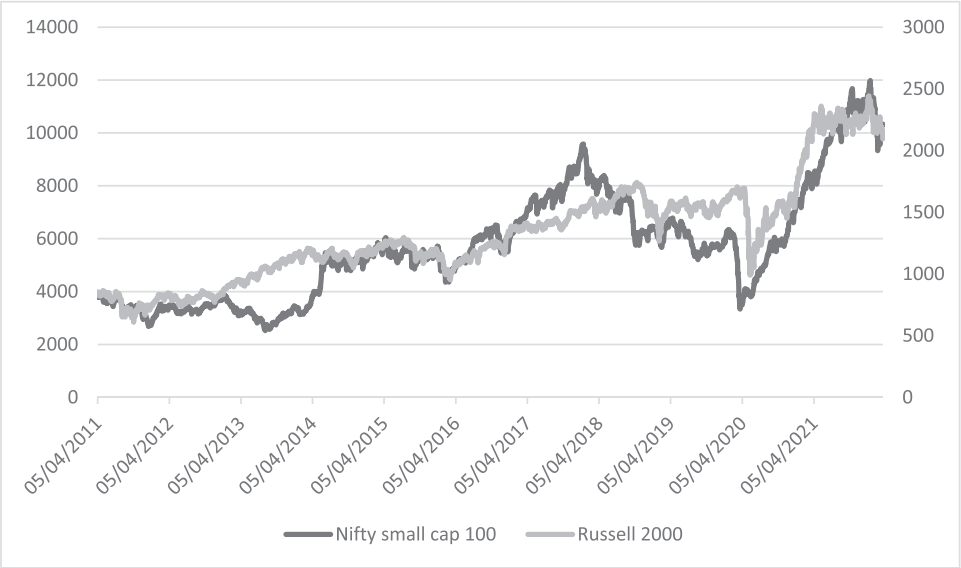



**Figure 3** The movement of the Nifty small-cap 100 and Russell 2000 indices between 4 May 2011 and 22 March 2022.

between 5 April 2011 and 22 March 2022. The graph reveals that while the small-cap cycles in India and the United States exhibit overall similar movement patterns, the macroeconomic factors driving these cycles differ. Interestingly, it is observed that in India, the fear of a COVID-19 lockdown among investors influenced the NIFSC100 index even before the official implementation of the lockdown. A similar movement is also observed in the Russell 2000 index after the COVID-19 lockdown in the United States. This episode underscores the significant influence of Indian government declarations on the movement of the NIFSC100 index.

In terms of policy implications, the findings of this study underscore the importance of considering the small-cap cycle when making investment decisions in Indian small-caps. Individual Indian small-cap firms vary in terms of their economic and technological development cycles, which can directly impact the small-cap cycle. When evaluating the performance of Indian small-cap stocks, the exponential moving average strategy may be preferable over the 'relative difference in percentage'. The ongoing trends in both Indian and US small-cap cycles suggest that investors may benefit from including small-caps in their investment portfolios to enhance overall liquidity. Moreover, investors looking to diversify their international portfolios can consider investing in both Indian and US small-cap stocks (Maiti, 2021). Lastly, investors exclusively interested in Indian small-caps should conduct thorough individual stock analysis to mitigate potential substantial losses.

Future studies could explore the delayed impact (lag) of macroeconomic variables on small-cap indices using lower-frequency and longer-term data. Additionally, an industry-specific analysis of small-cap stock performance in alignment with business cycles could provide deeper insights. Furthermore, since small-cap stocks are highly influenced by market sentiment, future research could investigate the relationship between small-cap performance and market sentiment.

## Declaration of competing interest

Authors have no conflict of interest to declare.

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## Data availability statement

The data supporting this study's findings are collected from multiple websites. It is also available from the corresponding author upon reasonable request.

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