Securities Market Report Card (SMRC) explanatory notes

Finance Research Group
IGIDR

May 31, 2019

Contents

1 SMRC coverage

Table 1 SMRC coverage and measures

Market	Coverage	Measures
Equity spot	Size: all stocks listed on NSE	ADTV, Top 100 stocks share of ADTV, Average trade size Efficiency: VR Volatility: Range, σ returns
Single stock derivatives	Top 50 liquid instruments in the single stock derivatives segment at NSE	Size: ADTV for Futures, Options and the Cash market for these instruments, Max OI for futures and options Efficiency: VR, Basis, Basis risk, Negative basis proportion for futures Volatility: Range, σ returns for futures
Index derivatives	Nifty	Size: ADTV for Nifty Futures, Nifty Options and for the Cash market for 50 stocks comprising the Nifty, Max OI for Nifty Futures and Nifty Options Efficiency: VR, Basis, Basis risk, Negative basis proportion for Nifty futures Volatility: Range, σ returns for Nifty futures
Currency	USD-INR derivatives across NSE, BSE and MCX, All INR-FX derivatives in the OTC market	Size: ADTV for OTC Spot market, OTC INR derivatives market, USD-INR futures, Max OI for USD-INR futures and USD-INR options. Efficiency: VR, Basis, Basis risk, Negative basis proportion for USD-INR futures Volatility: Range, σ returns For USD-INR futures
Agri commodity derivatives	Size: Soy bean, Soy oil, Guar seed, Guar gum, Turmeric futures	Size: ADTV, Max OI for for selected agri commodity futures Efficiency: VR, Basis, Basis risk, Negative basis proportion for selected agri commodity futures Volatility: Range, σ returns for selected agri commodity futures
Non agri commodity derivatives	Size: Gold, Silver, Lead, Copper, Zinc, Aluminium, Natural Gas, Crude Oil futures	Size: ADTV, Max OI for selected non-agri commodity futures Efficiency: VR, Basis, Basis risk, Negative basis proportion for selected non-agri commodity futures Volatility: Range, σ returns for selected non-agri commodity futures

2 SMRC: market quality measures

Market quality measures capture the financial health of the market. They enable: (1) market participants to make investment decisions, and (2) regulators and policy makers to better fulfill their market development objective by informing them of the various dimensions of market quality.

In our report card, we present three dimensions of market quality:

1. Size and liquidity
2. Efficiency, and
3. Volatility

2.1 Size and liquidity

Liquidity in a market is generally perceived as desirable because of the multiple benefits it offers, including improved allocation and information efficiency. Market participants perceive a financial asset as liquid, if they can quickly sell large amounts of the asset without adversely affecting its price. Liquid financial assets are thus characterized by having small transaction costs; easy trading and timely settlement; and large trades having only limited impact on the market price.

The SMRC uses two measures of liquidity: **Average Daily Traded Value (ADTV)** and **Max Open Interest (OI)**.

2.1.1 ADTV

This measure is calculated as a certain value of securities traded daily. It captures the depth dimension of liquidity. A high value of ADTV is indicative of high liquidity.

For computing ADTV, daily traded value for all securities traded in a day is computed. This is averaged across the reporting period. For instance, for a monthly ADTV computation, the averaging of daily traded value is done for the number of trading days that fall in that month.

Inputs

Daily traded values are available directly from the exchange Bhavcopy.

Reporting unit

ADTV in Rs. billion

2.1.2 Maximum OI

OI gives the number or value of derivatives contracts that are not yet settled. Participants have to set aside margin capital for all their open positions.

Inputs

Daily OI is available as units of underlying directly from the exchange Bhavcopy. This is converted to value by adjusting it for contract specifications and them multiplying the adjusted value with the closing price. The maximum OI within a month is reported as the monthly number.

Reporting unit

Maximum OI in Rs. billion

2.2 Efficiency

Efficiency of a market implies that securities prices fully reflect all available information (**Fama1970**). This would imply that in such (efficient) markets, future price changes are unpredictable, and thus, no investor can make extraordinary gains. It is now well-established that securities prices take some time to react to new information. The question however is, how long does it take for the securities prices to react to the new information. The more is the time taken, higher is the returns predictability (persistence), lower is the efficiency of the market.

The SMRC uses four measures of efficiency: **basis**, **basis risk**, **proportion of negative basis values**, and **variance ratio (VR)**.

2.2.1 Basis

Basis (as a percentage of spot price) is defined as

$$\text{Basis} = z_t = \frac{(F_t - S_t \times e^{(r-d)*(T-t)}) \times 100}{S_t}$$

Here, F_t is the price of futures contract at time t, S_t is the spot price at time t, r is the risk free interest rate for lending and borrowing, d denotes dividend rate[1], T is the date of expiry of the futures contract and $(T - t)$ captures number of days to expiry.

In the ideal notion of efficient markets without any transactions costs, the basis ought to be zero (**Roll2007**). But in the real world of markets with transactions costs, the basis will not be zero. These transactions costs can be liquidity costs of the market, short selling constraints, and transactions taxes (**Cornell1983**; **Modest1983**; **Brenner1990**). The magnitude of these costs will determine how much the basis will deviate from zero. For example, higher transaction taxes will lead to wider deviations of the basis from zero.

Inputs

Daily closing prices of the spot and the near month futures contract are required to compute the basis. The number of days to expiry is computed as the difference between the current date and the expiry date. The rollover to the next expiration occurs seven calendar days prior to the expiry of the nearby future. Lastly, the one month MIBOR rate is used as the risk-free rate.

Basis is computed at a daily level for each security. The daily average basis is computed as the TV weighted average of the basis of all securities. This is then averaged across the number of trading days in the month.

Reporting unit

[1] We assume d to be zero.

Average Basis for the month in %.

2.2.2 Basis risk

The volatility in basis over a period of time captures what is called the *basis risk*. Here, volatility is calculated as the standard deviation of basis over a month, and can be written as follows:

$$\sigma_{\text{Basis}} = \sqrt{\frac{1}{n-1}\Sigma_{t=1}^{n}(z_t - \overline{z})^2}$$

Here, z_t indicates the basis of a security at time period t, $\overline{z}$ is the average basis in a month, and n is the number of trading days in a given month.

The larger the value of the basis risk, the lower the efficiency of the markets.

Inputs

It requires the basis series of a security which is computed as mentioned in Section **??**. The σ_{Basis} is computed over the one month period and is reported as an annualised value.

Basis risk is computed at a monthly level for each security. The monthly average basis risk is computed as the TV weighted average of the monthly basis risk of all securities.

2.2.3 Proportion of negative basis values

Proportion of negative basis values is measured as the ratio of the number of observations with negative basis to the total number of basis observations over a period of time. This can be written as:

$$\text{Obs. with NegBasis}(\%) = \frac{n_1 \times 100}{n}$$

where, n and n_1 are, respectively, the number of observations of basis over a defined period and the number of observations less than zero in that period. We calculate Obs. with NegBasis for each month.

This measure captures the impact of short selling restrictions on the efficiency of the spot and the futures markets. Short selling restrictions on the spot market will result in persistence of negative basis over longer periods of time. This is because negative deviations in the basis will be difficult to correct by the force of arbitrage. A high value of this measure is indicative of adverse impact on market efficiency due to such restrictions.

Inputs

It requires the basis series of a security which is computed as mentioned in Section **??**.

Proportion of negative basis is computed at a monthly level for each security. The monthly average negative basis proportion is computed as the TV weighted average of the monthly average negative basis proportion of all securities.

Reporting unit

As a % of total number of basis observations.

2.2.4 Variance Ratio

VR is defined as the ratio of $1/k$ times the variance of k-period return to that of one period return (**Lo1988**) This can be written as:

$$VR(k) = \frac{Var[r_t(k)]}{k \cdot Var[r_t]}$$

where, r_t is the one period continuously compounded return, and $r_t(k) = r_t + r_{t-1} \ldots + r_{t-k}$. k indicates the lag at which the Vr is to be computed.

It is based on the property that, in an efficient market, prices should approximate a random walk. This implies that the variance of k-period returns (increments) is k times the variance of one-period return. Thus, if the markets are efficient the value of VR will not significantly differ from 1.

Inputs

Daily closing prices are required to compute returns, which is further used to calculate the VR.

VR is computed daily at $k = 2$ for each security. Then the daily VR is computed as the TV weighted average of the individual security VRs. The monthly VR is computed as the average of the daily VRs.

2.3 Volatility

Volatility plays a key role in investment, option pricing, financial regulation and risk management. Market participants associate higher volatility with greater risk and alter their decisions with changes in volatility. Given its importance, volatility is one of the key indicators computed to measure the financial health of the market.

This report card provides two measures of historical volatility, namely **standard deviation** and **range**. Standard deviation is the traditional estimator of volatility computed from changes in daily closing prices. The range on the other hand is computed from extreme prices and contains more information about the price process than returns sampled at regular intervals. It is a more efficient estimator of volatility and less prone to measurement errors (**Park80**, **GermanKlass80** and **Aletal02**).

2.3.1 Standard deviation

This measure is computed using daily price changes of the underlying asset. It is computed at the end of each quarter and is given by:

$$\sigma_{returns} = \sqrt{\frac{1}{(n-1)} \Sigma_{t=1}^{n} (r_t - \bar{r})^2} * \sqrt{252} * 100$$

Here, r_t refers to returns which is computed as the changes in the log prices from $t+1$ to t. $\bar{r}$ is the average return and n is the no. of trading days for the given quarter.

Inputs

Daily closing prices are used to compute the annualised standard deviation of returns for each security for the month. The monthly σ is computed as the TV weighted average of the σ of each security.

2.3.2 Range

Range **Park80** is computed for a given quarter using daily high and low prices and is given by:

$$\text{Range} = \sqrt{\frac{1}{n \times 4 \log 2} (logH_t - logL_t)^2} * \sqrt{252} * 100$$

Here, H_t and L_t refer to the high and low prices for $t = \{1 \dots n\}$, and n is the no. of trading days for the given quarter.

Inputs

Daily high and low prices are used to estimate the daily range for each security. The daily price range is computed as the TV weighted average of the prince range for all securities. This is then averaged for the month to compute the price range for the month.