COMPUTATIONAL FINANCE

COMMODITY REPORT

BARLEY

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Overview

Origin: The exact origin of barley is debatable, possibly originating in Egypt, Ethiopia, the Near East or Tibet. However, it is fairly certain that barley was among the earliest cultivated grains, around the same time as domestication of wheat. Barley was grown in the Middle East prior to 10,000 BC but barley's cultivation in China and India probably occurred later. Barley was grown on the Korean Peninsula by 1500-850 BC along with millet and wheat.

Barley is a cereal grain derived from the annual grass Hordeum vulgare. This widely adaptable crop is popular in temperate areas where it is grown as a summer crop and tropical areas where it is sown as a winter crop. In India, it is grown in the rabi season.

Uses of Barley

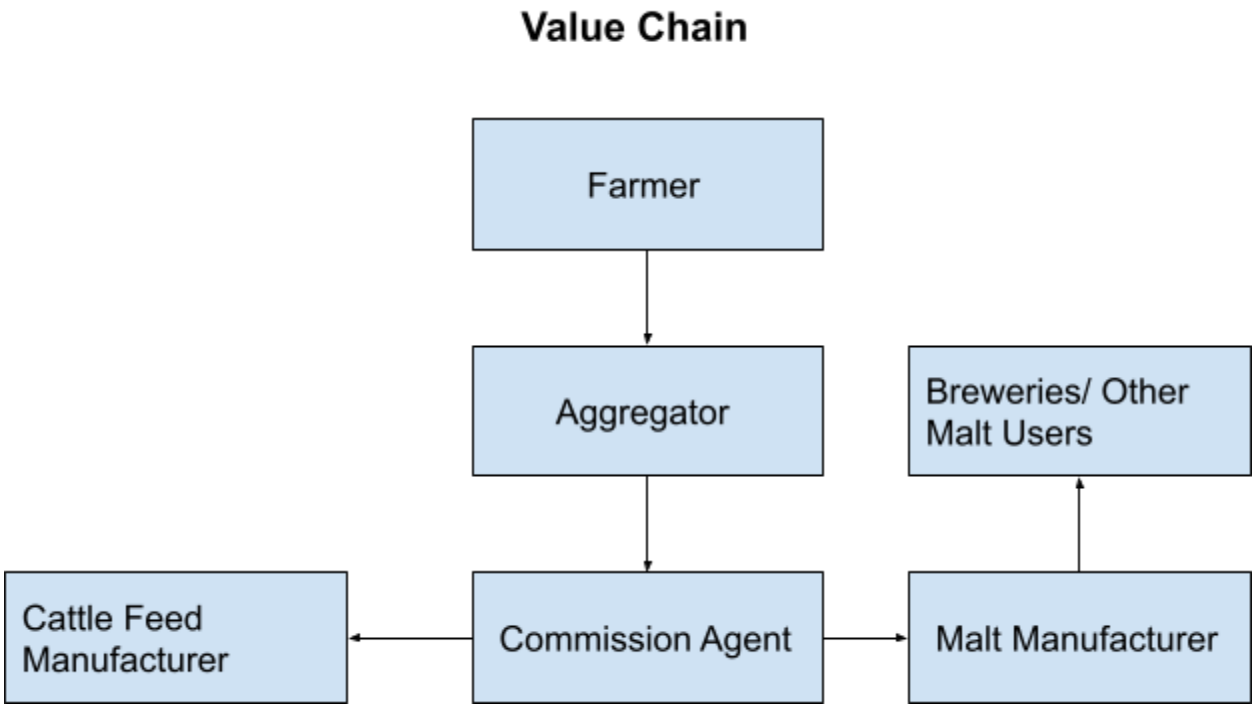
Barley is a rich source of nutrients like protein, B vitamins, niacin, dietary minerals, and dietary fiber. The grain is a particularly good source of manganese and phosphorus. Raw barley is 78% carbohydrate, 10% protein, 10% water, and 1% fat. De-hulled barley is used to prepare a number of food items like flour, flakes, grits, etc. Barley in these forms can be used to make porridge, gruel, and a wide variety of other dishes in Central and Eastern Europe. In Saudi Arabia, people consume barley soup during Ramadan. Several other recipes in the Middle East like the murri, kashk, and kashkak use barley.

Research suggests that barley consumption is beneficial in several ways. It reduces cholesterol levels in the blood, improves the regulation of blood sugar, and has other health benefits too. However, since barley contains gluten, it is not recommended for people with gluten-related disorders. Barley is also extensively used in beer and whiskey production. Non-alcoholic beverages like barley water and barley roasted tea are also produced from barley. In the US, half of the barley produced is used to feed livestock. Barley is also the principal feed grain in Canada, Europe, and the northern US. Barley is also used as an algicide in England where barley straw is placed in mesh bags and floated in fish ponds to curb algal growth in a natural manner.

Seasonality

In India, barley is mostly cultivated as a Rabi crop. Sowing normally takes place between October and December. Harvesting starts from end-March until mid-April in the northern states, whereas in the central and southern states, harvesting takes place from February to May.

Crop Cycle (India)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sowing			Harvesting								

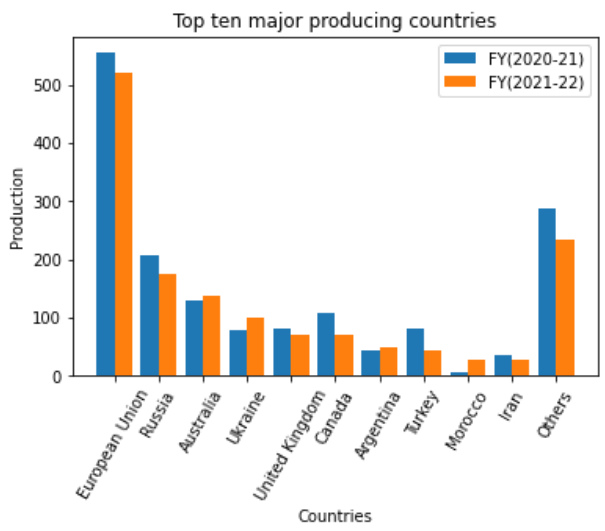


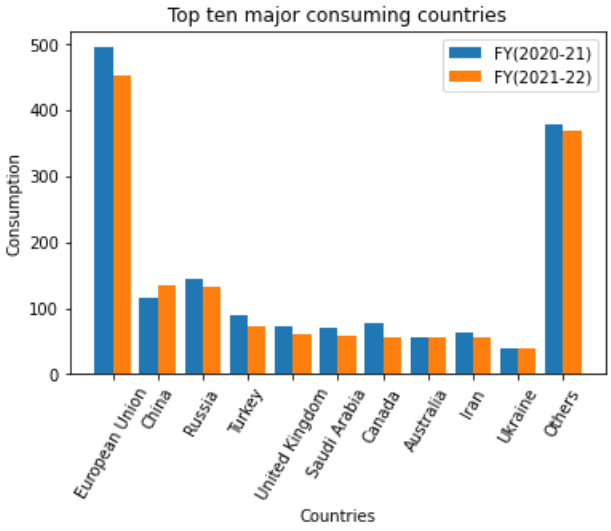
There are 3 important production-distribution/marketing channels. In all these channels, farmers/producers supply commodities to the APMC through village level traders. APMC commission agents in turn supply them to malt manufacturers and thereafter malt barley is supplied to domestic brewers and distillers (channel 1) and larger international brewers and distillers (channel 2). In channel 3 feed end barley is supplied through APMC commission agents to cattle feed manufacturers and then onward to domestic and global retailers.

Market

Global Scenario

The global barley market attained a volume of nearly 145,104 thousand metric tons in 2022, driven by the rapidly growing beer industry. Aided by the technological advancements, the market is expected to witness a growth in the forecast period of 2022-2027, growing at a CAGR of 6.34%. The market is projected to reach a volume of around 216,702 thousand metric tons by 2026. The major drivers of the industry, such as rising disposable incomes, increasing population, growing barley demand in many countries, and rapidly growing beer industry, are expected to aid the market growth. The key market trend guiding the growth of the market includes the increase in consumption of soy and corn in feed and biofuel industries.



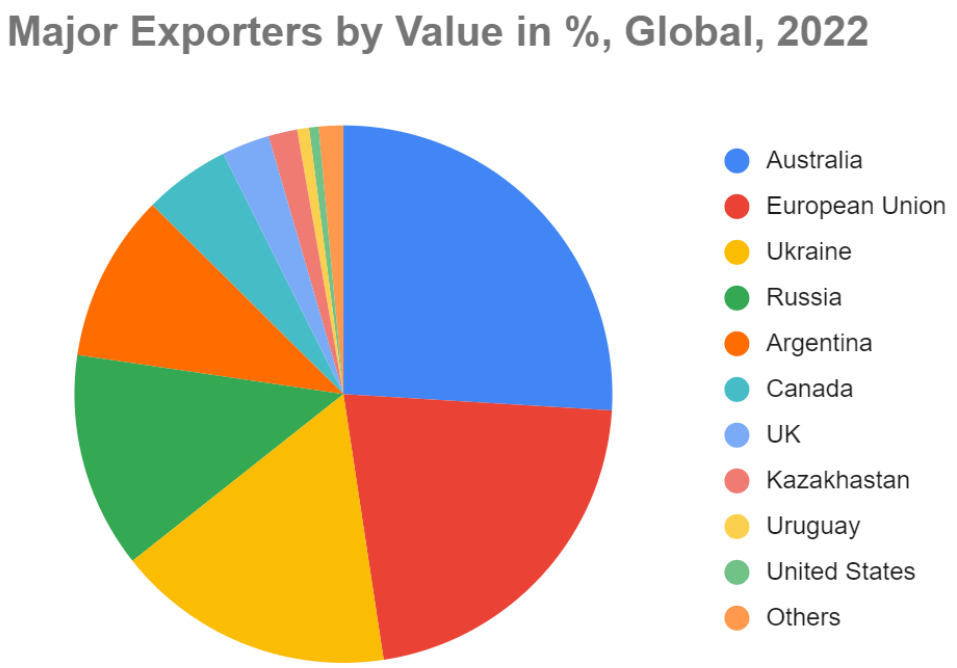


The European Union produces the major portion followed by Russia, Australia and Ukraine. The barley consumption is anticipated to grow at a CAGR of 3.1%, during the forecast period. Europe accounts for the majority of share in the global barley consumption. The major barley consuming countries are China, Saudi Arabia, Canada, and Turkey.

Key Market Trends

Increased Demand has led to Growth in Exports

Rising awareness about the nutritional aspect of consumption of whole grains is one of the major factors driving the global barley market. Besides, the surge in the demand for the inclusion of natural ingredients in snacks is supporting the growth of the barley market. Also, it is preferred for the manufacture of non-alcoholic beverages. These factors are propelling the growth of the barley market across the globe. An uptick in the demand for barley malt for the manufacture of alcoholic beverages is acting as a high-impact driver for the global barley market. This market is also propelled by the heightened demand for different kinds of convenience food products, emerging applications in the F&B industry, clean label trends, and escalating demand for natural ingredients. Thus, these factors have led to increased exports of barley across the globe from countries such as Australia, Ukraine, Russia, and Argentina. Hence, all these aforementioned factors are anticipated to drive the market during the forecast period.



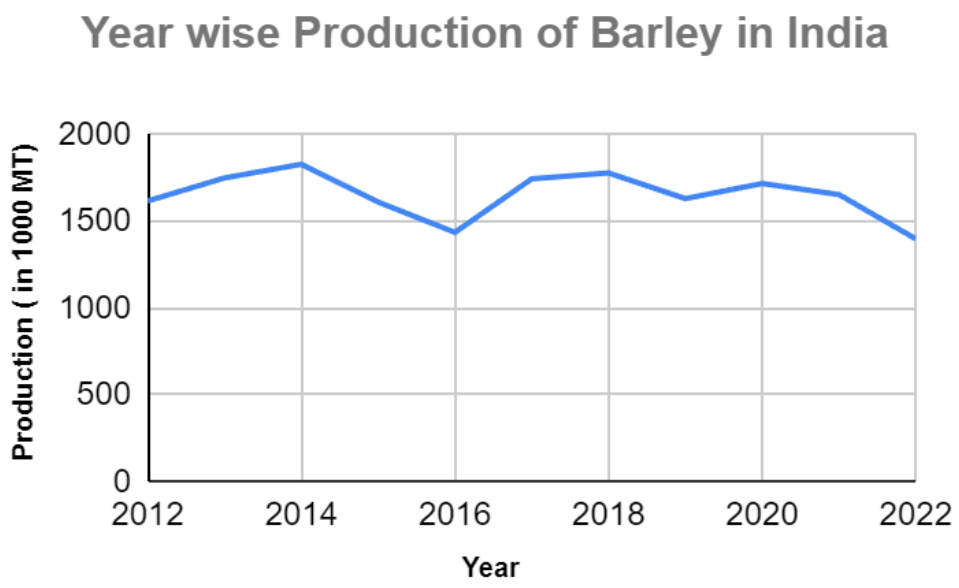
Indian Scenario

In India, barley is one of the most widely cultivated cereal grain crops. This is cultivated as a summer crop in temperature regions and as a winter crop in tropical regions. Barley is a short growing season crop and is drought tolerant. Production of Barley in India is limited to around 13 to 18 Lakh MT a year. Rajasthan and Uttarpradesh are the major producing states. Production of Barley India for the last ten years is presented in the table below:

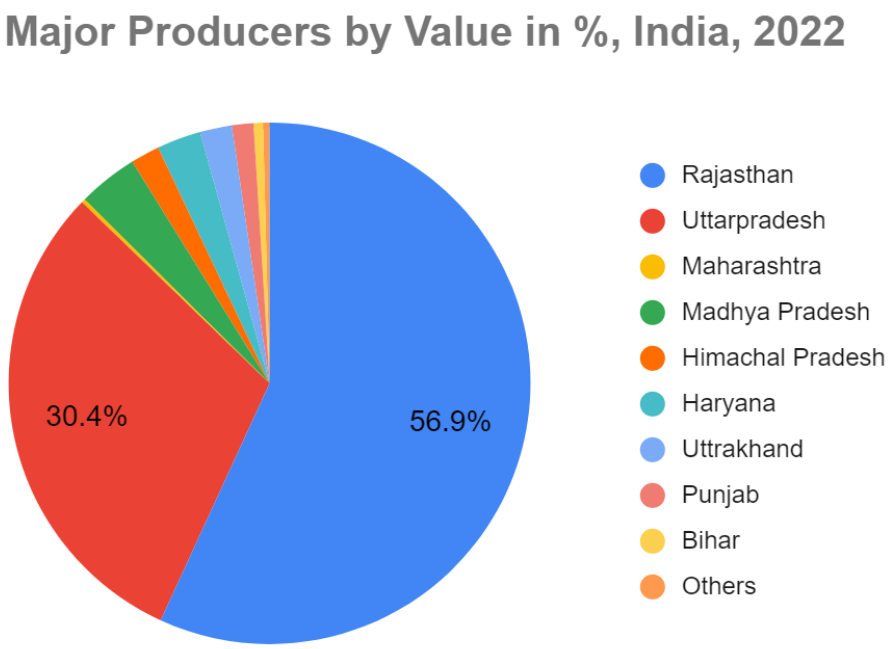
Year wise production of Barley in India

Year	Production (in 1000 MT)	Growth Rate
2012	1619	-2.65%
2013	1752	8.21%
2014	1831	4.51%
2015	1613	-11.91%
2016	1438	-10.85%
2017	1747	21.49%
2018	1781	1.95%
2019	1633	-8.31%
2020	1720	5.33%
2021	1656	-3.72%
2022	1400	-15.46%

The trend shows a mixed result with the production figures fluctuating around 1600 thousand MT since 2012. The reason possibly being the direct competition of barley with Wheat and Mustard in north India. Also good rainfall during 15-16 and 16-17 also boosted production of wheat and mustard and hence overall production of barley is negative in those two years. The negative growth rate in 2019 can be majorly attributed to the coronavirus pandemic.



India's annual production has been stable at around 16 lakh tonnes in recent years. Rajasthan and Uttarpradesh account for the major production of Barley in India touching around 87 %.



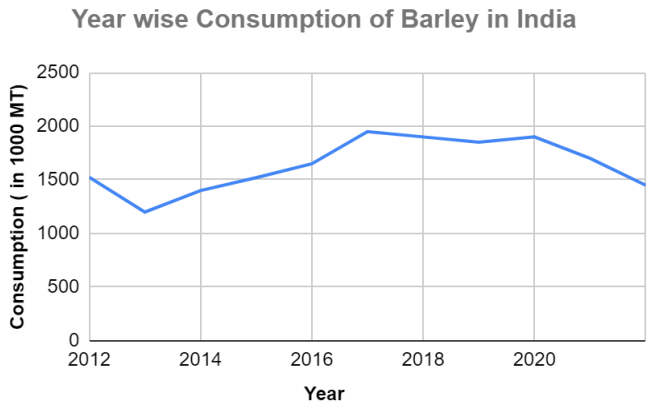
(In Lakh Tonnes)

Top 10 Major Producing States of Barley in India

Rank	State	Previous FY (2020-21)	Current FY (2021-22)
1	Rajasthan	9.79	9.36
2	Uttarpradesh	5.23	4.88
3	Maharashtra	0.04	0.48
4	Madhya Pradesh	0.64	0.48
5	Himachal Pradesh	0.31	0.32
6	Haryana	0.47	0.31
7	Uttrakhand	0.34	0.28
8	Punjab	0.23	0.22
9	Bihar	0.1	0.14
10	UT of Ladakh	0	0.04
	Others	0.07	0.05
	All India	17.22	16.56

Year wise Consumption of Barley in India

Year	Consumption (in 1000 MT)	Growth Rate
2012	1525	-1.61%
2013	1200	-21.31%
2014	1400	16.67%
2015	1520	8.57%
2016	1650	8.55%
2017	1950	18.18%
2018	1900	-2.56%
2019	1850	-2.63%
2020	1900	2.70%
2021	1700	-10.53%
2022	1450	-14.71%



Impact of Geopolitical issues (FY 2021-22)

- **Suez Canal traffic jam**

  The Suez Canal, a critical shipping artery that connects the Mediterranean and Red Seas through Egypt, was blocked after a large cargo ship ran aground while passing through it bringing traffic on the busy trade route to a halt.

  Impact: Supply Chain bottleneck with container shortage and port congestion. Freight rate hike. The congestion of the Suez Canal may delay nearly 7% of seaborne U.S. major grain shipments, according to USDA and vessel data analyzed by Bloomberg. More than 80% of the impacted grain shipments are corn, with close to 60% of it on six vessels headed to China. However, Moderate effects on prices were observed as this Jam was temporary in nature.

- **Russia's Invasion on Ukraine**

  Russian President Vladimir Putin on Feb 24, 2022 informed that he has launched a military operation in Ukraine.

  Impact: Russia's invasion on Ukraine has raised supply concerns for wheat, Barley, corn and edible oil supply in the Global market. Further. It is feared that it may lead to a food crisis on the global scale. Ukraine is the largest source for sunflower oil import in India. Further, Russia and Ukraine are key sources of world wheat products and trade. Prices of edible oils and grains are feared to get impacted from it.

Contracts

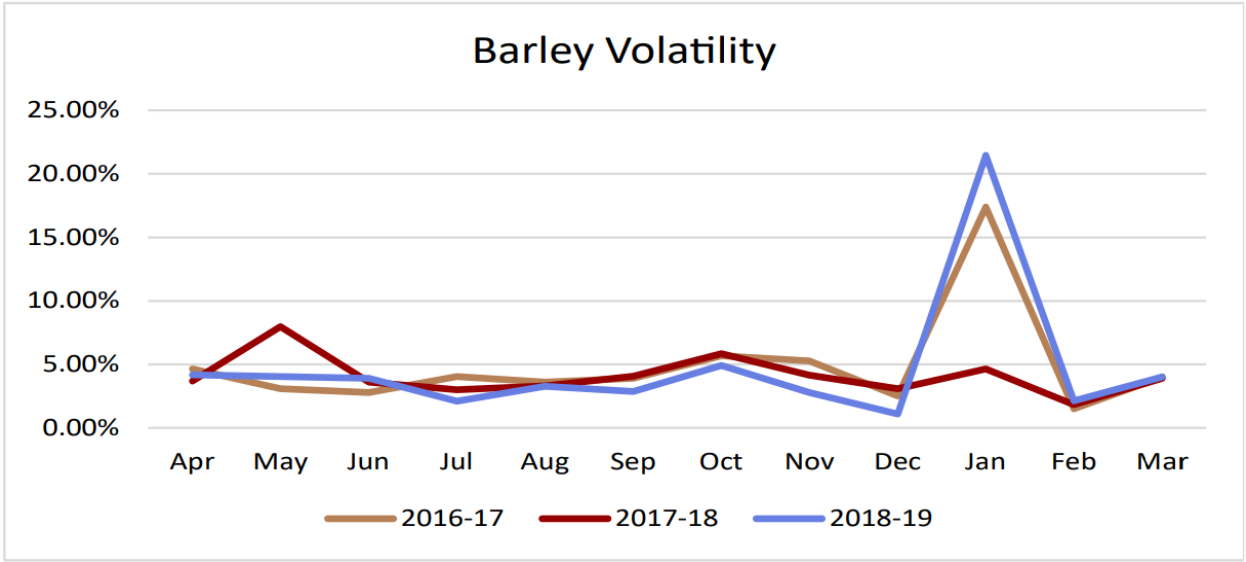
Contract Specification of Barley Futures Contract

Commodity	Ticker Symbol	Basis*	Additional Delivery center*	Delivery Logic
Barley	BARLEYJPR	Jaipur	Sri Ganganagar	Compulsory Delivery

Quotation	GST	Trading and Delivery Unit	Tick Size	Expiry date
Rs. / quintal	Exclusive	10 MT	50 Paisa	20th of the delivery month

Quality Specifications	Moisture	12% Max
	Damaged including Discolored	4% Max
	Weevilled	1% Max
	Foreign Matter	1% Max
	Other food grains	1% Max
	Broken Kernels	4% Max
	TCW	40 gm Basis
	Quality Variation	5% + and -

Barley Futures Monthly Annualized Price Volatility

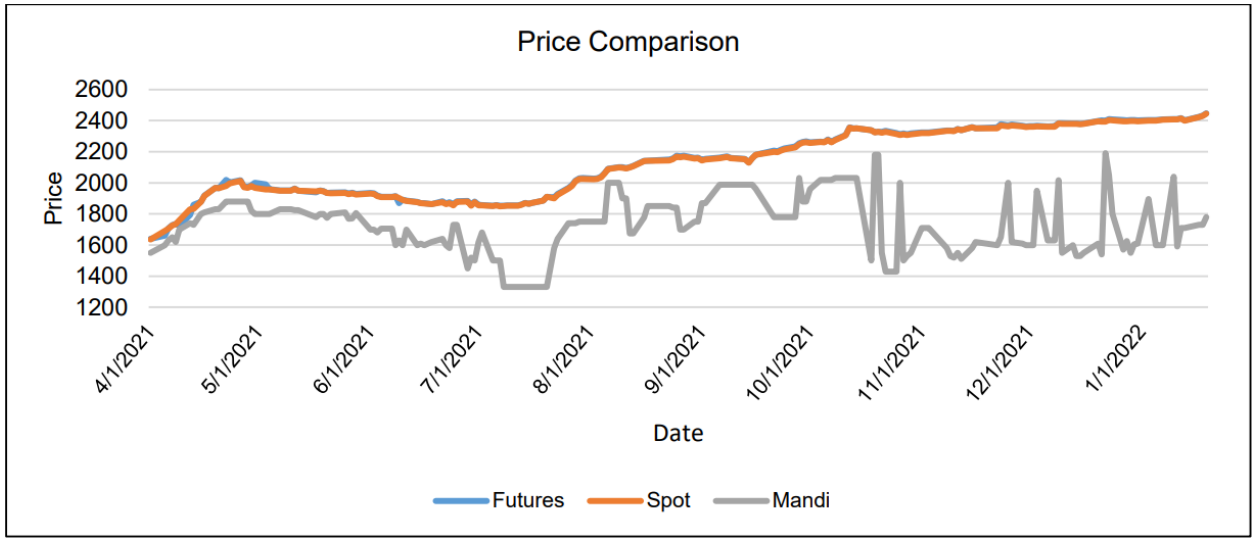


Factors Affecting the Price

- Weather condition
- Government policies on Import and Export
- International Prices
- Carryover stocks
- Price movement in other production and consumption countries

Correlation between exchange futures & domestic spot prices along with ratio of standard deviation

Correlation	0.81
Standard Deviation	1.04



Effect of Policy changes for governing trade in the spot markets (FY 2021-22)

Date	Policy
25 May, 2021	Release of 3rd Advance Estimate of Production: 2020-21 output at 18.2 lakh MT – An increase of 6% y-o-y
11 Aug, 2021	Release of 4th Advance Estimate of Production: 2020-21 output at 16.7 lakh MT – A decline of 3% y-o-y
08 Sept, 2021	Govt. announced MSP for Rabi crops for marketing season 2022-23

Contract Price Modeling Approaches

A futures contract is a legal agreement to buy or sell a particular commodity asset, or security at a predetermined price at a specified time in the future. The buyer of a futures contract is taking on the obligation to buy and receive the underlying asset when the futures contract expires. The seller of the futures contract is taking on the obligation to provide and deliver the underlying asset at the expiration date.

A mathematical model is used to price futures, which takes into account the current spot price, the risk-free rate of return, time to maturity, storage costs, dividends, dividend yields, and convenience yields. Assume that the one-year oil futures contracts are priced at ₹78 per barrel. By entering into this contract, in one year the producer is obligated to deliver one million barrels of oil and is guaranteed to receive ₹78 million. The ₹78 price per barrel is received regardless of where spot market prices are at the time.

Cost of Carry Model

The Cost of Carry Model assumes that markets tend to be perfectly efficient. This means there are no differences in the cash and futures price. This, thereby, eliminates any opportunity for arbitrage – the phenomenon where traders take advantage of price differences in two or more markets.

When there is no opportunity for arbitrage, investors are indifferent to the spot and futures market prices while they trade in the underlying asset. This is because their final earnings are eventually the same.

Market participants who need a certain commodity at the future time t, can either buy it in the spot market today and store it, or buy a futures contract and take delivery when the contract expires. In the former case, the participants will incur storage costs and opportunity costs because they might alternatively have invested the funds used to buy the commodity at the prevailing interest rate. The futures price should thus be equal to the spot price plus interest and storage cost – the so-called cost of carry. It is expressed as:
$F_0 = S_0 + I + W$

F_0 = futures price at t = 0, S_0 = spot price at t = 0, I = interest, W = storage cost

In markets for storable commodities, demand can be met out of current production or inventories to the extent that inventories offer protection against sudden supply disruptions. The holder of an inventory obtains a certain utility from the stock. This utility is the so-called convenience yield.

Due to the convenience yield, the forward price may be below the price defined above. The relationship between the futures price and the spot price – taking the convenience yield into account – is thus,

$F_0 = S_0 + I + W - C$

where C is the convenience yield.

The bottom line of this pricing model is that keeping a position open in the cash market can have benefits or costs. The price of a futures contract basically reflects these costs or benefits to charge or reward you accordingly.

Expectancy Model

The Expectancy Model of futures pricing states that the futures price of an asset is basically what the spot price of the asset is expected to be in the future.

This means, if the overall market sentiment leans towards a higher price for an asset in the future, the futures price of the asset will be positive.

In the exact same way, a rise in bearish sentiments in the market would lead to a fall in the futures price of the asset.

Unlike the Cost of Carry model, this model believes that there is no relationship between the present spot price of the asset and its futures price. What matters is only what the future spot price of the asset is expected to be.

Comments

The theoretical models discussed above are a good starting point to understand the basic structure of the future contracts but one must understand that in the actual market, other variables are also present that influence the future prices.