GLOBAL FINANCIAL MARKET DEVELOPMENTS

AUTHORS

Ali Cem Tezel

David Peisakhov

Estella Zaengle

Evgenia Raevskaya

Partha Sharma

Thomas Petters

WHO WE ARE

We are a group of part time Master's students specialised in Banking, Finance and Analytics at King's College London, with students joining from all corners of the world.

WHY WE DO THIS

Inspired by our diverse community, we created this project in order to join our experience and knowledge and apply it to the formation of a unique perspective on markets. We do so by capturing intriguing stories and combining them with detailed market research and data analysis. In such way we support each other to develop stronger analytical skills and become better investors. We are excited to share our analysis with the Finance community, or with anyone who shares the same passion!

WHAT IT DOES FOR YOU

Our comprehensive analysis spans across multiple crucial domains including the Macro Economy, stocks, bonds, commodities, cryptocurrencies and real estate. Through the in-depth study of these sectors, we aim to offer a holistic view of the financial world which enables our readers to make informed decisions and gain a strong understanding of the complex dynamics at play.

HIGHLIGHTS

Macro Overview

By Ali Cem Tezel

So far in 2024, stock markets held up well despite high interest rates as was the case in previous year. The optimism behind the rally in the stock market is very much related to the expectations for lower interest rates in the second half of the year which is believed to create an ideal environment for risky investments and to boost the valuations of the stocks.

Commodity prices started to rise due to conflicts in the Middle East and WTI Futures rose by more than 7% year-to-date. Precious metals have seen their prices increasing as well since the beginning of 2024. Lower interest rate prospects continue to support safe haven assets besides stocks. Bitcoin has surpassed all other assets in terms of rate of return in 2024 so far.

Figure 1: Retuns by Major Asset Classes

Index	2023	YTD as of 15th May 2024	MTD as of 15th May 2024
DXY	-3,08%	1,97%	-2,00%
SPX	24,70%	11,87%	4,60%
DJIA	13,70%	6,40%	5,10%
Nasdaq	42,12%	12,57%	7,00%
Stoxx 600	12,47%	9,40%	4,03%
NIKKEI 225 INDEX	29,53%	17,26%	2,14%
S&P 500 Bond Index	7,84%	-0,57%	2,20%
WTI Futures	-2,85%	7,83%	-0,03%
Bitcoin	154,00%	57,49%	11,79%
Gold (XAU/USD)	13,49%	15,60%	4,42%
EUR/USD	3,55%	-1,41%	1,87%
USD/JPY	7,57%	9,55%	-2,22%
USD/GBP	-4,98%	0,00%	-1,55%

Source: Investing, S&P

Prominent central banks' transition from quantitative tightening to quantitative easing is not a debate topic anymore. However, the timing of rate cuts will not be simultaneous due to idiosyncratic characteristics of economies. The Bank of England and the European Central Bank are expected to lower their policy rates during summertime (Thanks(!) to slower economic activity), while the Fed will possibly not change rates before the September. Figure 2 shows the market expectations about the timeline of future rate cuts. It is important to emphasize that the same indicator[1] was implying six rate cuts throughout 2024 a few months earlier.

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[1] CME – FedWatch Tool

Figure 2: CME FedWatch Tool - Conditional Meeting Probabilities (Current Range is at 525-550)

As of 15.05.2024	CME FedWatch Tool - Conditional Meeting Probabilities							
Meeting Date	350-375	375-400	400-425	425-450	450-475	475-500	500-525	525-550
12th June '24			0.0%	0.0%	0.0%	0.0%	8.5%	91.5%
31st July '24	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	30.8%	66.9%
18th Sep. '24	0.0%	0.0%	0.0%	0.0%	1.4%	19.4%	52.5%	26.8%
7th Nov. '24	0.0%	0.0%	0.0%	0.5%	8.3%	32.1%	42.6%	16.5%
18th Dec. '24	0.0%	0.0%	0.3%	5.3%	22.8%	38.5%	26.6%	6.4%
29th Jan. '25	0.0%	0.2%	2.6%	13.4%	30.1%	33.0%	17.2%	3.4%
19th Mar. '25	0.1%	1.6%	9.0%	23.2%	31.8%	23.8%	9.1%	1.4%
30th Apr. '25	0.7%	4.7%	15.0%	26.9%	28.4%	17.6%	5.9%	0.8%

Source: CME

Inflation rates diminished in DMs and many of the EMs and lately converged to 2% - considered as target level by many central banks – in the EU and the UK. However Consumer Price Index is expected to ramp up henceforth partly due to basis effect and to inflationary pressures that are associated with rising energy prices in 2024.

Figure 3: Inflation Rates by Country (April 2024 unless stated otherwise)

APRIL 2024	CPI (MOM)	CPI (YOY)	CORE CPI (MOM)	CORE CPI (YOY)
UNITED STATES	0.3%	3.4%	0.3%	3.6%
EU	0.6%	2.4%	0.7%	2.7%
GERMANY	0.5%	2.2%	0,3%	3,0%
UNITED KINGDOM	0.6% (March)	3.2% (March)	0.6% (March)	4.2% (March)
JAPAN	0.2% (March)	1.8% (Tokyo Apr.)	0.6% (Tokyo Apr.)	1.6% (Tokyo Apr.)
CHINA	0.1%	0.3%	-0.6% (March)	0.7%

Source: IMF, Statistisches Bundesamt (destatis), Office for National Statistics, Eurostat, Bureau of Labor Statistics, Trading Economics.

Tokyo Inflation in Japan was below 2% in April which is far from what the Bank of Japan seeks before making strides in tightening policy. BoJ recently abandoned YCC – the yield curve control strategy that was implemented back in 2016. However, the yields on Japanese Government Bonds (JGB) are still significantly lower than those in DMS which is the one of the reasons why the Yen dropped past 160 against the USD recently which is the weakest level since 1990.

U.S. 10-Year Treasury yield decreased by more than 35 basis point in the first half of May, a move that is most likely a result of the latest headline inflation readings which have beaten the monthly expectations and matched annual expectations. The headline CPI slowed to 3.4% in April from 3.5% in March. To put it simply, inflation in the U.S. stays way above the central bank target which is one of the reasons why Fed will likely to postpone the timing of initial rate cut from June to September (all else equal.) The initial battles with the inflation may be over but the "last mile" – the term that was brought up by many – is yet to be conquered. Accordingly the Fed lingers on high rates for the moment.

Figure 4: Government Bond Yields

(as of 16th May, 2024)

Bond	Yield (%)	1 Month Change (bps)	1 Year Change (bps)
US3M	5.40%	3	24
US2Y	4.77%	-23	68
US5Y	4.37%	-33	85
US10Y	4.35%	-31	82
US30Y	4.50%	-27	64
US10Y TIPS	2.05%	-21	71
GER2Y BUND	2.91%	-2	27
GER10Y BUND	2.44%	-4	9
UK2Y GILT	4.25%	-21	45
UK10Y GILT	4.07%	-23	25
JGB10Y	0.92%	6	53

Figure 5: Country Interest Rate Spreads

(as of 16th May, 2024)

COMPARISON	Spread (bps)	1 Month Change (bps)	1 Year Change (bps)
US2Y/US10Y	40.5	6	-19
GER2Y/GER10Y	45	-2	10
GER10Y/US10Y	-191.5	20.6	-68.3
UK10Y/US10Y	-30	1	-57
GRE10Y/GER10Y	102	3.4	-61.7
JAPAN10Y/US10Y	-344.6	26.6	-24
UK10Y/GER10Y	161.5	-19.8	11.2
FRA10Y/GER10Y	50.5	-1	-8
ITA10Y/GER10Y	130	-10	-54
AUS10Y/US10Y	-12	10	-3
CHI10Y/US10Y	-204	27.2	-120

Source: Bloomberg

US Market Update: First Quarter 2024 Insights and Projections

By Partha Sharma

Robust Earnings, Mixed Revenues

The first quarter of 2024 has brought a mix of optimism and caution to investors as the current landscape is shaped by healthy earnings results, a significant revenue growth challenge, and forward guidance that remains crucial for sustaining the ongoing rally.

The Russell 2000 index paints a less favorable picture with a blended growth rate of -12% for the first quarter. However, there's an optimistic outlook for small caps, which are expected to see a better earnings growth rate of 20.7% for 2024 compared to 9.9% for the S&P 500.

The Role of Valuations and Forward Guidance

Despite the positive earnings growth, valuations remain stretched across several metrics. The S&P 500's forward price-to-earnings (P/E) ratio is currently at 20.3, and its price-to-sales (P/S) ratio is 2.7, both significantly above their long-term averages of 16.5 and 1.7, respectively. This highlights the market's reliance on multiple expansions driven by investor optimism. While valuation is not a reliable short-term market-timing tool, the current high valuation levels underscore the need for continued strength in earnings growth to sustain the rally.

Moreover, the focus is shifting towards revenue growth and forward guidance. The revenue beat rate, the percentage of companies reporting revenue above analysts' estimates, has fallen to 59.4%, the lowest since the first quarter of 2020. In contrast, the earnings beat rate remains strong at 77.7%, higher than the historical average of 67%. This divergence indicates that while companies are managing to exceed earnings expectations through cost-cutting measures, revenue growth remains a challenge.

Figure 1: Prices of June 2024 Futures for E-mini S&P 500 vs RTY (Russell 2000) on CME Globex

Sectoral Performance and Market Reactions

Market reactions to earnings reports have been muted this quarter. The average S&P 500 member's daily return in excess of the index's return is a mere 0.05%, the weakest since the fourth quarter of 2020. This subdued response may be attributed to the lower revenue beat rates and the growing gap between earnings and revenue surprises.

Large Caps Versus Small Caps

One of the notable aspects of the current bull market, which began in October 2022, is the underperformance of small caps. The S&P 500 has outperformed the Russell 2000 by 8% this year and by nearly 10% over the past year. This disparity can be explained by the trajectory of forward earnings estimates. While the S&P 500's forward 12-month estimated earnings are well beyond their 2022 high, the Russell 2000's estimates, although improved, remain far from their peak.

Figure 2: Year-to-Date performance of S&P 500 vs Russell 2000.

Outlook and Strategic Focus

Despite April's challenging performance backdrop, the market continues to appear expensive across various metrics. While multiple expansion has driven stock prices higher, the bar is set higher for earnings growth. Current estimates suggest a solid year for profits, but there is a growing emphasis on revenue growth and forward guidance.

Investors are advised to focus on companies and industries that are well-positioned to weather the higher-for-longer interest rate environment. This includes entities with high interest coverage, strong revenue growth, and robust cash positions. Additionally, the broader market performance will heavily depend on the stabilization of interest rate volatility and the reacceleration of forward earnings growth.

Broader Economic Indicators and Market Sentiment

Beyond earnings reports, broader economic indicators also play a crucial role in shaping market sentiment. Bank lending standards remain restrictive, reflecting the Federal Reserve's view that financial conditions are tight. This could potentially influence future rate cuts, adding another layer of complexity to the market dynamics.

Summary

The first quarter of 2024 has shown a mixed bag of results, with robust earnings growth for large caps overshadowed by revenue challenges and underperformance from small caps. Valuations remain high, driven by investor optimism, but the focus is increasingly shifting towards sustainable revenue growth and forward guidance. The market's future trajectory will depend on how well companies can navigate these challenges and whether economic conditions stabilize in the coming months.

Crude Oil Developments

By Evgenia Raevskaya
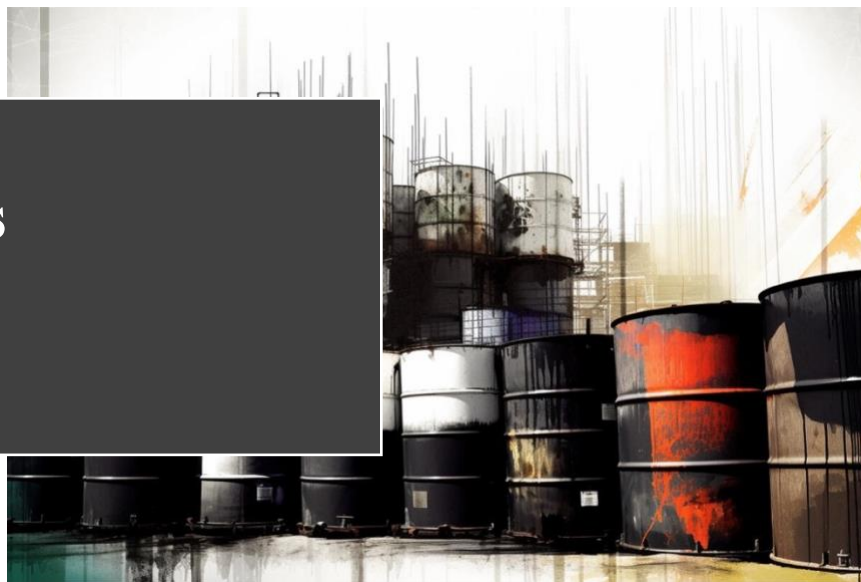
The last time we reviewed oil price performance was in September 2023. Much happened since then, and one could assume that world events would lead to increases in oil price. However, this wasn't the case. Although an upward trend prevailed since the start of the year, prices never quite reached the September 2023 highs of 94 USD/BBL for Brent and 93 USD/BBL for WTI. This year, prices peaked at 91 USD/BBL for Brent and 86.9 USD/BBL for WTI in April, and once again declined to 83.42 USD/BBL for Brent and 79.36 USD/BBL for WTI, by the 16th of May 2024. This dynamic is particularly interesting, considering that inflationary pressures still persist. Studies conducted by the FED explain this as second round effects of oil price hikes,[1] where earlier increases in oil prices create upwards pressure on headline inflation, with some delayed effect and in the longer term.

Chart 1: Brent crude price performance September 2023-May 2024.

Source: Tradingview.com

Therefore, oil may need to trade lower for longer in order for inflation to reduce. In the meantime, the FED has kept interest rates unchanged amidst mixed signals from the economy, which contributed to consistent strengthening of the dollar since the start of the year. The strengthening is reflected by the US Dollar Index (DXY), which had increased by 3% YTD to 104.45 as of the 16th of May 2024. This in turn may be one of multiple factors contributing to the observed decrease in oil price.

Nevertheless, it appears that global demand remains robust. According to EIA reports, The U.S total petroleum consumption is expected to rise by 200,000 bpd from 2024 to reach 20.6 million bpd in 2025, supported by the defence sector which is projected to grow at CAGR of 3.58% from 2024-2029[2]. China's GDP increased 5.3% YOY in the first quarter of 2024, led by strong performance of the manufacturing sector. The China Caixin Manufacturing PMI increased to 51.4 as of the end of April. Furthermore, the rapidly developing petrochemical sector is likely to ensure consistent demand for oil, with an anticipated launch of 410 petrochemical projects by

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[1] https://www.federalreserve.gov/econres/notes/feds-notes/second-round-effects-of-oil-prices-on-inflation-in-the-advanced-foreign-economies-20231215.html
[2] https://www.mordorintelligence.com/industry-reports/united-states-defense-market/market-size

2027[3].The IEA reports that 90% of China's increased oil demand from 2021 to 2024 comes from chemical feedstocks like LPG, ethane, and naphtha. Between 2019 and 2024, additional Chinese production capacity for ethylene and propylene are expected to exceed the combined current capacities of Europe, Japan, and South Korea. Meanwhile in India, oil consumption increased 4.8% in Q1 2024. Oil demand is primarily supported by increased household spending, with total spending projected to reach $3.97 trillion by 2029[4]. Additionally, the transportation sector is expected to grow at CAGR of 5.9%[5], and government policies are actively implemented to improve infrastructure[6]. Considering the varying oil consumption needs of these economies, it is evident that demand from the largest oil consumers is not expected to wane in the near future.

In light of this, we turn to the supply side for answers pertaining the latest downward price movements. In March 2024, the OPEC+ alliance announced an extension of supply cuts amounting to a total of 2.2 million BPD. Price rallied, until the 4th of April, followed by a trend reversal upon announcements of unexpected inventory increases in the US. Realistically, inventories have steadily increased since January this year, as displayed in Chart 2. Moreover, the increase occurs in a backwardation environment. Since the futures prices are below spot level, from a demand perspective there seems to be a lack of economic incentive for increased storage of oil. Reduced refinery utilization is commonly cited as the cause. The EIA reports reduced refinery utilization since January 2024, suggesting it occurred due to planned maintenance and cold temperatures.[7]

Chart 2: US Crude Oil Stocks December 2023-May 2024

Source: Ycharts
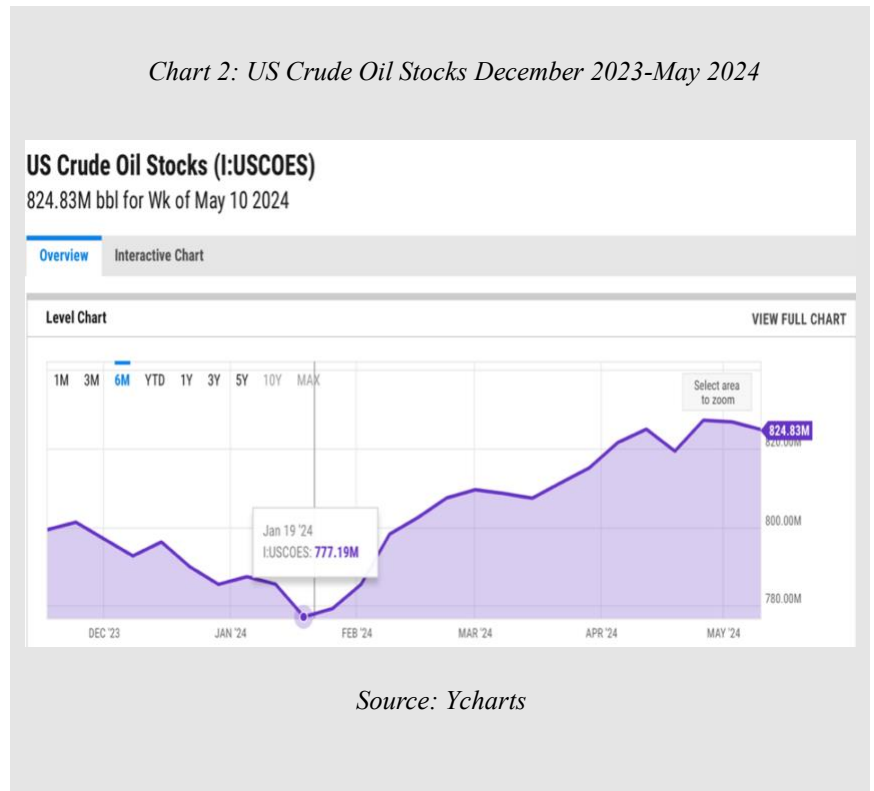
Another factor to consider is a possible market oversupply from non-OPEC+ countries. The US production output is currently at highs of 13.1 million bpd, (as of the 10th of May 2024)[8] And is forecasted rise to 13.19 million (bpd) this year, according to the EIA Short-Term Energy Outlook. Futhermore, additional output from Canada, Brazil and Guyana is expected to support supply growth until the end of the year. In total, non OPEC+ are forecasted to contribute 53 million bpd to total world supply by Q4 2024. The total supply with OPEC+ is expected to amount to103.5 million bpd[9], offsetting the global demand. Although supply currently appears abundant, we should recognize that the geopolitical environment assumes heightened risk of supply disruptions, which may cause a sudden upward reversal of prices. Considering that risks which aren't already priced in by markets do not materialize in the near term, and given the US inventories continue to rise, a downward trend towards February price levels may ensue.

[3] According to GlobalData.
[4] Statista Market Insights, World Bank, IMF, UN, Eurostat.
[5] Federation of Indian Chambers of Commerce and Industry.
[6] https://www.investindia.gov.in/team-india-blogs/indias-push-infrastructure-development#:~:text=The%20government%20has%20set%20ambitious,Modal%20Logistics%20Parks%20(MMLPs).
[7]https://www.eia.gov/todayinenergy/detail.php?id=61543#:~:text=The%20sharp%20decline%20in%20refinery,decline%20is%20also%20affecting%20inventories.
[8] https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?f=W&n=PET&s=WCRFPUS2
[9] https://www.axios.com/2024/01/24/oil-production-non-opec

Gold Report

By Ali Cem Tezel

Introduction

It is not a secret that gold is considered as a safe investment especially during times of economic uncertainty, and systemic shocks. Although we are not in a state where such shocks are realized, we can definitely see the blurriness along the way. Gold price climbed by 19% in the six weeks starting from the beginning of March, reaching US$ 2.431/oz on 12th of April. Between then and now the metal has traded around US$ 2.300/oz.

Contributing Factors

Monetary Policy Outlook

There are numerous factors that affect gold prices. Firstly, gold is a commodity that pays no interest at all which results in unfavorable consequences for gold investors when the interest rates are high. The main indicator here is the real interest rate in the economy, so if the nominal rates are over inflation rates, then we can say that an investor will be better off locking in their cash in the fixed income markets, and consequently maintain the purchasing power to a certain degree rather than investing in gold (all else equal) which pays no interest. Following the COVID-19 Pandemic many central banks started easing monetary policies whereas the fiscal stimuluses was performed by the governments simultaneously. This led to rising inflation rates on a global scale in 2021, and major central banks hesitated to intervene and instead chose to disregard the persistent inflation threats to economies. Real interest rates stayed relatively low until the Fed and other central banks started the hiking cycles in 2022. In 6 months following the start of the rate hikes, gold price had diminished by one-fifth of initial value in USD terms.

Nowadays there is a debate about the future path of the interest rates in the U.S. where the economy proves to be exceptional in terms of growth figures compared to European economies which suffer from sluggish growth. The strong economic activity along with over-the-target inflation figures in the U.S. makes it hard to justify for the Fed to start cutting the policy rate which has already peaked. On the other hand, there are some signs such as inverted yield curve, possible lagged effects of high rates on the economy, as well as significant revisions to economic and jobs data on the downside which point to a recession possibility ahead for the economy. All in all, there is a distinct separation between those who expect the U.S. economy to maintain its exceptional performance and those who assume that the U.S. economy may fall into recession. Federal Reserve should deliver around 3 rate cuts in 2024 according to the latter group whereas the former believes the rates should stay where they are throughout the year. FOMC members' projections have also pointed to 3 rate cuts in 2024 since the start of the year. However, the latest inflation figures - which proved to be hotter than expected – led the FOMC to a more cautious approach about the future path of the rates, as the committee expresses possibility of keeping the rates higher for an extended period.

The ECB and the BOE are also expected to start cutting their policy rates in 2024 – not immediately but probably during summertime - unlike the Fed who is expected to postpone the delivery of the first cut possibly

towards the end of Q3 or the year. Nevertheless, both markets and central banks expect policy rates to descend this year, which may be in favor of gold in 2024 as well as within the next year.

Inflation Outlook, Geopolitics & Systemic Risks

Another dimension needs to be accounted for while trying to understand the potential of gold. Inflation figures retreated from their peak of 2022 levels on a global scale, however they still run above the central bank targets in most of the major economies. The supply chain disruptions following the pandemic along with geopolitical tensions in the Middle East have fueled inflationary pressures, and prices have been exposed to supply issues rather than demand as a result. This limits the impact of monetary policies on containing the inflation rates. In an environment where nominal policy rates are decreasing when inflation is running hot above inflation targets, the real interest rates will start to diminish significantly which is prone to support gold prices.

Furthermore, economic and financial shocks usually attract interest towards safer assets. The U.S. Banking Turmoil back in March 2023 had helped gold prices to recover significantly in a short period of time amidst fears of a crash of the banking sector. Thanks to the immediate emergency actions that have been implemented by the FED, FDIC and the Treasury Department, the initial crisis was contained. However, high interest rates have been weighing on companies, households and consequently on banks for the last two years when it comes to refinancing credits that have been obtained from low interest rates earlier. The unrealized losses on securities reported by the U.S. banks in Q4 2023 were $477.6 billion, which is the lowest reading since Q2 of 2022 and a considerable decline from Q3 2023 levels – as a result of lower yields on U.S. Treasuries towards the end of the year - but still higher than historical averages.[1] Given the increase in U.S. government yields since the beginning of the year, unrealized losses on securities are expected to be higher than the fourth quarter of 2023 in the first quarter of 2024. To summarize; the figures do not look as bad as they used to when the banking turmoil took place and afterwards but still point to huge potential losses for the U.S. banking sector. The volatility seen in the government bond yields also adds to pressures in the fixed income market. Furthermore, there are growing concerns about the state of commercial real estate sector due rising borrowing costs in the United States and elsewhere. On the other side of the Pacific, Chinese economy has been dealing with the property crisis where the giants of the sector have failed to meet their obligations and whether there will be a spillover effect across the world is currently unknown.

As a consequence of political issues in the U.S. and in Europe, ongoing conflicts in several regions, forthcoming U.S. elections, political polarization, cyber threats and deglobalization leaves a fragmented world to live in. All these prospects combined with economic uncertainties make it hard for one to have a clear view about the future. Whatever the future brings will potentially accompany compelling changes to the current conjuncture. Therefore, precious metals and commodities are likely to occupy a larger share in portfolios until the uncertain outlook in global economy fades away.

Demand & Supply

The supply and demand breakdown for the gold is essential to analyze the future price expectations as well as recent price interpretations by the investors and the producers. According to the World Gold Council's (WGC) Q1 2024[2] report about demand and supply trends, total demand for gold surged by 3% YOY to 1,238t in the first quarter of 2024. Industrial demand for gold increased by 10% YOY to 78.6t with electronics sector leading the way. Global gold demand for jewelry in Q1 was down by 2% (YOY) to 479t but is above the Q1 average for the past five years. Demand for inventories were strong despite soaring prices towards the end of the quarter. In

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[1] https://www.fdic.gov/news/press-releases/2024/pr24014.html
[2] https://www.gold.org/goldhub/research/gold-demand-trends/gold-demand-trends-q1-2024

general, the jewelry demand was robust in January and February but weak in March due to soaring prices. Physical demand from Asia has been also strong partly owing to the Spring Festival. Gold have been traded near all-time-high recently and jewelry demand may diminish significantly quarterly in Q2 if prices continue to stay elevated.

Gold bar and coin investment in Q1 totaled 312t whereas global gold ETFs saw outflows up to 114t which helped reduce the total global gold investment on an annual basis offsetting the growth in bar and coin investments. However, the Over-the-counter (OTC) demand proved to be strong with net long positions soaring in March.

Central banks have continued to pile up gold for a while now, having engaged in net purchases for more than eight months in a row. Net demand by the central banks was 289.7t in Q1, 2024 which set the record for the first quarter. Turkey, India and China were amongst the countries driving the global net purchases whereas some other countries from Central Asia and East Europe also accumulated in the first quarter. The tendency for Eastern countries to accumulate more gold is obvious especially since the start of 2022 which can be attributed to the sanctions implemented on Russia, and desire to switch to the use of a common currency like gold in bilateral trades between those countries. The households in countries like China, India, and Turkey, view gold as a tool to preserve their wealth whereas the same inclination is not evident in the western world which may be bound to change if inflation remains elevated in those economies and continue to erode the purchasing power of the households. In such a scenario, we can expect the western central banks to jump into the race of strengthening reserve positions.

Figure 1: Central bank net purchases, tonnes
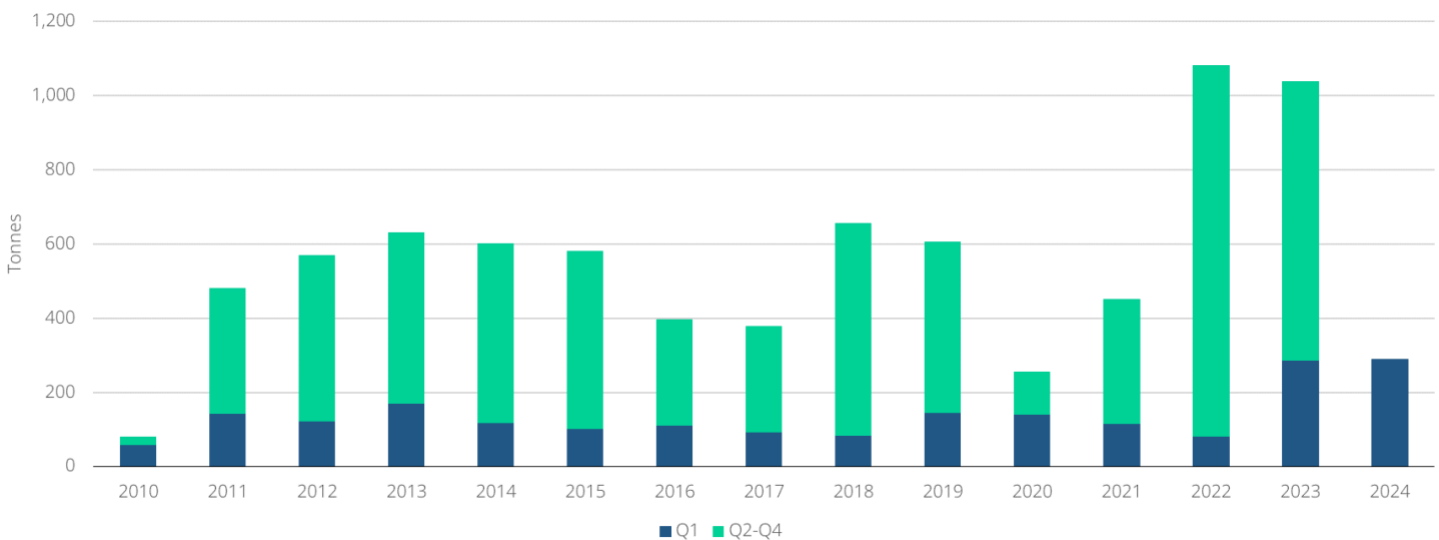
Source: Metals Focus, Refinitiv GFMS, World Gold Council

On the supply side, mine production rose by 4% in the first quarter reaching 893t and recycled gold reaching 350.8t. We expect the supply to keep up with the demand for the months to come as the high prices make it feasible for the miners to extract gold.

Price Analysis

As inflation rates started to come down in 2022, rising real interest rates started to erode the value of gold against the USD. Towards the end of 2023, it became apparent that the major central banks reached peak levels

in policy rates and from then on have been expected to change the course of monetary policies towards lower rates which has bolstered gold price.

Figure 2: Gold Spot / U.S. Dollar (XAUUSD) (Daily)

Source: Tradingview

Figure 2 shows how the spot price has evolved over time. There are turning points that has been decided by either shocks or drastic modifications in the monetary policy over the last couple of years.

The ounce price (XAUUSD) has mostly swung between US$2,066/oz on the upside and US$1,983/oz on the downside since the end of November 2023. On 4th of December 2023, the price reached US$2,148.99/oz intraday which was ATH back then before closing the day with US$2,029/oz. There have been a few breaches both on the upside and downside since then but each of them had fallen short in terms of beating the previous highs and lows, therefore the metal went back to trading horizontal range for a while. A significant upward trend starting on 1st of March 2024 has led XAUUSD to another ATH US$2,195/oz on 8th of March 2024 and the current ATH of US$2,431.59/oz which was reached on 12th of April. The price has consolidated at around US$2,300/oz since then trading at US$2,346/oz as of 14th of May 2024.

Why Has Gold Risen Recently?

Since the beginning of the year, gold price gained momentum partly as a result of strong demand party which accounts for both OTC futures and options market and also strong investment demand in the physical market led by China and Turkey. COMEX net long positioning has risen to 720t in the second week of April, a rise of roughly 270t from the end of February reflecting a significant increase in net long positions held by money managers. Central bank net purchases continued to be strong within the first quarter of 2024.

Federal Reserve and many other central banks stopped hiking rates around mid-2023 while inflation rates were retreating significantly from their peaks on a global scale. That took the real interest rates to higher levels in developed countries and eventually weighed on the price of gold amidst expectations of soft-landing scenarios. As a result, major central banks made official that they pivoted at the end of 2023 and stated that they would watch the path of inflation pointing out that several rate cuts would be on the agenda throughout 2024. Inflation rates were expected to reach target levels set out by the Fed and its counterparties whereas high rates would

slow the economic activity simultaneously so that these institutions would be cutting the rates overturning the tightening policies in order not to cause for a potential recession by keeping rates higher for longer. However, led by U.S. CPI inflation rates in DMs proved to be sticky, lingering above the target levels from where they started to climb modestly since the start of 2024. This had led to great confusion and to market mispricing the number of rate cuts to be delivered in 2024. The market was pricing 6 rate cuts by the FED a few months earlier while FOMC dot plots were pointing to 3 for the entire year. The correction was a significant increase in government yields which coincided with the soaring gold price as well as strengthening US Dollar Index (DXY). Historically gold is inversely related with the real interest rates and DXY. Nevertheless, this bond seems to have been deteriorated recently which we attribute to concerns over inflation.

What is Ahead?

We expect gold to consolidate around current levels in the short term mostly due to profit taking, subdued central banks purchases and potential overturn of the tendency towards gold investment in certain countries such as Turkey within 2024 due to strengthening domestic currency and ambiguities about the timeline of rate cuts to be performed by major central banks. At the same time, we expect gold to regain momentum and head north towards the end of 2024 as a result of;

- Inflation rates staying above 2% target level in many DMs,
- Major central banks delivering multiple rate cuts in 2024 i.e. lower real rates,
- Persisting geopolitical tensions especially in the ME,
- Return of escalated trade wars and elections in the U.S.,
- Strong demand towards the end of the year.

Relative Strength Index is currently over 61 level which can be considered as a historically confirmed boundary. Although there seems to be no technical divergence between the spot price and RSI recently, the current level of RSI necessitates caution for the time being.

Conclusion

Gold is a precious metal used in industrial production, jewellery and is an asset that acts as a store of value especially during turbulent times. Although the main indicators which show whether gold is a feasible investment are the real interest rate and the currency (USD) by which it is being valued, there are also other factors that affect expectations about the fate of this metal. Recently gold price has jumped while these two indicators were not in favor of gold. The metal price has been increasing since the start of the year and reached ATH on 12th of April since when it has retreated slightly. The price has consolidated around US$2,300/oz partly to due increased supply and ETF outflows ofsetting the upward potential that comes with robust demand. We expect the uncertainty about the monetary policies to persist for the upcoming months and even if the path goes clear, we expect major central banks to diminish policy rates in order not to undermine their economies. We also do not expect the inflation rates to retreat to 2% target in many of the DMs. Accordingly, we expect real rates to be lower by the end of 2024. Considering the ongoing tensions in the Middle East and their potential impacts, we believe gold still has a gap to explore on the upside unless the fog fades both in economic and geopolitical terms.


Exploring Volatility and Derivatives: Unraveling Market Dynamics

By Thomas Petters
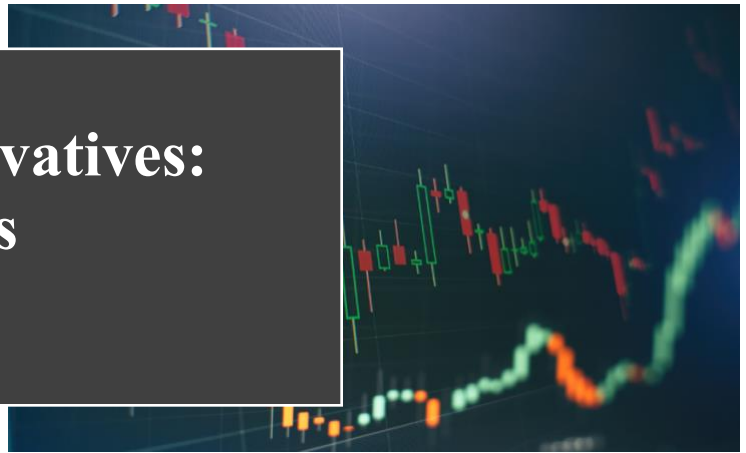
Welcome to our new section dedicated to the evolution of volatility and derivatives in different asset classes. In recent years, financial derivatives such as options, futures and structured products have experienced a remarkable upswing, which illustrates their growing importance on the financial markets.
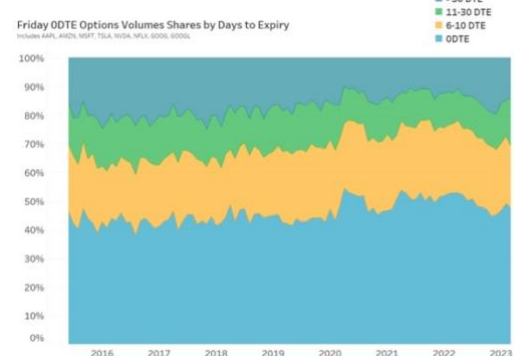
Driving Forces Behind Popularity and Growth

Total U.S. Options Volume

Sources: Cboe Global Markets, OCC (Options Clearing Corp.)
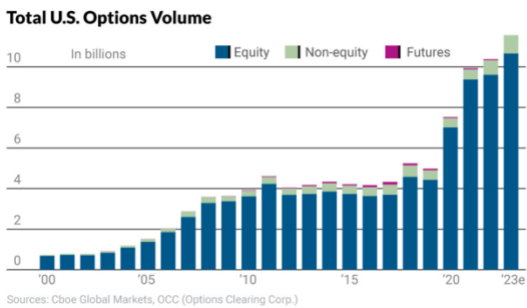
The thriving popularity of financial derivatives, especially options, can be attributed to several factors. The emergence of new trading platforms and brokers such as Robin Hood and others catering to retail investors, coupled with shorter expiry dates for a wide range of listed stocks and reduced margin requirements, has democratized access to these instruments. In particular, the margin requirements for 0dte are not subject to a general standard for brokers yet, which makes it particularly attractive for speculators. Moreover, the flexibility to utilize currently higher-yielding fixed-income securities, such as government bills and bonds, as collateral for option-based strategies has further incentivized their adoption. This allows investors to transition to high-yielding cash and simultaneously gaining exposure to equities through capital-efficient options and futures.

Of particular interest is the shifting behavior of traditionally risk-averse investor groups, who are now embracing option strategies to lever their conservative bond income in a risk-controlled way. By using strategies that sell volatility, investors can collect premiums and thus achieve interesting additional low-risk returns with a minimum correlation to their main portfolio. This trend is exemplified by the substantial increase in the issuance of structured products by banks and funds incorporating derivatives in their strategies, such as the notable AUM JPMorgan Hedged Equity Fund (JHEQX) with assets totaling $18.9 billion.

Friday 0DTE Options Volumes Shares by Days to Expiry
Includes AAPL, AMZN, MSFT, TSLA, NVDA, NFLX, GOOG, GOOGL

SOURCE: OCC DATA, NASDAQ ECONOMIC RESEARCH
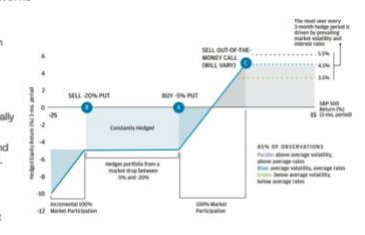
Possible market impacts of structured products

The substantial size of funds like JHEQX, with quarterly hedging activities involving contract sizes exceeding 40,000 per leg and notional values in the billions, has occasionally resulted in significant market impacts, particularly for the trading day on which most of the hedges take place. Such occurrences underscore the potential influence of large-scale derivative-based products on market dynamics. The infographic shows the framework of how a collar strategy as used by this fund works.

JHEQX Collar Hedge Infographic. Source: JP Morgan Asset Management
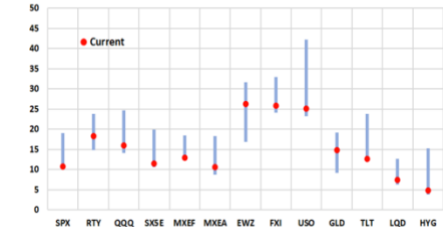
Insights from recent Volatility Trends

Exhibit 1: Cross-Asset Implied Volatility (1Y Percentile)
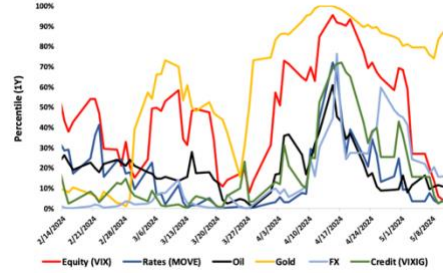
Source: Cboe

Despite relatively subdued volatility across most asset classes in the past six months, there was a perceivable uptick in implied volatility towards the end of March, peaking around option expiration (OPEX) on April 19th. Subsequently, implied volatility receded, as shown in the Cross-Asset Implied Volatility model by CBOE.

The main outlier was gold, where the recent rally in the precious metal prompted heightened demand for out-of-the-money (OTM) calls, driving a surge in implied volatility. Although gold prices experienced a temporary lull in the latter half of April, 1-month implied volatility remains elevated as it attempts to reclaim its all-time highs.

Exhibit 2: Global Equity Index Vols Near 1Y Lows

Source: Cboe

Despite geopolitical tensions and mixed macroeconomic signals, equity markets have exhibited remarkable stability, characterized by notably low levels of volatility thus far in May. Following a brief sell-off in early April, implied volatility for equities subsided significantly, with many major indices hovering around or near record highs.

Chinese stocks, which endured a bear market since early 2021, witnessed a robust resurgence in mid-April, particularly led by the HangSeng Index. Volatility was bid on the upside, with FXI 1M implied vol heavily increasing and screening as the richest global index vol at the beginning of May.

A noteworthy observation is the substantial decline in VVIX (vol-of-vol) for the S&P 500 Index, indicating a temporary suppression in volatility dynamics. According to CBOE, unlike recent instances, the recent drop in volatility didn't immediately spur demand for VIX calls, suggesting complacency in investor sentiment. However, volatility, by its very nature, is not a static phenomenon. Temporary stability, often resulting in a lack of hedging, can potentially sow the seeds for greater instability in the future.

The SPX 1M skew (25-delta spread) continued its flattening trend in the first half of May, reaching its 9th percentile low, while both RTY and QQQ skew experienced modest steepening from their previous lows. Of particular significance is the decline of the SPX 3M skew to its one-year lows across the curve, a trend attributed to subdued demand for hedging in both tails.
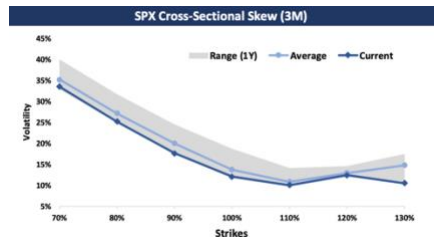
As earnings season draws to a close, the observe a decline in single-stock volatilities relative to the index, resulting in a drop of the Dispersion Index DSPXSM to 26.1%. Notably, this movement was spearheaded by key stocks, such as NVDA, PANW, CRM, and others which are yet to report their earnings.

Source: Cboe

Source: Cboe

SPX Cross-Sectional Skew (3M)

Source: Cboe

Looking Ahead

In upcoming editions, we will explore in greater depth impacts stemming from derivative markets on the broader market landscape. Illustrated by the example of JHEQX and the escalating volume of traded options, derivatives are progressively emerging as a potent market force, underscoring the necessity for ongoing exploration.

A Guide to Cryptocurrency Derivatives

By David Peisakhov and Estella Zaengle

The cryptocurrency market has evolved significantly over the past decade, offering various financial instruments to traders. One of the most advanced and appealing instruments in this market is cryptocurrency derivatives. This article delves into the different types of available derivatives contracts, their utility functions, trading use cases, trends in usage, and the most popular marketplaces for each.

Understanding Cryptocurrency Derivatives

Cryptocurrency derivatives are financial instruments that derive their value from an underlying cryptocurrency asset. Unlike direct trading of cryptocurrencies, derivatives allow traders to speculate on the price movements of these assets without actually owning them. This can lead to both higher potential profits and increased risks.

Available Derivatives Contracts

Futures Contracts

Futures contracts are agreements to buy or sell an asset at a predetermined price at a specific future date. They allow traders to hedge against price fluctuations and speculate on future price movements. Futures are used by both hedgers to mitigate risk and speculators aiming to profit from price changes. Typically, futures contracts require a margin deposit, which can range from 1% to 10% of the contract's value. This leverage allows for significant exposure with a smaller capital outlay. The taxation of futures contracts can vary by jurisdiction, but they are often taxed as capital gains. Short-term gains are taxed at a higher rate than long-term gains in many regions. High liquidity is often found on established platforms like Binance Futures, CME Group and EUREX markets, making it easier to enter and exit positions.

Options Contracts

Options contracts give the holder the right, but not the obligation, to buy (call option) or sell (put option) an asset at a specified price within a set period. They offer strategic flexibility and risk management, allowing traders to hedge or speculate with limited risk exposure. Options are commonly used for hedging, income generation through premiums, and strategic speculative trading. Options trading typically requires a margin account, and margin requirements can vary based on the broker and the specific option strategy employed. Writing options (selling) generally requires a higher margin compared to buying options. Options may be taxed as capital gains, with different rates for short-term and long-term holdings. Writing options and earning premiums can also have specific tax considerations. Platforms like Deribit and LedgerX offer high liquidity for options, facilitating ease of trading.

Perpetual Contracts

Perpetual contracts are like futures but without an expiry date. They are settled periodically, usually every 8 hours. They enable traders to maintain positions indefinitely and closely track the spot price. Perpetual contracts are favored by day traders and those looking to maintain long-term positions without dealing with contract expirations. Perpetual contracts typically require a margin deposit similar to futures, with leverage often ranging from 1:10 to 1:100, depending on the platform. Although taxation for these contracts can be complex, gains from perpetual contracts may be classified as income or capital gains, depending on the jurisdiction, and holding period. Bybit, BitMEX, and Binance provide substantial liquidity for perpetual contracts, ensuring efficient market functioning.

Cryptocurrency Swaps

Swaps involve the exchange of cash flows or other financial instruments between two parties. In the crypto market, interest rate swaps are the most common. They help manage exposure to fluctuations in interest rates and other financial metrics. Swaps are Utilized for managing risk and speculative trading based on future interest rate movements. Margin requirements for swaps can vary widely based on the type of swap and the counterparty's credit risk. Typically, swaps are more accessible to institutional traders. Tax treatment of swaps can be complicated, often involving both capital gains and income tax considerations. Liquidity for swaps is generally lower than for futures and options, with platforms like Synthetix and dYdX offering decentralized solutions.

Trends in Cryptocurrency Derivatives Usage

The use of cryptocurrency derivatives has seen substantial growth over the past few years. This surge can be attributed to increasing market maturity, higher institutional participation, and the development of more sophisticated trading platforms. The following graph illustrates the historical inflows of money into cryptocurrency derivatives markets.
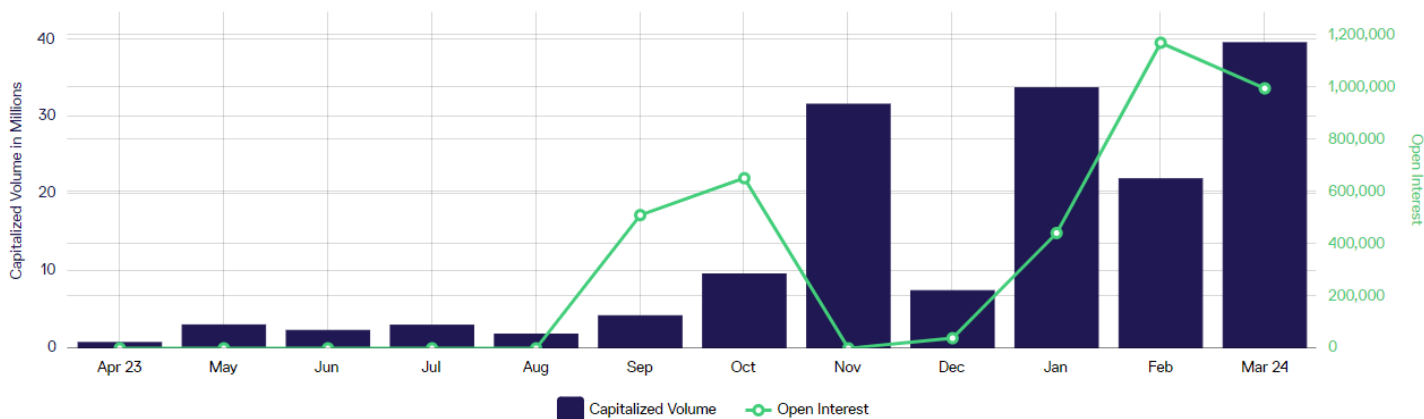

Figure 1: Capitalized Volume and Open Interest of Options on FTSE Bitcoin Index Futures (source: Eurex.com)

Major financial institutions have adopted cryptocurrency derivatives for portfolio diversification and risk management. This trend is evident in the growing trading volumes on platforms like CME and Bakkt. Regulatory clarity in several jurisdictions has boosted confidence in trading crypto derivatives, attracting more participants to the market. The development of advanced trading platforms and tools has made it easier for both retail and institutional traders to participate in the derivatives market. Increased market volatility has driven traders towards derivatives as they seek to capitalize on short-term price movements or hedge against potential losses.

Popular Marketplaces

- Binance Futures - known for its high liquidity and extensive range of futures contracts.
- BitMEX - one of the oldest platforms offering high leverage futures and perpetual contracts.
- Deribit - specializes in options trading with a user-friendly interface and deep liquidity.
- Bybit - popular for its perpetual contracts and user-friendly platform with significant leverage options.
- Synthetix - a decentralized platform offering a variety of swaps and synthetic assets.
- CME Group and EUREX Exchange - traditional financial exchanges offering Bitcoin futures and options.

Conclusion

Cryptocurrency derivatives are powerful tools that offer traders a variety of strategies for hedging, speculating, and managing risk. Understanding the different types of derivatives, their specific uses, trends in usage, and the leading marketplaces for trading them is crucial for anyone looking to navigate the complex landscape of the cryptocurrency market effectively. As the market continues to evolve, these instruments will likely become even more integral to trading strategies, providing both opportunities and challenges to savvy traders.

Enhancing Financial Services with Large Language Models and Generative AI

By Partha Sharma

Introduction

In the rapidly evolving landscape of artificial intelligence (AI), Large Language Models (LLMs) and Generative AI (Gen AI) emerge as groundbreaking technologies with the capacity to revolutionize numerous industries. LLMs, such as OpenAI's GPT-4 and Google's BERT, are sophisticated machine learning models adept at understanding, generating, and manipulating human language with exceptional precision. Gen AI, a subset of AI that creates new content from existing data, harnesses these models to produce human-like text, images, and even audio.

These technologies hold immense promise for the finance sector. Characterized by complex decision-making processes and vast amounts of data, the finance industry can leverage LLMs and Gen AI to enhance efficiency, accuracy, and strategic decision-making. LLMs, trained on extensive datasets including financial documents, news articles, and market data, can analyze and interpret information at a scale and speed beyond human capabilities. They can generate detailed financial reports, predict market trends, and assist in risk management by identifying patterns and anomalies in vast datasets. Meanwhile, Gen AI can create realistic financial simulations, draft personalized investment strategies, and predict future market scenarios based on historical data.

In this article, we first explore how general-purpose Gen AI models are built. Next, we examine Retrieval-Augmented Generation (RAG) systems, and finally, we discuss their applications in the finance sector.

Building a Generative AI model

Gen AI leverages advanced technologies and methodologies that empower machines to autonomously create content, make predictions, and deliver insights. A pivotal advancement in this field is the development of transformer technology, as introduced in the seminal paper *"Attention is All You Need."* This groundbreaking work laid the foundation for models that significantly enhance the capability of AI systems to process and generate language-based data effectively. The workflow of Gen AI, particularly when utilizing transformers, involves several key stages: starting from the input of large datasets, which are then processed through the transformer's attention mechanisms to capture complex relationships within the data. This process allows for more nuanced understanding and generation capabilities, leading to the final output that is both accurate and contextually relevant. This structured approach underpins the transformative impact of Gen AI across various applications. Here's a detailed look at how Gen AI works and the typical workflow involved in building such models:

Data Collection and Preprocessing: The foundation of any Gen AI system is high-quality data, underscoring the critical importance of the initial stages of data collection and preparation. In this phase, relevant data is gathered from a variety of sources, including internal databases, financial records, social media, market feeds, and other publicly available datasets. This data may include structured data, such as numerical entries in tables, and unstructured data, such as text in financial reports or news articles.

Once the data is collected, the next step is to prepare it for analysis, a process which involves several crucial tasks. Data cleaning is performed to remove any inaccuracies or inconsistencies, such as duplicates, outliers, or missing values, which could potentially skew the results. The data may also need to be normalized or

standardized to ensure that different datasets are compatible and can be effectively analyzed together. Additionally, this stage often includes data transformation, where data is converted into formats or structures that are suitable for use in machine learning models. For instance, text data might be tokenized into words or sentences, and categorical data encoded into numerical values.

Data augmentation can also play a role at this stage, particularly when the available data is not sufficient or lacks diversity. This technique involves artificially expanding the dataset using methods such as synthesizing new data points or applying transformations that preserve the underlying patterns but provide new perspectives or variations. This enriched dataset helps in building robust Gen AI models that can generalize better to new, unseen data.

The thoroughness and quality of these initial steps are crucial, as they directly impact the accuracy and effectiveness of the Gen AI system. High-quality data ensures that the system can learn the most relevant patterns and relationships, leading to better predictions, recommendations, or decisions based on the data it processes.

Model Training: This stage of the process involves training the Gen AI model using the meticulously prepared dataset, where the choice of model is critical and depends on the specific application and the type of data at hand. For instance, neural networks might be selected for their proficiency in handling vast and complex data sets, while decision trees could be chosen for their interpretability in scenarios requiring clear decision paths. The training involves feeding the data into the model, which then adjusts its internal parameters based on algorithms designed to minimize errors and improve prediction accuracy. This iterative learning process is crucial as it tunes the model to perform effectively on real-world tasks, making sure it not only learns from the data but also generalizes well to new, unseen scenarios.

Inference and Generation: Inference and Generation is a crucial phase in the workflow of a Gen AI model. Once the model is thoroughly trained, it is ready to be deployed for practical applications where it can generate content, make predictions, or provide insights. During this phase, new data inputs are fed into the model, which then applies its learned patterns and knowledge to produce outputs. This process is essential for tasks such as composing text, forecasting trends, or making recommendations. The model's ability to analyze and react to new information in real-time underscores its utility in dynamic environments, allowing for accurate and timely decision-making based on the latest data available. This functionality is critical in sectors where up-to-date information is crucial for operational success.

Evaluation and Optimization: Evaluation and Optimization are essential steps that follow the initial output generation in the lifecycle of a Gen AI model. After the model has produced its first set of results, it is critical to assess its performance to ensure that it meets the expected standards of accuracy, efficiency, and relevance. This evaluation is typically carried out using a set of predefined metrics such as precision, recall, or F1-score, which help to quantitatively measure the model's effectiveness against the intended tasks. Based on these evaluations, the model may require further optimization to refine its parameters and improve its performance. This could involve retraining the model with new data, tweaking its architecture, or adjusting its learning rate. Continuous optimization ensures that the model remains effective over time, adapting to new data and evolving requirements, thereby maintaining its reliability and utility in dynamic operational environments.

Deployment and Monitoring: Deploying a Gen AI model into a production environment and continuously monitoring its performance is crucial for ensuring its long-term effectiveness and reliability. Once the model is fully trained and optimized, it needs to be integrated into the operational framework where it will be used. This integration involves setting up the necessary infrastructure, such as servers and databases, to support the model's functions. Continuous monitoring is also essential to track the model's performance in real-time. This allows for the detection of any degradation or deviations in expected outcomes. Regular assessments help identify areas that may require adjustments or further optimization, ensuring that the model remains robust and performs optimally in varying real-world conditions.

Building an LLM from scratch is a resource-intensive endeavor that typically requires substantial financial investment and computational resources. Due to the high costs associated with the data collection, processing,

and training phases, this task is generally undertaken by large companies such as OpenAI, Google, and Meta, or well-funded startups that have the necessary capital and technical infrastructure. These organizations have the capacity to handle the enormous datasets and the extensive computing power needed to train sophisticated models that can understand and generate human-like text. For smaller entities, the financial and technical barriers can be prohibitive, making it challenging to compete in the development of such a LLMs from scratch.

Retrieval-Augmented Generation (RAG)

Building a LLMs from scratch is an expensive endeavor. As an alternative to this costly process, organizations can consider using Retrieval-Augmented Generation (RAG). A Retrieval-Augmented Generation (RAG) system is a type of AI architecture that combines the capabilities of LLMs with information retrieval techniques to enhance the quality and relevance of generated responses. In a RAG system, the language model retrieves relevant documents or data from a large corpus to inform its generation process, leveraging this external knowledge to produce more accurate and contextually relevant outputs. This approach not only improves the performance of the language model but also allows it to access a broader range of information than what was available during its initial training.
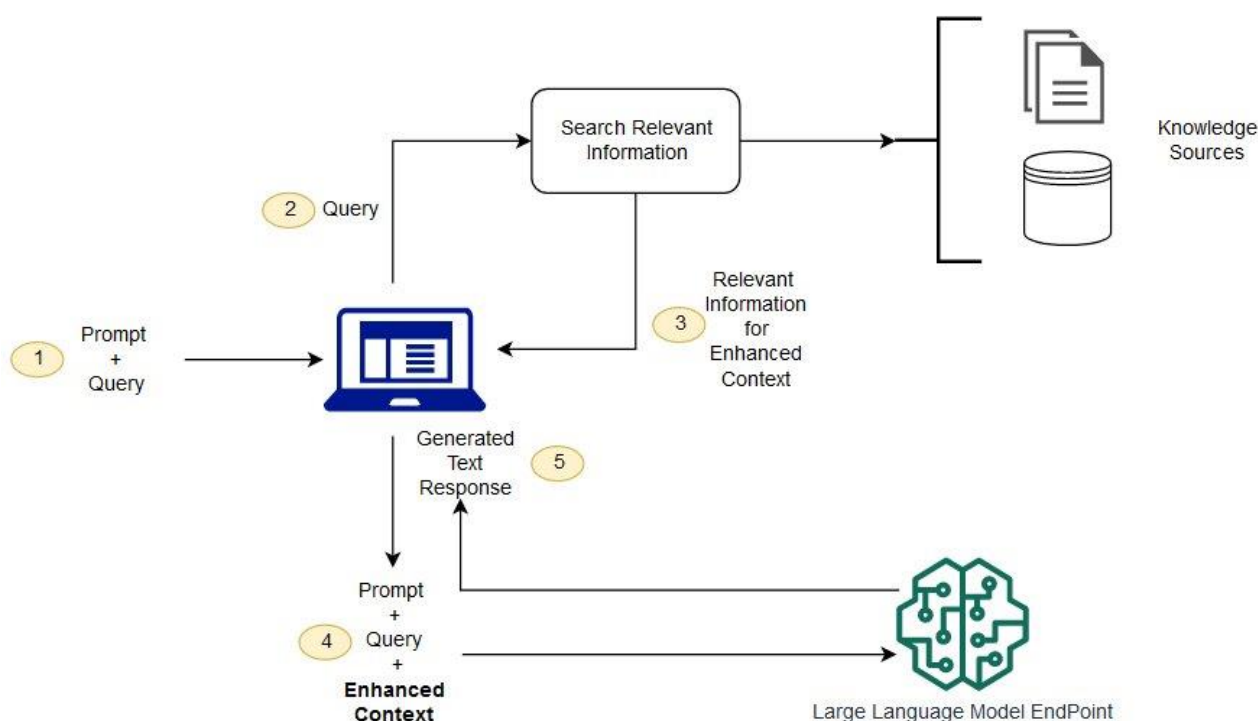

Figure 1: Retrieval-Augmented Generation (Source AWS)

This method offers a more cost-effective solution for developing powerful AI systems that maintain high performance without the extensive resources required to build an LLM from scratch. Tools like LangChain and LlamaIndex can be instrumental in building effective RAG systems.

Applications in Finance

The application of LLMs and Gen AI in the finance sector is particularly promising. These advanced technologies offer numerous advantages that can enhance efficiency, accuracy, and strategic decision-making. By automating routine tasks, providing deep insights, and delivering personalized customer experiences, LLMs and Gen AI are poised to transform the financial industry. Here are some key areas where Generative AI is making a significant impact in finance:

Automated Financial Analysis: One of the most promising applications of Gen AI in finance is automated financial analysis. Traditional financial analysis involves labor-intensive processes, requiring analysts to sift through vast amounts of data to identify trends and insights. Gen AI can automate these tasks, providing real-time analysis and generating comprehensive reports. This not only saves time but also reduces the risk of human error, leading to more accurate and reliable financial insights.

Fraud Detection and Prevention: Fraud detection is another area where Gen AI proves invaluable. Financial institutions constantly face the challenge of detecting fraudulent activities among vast amounts of transaction data. Gen AI models can identify anomalies and patterns indicative of fraud more accurately and quickly than traditional methods. By continuously learning from new data, these models can adapt to evolving fraudulent tactics, providing robust security for financial transactions.

Personalized Financial Services: Gen AI enables financial institutions to offer personalized services to their clients. By analyzing customer data, AI models can provide tailored financial advice, product recommendations, and investment strategies. This personalization enhances customer experience and satisfaction, fostering stronger client relationships. For instance, robo-advisors, powered by Gen AI, can create customized investment portfolios based on individual risk tolerance and financial goals.

Regulatory Compliance: The finance sector is heavily regulated, with institutions required to comply with various laws and regulations. Gen AI can streamline compliance processes by automating the monitoring and reporting of regulatory requirements. AI models can analyze transactions and flag potential compliance issues in real time, ensuring that financial institutions remain compliant and avoid costly penalties.

Risk Management: Risk management is a critical aspect of finance, involving the identification, assessment, and mitigation of financial risks. Gen AI can improve risk management by analyzing complex datasets to predict potential risks and recommend mitigation strategies. For example, AI models can assess credit risk by evaluating the likelihood of a borrower defaulting on a loan, considering a wide range of variables that traditional methods might overlook. This leads to more informed decision-making and enhanced financial stability.

Enhanced Customer Service: Customer service in finance can be significantly improved with Gen AI. AI-powered chatbots and virtual assistants can handle a wide range of customer inquiries, providing instant responses and support. These tools can resolve routine queries, freeing up human agents to handle more complex issues. Additionally, AI can analyze customer interactions to identify areas for service improvement, enhancing overall customer satisfaction.

Finance-Related Large Language Models (LLMs)

LLMs have revolutionized the field of artificial intelligence by enabling machines to understand, generate, and respond to human language in a highly sophisticated manner. In the finance sector, these models have been adapted and specialized to meet the unique requirements of financial analysis, trading, risk management, and customer service. Below are some key finance-related LLMs that are making significant impacts in the industry.

BloombergGPT: BloombergGPT is a language model developed by Bloomberg, specifically tailored for the finance industry. It leverages Bloomberg's vast repository of financial data and news to train a model that excels in understanding and generating financial content. This model finds applications in market analysis, financial reporting, and customer support. One of its key strengths is the access to Bloomberg's extensive financial database, which significantly enhances the model's accuracy and relevance, making it a powerful tool for various financial tasks.

FinBERT: FinBERT is a variant of the BERT (Bidirectional Encoder Representations from Transformers) model specifically trained on financial text. FinBERT is particularly effective in understanding the domain-specific language used in finance, making it ideal for applications such as sentiment analysis, document classification, and information extraction from financial documents. Its strengths lie in its ability to accurately

interpret and process financial terminology and concepts, which ensures high precision and relevance across various financial tasks. This capability allows it to excel in tasks that require a deep understanding of the financial sector's unique linguistic environment.

Robo-Advisor LLMs: Robo-advisor LLMs are developed to provide automated, algorithm-driven financial planning and investment advice with minimal human intervention. These models are used by platforms such as Betterment, Wealthfront, and Vanguard's Personal Advisor Services. They are applied in areas including portfolio management, financial planning, and market forecasting. A key strength of these LLMs is their ability to offer personalized and data-driven advice, which significantly enhances the user experience. This customization allows clients to receive individualized strategies that are optimized based on their financial goals and risk tolerance, thereby improving the overall effectiveness of their investment portfolios.

Future Prospects and Challenges

The future of AI in finance looks promising, with continuous advancements expected to bring even more sophisticated applications. However, to fully realize the potential of LLMs and Gen AI, the industry must address several challenges:

Data Privacy and Security: Ensuring the privacy and security of sensitive financial data is paramount. Robust measures must be implemented to protect against data breaches and misuse.

Model Transparency and Accountability: Transparency in AI models is crucial for building trust and ensuring accountability. Clear understanding and communication of how these models make decisions will be essential.

Integration and Scalability: Integrating AI models into existing systems and ensuring they can scale with growing data and user demands will be critical for their successful implementation.

Ethical Considerations: Addressing ethical issues, such as bias in AI models and ensuring fair treatment of all customers, will be essential to maintain integrity and trust in AI-driven financial services.

Conclusion

In summary, the integration of LLMs and Gen AI into the finance sector holds immense promise for revolutionizing how financial services are delivered and managed. By enhancing efficiency, accuracy, and strategic decision-making, these technologies provide significant competitive advantages. Financial institutions that leverage these tools effectively will be well-positioned to lead in innovation, customer satisfaction, and operational excellence. However, navigating the challenges related to data privacy, transparency, integration, and ethics will be crucial for maximizing the benefits and ensuring the responsible use of AI in finance. As the landscape of AI continues to evolve, the finance industry stands on the brink of a transformative journey, driven by the power of LLMs and Gen AI.

Unlocking Alpha: Leveraging Generative AI for High-frequency trading in Cryptocurrency markets

By David Peisakhov

High-frequency trading (HFT) within cryptocurrency markets has surged in prominence due to their inherent volatility and round-the-clock trading environment. HFT strategies, characterized by lightning-fast execution speeds and algorithmic decision-making, capitalize on fleeting market inefficiencies, exploiting price differentials across exchanges, and profiting from microsecond-level price movements. With the proliferation of digital assets and the growing sophistication of trading algorithms, HFT has become a dominant force, comprising a significant portion of overall trading volumes in cryptocurrency markets. Its rapid adoption underscores the importance of technological innovation and automation in navigating the complexities of digital asset trading, while also raising questions about market fairness, liquidity provision, and regulatory oversight.

Impact of Machine Learning and Generative AI techniques on HFT

Text analytics, Generative Adversarial Networks (GANs), Large Language Models (LLMs), and other generative AI techniques have revolutionized high-frequency trading (HFT) and quantitative research, offering powerful tools for analysing market data and generating trading signals.

The concept of text analytics has been developed and refined by researchers and practitioners over several decades. Notable contributions include work by Salton and McGill in the 1980s on information retrieval systems. Text analytics involves the process of deriving insights and meaning from unstructured text data. Techniques include natural language processing (NLP), sentiment analysis, and topic modelling. In HFT, text analytics can be used to extract valuable information from news articles,

Generative Adversarial Networks (GANs), proposed by Ian Goodfellow and his colleagues in 2014. GANs consist of two neural networks, the generator, and the discriminator, trained simultaneously in a game-like fashion. The generator creates synthetic data samples, while the discriminator evaluates their authenticity. Through iterative training, GANs learn to generate highly realistic data samples indistinguishable from real ones. In HFT, GANs can be used to generate synthetic market data, simulate trading environments, and augment limited historical data for training predictive models. They enable traders to explore "what-if" scenarios, test strategies in virtual environments, and improve risk management practices.

Large language models (LLMs) have become increasingly diverse and sophisticated, with various iterations offering unique capabilities. Models like BERT (Bidirectional Encoder Representations from Transformers), RoBERTa (Robustly optimized BERT approach), LLama 3, and T5 (Text-To-Text Transfer Transformer) have emerged, each with its own strengths and applications in natural language processing tasks. These models build upon the foundations laid by GPT-3, incorporating advancements in architecture design, training methodologies, and data augmentation techniques to further enhance their generative capabilities. Additionally, OpenAI's recent announcement of GPT-4o (Omni) multimodal represents a significant leap forward, combining real-time text, audio, and video inputs to unleash the full generative power of AI across multiple modalities. This convergence of cutting-edge technologies underscores the continuous evolution and expansion of LLMs, opening new avenues for innovation and discovery in high-frequency trading (HFT) and quantitative research. Text analytics, GANs, LLMs, and other generative AI techniques offer immense potential for enhancing HFT

social media feeds, and other textual sources, helping traders anticipate market movements and sentiment shifts. Text analytics enhances quantitative research by providing access to a vast array of textual data sources. It enables traders to incorporate qualitative information into their models, improving predictive accuracy and decision-making in fast-moving markets.

Text analytics, GANs, LLMs, and other generative AI techniques offer immense potential for enhancing HFT and quantitative research. By leveraging these tools, traders can gain deeper insights into market dynamics, develop more sophisticated trading strategies, and navigate complex financial landscapes with greater precision and agility.

Understanding High-Frequency Trading (HFT) in Cryptocurrency Markets

High-frequency trading (HFT) refers to the practice of executing many trades at extremely high speeds using automated algorithms. In cryptocurrency markets, HFT involves leveraging advanced technology and algorithms to capitalize on small price discrepancies across multiple exchanges, often exploiting fleeting market inefficiencies that exist for mere microseconds. The significance of HFT in cryptocurrency trading lies in its ability to provide liquidity, narrow bid-ask spreads, and improve market efficiency by facilitating swift order execution. HFT firms play a crucial role in ensuring smooth market functioning and enhancing overall liquidity in cryptocurrency markets.

Figure 1: Relative price dynamics of Bitcoin (BTCUSDT) and Ethereum (ETHUSDT) on Binance exchange.

There are challenges and opportunities unique to cryptocurrency markets in HFT Strategies. **Market volatility in cryptocurrency markets** is the most noticeable challenge, with prices often experiencing rapid and unpredictable fluctuations. While volatility can present opportunities for profit, it also introduces heightened risk, requiring traders to employ robust risk management strategies.
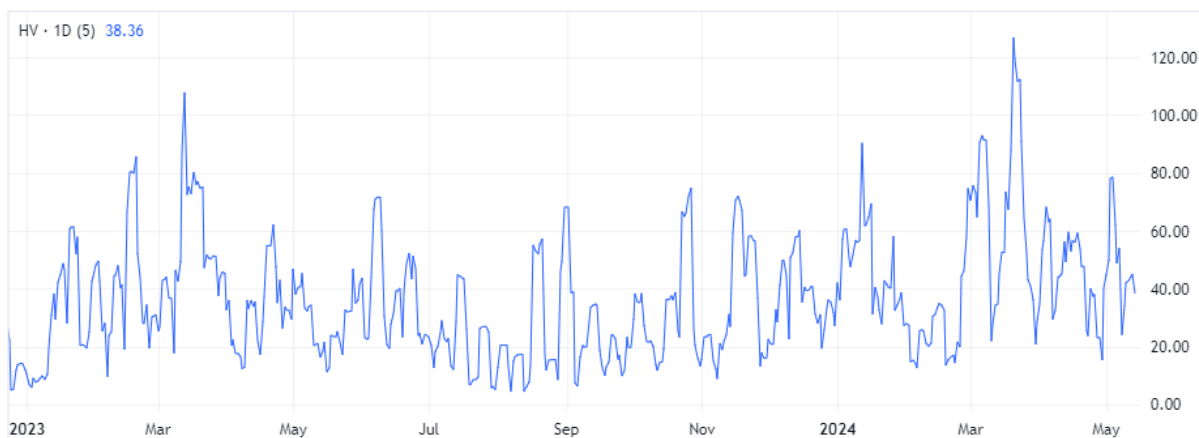

Figure 2: Bitcoin (BTCUSDT) realized volatility since 2023 on Binance exchange.

Information asymmetry in cryptocurrency markets destroys the illusion of a fair game, meaning that certain market participants may have access to privileged or proprietary information not available to others. This information asymmetry can distort market dynamics and make it challenging for traders to make informed decisions.

Liquidity, or the ability to buy or sell assets without causing significant price changes, can vary widely across different cryptocurrencies and trading platforms. Low liquidity in certain markets can result in slippage and increased trading costs, impacting the execution of trading strategies.

The cryptocurrency markets are highly **fragmented markets**, with thousands of digital assets traded across numerous exchanges worldwide. This fragmentation can complicate price discovery, but it increases arbitrage opportunities, and unfortunately also presents challenges in accessing liquidity and executing trades efficiently.

Regulatory uncertainty surrounding cryptocurrencies and blockchain technology can create uncertainty and volatility in the market. Changes in regulatory policies and legal frameworks in different jurisdictions can have profound impacts on market sentiment and investor confidence.
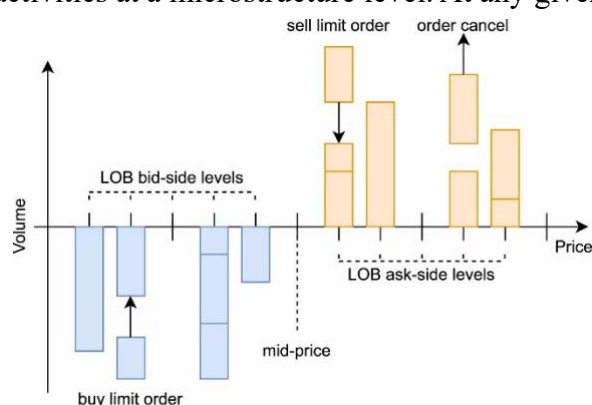
Considering these and other challenges, traders must adopt a multidimensional approach that combines technical expertise, risk management strategies, and innovative technologies to navigate the complexities of cryptocurrency trading successfully. In the following sections, we will explore how emerging technologies such as Large Language Models (LLMs) and Generative Artificial Intelligence (AI) can enhance predictive power and address some of these challenges, ultimately enabling traders to unlock alpha in cryptocurrency markets.

Case Study: Modelling Limit Order Book in Crypto Market using GAN.

Modelling the limit order book (LOB) is crucial for understanding market dynamics and predicting price movements in cryptocurrency trading. Traditional approaches often struggle to capture the complex and non-linear relationships inherent in LOB data. In this case study, we provide a brief exploration of the application of Generative Adversarial Networks (GANs) to model the LOB in cryptocurrency markets, leveraging their ability to generate realistic synthetic data distributions.

Elements of Limit Order Book

The Limit Order Book (LOB) in cryptocurrency markets serves as a comprehensive record of all orders submitted to an exchange system, offering a detailed snapshot of market activities at a microstructure level. At any given moment, the LOB contains active orders organized by price levels, categorized as either asks or bids. These orders, whether market orders executed immediately at the best available price or limit orders executed only when matched with a corresponding order at a desired price, contribute to the continuous evolution of the LOB's state. Fig. 1 illustrates a simplified visualization of a cryptocurrency LOB, subject to constant updates due to the arrival of new orders, cancellations, and executions, reflecting the dynamic nature of the cryptocurrency market.

Figure 3: Schematic figure of Limit Order Book.

Testing new algorithms or trading strategies in real cryptocurrency market environments necessitates thorough evaluation under diverse market scenarios. Such evaluations often occur within simulation frameworks that replicate the states of the LOB. However, due to the dynamic and complex nature of the cryptocurrency LOB, expressing it explicitly as a function proves challenging, given the hidden complexity of its underlying dynamics.

Moreover, despite the increasing adoption of Generative Adversarial Networks (GANs) in various stock market applications, their application for cryptocurrency LOB simulation remains relatively understudied. Only a limited number of studies have explored specific aspects of GANs for simulating cryptocurrency market LOBs, with others focusing solely on generating individual cryptocurrency price time series.

The multi-agent approach serves as a prevalent technique for generating cryptocurrency markets, simulating interactions among agents within the market. This approach involves emulating various types of traders with diverse trading strategies and assessing the performance of experimental trading strategies by simulating market responses to modifications of agent archetypes within the simulation environment.

Principal Components of the GAN Framework

The GAN framework consists of two main components: the Generator and the Discriminator, operating within an adversarial scheme. Real LOB data undergo preprocessing to remove noise and standardize features before being passed to the Generator, which learns to generate synthetic LOB data distributions resembling real market conditions. The Discriminator, on the other hand, distinguishes between real and synthetic data, providing feedback to the Generator to improve the quality of generated samples.

It is common to feed market condition vector to Generator with some random noise. The addition of random noise performs two key roles: a) adds extra regularisation force to the model of Generator to control overfitting to training data, b) forces the Generator to focus on underlying dynamics of Limit Order Book, rather than fitting fluctuations in market. This allows to create a common Generator model across group of cryptocurrencies with different signal-to-noise hyperparameter, but with similar LOB dynamics.
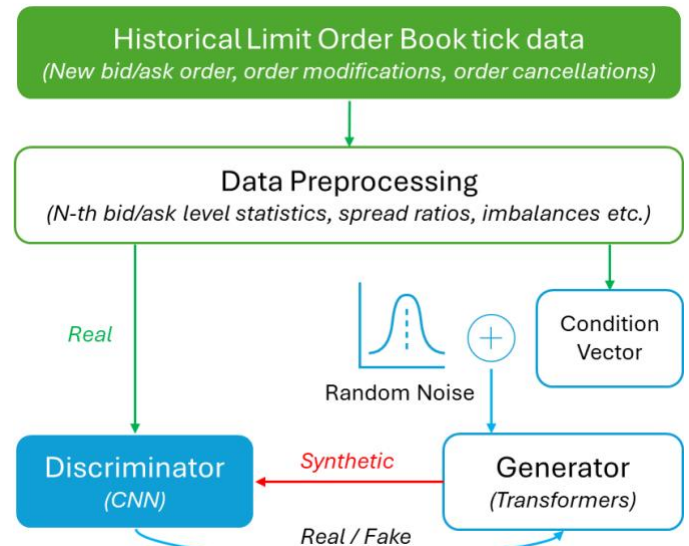

Figure 4: Diagram of typical GAN framework.

Real and Generated Mid-Price Distributions

Comparison of real and generated mid-price distributions highlights the effectiveness of the GAN model in capturing the underlying dynamics of cryptocurrency markets. The distributions exhibit similar patterns and statistical properties, indicating that the GAN successfully learns the latent structure of the LOB and generates realistic mid-price movements.
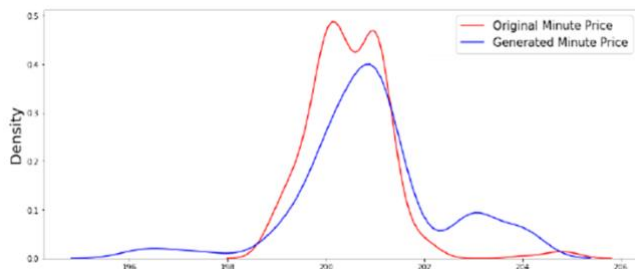
Real and Synthetic Ask and Bid Timeseries

Visualizing the ask and bid timeseries of real and synthetic LOB data further demonstrates the fidelity of the GAN-generated samples. The synthetic distributions closely match the characteristics of real market data, reflecting the depth, spread, and shape of the order book on both the ask and bid sides.
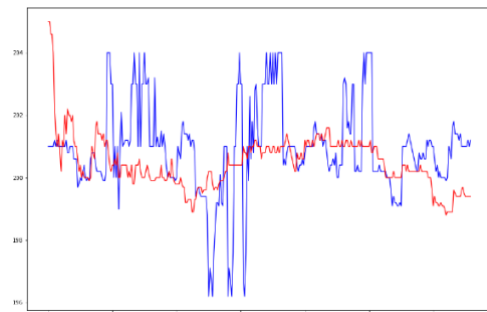

Figure 5: Example of Real vs Synthetic Price distributions.

Figure 6: Example of Real vs Synthetic Bid/Ask timeseries.

Conclusion

The application of GANs for modelling the limit order book in cryptocurrency markets offers a promising approach to capturing the intricate dynamics of order flow and market depth. By generating realistic synthetic data distributions, GANs enable traders and researchers to explore and analyse LOB dynamics, develop predictive models, and devise trading strategies with improved accuracy and robustness.

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