January 13, 2023

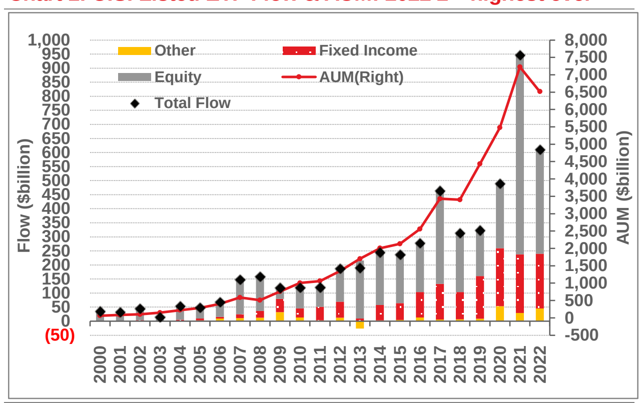
December and Calendar Year 2022: Full Report

- *Despite a tumultuous year in the markets, U.S. ETFs still received $610 billion, the second highest inflow year ever*
- *Ultra-low-cost passive still dominated, but the active landscape is changing with record launches and conversions*
- *Investors switched to more defensive positions such as health care, dividend/income and ultra-short-term bonds*
- *Alternative strategies such as managed futures delivered outstanding returns in 2022*

Summary

2022 has been a challenging year for many investors - a rare period when both equity and fixed income markets backslid on geopolitical tensions, rising inflation and recession fears. Despite these setbacks, U.S. ETFs still welcomed $610 billion in flows, the second highest annual figure in history (Chart 1). As in prior years, the top ETFs are still ultra-low-cost index-trackers for the S&P 500 (VOO) and total U.S. stock market (VIT), but in 2022, defensive strategies received great traction, especially U.S. treasuries, value and dividend/income ETFs. The frenzy for ESG-investing took a pause; inflows to ESG ETFs dropped from 2021's $40.9 billion to $4.7 billion in 2022. Given the market declines in traditional assets last year, it makes sense that "alternative" ETFs enjoyed significant growth, taking in $2.4 billion new money, or 48% of the 2022 starting AUM. Finally, "Single stock" ETFs debuted in the U.S., which offer highly specific and speculative exposure on U.S. securities. Outside a few specific stock exposures, the interest in this new product category has been lackluster overall.

Chart 1: U.S. Listed ETF Flow & AUM: 2022 2nd highest ever



Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

ETF Flows Trumped Mutual Fund Flows:

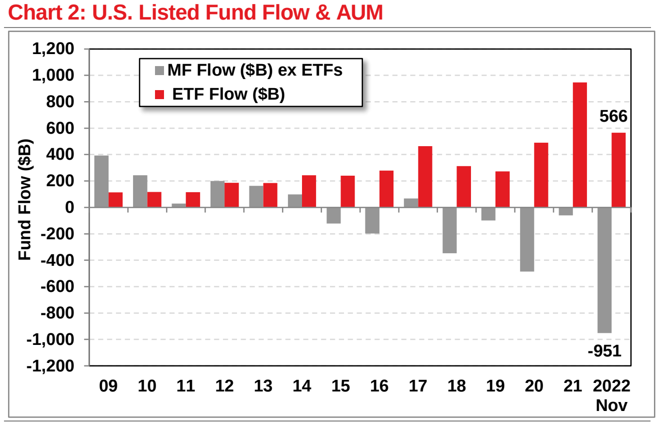
Although 2022's net sales significantly declined from 2021's eye-popping $947 billion, ETFs still had the second-best year of inflow in history, which marks the *10th* consecutive year outselling mutual funds (Chart 2) in the U.S. In fact, U.S. mutual funds registered a record high *outflow* of $951 billion in 2022. In the past, mutual fund outflows were primarily driven by withdrawals from equity funds, but in 2022, more than half of the outflows came from fixed income products, as investors

Table 1: ETF Flows by Category

	AUM ($B)	Mkt Shr	Dec 2022 Flow ($B)	Dec 2022 Flow/AUM	Jan-Dec 2022 Flow ($B)	Jan-Dec 2022 Flow/AUM
Equity	$4,951		$28.6	0.5%	$370.4	6.5%
U.S. Broad/Large-Cap	$1,522	23%	-$2.0	-0.1%	$83.4	4.6%
U.S. Other	$2,292	35%	$19.9	0.8%	$181.7	7.2%
Int'l / Global	$872	13%	$7.0	0.8%	$73.4	7.4%
Emerging Markets	$266	4%	$3.6	1.3%	$31.9	10.5%
Fixed Income	$1,294	20%	$14.8	1.1%	$194.7	15.3%
Commodity	$131	2%	-$1.6	-1.2%	-$4.1	-3.0%
Multi-Asset	$68	1%	$2.1	3.1%	$23.1	42.3%
Levered Long	$44	1%	$1.8	3.4%	$20.7	27.2%
Inverse	$24	0%	-$0.7	-3.5%	$5.3	45.4%
Crypto-Asset	$1	0%	$0.0	-2.6%	$0.2	17.4%
Total	**$6,513**	**100%**	**$44.9**	**0.7%**	**$610.4**	**8.4%**

Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Chart 2: U.S. Listed Fund Flow & AUM



Note: Mutual fund flow excludes money market fund flow
Source: NBF ETF Research, Bloomberg, ICI. Data as of November 2022.

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cashed out amid a series of historic rate hikes from the fed. As a result of market declines and investor redemptions, U.S. mutual fund assets shrunk by 22% in one year from $22.1 trillion in 2021 to $17.3 trillion as of November 2022, while ETF assets dropped by 6% over the same period, contributing to a remarkable swing in market share between the two fund structures (a 4% jump to 28% for ETFs).

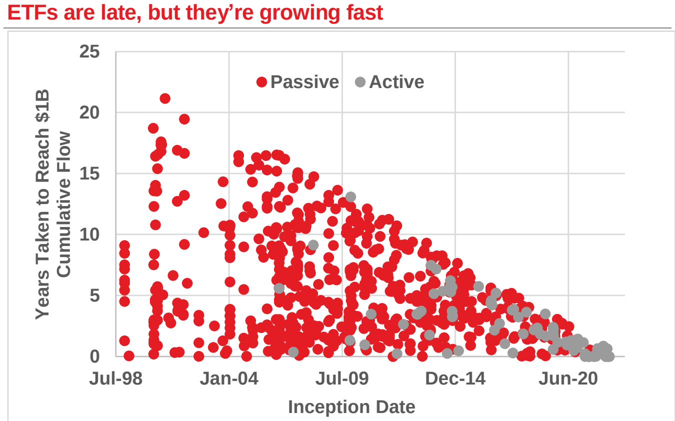
Two years ago, in 2021, the U.S. ETF market received a jolt of inflows from mutual fund conversions; that year, 19 mutual funds from seven issuers converted to ETFs, bringing $40.6 billion to the U.S. ETF landscape. In 2022, another 20 mutual funds converted and joined the ranks of ETFs. The dollar amount of the assets converted was $26 billion, just 63% of 2021's conversion total, but this amount is still substantial relative to the inflows and AUM of actively managed ETFs in the U.S. As of December 2022, "converted" assets from mutual funds represent 17.5% of total U.S. listed active ETF assets and almost one quarter of the active ETF inflow in 2022 (Table 2). Will more mutual fund managers enter the ETF market this way in 2023? According to data compiled by Bloomberg, 15 mutual funds are scheduled for conversion to ETFs in 2023. In addition, although it is common for Canadian mutual funds to offer a parallel ETF series, in the U.S., this structure is unique to the Vanguard organization, which owns a patent for it. As the patent is set to expire in May 2023, we may see a wave of ETF "series" of mutual funds file and launch in the U.S.

Table 2: Mutual-Fund-to-ETF-Conversion Continued in 2022

Providers	2021 Flow ($M)	2021 AUM ($M)	2022 Flow ($M)	2022 AUM ($M)
Dimensional Holdings	39,182	41,038	16,722	51,528
Motley Fool	927	948	(118)	573
Adaptive Investments	467	460	(56)	307
Guinness Atkinson	26	29	-	24
Alpha Architect	9	12	(0)	7
Foothill Capital	6	4	(3)	-
Water Island	4	3	(0)	3
JPMorgan			7,194	7,123
Kovitz			608	583
Neuberger Berman			211	219
Franklin Templeton			209	184
Bridgeway			173	138
Blue Sky			161	164
Fundx Investment			158	166
Habor			155	144
Conductor Fund			105	107
Soundwatch			95	96
Logan Capital			48	43
Innovative Portfolios			31	26
Convergence			25	24
Total	40,620	42,494	25,716	61,461
Contribution to Total Active ETF Flow/AUM	31.7%	14.3%	24.2%	17.5%

Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Chart 3: Years Taken to Reach $1 Billion Cumulative Flow – Active ETFs are late, but they're growing fast



Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

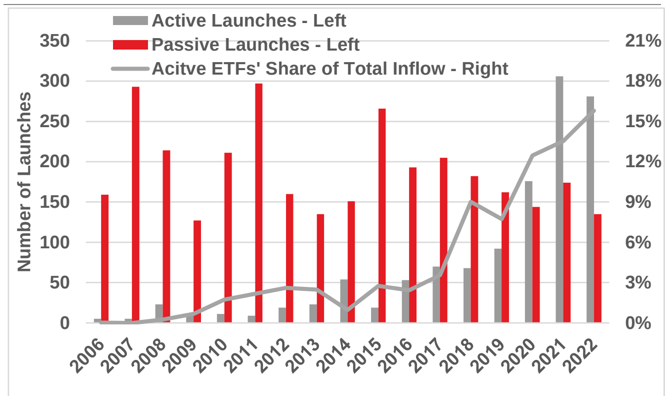
Actively Managed ETFs and Record New Launches

More than 250 actively managed ETFs launched in 2022, beating number of passive launches for the third year running. Active ETF launches have bloomed since 2019 and in the same period the number of passive ETF launches has gradually declined. Passive ETFs still occupy the majority of the assets and inflows, but in recent years, active ETFs are receiving a growing slice of the pie; in 2019, active ETF flow represented 8% of the total, but in 2022, the percentage rose to 16% (Chart 4).

Consider the ETFs that comprise the most "successful" launches; we define these as ETFs that received more than $1 billion of cumulative inflow, looking back over three decades of ETF history. There are 654 passive and 87 active ETFs that have reached the $1 billion milestone, representing 19% (passive) and 7% (active) of all ETF launches (including delistings) in each category. Interestingly, among the "successful" *active* ETFs, 82% took less than four years to gather $1 billion (including some of the trending tickers: **ARKK**, **DBMF**, **BITO**), versus 45% for passive ETFs. The faster observed growth of active ETFs could be attributed to various factors, such as the above-mentioned mutual-fund-to-ETF conversions (as reflected through the grey cluster around 2021-2022, Chart 3) and big asset managers attempting to grab market share via legitimate but inorganic "bring your own asset" strategies.

Timing may also critical be critical for an ETF to amass new money and reach that "successful" $1 billion threshold. Unlike passive ETFs, truly active managers can maximize participation in market rallies through tactical overweights; thus, attracting more assets from performance-chasing investors. **DBMF**, for example, was a $60 million fund at the beginning of 2022. Based almost entirely on inflows, its assets soared twentyfold over 2022 as commodity futures prices skyrocketed.

Chart 4: Active ETF Launches now Outnumber Passive Ones

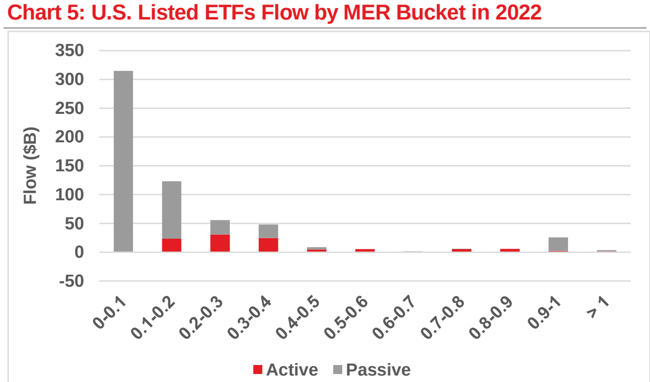


Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Flow by MER (Chart 5)

In 2022, ultra-low-cost products (ETFs that have less than 10 bps MER) continued to take the lion's share of ETF inflow - 53% of total creations. Within the active space, the flow distribution skewed towards the less-costly end, assisted by the low-cost mutual-fund-to-ETFs conversions from Dimensional and JP Morgan. On the higher end of the fee distribution, the 90 bps to 100 bps bucket looks striking with $26 billion created in 2022. These inflows went to mostly leveraged/inverse ETFs, a highly risky structural category used by day traders for short holding periods, which might lead to less fee sensitivity. Interestingly, in a year when the broad market indices went down 20% or more, leverage *long* ETFs saw more demand than inverse ETFs; in fact, levered long ETFs clocked a record-high amount of annual inflow. The last time we observed such "buying the dip" behaviour during a bear market was in 2008, when the ETF market was significantly smaller.

Chart 5: U.S. Listed ETFs Flow by MER Bucket in 2022



Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Table 3: Equity ETF Flows by Geography

Geography	AUM ($B)	Mkt Shr	Flow ($B)	Flow/AUM
U.S.	$3,814		$265.1	6.1%
Broad/Large Cap	$1,522	31%	$83.4	4.6%
U.S. Other	$2,292	46%	$181.7	7.2%
International Developed	$529		$41.6	7.0%
Broad Int'l Dev	$415	8%	$45.4	10.2%
Broad Europe	$36	1%	-$10.5	-18.4%
Japan	$20	0%	-$0.3	-1.4%
Canada	$10	0%	$1.1	11.3%
Other Developed	$49	1%	$5.8	10.8%
Emerging Markets	$266		$31.9	10.5%
Broad Cap Weighted	$176	4%	$16.4	8.0%
China (A+H)	$26	1%	$7.0	25.4%
Other EM	$63	1%	$8.5	12.0%
Global/Regional	$343	7%	$31.8	7.8%
Total Displayed	**$4,951**	**100%**	**$370.4**	**6.5%**

Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Equity Flows by Region (Table 3)

In 2022, more than 70% of the equity inflows went into U.S. stocks. Low-cost passive ETFs from Vanguard (**VOO**, **VTI**) and iShares (**IVV**) topped the single long ETF inflow leaderboard with persistent creations throughout the year, despite the U.S. equity market's sluggish performance in most months. More than two-thirds of the U.S. equity inflow went into non-beta ETFs, in particular factor products.

Broad European equity ETFs were one of the most popular categories back in 2021. That year, they enjoyed an impressive inflow of $16.1 billion, or 45%% of 2021's starting AUM. However, in 2022, investors turned away from the category, withdrawing $10.4 billion. Rising inflation, energy shortages and ongoing war between Russia and Ukranie added to the gloomy outlook for Europe's economy.

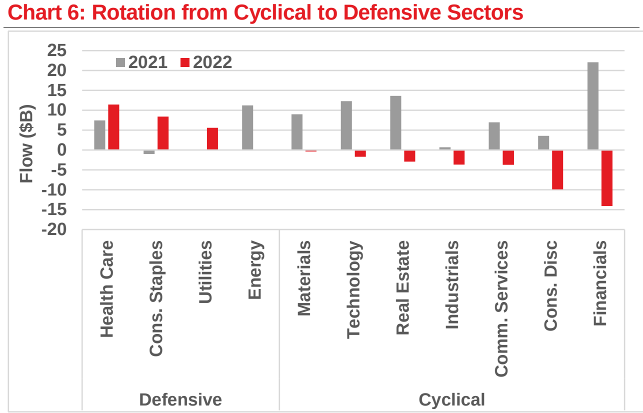
Chinese equity ETFs continued to enjoy massive growth in 2022, welcoming $6.4 billion of fresh money, or 23% of their starting AUM. After three years of effort to combat the coronavirus though measures such as lockdowns and mandatory PCR testing, in late November, the government decided to ease its COVID-zero policies. The decision may have sounded encouraging at first, but China's health care system has come under pressure from the increasing number of COVID-19 cases and medicine shortages.

Equity Flows by Sector (Chart 6)

Sector and thematic ETFs suffered net outflows of $4.0 billion in 2022, reflecting a reversal from last year's high demand, when sector and thematic ETFs received $146 billion combined.

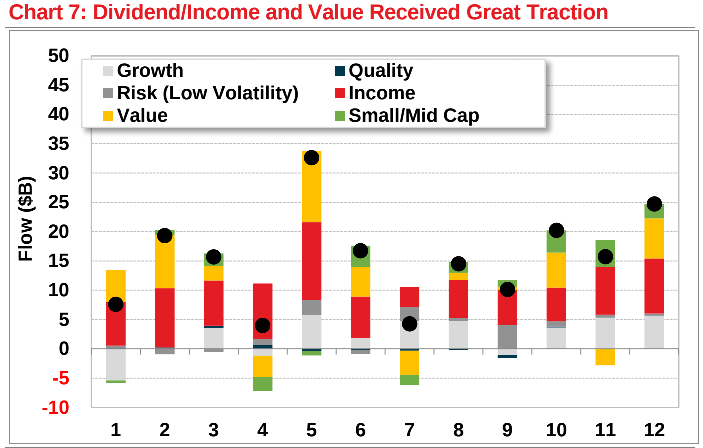
In 2021, most ETF inflows were led by cyclical sectors, such as financials, real estate and technology, but some money started to pile into defensive sectors near year-end as some investors anticipated monetary tightening plans from the Fed and a slowing economy. Throughout 2022, as inflation remained stubbornly high, even during the Fed's accelerated rate hikes, we observed cyclical-to-defensive rotations in ETF flows. However, the magnitude of flows was below 2021's demand surge for "growthy" sectors. This asymmetry may arise from the fact that when sentiment is bullish, investors latch onto growth sectors like technology with high uniformity, but when the tide turns to fears of recession, there are many alternatives to "defensive sectors" for protecting capital, including factor strategies such as dividend/income, not to mention other asset classes.

Chart 6: Rotation from Cyclical to Defensive Sectors



Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Chart 7: Dividend/Income and Value Received Great Traction



Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Equity Flows by Factor (Chart 7)

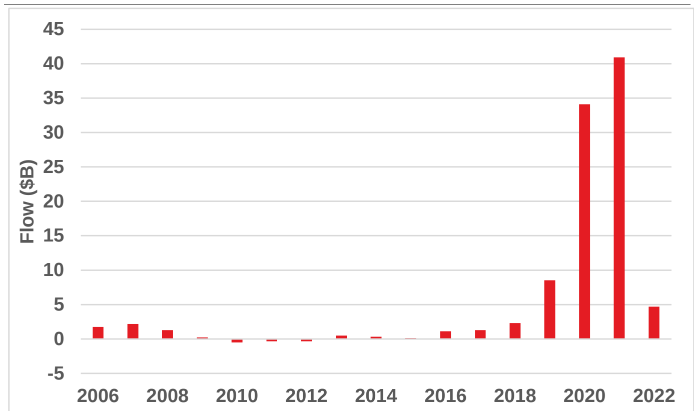
Dividend/income ETFs dominated factor ETF flows in 2022 as investors sought stable sources of income in a declining market. Unlike the pattern in sector ETF flows, investors didn't give up on "aggressive" factor categories like growth and small/mid-cap. ETFs offering such factor exposures managed to gain substantial interest, especially near the year-end in concert with dovish signals from the Fed. All told, growth ETFs received $28.2 billion in 2022. In fact, if we take out the $8.0 billion inflow that came from the mutual fund conversion of Dimension US Marketwide Value ETF (**DFUV**), value ETFs only outsold growth by $3.0 billion, which seems too small to be true considering the S&P 500 Value Index outperformed the S&P 500 Growth Index by almost 25% in 2022; this speaks to the attitude towards the value factor after a prolonged period of underperformance from 2013 to 2021.

Low volatility ETFs disappointed in the COVID-meltdown of 2020 but have since proven its ability to protect investor capital in a bear market like 2022; for example, the S&P 500 Low Volatility Index outperformed the S&P 500 index by over 10%. Low volatility ETFs saw a resurgence in creation, taking in $10.5 billion in the year, or 16% of 2022's starting AUM. It is the second-best factor category in terms of percentage flow.

ESG Flows (Chart 8)

After two years of explosive growth, the ESG ETF space saw a falloff in demand in 2022. ESG ETFs received $4.7 billion in 2022, a nearly 90% decline from the 2021 figure. The prospect of underperformance in 2022 may have been one of the key considerations steering investors away from ESG in 2022. Although the "ESG-ness" of a company can be evaluated through different lenses, as a group, ESG strategies generally have lower energy exposure than their cap-weighted counterparts. Energy happened to be the only sector in 2022 with significant gains. Accordingly, among U.S.-focused equity ESG ETFs, two-thirds underperformed the S&P 500 index in 2022. We also saw some institutional-sized redemptions from the iShares ESG Aware suite (**ESGU**, **ESGE**), which were among the top inflow ESG ETFs in 2021.

Chart 8: U.S. Listed ESG ETF Flow Declined by 90% From 2021's Record Amount



Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Another possible cause for stalling ESG ETF demand might be concerns around increasing politicization and regulation surrounding ESG funds. For instance, in August 2022, Florida banned its pension funds from considering ESG factors while making investment decisions. On the regulation side, the SEC has pushed for greater scrutiny over ESG-related investment fund disclosures and marketing to clamp down against claims of "greenwashing," specifically when it comes to the branding or naming of funds; the SEC has indicated the "ESG funds" must disclose certain criteria and factors for investment selection. Perhaps in response to those pressures, we noticed some ETF rebranding taking place. For example, the ETF provider Inspire Investing removed the term "ESG" from the names of its "biblical-value" ETF suite.

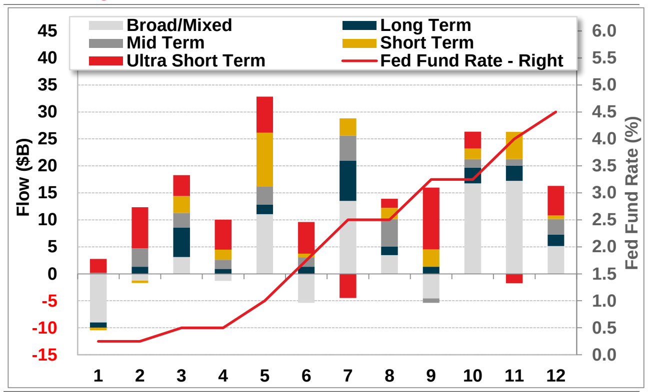
Fixed Income ETFs

Fixed income ETFs gathered a solid $195 billion in flows in 2022, despite historic bond selloffs in other investment vehicles and the long-expected era of rising rates. Investors used fixed income ETFs tactically throughout the year, sometimes in anticipation of the Fed's rate decisions (Charts 9, 11). Prior to the Fed's first rate-hike in March, investors were highly risk-off and reduced duration and credit exposure by switching from broad/mixed term ETFs to ultra-short-term ETFs and from high yield ETFs to U.S. government bond ETFs.

However, as the Fed started to accelerate its pace of hiking and CPI data showed signs of improvement (i.e., slowing inflation), some investors returned to long-duration bond ETF positions in summer, under the expectation that the Fed would soon conclude its monetary tightening. In particular, if we compare the flow pattern before and after Chair Powell's speech at the Jackson Hole Symposium on August 26th, we can see that fixed income investors were acting optimistically, seeking yield by increasing duration and credit exposure (Chart 10). However, after Powell delivered his hawkish outlook and pushed back on the market's pricing-in of interest rate cuts in 2023, the flow trend reversed drastically.

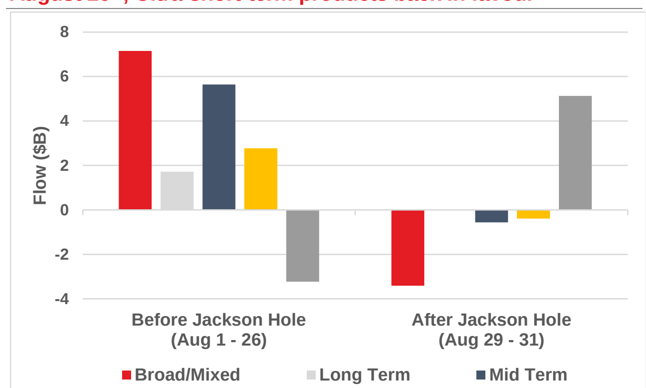
In the fourth quarter, market sentiment turned again, based on growing optimism around easing inflation and a potential Fed pivot, supported by the unexpected October CPI data (+0.4% versus +0.6% by consensus); Powell then suggested moderating the pace of policy rate increases "as soon as the December meeting". Investors allocated more towards credit and duration exposure through high yield and broad term bond ETFs.

Chart 9: Investors sought low duration exposure as rate hikes began, but some used long duration products to anticipate dovish signals from the Fed



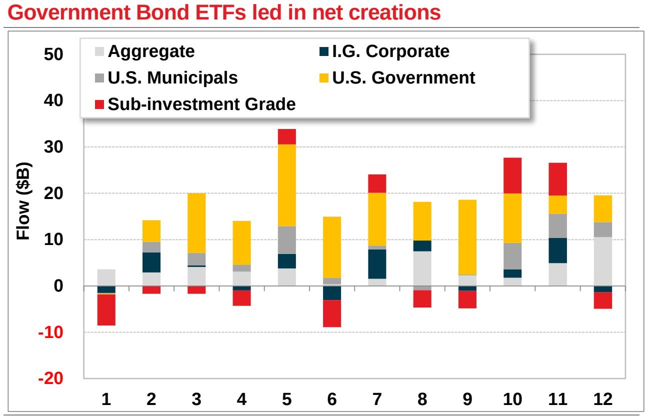
Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Chart 10: Investor sentiment shifted after Powell's speech on August 26th; Ultra-short-term products back in favour



Source: NBF ETF Research, Bloomberg. Data as of August 31, 2022.

Chart 11: Fixed Income ETF Flow by Category: U.S. Government Bond ETFs led in net creations



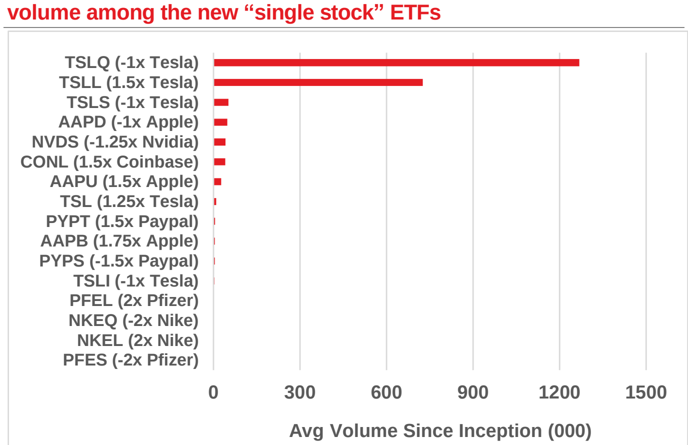
Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Single Security ETFs

In July 2022, AXS Investment introduced the first eight U.S. listed single stock leveraged/inverse ETFs. Other providers followed suit and expanded product coverage to single stocks combined with option strategies such as collar spread and covered call overlays. 27 single stock ETFs launched in the U.S. in 2022. Despite the flurry of launches, only a few ETFs saw any notable demand; ETFs that offer leveraged/inverse exposure to Tesla received most of the inflows and attention, while more than half of the single stock ETFs have received less than a million dollars in creation beyond their seed capital (Chart 13). In addition, we observed a strong first mover advantage. There are three -1x Tesla ETFs in the market, but only the first one from AXS Investment (**TLSQ**) had significant trading volume (Chart 12).

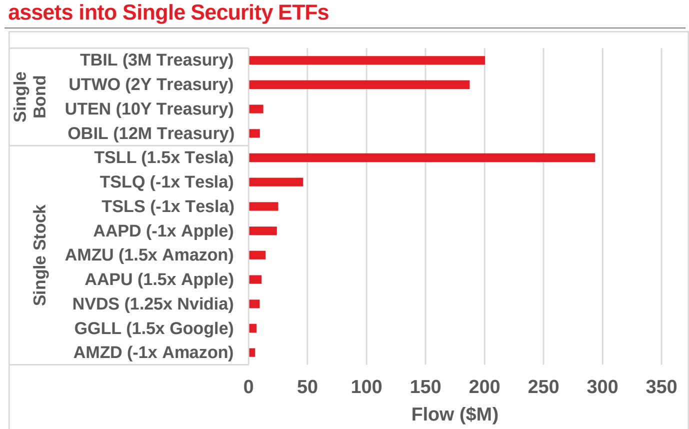
Shortly after the first launches of single stock ETFs, F/m Investments debuted three "single-bond" ETFs (**UTEN**, **UTWO**, **TBIL**), the first of their kind in the U.S. Each ETF invests only in a single on-the-run U.S. Treasury of a specific maturity, namely 10-year, two-year and three-month, rolling monthly to the next on-the-run issue. F/m Investments later added the 12-month treasury (**OBIL**) to the product shelf. These single-bond ETFs might be useful to a trader or institution running a very precise yield curve model, but they may not be ideal for investors simply seeking to add U.S. government bond exposure to their portfolios. One disadvantage is the monthly rolling feature, which results in high portfolio turnover that could generate more capital gains, not to mention slippage and transaction costs. The four ETFs together received a modest but appreciable $410 million in flows since inception.

Chart 12: Leveraged/Inverse Tesla ETFs had most of the trading volume among the new "single stock" ETFs



Source: NBF ETF Research, Bloomberg. Data as of November 30, 2022.

Chart 13: Single Bond ETFs and Tesla ETFs attracted most of the assets into Single Security ETFs



Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Crypto-asset ETFs

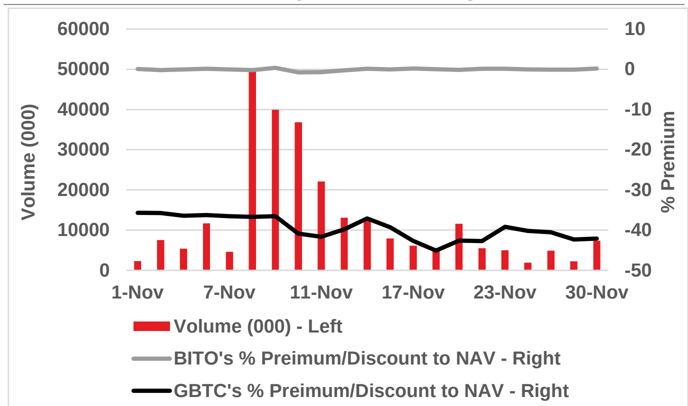
Investors witnessed another "crypto winter" as the prices of bitcoin and other crypto assets dropped in the aftermath of a series of spectacular company failures: the collapse of Luna coin, the crypto exchange FTX fraud and bankruptcy and the contagion effect among various crypto lending firms that led numerous related businesses to insolvency.

More than half of crypto ETF assets were wiped out in 2022, but we noticed that money invested in U.S. listed crypto ETFs has remained somewhat sticky (Chart 15). For example, during FTX's collapse, the single long futures-based ETFs listed in the U.S. had $2 million of outflow, just 0.3% of its AUM at the beginning of November. Trading volumes for Bitcoin futures ETFs (such as Proshares Bitcoin Strategy ETF, **BITO**) did heighten amid the FTX failure, but their prices traded quite closely to NAV, reaching discounts of 0.8%, at worst (Chart 14). This compares favourably with other structures such as Grayscale Bitcoin

Trust (**GBTC**), which is closed and does not have an active creation-redemption mechanism; its price discount-to-NAV reached -45% in November.

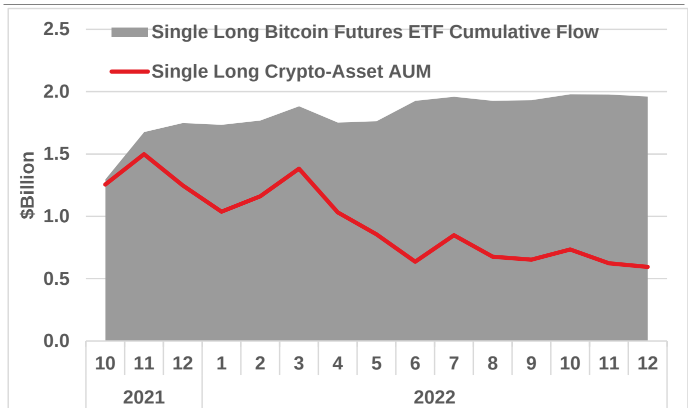
The use cases of blockchain technology may extend beyond the simple creation of digital securities, but the performance of blockchain-themed ETFs remains highly correlated with the price of bitcoin. In Chart 16, we present the cumulative daily dollar return of the money invested in Blockchain ETFs, together with cumulative money flows. We can see that the returns greatly resemble the movements of bitcoin price. Most of the assets to "blockchain-themed ETFs" flowed in during bitcoin's price boom in 2020-2021 and are as sticky as the assets in bitcoin futures ETFs; the cumulative flow plateaued even as the price of bitcoin was in freefall.

Chart 14: BITO Traded Closely to NAV amid High Volume



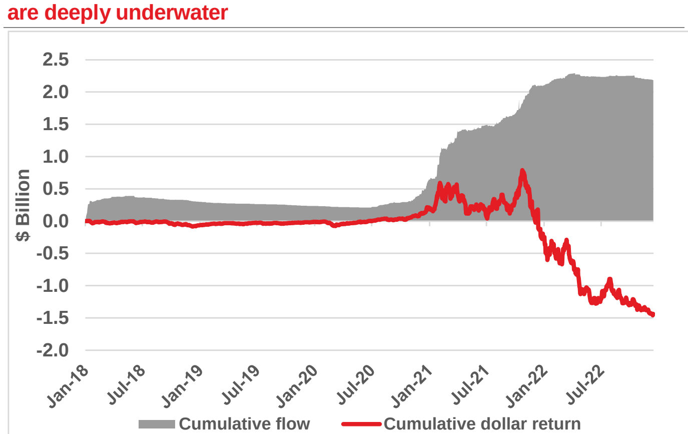
Source: NBF ETF Research, Bloomberg. Data as of November 30, 2022.

Chart 15: No significant outflow from Bitcoin Futures ETFs despite the huge decline in Bitcoin's price— "bag holding" or "diamond hands?"



Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Chart 16: Blockchain-themed ETFs: Performance-chasing investors are deeply underwater

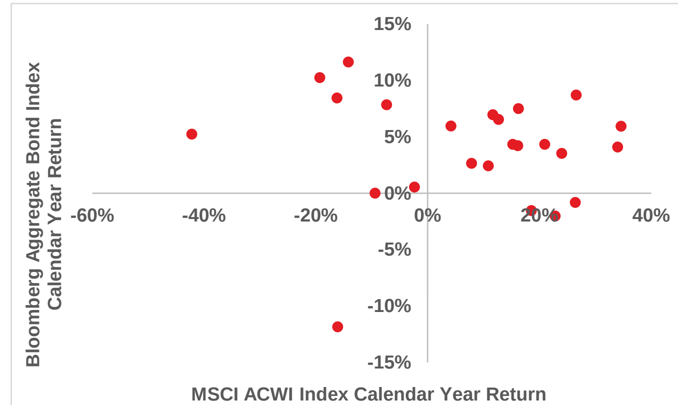


Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

ETF Strategies – What worked in 2022 (and what didn't):

Balanced portfolio (Chart 17): Both equities and bonds declined in 2022, a rare example of a calendar year in which both asset classes trended down together. 2022 represented the first calendar year in at least 30 years when the natural anticorrelation between stocks and bonds did not work out for traditional "multi-asset" balanced portfolio investors (as illustrated using the MSCI ACWI Index and the Bloomberg Aggregate Bond Index). Some argue that the traditional equity-bond portfolio is inadequate in today's market environment. However, from another perspective, given 2022's losses, 2023 might be a comeback year for the 60-40 portfolio if both equities and bonds mean-revert.

Chart 17: 2022 - A rare period when both Equities and Bonds were down (and down a lot)



Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Option strategies (Table 4): Buying out-of-the-money put options is often analogous to purchasing insurance; the investor pays an ongoing "premium" to the insurer/put-writer and then hopes to be compensated when losses occur. The outcomes are greatly dependent on the option portfolio manager's executions. A put-writing strategy can go wrong in many ways, for instance, one may end up paying too much premium, grinding returns with insurmountable headwinds over long periods. As another example, one might not receive any appreciable payoff, even in a down market, if the put option strike prices are set too far from spot levels. Either scenario can result in eroded portfolio gains.

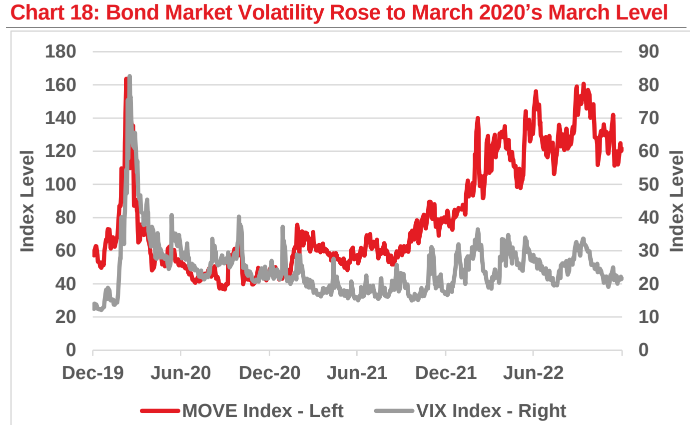
Table 4: Performance and Flow of Long Put Equity Option ETFs vs Long Put Bond Option ETFs

Ticker	Name	2022 Flow ($M)	Flow/AUM (%)	2022 Total Return (%)
SPY	*SPDR S&P 500 ETF Trust*			*-18.2*
TAIL	Cambria Tail Risk ETF	-23	-7	-13.1
HEGD	Swan Hedged Equity US Large Cap ETF	-11	-7	-11.3
XTR	Global X S&P 500 Tail Risk ETF	0	0	-17.7
AGG	*iShares Core U.S. Aggregate Bond ETF*			*-13.0*
PFIX	Simplify Interest Rate Hedge ETF	123	106	92.0
RRH	Advocate Rising Rate Hedge ETF	16	90	37.8

Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

In Chart 18, we look at the implied volatilities of the equity market and bond market through the CBOE Volatility Index (the VIX Index, which represents the implied volatilities of the S&P 500) and ICE BofAML MOVE Index (the MOVE Index, which calculates the implied volatility of U.S. treasuries) respectively. Although the equity market has been more volatile than the previous years and stock prices have declined significantly, there wasn't much fear of uncertainty that would cause a sudden explosion of volatility and a dive in equity prices, like what happened in March 2020. Therefore, equity tail-risk-hedged ETFs, such as those that hold deep-out-of-the-money S&P 500 put options, still outperformed the benchmark index in 2022, but didn't reproduce the stellar returns they delivered during the sudden and surprising 2020 "corona-pocalypse". U.S. equity tail-hedged ETFs on average just outperformed the SPY by 4.2%, which is impressive but cold comfort for investors in such a negative year.

Chart 18: Bond Market Volatility Rose to March 2020's March Level



Source: NBF ETF Research, Refinitiv. Data as of December 31, 2022.

On the fixed income side, aggregate bond indices delivered their worst returns in decades. Bond implied volatilities were at the same level as those during the early 2020 bond selloff. As a result, **PFIX**, which longs treasury puts, achieved a whopping

92% gain. **RRH** which uses a similar strategy also had an impressive year, up by 38%. Their assets have doubled based on flows in 2022, reflecting the increasing appetite for credit hedge strategies.

Alternative ETFs (Table 5): Hedge-fund-like alternative ETFs enjoyed 31% asset growth as many achieved outstanding returns. Managed futures ETFs, for example, gained 12.7% on average, handily outperforming the S&P 500 Index and the Bloomberg Aggregate Bond Index each by over 20%. Managed futures ETFs generally take long or short positions on various markets, such as commodities, energy, agriculture and currency, based on fundamentals or technical signals. Though different funds may position differently, all benefited from 2022's commodity rally as a result of global supply-demand imbalance. Managed Futures are now on the map as a credible alternative strategy available to ETF investors, but whether they will repeat 2022's outperformance remains to be seen.

Table 5: Managed Futures ETFs welcomed a significant amount of inflow in 2022

Focus	2022 Flow ($M)	AUM ($M)	2022 Total Return (%)	Number of ETFs
Managed Futures	1783	1,929	12.7	6
Market Neutral	247	399	13.9	2
Equity Focused	205	1,514	-6.3	13
Other	96	1,374	-10.6	8
Fixed Income	59	95	24.7	4
Multi-Alternative	27	1,186	-7.9	12

Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

Market-neutral ETFs also had an impressive year. Market-neutral ETFs aims to maintain a zero or low correlation to the broad equity market; they do so by shorting one group of stocks and longing another, so that the portfolio is almost immune to broad equity market movements. Market-neutral ETFs will not participate much in the market rallies, but during a bear market like 2022, could help to significantly mitigate losses.

Top-performing ETFs (Table 6): 2022's best performers were mostly energy-related, ranging from natural gas ETNs to U.S. broad energy sector and sub-sector equity ETFs. Lingering supply shortages are one cause for a run-up in prices. For example, Russia reduced its natural gas supply to European countries since its invasion of Ukraine; and in October, OPEC+ announced a decision to cut crude oil output targets. U.S. energy stock prices were also supported by outstanding company earnings and investors' strong demand for defensive equity exposure.

Table 6: Best Performing ETFs* - Full-Year 2022

Ticker	Name	2022 Flow ($M)	Flow/AUM (%)	2022 Total Return (%)
TUR	iShares MSCI Turkey ETF	-83	-30	105.8
PFIX	Simplify Interest Rate Hedge ETF	123	106	92.0
OIH	VanEck Oil Services ETF	-680	-32	66.2
IEZ	iShares U.S. Oil Equipment & Services ETF	200	199	65.7
XLE	Energy Select Sector SPDR Fund	-1008	-4	64.2
FENY	Fidelity MSCI Energy Index ETF	46	5	63.1
VDE	Vanguard Energy ETF	-671	-11	62.9
PXJ	Invesco Dynamic Oil & Gas Services ETF	44	207	62.1
XES	SPDR S&P Oil & Gas Equipment & Services	99	80	62.0
IYE	iShares U.S. Energy ETF	-1395	-56	60.3

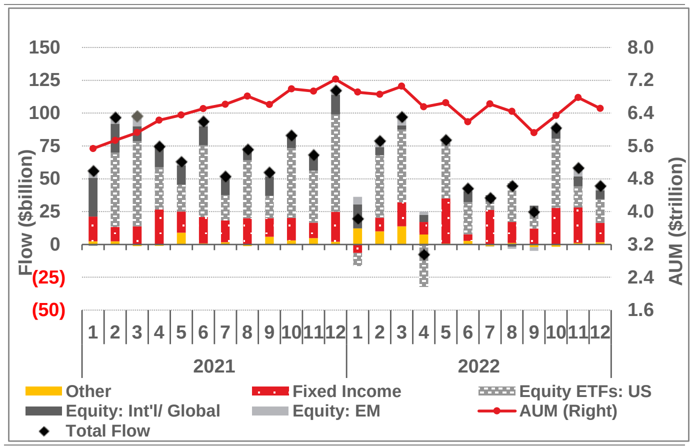
* excluding leveraged / inverse ETFs. Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

The best performing ETF is an outlier: iShares MSCI Turkey ETF (**TUR**). Despite Turkey's inflation soaring to "hyper" levels in the neighbourhood of 80%, the Turkish government decided to cut interest rates to the stimulate economy, in defiance of global central bank trends and practices. Turkey's stock market rally might be due to domestic investors attempting to preserve purchasing power in the face of runaway price inflation. However, U.S. ETF investors reacted in the opposite way, as reflected through the significant outflow from **TUR**.

December 2022 ETF Flows (Chart 19):

The U.S. ETF market concluded the year with $44.9 billion new creations in December, bringing the full-year amount to $610 billion. Factor ETFs contributed most of the equity ETF inflows. Dividend/income ETFs and value ETFs led in terms of new money. Growth ETFs also had a steady inflow of $5.6 billion. On the fixed income side, investors retreated from corporate bond ETFs (both investment grade and the high yield). While some found longer-duration ETFs' valuations to be attractive, others chose to position conservatively and invested in ultra-short-term bond ETFs.

Chart 19: U.S. Listed ETF Flow and AUM



Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022.

December 2022 ETF Flows: Tables 7 – 13 *(Continued Next Page)*

Table 7 - Equity ETF Flows by Geography - Dec 2022				
Geography	AUM ($B)	Mkt Shr	Flow ($B)	Flow/AUM
U.S.	$3,814		$17.9	0.4%
Broad/Large Cap	$1,522	31%	-$2.0	-0.1%
U.S. Other	$2,292	46%	$19.9	0.8%
International Developed	$529		$3.4	0.6%
Broad Int'l Dev	$415	8%	$3.4	0.8%
Broad Europe	$36	1%	-$0.1	-0.4%
Japan	$20	0%	$0.1	0.7%
Canada	$10	0%	-$0.2	-2.4%
Other Developed	$49	1%	$0.3	0.5%
Emerging Markets	$266		$3.6	1.3%
Broad Cap Weighted	$176	4%	$2.0	1.1%
China (A+H)	$26	1%	$0.6	2.4%
Other EM	$63	1%	$1.0	1.6%
Global/Regional	$343	7%	$3.6	1.0%
Total Displayed	**$4,951**	**100%**	**$28.6**	**0.5%**

Source: National Bank of Canada, Bloomberg

Table 8 - Equity ETF Flows by Sector and Themes* - Dec 2022				
Sector	AUM ($B)	Mkt Shr	Flow ($B)	Flow/AUM
Real Estate	$70	9%	$0.7	0.9%
Consumer Staples	$31	4%	$0.5	1.4%
Industrials	$33	4%	$0.4	1.1%
Communication Services	$24	3%	-$0.3	-1.0%
Materials	$41	5%	-$0.3	-0.6%
Energy	$86	11%	-$0.4	-0.4%
Utilities	$26	3%	-$0.5	-1.9%
Consumer Discretionary	$23	3%	-$0.5	-2.0%
Health Care	$105	14%	-$0.7	-0.6%
Technology	$136	18%	-$1.2	-0.8%
Financials	$58	8%	-$1.6	-2.6%
ESG	$84	11%	-$0.3	-0.4%
Thematic	$55	7%	$0.1	0.1%
Total Displayed	**$773**	**100%**	**-$4.2**	**-0.5%**

**Includes all geographic focus; Source: National Bank of Canada, Bloomberg*
QQQ is classified as a broad market ETF and does not belong to technology sector

Table 9 - Fixed Income ETF Flows by Type - Dec 2022				
Type	AUM ($B)	Mkt Shr	Flow ($B)	Flow/AUM
U.S. Aggregate	$295	23%	$8.9	3.1%
U.S. Government	$397	31%	$5.8	1.5%
U.S. Municipals	$100	8%	$3.3	3.4%
U.S. I.G. Corporate	$212	16%	-$1.4	-0.7%
Developed Markets&Global	$137	11%	$1.8	1.3%
Emerging Markets	$27	2%	$0.6	2.2%
Sub-investment Grade	$87	7%	-$3.6	-3.9%
Convertibles and Preferreds	$39	3%	-$0.6	-1.4%
Total Displayed	**$1,294**	**100%**	**$14.8**	**1.1%**

Source: National Bank of Canada, Bloomberg

Table 10 - Fixed Income ETF Flows by Maturity - Dec 2022				
Maturity	AUM ($B)	Mkt Shr	Flow ($B)	Flow/AUM
Broad/Mixed	$632	49%	$5.1	0.8%
Ultra Short Term	$167	13%	$5.5	3.4%
Short Term	$261	20%	$0.6	0.2%
Mid Term	$143	11%	$2.9	2.1%
Long Term	$58	4%	$2.1	3.7%
Target Maturity	$32	2%	-$1.4	-4.2%
Rate Hedged	$2	0%	-$0.1	-5.9%
Total Displayed	**$1,294**	**100%**	**$14.8**	**1.1%**

Source: National Bank of Canada, Bloomberg

Table 11 - Equity ETF Flows by Factor* - Dec 2022				
Factor	AUM ($B)	Mkt Shr	Flow ($B)	Flow/AUM
Income	$386	22%	$9.4	2.4%
Value	$404	23%	$6.9	1.6%
Growth	$311	17%	$5.6	1.7%
Small/Mid Cap	$414	23%	$2.4	0.6%
Low Vol	$68	4%	$0.4	0.5%
Momentum	$24	1%	$0.1	0.4%
Quality	$36	2%	$0.1	0.3%
Multi-Factor and Other	$136	8%	$0.3	0.2%
Total Displayed	**$1,780**	**100%**	**$25.1**	**1.4%**

**Includes all geographic focus, excluding sector ETFs; Source: NBC, Bloomberg*

Table 12 - Top Single Long ETF Inflows - Dec 2022				
	Ticker	Name	Flow ($B)	Flow/AUM
1	**AGG**	iShares Core U.S. Aggregate Bond ETF	$2.8	3.4%
2	**VTI**	Vanguard Total Stock Market ETF	$2.5	0.9%
3	**BND**	Vanguard Total Bond Market ETF	$2.3	2.7%
4	**IWF**	iShares Russell 1000 Growth ETF	$1.8	2.8%
5	**SGOV**	iShares 0-3 Month Treasury Bond ETF	$1.6	28.4%
6	**SCHD**	Schwab US Dividend Equity ETF	$1.6	3.6%
7	**JPST**	JPMorgan Ultra-Short Income ETF	$1.6	7.0%
8	**VTV**	Vanguard Value ETF	$1.5	1.5%
9	**JEPI**	JPMorgan Equity Premium Income ETF	$1.4	8.7%
10	**IEF**	iShares 7-10 Year Treasury Bond ETF	$1.2	5.6%
11	**VEA**	Vanguard FTSE Developed Markets ETF	$1.1	1.1%
12	**SUB**	iShares Short-Term National Muni Bond ETF	$1.1	10.6%
13	**SPYV**	SPDR Portfolio S&P 500 Value ETF	$1.0	6.9%
14	**IWD**	iShares Russell 1000 Value ETF	$1.0	1.8%
15	**VOO**	Vanguard S&P 500 ETF	$0.9	0.3%
16	**GBIL**	Goldman Sachs Access Treasury 0-1 Year ETF	$0.9	21.9%
17	**VIG**	Vanguard Dividend Appreciation ETF	$0.9	1.3%
18	**HDV**	iShares Core High Dividend ETF	$0.8	6.5%
19	**VGSH**	Vanguard Short-Term Treasury ETF	$0.8	4.6%
20	**VTEB**	Vanguard Tax-Exempt Bond Index ETF	$0.8	3.4%

Source: National Bank of Canada, Bloomberg

Table 13 - Top Single Long ETF Outflows - Dec 2022				
	Ticker	Name	Flow ($B)	Flow/AUM
1	**IVV**	iShares Core S&P 500 ETF	-$3.5	-1.1%
2	**HYG**	iShares iBoxx High Yield Corporate Bond ETF	-$2.1	-11.5%
3	**QQQ**	Invesco QQQ Trust Series 1	-$2.0	-1.2%
4	**SPY**	SPDR S&P 500 ETF Trust	-$1.8	-0.5%
5	**BSCM**	Invesco BulletShares 2022 Corporate Bond ETF	-$1.5	-99.7%
6	**TIP**	iShares TIPS Bond ETF	-$1.5	-6.1%
7	**IBDN**	iShares iBonds Dec 2022 Term Corporate ETF	-$1.3	-99.9%
8	**LQD**	iShares iBoxx $ Investment Grade Corporate Bond	-$1.1	-3.1%
9	**SHY**	iShares 1-3 Year Treasury Bond ETF	-$1.0	-3.6%
10	**VTIP**	Vanguard Short-Term Inflation-Protected	-$0.9	-4.9%
11	**MINT**	PIMCO Enhanced Short Maturity Active ETF	-$0.8	-8.5%
12	**VCSH**	Vanguard Short-Term Corporate Bond ETF	-$0.8	-1.9%
13	**XLU**	Utilities Select Sector SPDR Fund	-$0.6	-3.4%
14	**SMH**	VanEck Semiconductor ETF	-$0.6	-7.4%
15	**HYDW**	Xtrackers Low Beta High Yield Bond ETF	-$0.5	-41.4%
16	**BSJM**	Invesco BulletShares 2022 HY Corp Bond ETF	-$0.5	-99.8%
17	**XLF**	Financial Select Sector SPDR Fund	-$0.5	-1.3%
18	**JIRE**	JPMorgan Int'l Research Enhanced Equity ETF	-$0.4	-7.9%
19	**VNQ**	Vanguard Real Estate ETF	-$0.4	-1.2%
20	**MDYG**	SPDR S&P 400 Mid CapGrowth ETF	-$0.4	-19.1%

Source: National Bank of Canada, Bloomberg

Appendix 1: 2022 January – December ETF Flow Tables

Table 14 - Equity ETF Flows by Geography - Jan-Dec 2022

Geography	AUM ($B)	Mkt Shr	Flow ($B)	Flow/AUM
U.S.	$3,814		$265.1	6.1%
Broad/Large Cap	$1,522	31%	$83.4	4.6%
U.S. Other	$2,292	46%	$181.7	7.2%
International Developed	$529		$41.6	7.0%
Broad Int'l Dev	$415	8%	$45.4	10.2%
Broad Europe	$36	1%	-$10.5	-18.4%
Japan	$20	0%	-$0.3	-1.4%
Canada	$10	0%	$1.1	11.3%
Other Developed	$49	1%	$5.8	10.8%
Emerging Markets	$266		$31.9	10.5%
Broad Cap Weighted	$176	4%	$16.4	8.0%
China (A+H)	$26	1%	$7.0	25.4%
Other EM	$63	1%	$8.5	12.0%
Global/Regional	$343	7%	$31.8	7.8%
Total Displayed	**$4,951**	**100%**	**$370.4**	**6.5%**

Source: National Bank of Canada, Bloomberg

Table 15 - Equity ETF Flows by Sector and Themes* - Jan-Dec 2022

Sector	AUM ($B)	Mkt Shr	Flow ($B)	Flow/AUM
Health Care	$105	14%	$11.5	10.8%
Consumer Staples	$31	4%	$8.5	35.6%
Utilities	$26	3%	$5.4	25.3%
Energy	$86	11%	$0.4	0.7%
Materials	$41	5%	-$0.8	-1.5%
Technology	$136	18%	-$1.6	-0.8%
Real Estate	$70	9%	-$3.0	-3.0%
Industrials	$33	4%	-$3.7	-9.2%
Communication Services	$24	3%	-$3.9	-9.1%
Consumer Discretionary	$23	3%	-$9.9	-20.1%
Financials	$58	8%	-$13.8	-16.3%
ESG	$84	11%	$3.5	3.5%
Thematic	$55	7%	$3.3	4.4%
Total Displayed	**$773**	**100%**	**-$4.0**	**-0.4%**

**Includes all geographic focus; Source: National Bank of Canada, Bloomberg*
QQQ is classified as a broad market ETF and does not belong to technology sector

Table 16 - Fixed Income ETF Flows by Type - Jan-Dec 2022

Type	AUM ($B)	Mkt Shr	Flow ($B)	Flow/AUM
U.S. Aggregate	$295	23%	$30.7	10.1%
U.S. Government	$397	31%	$116.8	35.6%
U.S. Municipals	$100	8%	$28.2	35.8%
U.S. I.G. Corporate	$212	16%	$16.0	7.0%
Developed Markets&Global	$137	11%	$16.4	12.1%
Emerging Markets	$27	2%	-$0.3	-0.8%
Sub-investment Grade	$87	7%	-$7.9	-7.3%
Convertibles and Preferreds	$39	3%	-$5.2	-9.2%
Total Displayed	**$1,294**	**100%**	**$194.7**	**15.3%**

Source: National Bank of Canada, Bloomberg

Table 17 - Fixed Income ETF Flows by Maturity - Jan-Dec 2022

Maturity	AUM ($B)	Mkt Shr	Flow ($B)	Flow/AUM
Broad/Mixed	$632	49%	$45.6	6.5%
Ultra Short Term	$167	13%	$51.2	43.3%
Short Term	$261	20%	$31.5	12.8%
Mid Term	$143	11%	$28.8	21.2%
Long Term	$58	4%	$28.4	58.6%
Target Maturity	$32	2%	$11.0	48.4%
Rate Hedged	$2	0%	-$1.7	-46.7%
Total Displayed	**$1,294**	**100%**	**$194.7**	**15.3%**

Source: National Bank of Canada, Bloomberg

Table 18 - Equity ETF Flows by Factor* - Jan-Dec 2022

Factor	AUM ($B)	Mkt Shr	Flow ($B)	Flow/AUM
Income	$386	22%	$95.4	29.9%
Value	$404	23%	$39.2	9.8%
Growth	$311	17%	$28.2	7.0%
Small/Mid Cap	$414	23%	$15.6	3.2%
Low Vol	$68	4%	$10.5	16.0%
Momentum	$24	1%	$0.6	2.0%
Quality	$36	2%	$0.0	-0.1%
Multi-Factor and Other	$136	8%	$14.5	10.1%
Total Displayed	**$1,780**	**100%**	**$204.0**	**10.8%**

**Includes all geographic focus, excluding sector ETFs; Source: NBC, Bloomberg*

Table 19 - Top Single Long ETF Inflows - Jan-Dec 2022

	Ticker	Name	Flow ($B)	Flow/AUM
1	**VOO**	Vanguard S&P 500 ETF	$39.8	14.2%
2	**VTI**	Vanguard Total Stock Market ETF	$26.2	8.8%
3	**IVV**	iShares Core S&P 500 ETF	$18.8	5.6%
4	**TLT**	iShares 20+ Year Treasury Bond ETF	$15.7	79.6%
5	**SCHD**	Schwab US Dividend Equity ETF	$15.6	49.7%
6	**BND**	Vanguard Total Bond Market ETF	$14.3	17.0%
7	**BIL**	SPDR Bloomberg Barclays 1-3 Month T-Bill ETF	$13.1	96.5%
8	**JEPI**	JPMorgan Equity Premium Income ETF	$12.9	219.9%
9	**USFR**	WisdomTree Floating Rate Treasury Fund	$11.3	610.9%
10	**VTV**	Vanguard Value ETF	$11.1	12.0%
11	**VTEB**	Vanguard Tax-Exempt Bond Index ETF	$10.9	73.0%
12	**VEA**	Vanguard FTSE Developed Markets ETF	$10.4	9.4%
13	**VUG**	Vanguard Growth ETF	$9.3	10.3%
14	**COWZ**	Pacer US Cash Cows 100 ETF	$9.3	734.0%
15	**MUB**	iShares National Muni Bond ETF	$9.0	35.8%
16	**VYM**	Vanguard High Dividend Yield ETF	$8.9	20.8%
17	**IEF**	iShares 7-10 Year Treasury Bond ETF	$8.8	50.1%
18	**GOVT**	iShares US Treasury Bond ETF	$8.8	54.2%
19	**SHY**	iShares 1-3 Year Treasury Bond ETF	$8.1	39.5%
20	**DFUV**	Dimensional US Marketwide Value ETF	$8.1	NA

Source: National Bank of Canada, Bloomberg

Table 20 - Top Single Long ETF Outflows - Jan-Dec 2022

	Ticker	Name	Flow ($B)	Flow/AUM
1	**SPY**	SPDR S&P 500 ETF Trust	-$22.2	-4.8%
2	**TIP**	iShares TIPS Bond ETF	-$9.9	-25.4%
3	**XLF**	Financial Select Sector SPDR Fund	-$6.7	-15.2%
4	**VLUE**	iShares MSCI USA Value Factor ETF	-$6.4	-39.6%
5	**BBEU**	JPMorgan BetaBuilders Europe ETF	-$5.0	-51.1%
6	**MINT**	PIMCO Enhanced Short Maturity Active ETF	-$4.5	-33.1%
7	**SCHP**	Schwab US TIPS ETF	-$4.2	-19.6%
8	**PFF**	iShares Preferred & Income Securities ETF	-$3.4	-16.4%
9	**HYG**	iShares iBoxx High Yield Corporate Bond ETF	-$3.3	-15.1%
10	**VGK**	Vanguard FTSE Europe ETF	-$3.0	-13.5%
11	**IWM**	iShares Russell 2000 ETF	-$2.8	-4.0%
12	**FALN**	iShares Fallen Angels USD Bond ETF	-$2.7	-54.2%
13	**XLY**	Consumer Discretionary Select Sector SPDR	-$2.6	-11.2%
14	**FDN**	First Trust Dow Jones Internet Index Fund	-$2.6	-26.5%
15	**XLI**	Industrial Select Sector SPDR Fund	-$2.6	-14.6%
16	**BSCM**	Invesco BulletShares 2022 Corporate Bond ETF	-$2.4	-99.2%
17	**QUAL**	iShares MSCI USA Quality Factor ETF	-$2.4	-9.4%
18	**GLD**	SPDR Gold Shares	-$2.4	-4.1%
19	**VNQ**	Vanguard Real Estate ETF	-$2.2	-4.3%
20	**IXG**	iShares Global Financials ETF	-$2.1	-74.4%

Source: National Bank of Canada, Bloomberg

Table 21: ETF Provider Table

	Provider	AUM ($B)	Mkt Shr	Dec 2022 Flow ($B)	Dec 2022 Flow/AUM	Jan-Dec 2022 Flow ($B)	Jan-Dec 2022 Flow/AUM
1	BlackRock iShares	$2,204	34%	$16.3	0.7%	$166.1	6.7%
2	Vanguard	$1,887	29%	$16.5	0.8%	$192.8	9.3%
3	State Street SSGA	$979	15%	-$0.8	-0.1%	$25.2	2.3%
4	Invesco	$328	5%	-$3.9	-1.1%	$19.7	4.8%
5	Charles Schwab	$260	4%	$3.6	1.3%	$35.5	13.1%
6	First Trust	$133	2%	$0.2	0.1%	$9.2	6.1%
7	JPMorgan	$90	1%	$2.5	2.8%	$26.0	36.0%
8	Dimensional Holdings	$72	1%	$4.1	5.7%	$34.3	75.8%
9	ProShares	$57	1%	$0.9	1.5%	$14.7	20.5%
10	WisdomTree	$56	1%	$1.0	1.8%	$14.6	30.2%
11	VanEck	$51	1%	-$0.4	-0.8%	$1.6	2.6%
12	Global X	$36	1%	$0.0	-0.1%	$3.8	9%
13	Fidelity	$30	0%	$0.2	0.6%	$2.8	8%
14	Goldman Sachs	$27	0%	$0.7	2.7%	$4.6	16.9%
15	Direxion	$23	0%	-$0.1	-0.2%	$11.1	37.1%
16	PIMCO	$21	0%	-$0.7	-3.2%	-$3.6	-13.5%
17	Northern Trust	$21	0%	-$0.1	-0.3%	$2.2	10.8%
18	Pacer Financial	$19	0%	$0.9	4.6%	$11.3	111.5%
19	American Century	$19	0%	$1.3	7.1%	$10.8	108.8%
20	DWS Xtrackers	$18	0%	-$0.5	-2.5%	-$1.6	-6.8%
	Top 20 Total	**$6,333**	**97%**	**$41.8**		**$580.9**	
	Total ETF	**$6,513**	**100%**	**$44.9**		**$610.4**	

Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022

Table 22: ESG ETF Flows by Categories

Category	AUM ($M)	AUM (%)	December 2022 Flow ($M)	December 2022 Flow/AUM	Jan - Dec 2022 Flow ($M)	Jan - Dec 2022 Flow/AUM
Equity	$84,920	91%	-$305	-0.3%	$3,860	3.7%
Broad - U.S.	$45,981	50%	$2	0.0%	$994	1.7%
Broad - DM	$7,888	8%	-$25	-0.3%	$855	10.0%
Broad - EM	$4,167	4%	-$52	-1.2%	-$702	-10.7%
Broad - Global	$3,729	4%	$25	0.6%	$592	14.7%
Environment	$7,585	8%	$91	1.1%	$1,799	23.3%
Clean Energy	$12,259	13%	-$247	-1.8%	-$731	-4.6%
Social	$2,352	3%	-$113	-4.3%	$533	23.3%
Other	$663	1%	$8	1.1%	$297	61.8%
Commodities	$967	1%	-$45	-4.0%	-$534	-28.5%
Multi-Asset	$160	0%	$0	0.0%	-$1	-0.5%
Fixed Income	$6,788	7%	$118	1.8%	$1,696	27.8%
Total Displayed	**$92,836**	**100%**	**-$232**	**-0.2%**	**$5,020**	**4.5%**

Source: NBF ETF Research, Bloomberg. Data as of December 31, 2022

Appendix 2 – Glossary

Exchange Traded Funds (ETFs) are open-ended mutual funds in continuous distribution. This report also includes other Exchange Traded Products such as notes, grantor trusts, limited partnerships and unit investment trusts.

AUM (Assets Under Management): AUM is expressed in local currency, which is the U.S. dollar for the purpose of this report.

Market Share / AUM (%): AUM as % of category total AUM on the last line of the table.

Flow: The net dollar amount of fund creations and redemptions for the period based on daily NAV and the change in Shares Outstanding. Flows are expressed in local currency, which is the U.S. dollar for the purpose of this report.

Maturity: We categorize fixed income ETFs into the following maturity brackets:

- **Broad/Mixed:** ETF that holds issues from across more than one maturity bucket (short, mid and/or long term).
- **Floating Rate:** ETF that mainly invests in floating rate issues with periodic interest rate resets.
- **Long-Term:** ETF that mainly invests in long-term issues and has a weighted average maturity greater than 10 years.
- **Mid-Term:** ETF that mainly invests in intermediate-term fixed issues and has a weighted average maturity between three and 10 years.
- **Short-Term:** ETF that mainly invests in short-term issues with weighted average maturity less than three years.
- **Target Maturity:** ETF that has a target maturity, such as a fixed date or year.
- **Rate Hedged:** ETF that uses derivatives to mitigate interest rate risk and to maintain a zero or negative portfolio duration.

NAV (Net Asset Value per share): ETF price is used when NAV is not available.

Flow/AUM (Flow as % AUM): Flow as a percentage of assets under management from the beginning of the period.

Defensive Sectors: We classify Consumer non-cyclicals, Energy, Health care, Utilities as defensive sectors.

Cyclical Sectors: We classify Consumer Cyclicals, Financials, Real Estate, Industrials, Information Technology, Materials, Communication Services as cyclical sectors.

All numbers are as of last month's final business day.

Appendix 3 - Equity ETF by Factor Categories

We group Factor Equity ETFs (exclude cap-weighted ETFs, sector ETFs and thematic ETFs) into the categories below. These groupings follow NBF's discretion and can differ from the ETF Provider's definition and classification from other sources.

Small/Mid Cap: A fund with small/mid cap focus.

Income: A fund with the primary goal of providing income. We classify a fund as belonging to the Income category when its strategy focuses on providing income, or the fund self-identifies as using an income strategy even though it may incorporate other factors in addition to income.

Value: A fund that invests primarily in the stocks that are considered undervalued using metrics such as price-to-earnings, price-to-book, EV/EBITA, etc.

Growth: A fund that invests primarily in fast-growing stocks using metrics such as earnings growth, sales growth, momentum, etc.

Momentum: A fund that invests primarily in high momentum stocks using metrics such as period returns.

Quality: A fund that invests primarily in high quality stocks using metrics like ROE, debt/equity and earnings growth.

Low Vol or Risk: A fund that aims to achieve reduced portfolio volatility, either by screening for low volatility stocks, low beta stocks and/or minimizing the portfolio volatility.

Other: Any non-cap weighted factor strategy that is not covered by otherwise defined categories. This includes equal-weight, multi-factor, AlphaDEX and other fundamental-based ETFs.

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