



HORIZONS
EXCHANGE TRADED FUNDS

Educational Report: Swap-Based Exchange Traded Funds

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SWAP-BASED EXCHANGE TRADED FUNDS

This paper provides an outline of the basic structure and characteristics of swap-based Exchange Traded Funds (ETFs) including:

- Swap-based ETFs obtain perfect index tracking (before fees and expenses) through swap contracts with major commercial and investment banks
- This approach utilizes the innovations and advances developed in institutional index management
- Swap-based ETFs usually have lower costs for investors and can be more tax efficient
- Swap-based ETFs introduce an element of counterparty risk and collateral credit risk
- Differences in approaches and risk exposures between swap-based and cash replication ETFs have to be weighed in terms of their relevance and importance
- Greater transparency and information is good for the industry as it promotes safer returns

Introduction

Canadian swap-based ETFs, like all other ETFs, are exchanged traded mutual funds that fall under the rules, regulations and requirements of the Canadian National Instrument 81-102 *Mutual Funds* ("NI 81-102"). A swap-based ETF invests its assets into a collateral account and enters into a total return swap of a referenced index with a counterparty. The swap counterparty, typically a large commercial or investment bank, is contractually obligated to deliver the precise index return, and bears all responsibilities, risks and costs of managing the index portfolio.

The focus of the paper is on Canadian, swap-based ETFs. The paper provides a description of the basic swap structure, the way that ETFs utilize the swap approach, and assesses the performance and return characteristics of swap-based ETFs relative to those ETFs that utilize the traditional cash replication method - physical buying and selling of the underlying securities of an index.

While both approaches deliver index returns, their costs, performance and risk characteristics differ. The paper addresses the various relevant factors that have to be considered in assessing the importance and relevance of these differences.

Index Replication

There are basically two methodologies used to replicate an index portfolio or any well defined set of securities.

- a) The traditional cash (physical, or in-kind) replication approach delivers index returns by holding all index constituent securities in the proportion that these securities are represented in the referenced index, and
- b) The synthetic approach obtains the index exposure through derivatives such as futures and swaps.

Many large institutional index portfolios have transitioned from cash replication to what is now the dominant methodology; synthetic replication. It is estimated that over 75% of all S&P/TSX 60 Index related investments are now implemented synthetically¹. This is precisely what the author and his team did in managing numerous multi-billion dollar Canadian, U.S. and global portfolios for a large Canadian pension plan. The widespread adoption of synthetic replication reflects the fact that this approach provides the opportunity to enhance returns, is operationally easier and it delivers more precise index tracking at a lower cost. The tradeoff is the introduction of an element of counterparty credit risk. On balance, as demonstrated by the dominance of this approach, institutional investors have concluded that the advantages far outweigh the incremental risks.

Some ETFs have adopted the innovations of synthetic replication to deliver to smaller institutional accounts and to individual investors the same advantages enjoyed by large institutional investors within a tax-efficient structure. In Europe, swap-based ETFs have grown very rapidly and currently account for almost half of the ETF market. Growth has also been very strong in certain Asian markets. In Canada, the Horizons Exchange Traded Funds Inc. organization offers two swap-based ETFs; The Horizons S&P/TSX 60 Index™ ETF, ticker symbol HXT, tracking the S&P/TSX 60 total return index, and The Horizons S&P 500® Index (C\$ Hedged) ETF, ticker symbol HXS, tracking the S&P 500 total return index.

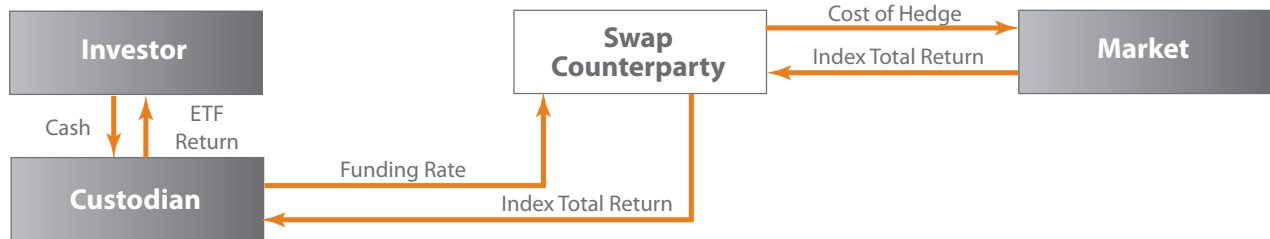
The Basic Swap Structure

A swap is exactly what the name implies, an exchange (a swap) of payments based on a notional principal amount. In a generic equity swap, two counterparties agree to swap a funding amount² in exchange for the return of an equity index. The ETF which seeks the return of an equity index pays the funding amount to the swap counterparty. The swap counterparty which pays the total return of the index is typically a commercial or investment bank. The bank will normally purchase the equities in proportion to the index or futures as its hedge to the swap with the ETF. The bank is able to provide this service, in part because its costs of funds are lower than the ETF funding amount that it receives through the swap, and because it benefits from economies of scale managing similar portfolios for other counterparties and its own account and various arbitrage opportunities that may be available in certain markets.

¹From TD Index Research Group, 2011

²Funding amount or funding rate is typically CDOR +/- a spread

The Basic Swap Structure



Under this approach, the management of the index is outsourced to the swap counterparty who bears the responsibility, risks and costs of managing the index portfolio and is responsible for any tracking error that may arise from this activity. Swap providers have the scale, infrastructure and expertise to manage this activity and are able to exploit various arbitrage opportunities. Swap providers also tend to have local presence on a global scale and are able to hold their securities in the most tax and cost attractive jurisdiction.

Swaps are especially attractive in situations where cash replication is problematic. This is usually the case when indices have a large number of constituents and when indices span multiple jurisdictions with different currencies and time zones. Swaps are also ideal for accessing markets where various kinds of restrictions on foreign investors are present. The MSCI EAFE Index, global, emerging markets and commodity markets are examples of indices where physical replication may be problematic for most investors.

Overall, the swap market is fiercely competitive, which results in very attractive pricing.

Swap-Based Exchange Traded Funds

In traditional cash replication, the investment manager either accepts “in-kind” subscriptions (holding the actual securities in the index) in the same proportion or weights as the index or uses the cash proceeds from the sale of units to purchase the index securities in the proportions that these securities are represented in the referenced index, and regularly adjusts (trades) the security holdings to ensure that they reflect the index composition properly.

In swap-based ETFs, instead of buying the basket of index securities, the ETF provider places the proceeds received from the sale of ETFs units in a collateral account and enters into an index swap with a counterparty. Per above diagram, the counterparty delivers the total return of the index in exchange for an agreed funding rate. The collateral account is typically a portfolio of high quality short-term money market investments. The ETF offsets the funding rate by the return it receives on its collateral. Typically the difference between the funding rate and the interest on the collateral can

be minimized if not eliminated, so that the ETF investor has limited or no exposure to interest rate risk.

In the case of the Canadian swap-based ETFs offered by Horizons ETFs the swap is collateralized with cash and the interest generated on its cash balances match the funding rate in the swap.

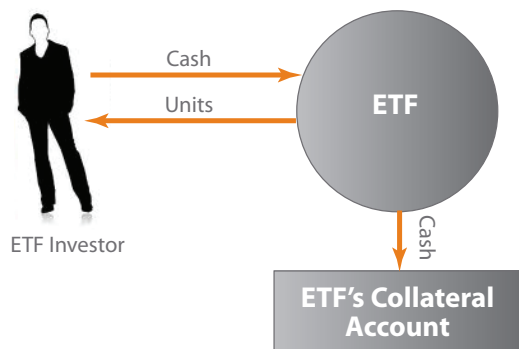
The swap counterparty is contractually obligated to deliver the total return of the index to the ETF provider. Any change in the value of the referenced total return index is immediately reflected in the value of the swap. In this way, a swap-based ETF obtains the exact return of the total return index.

At any point in time, the assets of the ETF units consist of the combined value of the collateral and the marked-to-market from/to the swap counterparty.

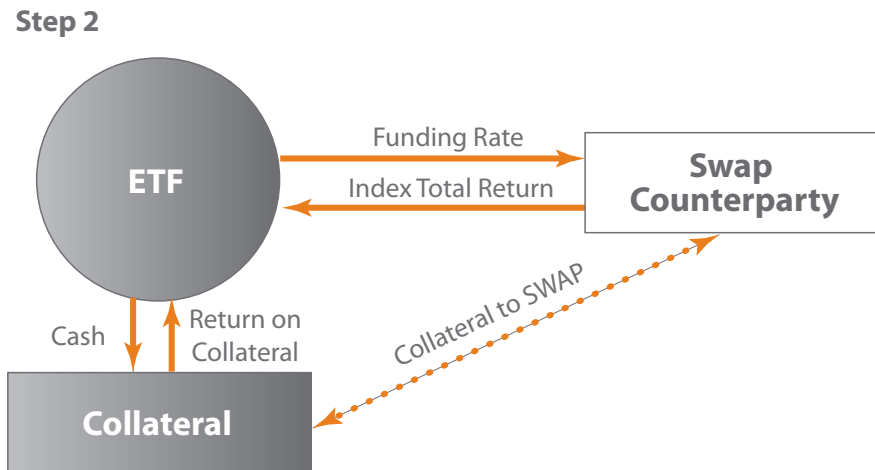
The Mechanics

Step 1: The ETF provider raises cash by selling ETF units. The cash is placed into a collateral account held in trust with a custodian.

Step 1



Step 2: The ETF enters into an index swap with a counterparty. On a daily basis, the swap is marked-to-market. The swap counterparty pays the index total return to the ETF provider in exchange for the funding rate. The funding rate is offset by the returns on the deposited collateral held in trust with the ETF's custodian. In the case of Canadian swap-based ETFs, the swap is fully collateralized by the proceeds raised by the ETF.



An exchange of payments is made either at regular time intervals or if the index return from the time of the last settlement exceeds a predefined threshold. (e.g. 10% marked to market limit as prescribed under the Canadian National Instrument 81-102 Mutual Funds ("NI 81-102")). In between these periods the value of the respective payments are reflected in the marked-to-market of the daily value of the net-asset-value calculation performed by the ETF's accountants and valuation agent.

The simplified example below demonstrates the basic equivalency of each of the replication approaches (fees are not considered for simplicity).

	Physical Replication	Total Return Swap-Based Replication
1. Value at regular settlement periods		
Scenario 1:		
Opening position	\$100 in index securities	\$100 in collateral
Index appreciates by 8%	+\$ 8 price appreciation + taxable dividends	+\$ 8 net payment from swap counterparty
Total Value of position:	\$108 in index securities	\$108 in collateral account
Scenario 2:		
Opening position	\$ 100 in index securities	\$100 in collateral
Index depreciates by 8%	-\$ 8 price depreciation + taxable dividends	-\$ 8 net payment to swap counterparty
Total Value of position:	\$ 92 in index securities	\$ 92 in collateral account
2. Value prior to regular settlement periods		
Scenario 3:		
Opening position	\$100 in index securities	\$100 in collateral
Index appreciates by 6%	+\$ 6 price appreciation + taxable dividends	+\$ 6 net receivable from swap counterparty
Total Value of position:	\$106 in index securities	\$106 in collateral and MTM (positive)
Scenario 4:		
Opening position	\$100 in index securities	\$100 in collateral
Index depreciates by 6%	-\$ 6 price depreciation + taxable dividends	-\$ 6 net payable to swap counterparty
Total Value of position:	\$ 94 in index securities	\$ 94 in collateral and MTM (negative)

Since the swap-based ETF provider earns the collateral return and any positive/(negative) index return less the funding rate to the swap counterparty, the net effect is to track the index perfectly less any management fees, general administration and operational expenses, if applicable, and the swap costs including funding basis.

While the two approaches are fundamentally equivalent, in practical terms they have meaningful differences in costs, tracking errors, tax treatment and risk exposures.

³ Mark-to-market

Costs

Swap-based ETFs can often be cheaper than the corresponding cash replication ETFs reflecting the economies of scale and scope that swap providers enjoy and the other advantages of the swap-based methodology. Swap providers have a comparative advantage in funding the index basket they hold for swap purposes. They utilize their extensive existing infrastructure and access to markets in order to trade and manage the required index exposures. Cash replication as shown in the “Tracking Error” section below is not as practical and is more difficult and costly to implement.

The table below shows the difference in cost between HXT and the iShares S&P/TSX 60 Index Fund, ticker symbol XIU, and the U.S.-based iShares MSCI Canada Index Fund, ticker symbol EWC.

	HXT	XIU	EWC** (US listed ETF)
Management fee	0.07%*	0.15%*	0.55%
Operating Expenses	None	Capped at 2bps*	2bps*
Tracking Error	Management fee plus applicable sales taxes	Management fee plus applicable sales taxes, operating expenses and trading commissions	Management fee plus applicable sales taxes, operating expenses and trading commissions

*Before applicable sales taxes which may or may not be paid or absorbed by the manager

**iShares MSCI Canada Index Fund

TRACKING ERROR

Tracking error measures how accurately the referenced index is being replicated. The primary objective of ETF providers is to design ETFs that minimize the variability of returns around the referenced index, and slippage from the index returns.

Swap-based ETFs receive the exact total return index exposure from the swap counterparty so they efficiently and accurately track the index less their all-in management costs. In contrast, cash replication ETFs usually have higher tracking errors because they have to overcome a number of frictions in replicating the index returns. While cash index replication appears straight forward requiring the investment manager to hold a portfolio of securities in the same proportions that the securities are represented in the reference index, in practice cash index replication can be cumbersome, costly and impractical. The simple illustration that is presented in the box on the following page demonstrates some of the challenges of implementing the cash replication approach.

Index calculation methodologies do not make allowances for all of the practical issues that arise in the management of a portfolio such as cash holdings and trading costs (trading commissions, market impact, timing of execution, etc.) Instead published index returns assume costless and instantaneous index adjustments and the automatic re-investments of dividends. All of these items tend to represent costly features in actually executing physical replication strategies that result in the portfolio return slipping relative to the performance of the index.

In order to maintain the correct security index weights, portfolio managers have to regularly transact in the market to re-adjust the weights (portfolio allocations) of each and every security whenever there is an index event such as a share update, deletion and/or addition of a security. Portfolio managers also have to re-invest the dividends and other cash flows the ETF receives. Given the practical difficulties of doing so on an ongoing basis, portfolio managers tend to tolerate some cash holdings and deviations from index weights. When the number of index constituent securities is large, or certain securities are difficult to trade, portfolio managers may in some cases use optimization techniques to hold only a subset of the index securities in an effort to match the performance of the referenced index.

Naturally these frictions tend to be more significant in indices with a large number of constituent securities, small capitalization securities, and indices that span multiple jurisdictions in different time zones and different currencies. In these situations the advantages of the swap based approach are even more pronounced.

Maintaining the Correct Index Weights

Index weight changes arise from regular index maintenance by the index provider and from corporate actions (e.g. mergers, spin-offs, new share issuances). Since the index weight always has to add up to 100%, an increase (decrease) of the weight of an index security can only occur with a corresponding and proportionate decrease (increase) in the weights of all the remaining index securities. This causes the need to trade not only on the security in question, but in all of the remaining index securities as well.

For example, assume that there is an index change due to a merger and index security A is being replaced with security B. If security A has a current index weight of 25 basis points and the replacement security B will have an index weight of 10 basis points, the index change will generate 15 basis points of cash that will have to be reinvested across all of the other securities in the index at the time of the index change. On a \$100 million asset base, there will be a need to re-invest \$150,000 across the remaining index securities. In practical terms, the portfolio manager will likely not be able to trade the portfolio at the same time as the index change because the merger proceeds will not be available for re-investment until well after the index change is reflected in the index. Trading the portfolio will also incur various trading costs (commissions, bid-ask spread, etc.) and, in all likelihood, the portfolio manager will only partially implement the required trades, leaving most of the security positions slightly over-weight or under-weight relative to the index.

Consequently the portfolio will likely experience some tracking error which over the course of a year could even exceed the slippage caused by management fees⁴.

Dividend Reinvestment

Total return indices typically assume that dividends are re-invested in the index on the ex-dividend date. In practice, the index portfolio manager does not receive the dividend payments until well after the ex-dividend date. Further, it is cumbersome, costly and impractical to continually reinvest small amounts of dividends across all of the index securities.

⁴While the slippage differs across markets and portfolio managers, a generalized average of 20 basis points is not unreasonable.

Because of these very real issues, many physical replication ETFs accumulate dividend payments and pay them out to investors on regular intervals, e.g. quarterly. This practice has three important implications:

- a) The investor does not have use of the dividend payments until the ETF provider makes the dividend distributions.
- b) These dividend distributions are subject to dividend taxes, even in cases where Dividend Reinvestment Plans are available.
- c) Investors who want to re-invest the proceeds in the index have to incur additional trading costs. Further, for many small investors, these dividend distributions are so small that reinvestment is impractical until a meaningful amount is accumulated (resulting in further cash drag).

In contrast, within swap-based ETFs, the value of any dividend distributions are reflected immediately and at no cost into the net asset value of the ETF on the ex-dividend date.

TAX EFFICIENCY

Swap-based ETFs can be more tax efficient than cash replication ETFs.

Swap-based total return index ETFs do not make any dividend distributions. Under the swap contract, the counterparty pays the total return of the index, which incorporates and reflects the immediate and cost-less re-investment of all dividends within the index as per the index construction methodology. The full value of dividends compounds within the ETF until the investor decides to sell the ETF.

In Canada, the current dividend yield on the S&P/TSX 60™ is about 2.5%. Assuming a dividend tax rate of 25%, this translates to about 62 basis points, which is significant by any measure. More importantly, the full dividend (together with the savings from the lower management expense cost, and the absence of any return slippage) compounds within the ETF structure until the investor decides to sell the ETF, at which time the investor may be exposed to capital gains taxes. However, capital gains taxes are typically lower than dividend taxes and the investor has control as to when to realize them. In other words, investors benefit from both a tax deferral and a lower tax rate.

The tax efficiency of swap-based ETFs providing foreign exposure is even higher. Swap providers generally have the ability to hold the index securities in the most tax efficient jurisdiction (which is normally the local market) so as to minimize or eliminate dividend withholding taxes (which generally range from 15% to 30%), mitigate capital gains taxes, stamp duties and in general obtain the same benefits available to local investors. Further, in Canada foreign dividends are taxed as income, but since swap-based ETFs do not make dividend distributions, the full value of foreign dividends compounds within the ETF until the investor decides to sell the ETF at which time the investor is exposed to capital gains taxes.

A foreign investor owning Canadian exposure through a swap-based ETF would experience this same advantage versus owning the traditional cash-replication ETF.

Below is an example of how taxes could be expected to erode the one year return of a foreign index ETF that uses the traditional method of holding the physical securities in order to replicate index returns.

Initial Investment	\$1,000,000
# of Units	100,000
Tax Rate* (Foreign dividends taxed as income)	46.41%
Return of US Price Return Index ETF	15%
Index Yield	2%
Total Distributions	\$20,000
Tax Liability**	\$9,282
Total Return (Return + Dividends)**	\$170,000 or 17%
Total Gain After Tax Return**	\$160,718 or 16.07%
Difference between Total Return And Total Gain After Tax Liability	\$9,282 or 0.93%

*Highest Marginal Tax Rate for Ontario Resident

**Based on initial investment amount or price of \$10.00

Roughly 5.4% of its total return goes to taxes

While the tax efficient structure is of greater relevance to taxable accounts, investments within tax exempt structures (RRSPs and TSFAs) also benefit from the reduction or elimination of dividend frictions present in physical replication.

The Canada-US Tax Treaty provides that interest and dividends are not subject to withholding taxes within an RRSP or a pension, but Canada does not have the same treaty with all jurisdictions (e.g. UK and many other jurisdictions). Also, in practice, many times US dividend withholding taxes are imposed for dividends received within an RRSP and have to be reclaimed. Further, TSFA's are not exempt from withholding taxes.

Within a tax exempt structure, the full value of dividends received through a swap-based ETF, together with the cost savings from the lower management fee and any potential index-tracking slippage is immediately, and without any cost, reinvested within the swap-based ETF structure.

COUNTERPARTY RISK

Swap-based ETFs introduce an element of counterparty risk that does not exist in physical replication ETFs and therefore it is important to assess the credit worthiness of the swap counterparty. In the case of the existing Canadian-based ETFs the swap counterparty is one of the major Canadian banks. It is likely that in the future major international banks will be utilized as swap counterparties for exposures in areas where these international banks tend to hold a comparative advantage (e.g. Emerging or European markets).

Without getting into a praise of the stability and strength of the Canadian banking system we need to consider the following principles that can help us assess this risk.

- a) When is counterparty exposure problematic? In short it becomes problematic when an investor is in the money and the counterparty fails. The table below provides an illustration of this.

	Counter Party Fails	Counter Party Solvent
"In the money"	Risk Position	No Risk
"Out of the money"	No Risk	No Risk

- b) What is the likelihood that, and the circumstances under which, a Canadian bank would fail?
 While it is possible that any particular Canadian bank may fail while the remaining banks and the economy prosper, it is more likely that a bank failure will occur under a severe adverse economic environment that will negatively impact most other companies, including the financial services sector. Considering the composition of the broad Canadian index, which has a large weighting in financial services, it is hard to imagine that under this scenario, the ETF will be receiving a positive return from the counterparty or will be "in the money". A parallel, but somewhat different rationale can be developed to assess the counterparty risk on swap-based ETFs that provide non-Canadian exposures.
- c) What is the maximum amount exposed to counterparty risk?
 Under NI 81-102, the counterparty risk or marked to market value cannot exceed 10% of the value of the ETF. In addition, NI 81-102 requires that only "acceptable counterparties" can be used based on a credit rating scale in the instrument.
- d) What are the likely recoveries?
 Swap obligations are effectively ranked as senior unsecured obligations. This means that if the bank defaults, the bank's swap obligations will have a claim priority over the bank's subordinate unsecured obligations.

Counterparty risk may also be present in cash replication approaches if the ETF provider participates in securities lending (as most do). When the securities are loaned out, the legal title of the securities is transferred to the borrower who in turn posts and maintains on a daily basis collateral of at least 102% of the value of the loaned securities. As in any other bilateral agreement, it is conceivable that the borrower may not be able to fulfill its obligations when the securities are recalled, and the value of the collateral may be insufficient to indemnify the lender.

For swap-based ETFs counterparty risk is further diminished by the argument that an eligible counterparty must meet the “approved credit rating organization” as defined in NI 81-102 as mentioned above.

Collateral assets represent most of the value of a swap-based ETF. It is therefore imperative to understand the policies and the rules that govern the collateral, and to understand any risk exposures that may be present.

Generally, Collateral Assets are Utilized in One of the Following Forms:

- Maintained as cash in an interest-bearing account, or invested in short-term money market securities, in order to generate the floating rate income to closely match the funding rate paid by the swap counterparty. This is the case for the existing Canadian-based ETFs. Under this approach any losses on the collateral impact the value of the ETF units directly. Therefore, an investor should be aware of, and be comfortable with the policies governing the management of the collateral.
- Invested in other securities to exceed funding rate in order to generate excess returns or minimize the cost of maintaining the collateral. This results in additional risk and should be a careful consideration when structuring the swap’s collateral.

Other Considerations:

Understanding the collateral

An investor should be aware and comfortable with the way that the collateral is managed. In the case of the existing Canadian ETFs, the collateral is maintained as cash in an interest-bearing account with the custodian.

ETF trading

ETFs are exchange traded and therefore they may trade at values different than their Net Asset Value (NAV) and at different bid ask spreads in line with market conditions. The price at which a trade can be executed relative to the NAV has a direct impact on profitability.

Simplicity or complexity

Being the newer product, there is less familiarity with the swap-based approach compared to the physical replication approach at the retail sales level. Education is key.

At a certain level the fundamental structure of swap-based ETFs is simpler and more transparent because the index tracking is guaranteed by the swap counterparty and the return the ETF investor is quantifiable at the inception, as tracking error is known. In contrast, the operational complexity of how physical replication ETFs obtain their returns, and attempt to reduce tracking error and index slippage can be daunting and sometimes results in surprising deviation from the index.

Quality of ETF provider

Although the ETF assets are typically held in segregated accounts by the custodian, the quality of the ETF provider is essential for the ongoing delivery and success of the program. While there has been a general movement to provide more transparent and timely information on holdings, policies, and day-to-day exposures, disclosures differ from provider to provider.

Regulatory and Tax changes

Any number of regulatory and tax changes may be implemented in the future and affect the basic structure of swap-based ETFs or their tax treatment.

It has to be noted that regulators globally have been paying increasing attention to the growth and size of the swap-based ETF market. The primary concerns relate to situations of potential conflicts of interest where the ETF provider and the swap counterparty are affiliates and in the quality and use of collateral, which may be problematic between related entities. In certain cases in Europe the collateral may be illiquid and/or of low quality raising concerns as to the ability of ETFs providers to meet redemption demands in situations of adverse financial conditions.

Many ETF providers have welcomed this scrutiny because the long term prosperity of the industry will be enhanced with uniform high standards, (e.g. minimum collateral quality requirements), increased transparency and better information available to investors.

CONCLUSION

Swap-based ETFs have lower costs, superior index tracking, less friction and are more tax efficient than the physical replication alternatives, but they also introduce counterparty and in some circumstances, such as European-based swap ETFs, collateral risk. Counterparty risk for the existing Canadian swap-based ETFs rests with a major Canadian Bank and collateral is maintained as cash in an interest-bearing account with the custodian.

Swap-based ETFs provide smaller institutional investors and retail investors access to the advantages and economies that larger institutional investors enjoy without the need to develop and implement an expensive permanent infrastructure to deal with swap contracts, settlements, systems, personnel, fund transfers, monitoring, etc.

Tax efficiency is a very important characteristic for taxable investment accounts.

Lower costs and avoidance of slippage in tracking the index, together with fewer frictions in the reinvestment of dividends and the power of compounding, benefits both taxable and tax exempt accounts.

Knowledge and understanding of the fundamental underlying characteristics and exposures of the swap-based and cash replication approaches are necessary for developing a sense of proportion and relevance on which the various considerations can be weighted. Investors should perform their own due diligence.

The exponential global growth of swap-based ETFs reflects, and is testament to, the advantages of this structure.

AUTHOR BIOGRAPHY



Savvas Pallaris has over 20 years of extensive and diverse investment experience. In his last role as Vice-President, Structured and Quantitative Investments with a major Canadian institutional investor for eight years, Savvas lead a team that developed, implemented and managed approximately \$10 billion in Canadian, U.S. and Global structured and quantitative products, and a collateralized commodities futures product. Prior to that, Savvas worked in a number of areas including debt issuance, performance measurement and evaluation, portfolio analysis and research, alpha transfer, asset allocation, investment strategy development and implementation, and as a Bank Economist with the Hellenic Bank of Cyprus.

Savvas Pallaris is a Chartered Financial Analyst (CFA). He earned a Bachelor of Science (Honours) degree from Surrey University, UK, a Master of Arts in Economics from Queen's University and a Masters in Business Administration with specialization in Finance from the University of Alberta. Savvas has been an active volunteer with the CFA Institute, has served as president of the Edmonton CFA Institute society, and has participated as speaker or panelist in a number of investment industry conferences. Savvas is currently a lecturer for the department of Finance and Statistical Analysis at the University of Alberta.

GLOSSARY

Collateral: Principal investment gathered from ETF unit holders which is used to secure the swap transaction.

Counterparty Risk: The likelihood that the swap counterparty will default on its obligation to deliver the return of the swap.

Funding Rate: Agreed upon payment used to fund the swap.

In-The-Money: An option or derivative that if exercised today has value.

Notional amount: The amount on which swap calculations are based between reset periods.

Out-of-the-Money: An option or derivative that would be worthless if it expired today.

Physical, in kind, or cash replication: Replicating the index by buying and selling the actual index securities.

Portfolio Optimization: Constructing a portfolio where return is maximized to a given level of risk.

Swap: A contract to exchange, or swap, a series of cash flows where the cash flows are linked to the performance of an underlying asset and are based on an agreed upon notional amount.

Swap based replication: A kind of synthetic replication that utilizes swaps.

Swap Counterparty: Accredited financial institution obligated to provide a specified return on the swap.

Tracking Error: The difference between the return of an ETF and its underlying benchmark.

Synthetic replication: Replicating the index utilizing derivative instruments such as futures and swaps.

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