Guide to pragmatic replication

This document is for the exclusive use of investors acting on their own account and categorised either as “eligible counterparties” or “professional clients” within the meaning of markets in financial instruments directive 2014/65/EU.
We are pragmatic replicators
Welcome

Our simple goal is to do the right thing for you. We start by giving you more choice through our far-reaching product capabilities, and finish with immaculately engineered ETFs. We tackle every last detail to ensure our funds do exactly what you expect. After all, no one likes surprises.

Ultimately, our mission is to create and manage a range of funds that track their indices, and trade, as efficiently as possible, no matter what the asset class or geography. You should be free to think about where you want to invest, rather than have to worry about whether you’ve got the right kind of fund.

This takes pragmatism: we will not restrict ourselves to one form of replication or another; we will do what is best for our investors. That means using the most appropriate form of replication for every index we track.

Arnaud Llinas,
Global Head of ETFs & Indexing
Lyxor Asset Management

There is simply no single replication method that always works best. We take the best of both worlds, and use each method where it really counts.
Putting our investors first

Pragmatism implies a tendency towards taking things on a case-by-case basis, rather than applying some kind of broad-brush approach to a strategy. For us, it means dealing with things sensibly and realistically. We put it at the heart of our decision-making – considering the pros and cons of each choice, taking the particular circumstances into account and making well-informed decisions.

Which method of replication is best - physical or synthetic – has been the subject of much debate. The result has often boiled down to a simple, misguided view that one is “good” or “better” and the other is “bad” or “worse”. Things are never as black and white, despite what some might say.

Asset flows show just how much this perception has become the norm. In 2010, just short of a decade ago the split of assets between those held in physical and synthetic replication ETFs was fairly even at around 55%:45%, compared to a skew of around 80%:20% today.

We won’t follow the crowd.

Our pragmatic approach to index replication is built to ensure the best possible outcome for our investors. In some cases, the best route to that outcome will be synthetic replication while in others, physical will make more sense. In this document, we’ll explore what makes each route different and in doing so articulate how you, the investor, always drive our decision-making.

Our pragmatic approach to index replication is built to ensure the best possible outcome for our investors.

---

1 Source: Lyxor International Asset Management. Data as at 29 March 2019
What’s the difference anyway?

People buy ETFs to receive the return of a given index. They therefore want them to track their indices as closely, continually and accurately as possible, wherever they are investing. The sheer diversity of indices available means that no one approach can deliver the best result in every case.

Before demonstrating when each form of replication is most appropriate, it’s worth describing how they differ from each other.

Both are perfectly valid and it is simply the underlying index that should determine which route to take.

At Lyxor, in both cases, your money is invested in a portfolio of physical assets, owned by the fund and held in a segregated account. This means regardless of the fate of the manager of the fund, your assets can always be sold in order to redeem your shares.

The main difference between the two approaches is one of function: physical replication relies on the assets to deliver performance, while synthetic replication uses them for safety. The performance of a synthetic ETF is delivered through a financial transaction called a ‘Performance Swap’. More on that later.

Physical assets are owned by the fund in both our physical and synthetic ETFs.
Physically replicating funds actually purchase all, or at the very least a representative subset, of the component parts of a given index, in order to mirror its return. They therefore tend to be the same (or very similar) to the benchmark they track.

They work well in large, liquid markets where the underlying stocks or bonds can be bought and sold with ease. By buying shares in the ETF, you access the collective performance of the underlying holdings, bearing in mind that some tracking error may occur.

Example: European government bonds

The bonds issued by developed European countries tend to be high-quality, liquid securities so there is little opportunity to enhance performance as they are easily bought and sold.

Best option = physical replication; no need for securities lending
When it’s time for a boost

Replicating a large, liquid index should be fairly straightforward, but there are factors that can hamper the accuracy. This is where securities, or stock lending, can make all the difference.

In the same way the owner of a flat can rent it out for money, the owner of a basket of securities can lend them for a fee. Some securities have great lending value, while others don’t. So by selectively lending out some of the funds’ underlying assets to a financial institution (the counterparty) in return for a fee, and then reinvesting those fees into the ETF, the performance of the fund can be significantly boosted. Any stocks on loan are collateralised according to strict rules around quality and diversification. More on that later.

Example: European equities

For instance, in the case of developed European equity markets the additional gains that can be made from securities lending might offset a significant portion of the annual management fee. You may even find the ETF outperforms the index. A carefully managed securities lending programme can sometimes be worth it.
When the going gets tough

However, buying the underlying assets is not quite as straightforward in less liquid or less accessible markets. It can also be an issue if an index requires frequent rebalancing. Here synthetic replication can provide a real benefit.

Don’t forget, synthetic ETFs also invest in a basket of physical assets such as equities or bonds, which are owned directly by the fund. But they don’t use the physical assets to deliver performance, they use them to ensure safety.

Performance is delivered by a form of derivative contract called a performance swap. The advantage here is that the bank issuing the swap is contractually obliged to provide the index’s performance, so the ETF can track precisely, even when conditions are more challenging.

Because the physical assets do not affect performance, they can be different to those held in the underlying index, and in some cases, of superior quality and higher diversification.

What is a swap?

A swap is a contractual arrangement between the ETF manager and an investment bank.

Under the terms, the investment bank commits to pay the precise daily performance of the index to the ETF.

In addition to the index performance, there is a swap spread which can be either positive (i.e. the ETF receives additional performance from the swap counterparty) or negative (i.e. the ETF is paying a cost to the counterparty). On top of this spread which represents the swap price, the counterparty receives the performance of the ETF’s basket of physical assets.
Example: Emerging Markets

Emerging Market stocks may be quite illiquid, expensive, or difficult to trade. This can be a challenge for physical replication, which relies on buying those stocks for performance. In our view, using a synthetic approach, and getting the performance of your underlying index directly from the swap counterparty instead can lead to much more precise and stable returns.

In fact, looking at ETFs tracking Emerging Markets, Synthetic ETFs offer on average 2 to 3 times lower tracking error - though it can be as much as 10 times lower - giving you much smoother performance.*

Best option = synthetic replication

*Source: Lyxor International Asset Management, Bloomberg. Past performance is not a reliable indicator of future results. Data based on a peer group of physically and synthetically replicated European listed ETFs tracking the MSCI Emerging Markets index, over the period 05/12/2013 to 29/03/2019. The rationale and construction of the Efficiency score are detailed in an academic paper published by Thierry Roncalli, former Head of Research & Development at Lyxor and Professor of Finance at the Evry University, and Marlene Hassine, ETF strategist. The academic paper can be downloaded from SSRN: http://ssrn.com/abstract=2212596 or from REPEC http://ideas.repec.org/p/pra/mprapa/44298.html
Our pragmatic approach to index replication offers you, in our view, the best of both worlds, and gives you one less thing to worry about.

We’re not for one minute suggesting how an investment is constructed isn’t important. We do however genuinely believe your primary decisions ought to focus on when and where to invest rather than on choosing a method of replication.

As one of Europe’s largest and longest-standing provider of ETFs you can leave the first part to us. It’s what we do, day in day out. You can rest assured that the right decisions are being made on your behalf.

### How we decide
1. The best interests of our clients
2. The specifics of the underlying market
3. The ability of the portfolio manager to deliver the most efficient tracking possible

---

<table>
<thead>
<tr>
<th>SIMPLE EXPOSURES</th>
<th>COMPLEX EXPOSURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>LARGE, LIQUID DEVELOPED MARKETS</td>
<td>NICHE OR HARDER TO ACCESS MARKETS</td>
</tr>
<tr>
<td>Physical</td>
<td>Physical with securities lending</td>
</tr>
<tr>
<td>When no optimisation is required</td>
<td>Physical with securities lending</td>
</tr>
<tr>
<td>When tracking is complex and significant improvement</td>
<td>Synthetic</td>
</tr>
<tr>
<td>e.g. Developed Market government bonds</td>
<td>e.g. European equities</td>
</tr>
<tr>
<td>e.g. Developed Market government bonds</td>
<td>e.g. Emerging Markets</td>
</tr>
</tbody>
</table>
Getting the balance right

We switched our first funds to physical replication back in 2012. Now almost half our assets are using it.

We started back in 2012 with a number of government bond funds, and have since converted a total of 55 ETFs representing approximately €23bn of assets under management, bringing our total physical assets figure to €27bn today.* Our approach has always been to allow efficiency to drive our choice of replication. If we can improve performance by switching to physical replication, that is what we do.

Synthetic replication will be kept for more complex, or more niche exposures, where it offers greater efficiency. As an innovative ETF provider we pride ourselves on the comprehensive nature of our range, and our ability to provide precise tracking in even the most remote investment markets. Without synthetic replication our ability to do this would be seriously restricted, and this would impact our investors.

*Source: Lyxor International Asset Management. Data as at 28/03/2019.
Managing your risk

When it comes to replication, the main thing keeping investors up at night is counterparty risk – the risk that a party the fund relies on fails, and can’t meet their obligations to the ETF. Without the appropriate safeguards, this can be disastrous. You can rest assured the risk management principles we employ go above and beyond anything requested by our regulators.

A good swap
In the case of a synthetic ETF, the counterparty is the swap provider. If they fail, the swap becomes worthless, and the fund becomes reliant on its physical assets.

As long as a synthetic ETF holds enough assets – i.e. they are worth as much, or more, than the ETF itself – there is no counterparty risk. Any failure by the swap provider is mitigated by its assets.

Our investors can check the identity of swap counterparties and the counterparty risk level on a daily basis on our website.

Going further than the regulation
Under UCITS regulations, an ETF can only ever put 10% of its value at the risk of a counterparty failure. In practice this means the ETF’s assets must cover at least 90% of its value.

At Lyxor, we go much further than the regulation. Our aim is to ensure our synthetic funds hold enough assets to cover their value in full. This means managing the assets daily, and topping them up if they ever drop below their target.

How we go further than the rest
► We aim to remove counterparty risk altogether – by resetting the swap every day to protect 100% of the ETF’s value
► In line with our best execution policy, we may use more than one counterparty arrangement in order to negotiate the best swap spread available, reducing costs and therefore delivering a higher return to our investors
► We constantly scan the market for counterparties offering the most favourable swap spread. While Société Générale Corporate & Investment Bank is our most prominent counterparty, we trade back-to-back with over a dozen different institutions, among the highest rated by Standard & Poor’s, Fitch and Moody’s in their peer group.

1 J.P. Morgan is the swap counterparty of Lyxor’s range of equity risk factor ETFs.
Keeping our lending on track

For physical funds, counterparty risk only exists if the fund uses securities lending. Here your risk is that one of the parties borrowing the stocks fails and can’t give it back. Without proper cover this could create a big loss to the fund.

But that is where good governance prevails, and again, where Lyxor goes further than most to keep your money safe:

► Limit how much we’re lending. In most cases we don’t lend out more than 25% of the portfolio.
► Control who we lend to. We’ll never lend to anyone that hasn’t been vetted by the risk divisions of both Societe Generale and Lyxor.
► Cover the lending. Every euro of stock we lend out is covered by at least €1.05 of collateral. That collateral is held in a segregated account with the fund custodian. It is monitored every day to ensure it provides sufficient protection.
► Demand quality collateral. Unlike some providers who accept stocks as collateral for their government bond ETFs, or even emerging market ETFs as collateral for their US Treasuries ETFs, we ensure the collateral type matches that of the assets on loan (i.e. bonds for bonds, equities for equities).

Our clients can see the value of the securities lending collateral, as well as the amount of assets on loan, on a daily basis on our website.

Quality foundations

Regardless of where you are investing, with Lyxor ETF you know you are always backed by the security of high quality stocks and bonds. All physical assets are held in a segregated account and are monitored every day to ensure they always comply with our stringent policies.

Pure physical ETFs largely have to hold the same assets as the index they’re tracking so you know what you’re getting. But what about synthetic ETFs, or the collateral used in a securities lending programme? How do you know if these are up to standard? At Lyxor we made it simple by creating a quality charter to govern what we can put in our ETFs.

Why we go further than the rest

► All profits gained through securities lending have to be reinvested back into the fund – ensuring its investors reap the rewards
► Unlike some managers who can lend out as much as 100% of the fund’s assets, our securities lending is capped at 25%2 each day – adding an additional layer of rigour and control
► We also insist on liquid, high quality collateral in order to cover up to 110% of the borrowed value on equities and 110% of the borrowed value on bonds
► Fund holders are further protected by a borrower default indemnification, which is provided by the securities lending agent in case of a borrower failure

2 Source: Excludes Topix and Nikkei of which all dividends paid daily.
Fund holdings

No matter how your fund tracks its index, you can be sure that the physical assets it holds are at least as good as the index it tracks.

All our synthetic ETFs follow the same standards. The assets held are consistent with the index – bonds for fixed income indices and stocks for equity indices – so you won’t find any nasty surprises.

We also have strict qualitative, quantitative and geographic restrictions to ensure we maintain the highest standards. The rules we apply for collateral assets are similar, with strict rules governing quality and diversification.

Guidelines for synthetic funds

<table>
<thead>
<tr>
<th>Criteria for eligibility within Lyxor ETF Eligible Securities</th>
<th>Equity</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>- UCITS rules of diversification applied</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>- Geographic and sectorial rules applied</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>- Blue Chip equities</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>- Issuances from major developed countries</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>- Min. Average Trading Daily Volumes</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>- Min. Market capitalisation</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>- Issuances with min. size</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>- Issuances with min. credit rating</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>- No security issued by one ETF counterparty unless it is among the underlying index</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

Quality collateral against securities lending

<table>
<thead>
<tr>
<th>Direct Replication using Securities Lending</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equities</strong></td>
<td></td>
</tr>
<tr>
<td>- Only stocks belonging to a defined list of large indices</td>
<td></td>
</tr>
<tr>
<td>- Issuers must be rated Investment Grade</td>
<td></td>
</tr>
<tr>
<td>- Diversification:</td>
<td></td>
</tr>
<tr>
<td>- A minimum of three sectors required</td>
<td></td>
</tr>
<tr>
<td>- Weight of stocks issued by financial companies limited to 30% of the NAV</td>
<td></td>
</tr>
<tr>
<td>- Minimum initial margin (i.e. ratio of collateral value to loan amount): 110%</td>
<td></td>
</tr>
<tr>
<td><strong>Bonds</strong></td>
<td></td>
</tr>
<tr>
<td>- Only sovereign bonds allowed issued by developed countries</td>
<td></td>
</tr>
<tr>
<td>- Maximum residual time to maturity is 10 years</td>
<td></td>
</tr>
<tr>
<td>- Minimum initial margin (i.e. ratio of collateral value to loan amount): 110%</td>
<td></td>
</tr>
<tr>
<td>Collateral restrictions: we do not accept cash or ETFs as collateral</td>
<td></td>
</tr>
</tbody>
</table>

Lyxor’s risk department is in charge of controlling on a regular basis that all guidelines are correctly enforced.

Why you can trust Lyxor

Having launched our first ETF in 2001, our pioneering spirit helped shape the market you know today. We’ve become one of Europe’s largest\(^1\), and most liquid ETF managers\(^2\). Our quality standards go further than most.

**Risk Control**
Each fund has a daily target of zero Counterparty Risk and holds a basket of shares or bonds (depending on the ETF) in a segregated account to provide the highest level of security for investments.

**Performance**
Precise index tracking, competitive and transparent fees and low trading costs make Lyxor ETFs one of the most efficient ways to access the global markets.

**Transparency**
All fund holdings, risk levels, performance measures and management fees are updated daily on our websites so you know exactly what you are investing in.

**Liquidity**
Lyxor ETFs are some of the most liquid and flexible in Europe, ensuring trading costs are as low as possible for investors\(^2\).

---

\(^1\) Source: Lyxor International Asset Management. ETF Assets under Management of $64.2bn, as at 29/03/2019.
\(^2\) Source: Lyxor International Asset Management. Data as at 29/03/2019.
We give you more choice through our far-reaching product capabilities.
Knowing your risk

It is important for potential investors to evaluate the risks described below and in the fund prospectus on our website www.lyxoretf.com

Capital at risk
ETFs are tracking instruments: Their risk profile is similar to a direct investment in the Underlying index. Investors’ capital is fully at risk and investors may not get back the amount originally invested.

Replication risk
The fund objectives might not be reached due to unexpected events on the underlying markets which will impact the index calculation and the efficient fund replication.

Counterparty risk
With synthetic ETFs, investors are exposed to risks resulting from the use of an OTC swap with Société Générale. In-line with UCITS guidelines, the exposure to Société Générale cannot exceed 10% of the total fund assets. Physically replicated ETFs may have counterparty risk if they use a securities lending programme.

Underlying risk
The Underlying index of a Lyxor ETF may be complex and volatile. For example, when investing in commodities, the Underlying index is calculated with reference to commodity futures contracts exposing the investor to a liquidity risk linked to costs such as cost of carry and transportation. ETFs exposed to Emerging Markets carry a greater risk of potential loss than investment in Developed Markets as they are exposed to a wide range of unpredictable Emerging Market risks.

Currency risk
ETFs may be exposed to currency risk if the ETF is denominated in a currency different to that of the Underlying index they are tracking. This means that exchange rate fluctuations could have a negative or positive effect on returns.

Liquidity risk
Liquidity is provided by registered market-makers on the respective stock exchange where the ETF is listed, including Société Générale. On exchange, liquidity may be limited as a result of a suspension in the underlying market represented by the Underlying index tracked by the ETF; a failure in the systems of one of the relevant stock exchanges, or other market-maker systems; or an abnormal trading situation or event.
Important information

This document is for the exclusive use of investors acting on their own account and categorised either as “eligible counterparties” or “professional clients” within the meaning of markets in financial instruments directive 2014/65/EU. This communication is not directed at retail clients. Except in the UK, where the document is issued by Lyxor Asset Management UK LLP, which is authorized and regulated by the Financial Conduct Authority in the UK, under Registration Number 435658, this document is issued by Lyxor International Asset Management (LIAM), a French management company authorized by the Autorité des marchés financiers and placed under the regulations of the UCITS (2014/91/EU) and AIFM (2011/61/EU) Directives. Société Générale is a French credit institution (bank) authorised by the Autorité de contrôle prudentiel et de résolution (the French Prudential Control Authority). Some of the funds described in this brochure are sub-funds of either Multi Units Luxembourg or Lyxor Index Fund, being both investment companies with Variable Capital (SICAV) incorporated under Luxembourg Law, listed on the official list of Undertakings for Collective Investment, and have been approved and authorised by the CSSF under Part I of the Luxembourg Law of 17th December 2010 (the “2010 Law”) on Undertakings for Collective Investment in accordance with provisions of the Directive 2009/65/EC (the “2009 Directive”) and subject to the supervision of the Commission de Surveillance du Secteur Financier (CSSF).

Alternatively, some of the funds described in this document are either (i) French FCPs (fonds commun de placement) or (ii) sub-funds of Multi Units France a French SICAV, both the French FCPs and sub-funds of Multi Units France are incorporated under the French Law and approved by the French Autorité des marchés financiers. Each fund complies with the UCITS Directive (2009/65/CE), and has been approved by the French Autorité des marchés financiers. Société Générale and Lyxor AM recommend that investors read carefully the “risk factors” section of the product’s prospectus and Key Investor Information Document (KIID). The prospectuses and the KIID are available in French on the website of the AMF (www.amf-france.org). The prospectus in English and the KIID in the relevant local language (for all the countries referred to, in this document as a country in which a public offer of the product is authorised) are available free of charge on lyxoret.com or upon request to client-services-etf@lyxor.com. The products are the object of market-making contracts, the purpose of which is to ensure the liquidity of the products on NYSE Euronext Paris, Deutsche Boerse (Xetra) and the London Stock Exchange, assuming normal market conditions and normally functioning computer systems. Units of a specific UCITS ETF managed by an asset manager and purchased on the secondary market cannot usually be sold directly back to the asset manager itself. Investors must buy and sell units on a secondary market with the assistance of an intermediary (e.g. a stockbroker) and may incur fees for doing so. In addition, investors may pay more than the current net asset value when buying units and may receive less than the current net asset value when selling them. Updated composition of the product’s investment portfolio is available on www.lyxoret.com. In addition, the indicative net asset value is published on the Reuters and Bloomberg pages of the product, and might also be mentioned on the websites of the stock exchange where the product is listed. Prior to investing in the product, investors should seek independent financial, tax, accounting and legal advice. It is each investor’s responsibility to ascertain that it is authorised to subscribe to or invest in this product. This document together with the prospectus and/or more generally any information or documents with respect to or in connection with the Fund does not constitute an offer for sale or solicitation of an offer for sale in any jurisdiction (i) in which such offer or solicitation is not authorized, (ii) in which the person making such offer or solicitation is not qualified to do so, or (iii) to any person to whom it is unlawful to make such offer or solicitation. In addition, the shares are not registered under the U.S Securities Act of 1933 and may not be directly or indirectly offered or sold in the United States (including its territories or possessions) or to or for the benefit of a U.S Person (being a “United State Person” within the meaning of Regulation S under the Securities Act of 1933 of the United States, as amended, and/or any person not included in the definition of “Non-United States Person” within the meaning of Section 4.7 (a) (1) (ii) of the rules of the U.S. Commodity Futures Trading Commission.). No U.S federal or state securities commission has reviewed or approved this document and more generally any documents with respect to or in connection with the fund. Any representation to the contrary is a criminal offence. This document is of a commercial nature and not of a regulatory nature. This document does not constitute an offer, or an invitation to make an offer, from Société Générale, Lyxor Asset Management (together with its affiliates, Lyxor AM) or any of their respective subsidiaries to purchase or sell the product referred to herein. These funds include a risk of capital loss. The redemption value of this fund may be less than the amount initially invested. The value of this fund can go down as well as up and the return upon the investment will therefore necessarily be variable. In a worst case scenario, investors could sustain the loss of their entire investment. This document is confidential and may be neither communicated to any third party (with the exception of external advisors on the condition that they themselves respect this confidentiality undertaking) nor copied in whole or in part, without the prior written consent of Lyxor AM or Société Générale.

The obtaining of the tax advantages or treatments defined in this document (as the case may be) depends on each investor’s particular tax status, the jurisdiction from which it invests as well as applicable laws. This tax treatment can be modified at any time. We recommend to investors who wish to obtain further information on their tax status that they seek assistance from their tax advisor. The attention of the investor is drawn to the fact that the net asset value stated in this document (as the case may be) cannot be used as a basis for subscriptions and/or redemptions. The market information displayed in this document is based on data at a given moment and may change from time to time.