



Project mBridge

UBS submission of potential applications for Project mBridge, with a focus on use cases in the Greater Bay Area ("GBA")

November 2021

This report was prepared by UBS AG Hong Kong Branch, as part of Project mBridge, co-led by the Hong Kong Monetary Authority (HKMA), Bank of Thailand (BoT), Central Bank of the United Arab Emirates (CBUAE), People's Bank of China Digital Currency Institute (PBC DCI) and the Bank of International Settlements Innovation Hub Hong Kong Center (BISIH HK).

Preamble

As a global financial institution operating in the Asia Pacific, UBS is privileged to contribute insights as part of Project mBridge, co-led by the Hong Kong Monetary Authority (HKMA), Bank of Thailand (BoT), Central Bank of the United Arab Emirates (CBUAE), People's Bank of China Digital Currency Institute (PBC DCI) and the Bank of International Settlements Innovation Hub Hong Kong Center (BISIH HK).

This briefing presents use cases where Distributed Ledger Technology (DLT) architectures can be used to support expanded functionality of cross-border / cross-boundary applications, and in particular focuses in on the application of Project mBridge around use cases in the Greater Bay Area ("GBA").

This briefing should be read in conjunction with the main report published by the Project mBridge co-leads, which can be found at <https://www.bis.org/publ/othp40.htm>.

About UBS

UBS provides financial advice and solutions to wealthy, institutional and corporate clients worldwide, as well as private clients in Switzerland. UBS's strategy is centered on our leading global wealth management business and our premier universal bank in Switzerland, enhanced by Asset Management and the Investment Bank. The bank focuses on businesses that have a strong competitive position in their targeted markets, are capital efficient, and have an attractive long-term structural growth or profitability outlook.

UBS is present in all major financial centers worldwide. It has offices in more than 50 regions and locations and employs over 68,000 people around the world. Its shares are listed on the SIX Swiss Exchange and the New York Stock Exchange (NYSE).

Please see important disclaimers at the end of the document.

Introduction to CBDCs

Central Bank Digital Currencies (CBDCs) represent a wider application of Distributed Ledger Technologies (DLTs) and are an important component in the journey towards full digitization and dematerialization of assets and cash. The applications for CBDCs can be wide-ranging, especially if they function as the “payment-leg” in the settlement of commercial transactions in the real and financial economy (i.e. in DvP¹ and PvP² situations).

In economic terms, a CBDC would be part of a country’s fiat currency system. It is a liability of the central bank, which is either directly accessible³ (just as notes and coins are) or indirectly accessible⁴ (just as bank reserves are, via the banking system). Regardless of the access model, key differences between CBDCs vs existing fiat currencies are that they can be:

- Held digitally such as in electronic wallets⁵ (*vs bank accounts*);
- Recorded on synchronized recordkeeping platforms, such as DLTs (*vs distinct and segregated bank sub-ledgers*);
- Programmed and executed automatically using smart contracts (*vs relying on paper-based manual processes*)

By adding new functionality to a monetary medium, CBDCs offer a new “format” of payment which can be used by financial institutions, regulators, and other market participants to drive innovation – from generating operational efficiencies to creating new operating models.

CBDCs and Asia Pacific

Over the past few years there has been an increase of CBDC use cases globally. While futuristic application of new technologies (i.e. DLTs, smart contracts and electronic wallets) are an important element of these use cases, to be effective they should be contextualized against jurisdiction-specific macro and financial market infrastructure considerations.

Nowhere is this more relevant than in the Asia Pacific region, where payments, banking and capital market infrastructure evolved in a different way compared to more developed markets. In particular, many Asia Pacific jurisdictions operate on a basis of balancing impacts of cross-border capital flows for economic development (i.e. linked to trade, direct investment, and/or portfolio channel investments) versus macroprudential factors. As a result, a number of markets in the region currently operate with certain currency controls (i.e. quotas, schemes,) which impact cross-border flows.

These features of the broader Asia Pacific markets present a differentiated problem statement for Project mBridge to address (in contrast to other markets where there are limited currency controls and highly advanced foreign exchange markets).

¹ Delivery versus Payment

² Payment versus Payment

³ General purpose or Retail CBDC

⁴ Wholesale CBDC

⁵ Public-private key based electronic wallets

Applications of mBridge

GBA Case Study

Project mBridge is a joint effort co-led by the HKMA, BoT, CBUAE, PBC DCI and BISIH Hong Kong Centre. Given the scope of jurisdictions engaged there were a number of directions that project participants could take with regards to use case development.

As a guiding principle, the selection of potential use cases (as described below) attempts to demonstrate value propositions that are broad enough to generally highlight technology and operational improvements (i.e. using DLT, smart contracts and electronic wallets), while being focused enough to illustrate meaningful business impacts (i.e. focusing hypothetical use case narratives around specific mBridge payment currencies in scope).

Our use case development for Project mBridge has particularly focused on hypothetical use cases in the Greater Bay Area (GBA). The GBA – consisting of nine municipalities in the Guangdong Province, HK Special Administrative Region (SAR), and the Macau SAR – already have initiatives seeking to enhance cross-boundary connectivity between Mainland China and Hong Kong SAR (i.e. Stock Connect, Bond Connect, Wealth Management Connect, and various qualified investor quota schemes), and was therefore deemed to be a good potential fit for use case ideation.

Introduction to the GBA⁶

The GBA was established in 2017, and the State Council of the People's Republic of China outlined its development plan in February 2019. The GBA comprises nine municipalities in Guangdong Province (Guangzhou, Shenzhen, Zhuhai, Dongguan, Huizhou, Foshan, Zhongshan, Jiangmen and Zhaoqing), the HK SAR and Macau SAR. It has an area of 56,000km² and a population of over 86m. In 2020, the GBA had a GDP of RMB 10.9trn, or USD 1.67trn.

Enhancing cross-boundary financial connectivity is an important aspect of development of the GBA. More convenient capital flows in the GBA should help to stimulate demand for accounts, settlement and remittance, mobile banking, private banking and wealth management services. Both onshore and HK banks could thus penetrate a larger customer base and monetize their richer financial service offerings.

⁶ UBS Research: China Equity Strategy. Follow GBA #1: what is the addressable market?. 19 August 2021

A digital infrastructure to enable further connectivity

Project mBridge has the potential to offer a new payment architecture to more flexibly facilitate cross-boundary capital flows to meet the GBA's ever-evolving and sophisticated connectivity needs.

To-date, the execution and oversight of north/southbound cross-boundary flows within the GBA is conducted by a series of intermediaries, agents, and service providers (i.e. custodians, correspondent banks, etc). This results in added costs and frictions (i.e. operations, technology, reporting, etc) in managing the front-to-back processes that link cross-boundary flows for market participants. In addition, there are a series of supervisory constraints around the timely aggregation, monitoring and enforcement of cross-boundary program usage.

With the mBridge, a digital (DLT, smart contract and electronic wallet-based) architecture can address the aforementioned ecosystem bottlenecks and support expanded functionality. This could generate efficiencies while opening up the possibility for new business opportunities.

Notable features of an mBridge architecture can include:

- **Real-time quota monitoring:** An mBridge architecture enables central banks to have transparency over the usage of applicable quotas on a real-time basis, facilitating prompt enforcement of quotas in a closed-loop system or cross-boundary application. This also reduces administrative work and potential errors involved in stakeholders' reporting submissions.
- **Closer collaboration and wider partnership options:** With the use of smart contracts, regulated activities (i.e. issuance, redemption and transfer of CBDCs) can be directly governed and executed by role-aligned private keys. These keys can be managed on behalf of the end-clients (i.e. corporates, investors) by different regulated entities (different private keys will control different functions). This allows for a more direct relationship between end-clients and their financial services providers (i.e. wealth and asset managers, securities firms, etc) without the need for layers of additional intermediaries, agents, and service providers.
- **Potential for customization:** An mBridge architecture offers the possibility to deploy smart contracts that can be programmed to both set risk-adjusted and customized quotas, and specify a permitted product range at a client-level (i.e. wallet-level), depending on the profile and suitability of clients (i.e. retail, affluent and professional clients). Supervisory agencies and central banks would have enhanced transparency and oversight tools available to ensure enforcement, even if there were multiple wallets per investor.

To highlight how these features can drive innovation in cross-boundary applications, two hypothetical GBA use cases have been shared as part of Project mBridge: one for corporates & institutional investors (**Use case #1: FX derivatives / Dual Currency deposits**) and one for individual investors (**Use case #2: Enhancing Wealth Management Connect**).

Use case #1: FX derivatives / Dual Currency deposits

Description of the use case

FX Dual Currency deposits are well-known money market investments where clients (i.e. corporates and institutional investors) are receiving an improved rate of return by taking a risk of being reimbursed in an alternative currency at maturity. As cross-boundary connectivity within the GBA continues to develop – in part driven by various connect and quota schemes – corporates and institutional investors will increasingly be holding liquidity in both HKD and CNY. The demand from corporate treasuries and portfolio managers to risk manage these positions, directly, and without the use of alternative currencies, would potentially grow.

The use case below explores FX derivative instruments, like dual currency HKD denominated notes (DCN), that are digitized and settled directly at maturity via the mBridge (either in e-HKD or e-CNY) depending on a market event (the final exchange rate in this use case). The full digitalization of the product (the security on the asset-side, and CBDC on the cash-side) allows for front-to-back efficiency gains while improving clients' and supervisors' visibility and helping to facilitate quota management. The efficiency gains from a fully digitalized product allows product distributors to expand and diversify the pool of potential note issuers and could increase distribution of (FX) structured products upon client demand, increasing servicing capacity.

Design of the use case

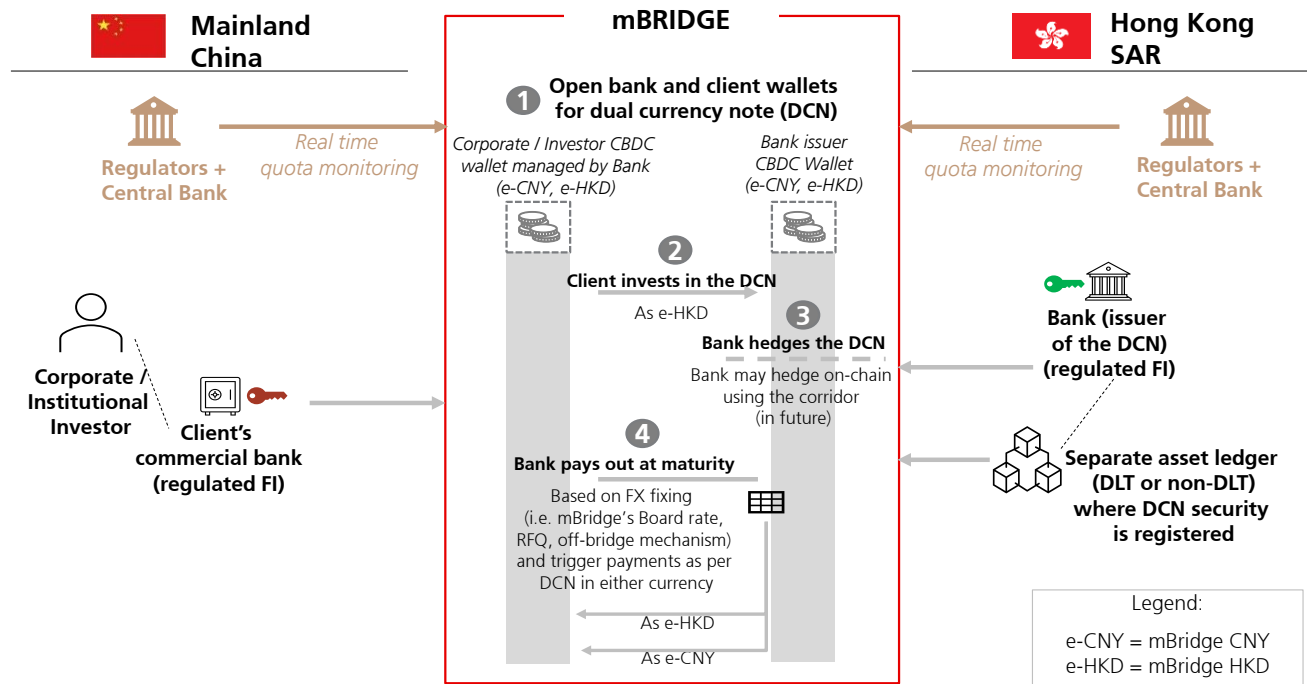


Figure1: Dual currency note use case illustration

Current challenges and benefits

Technology, Operational and Reporting challenges and benefits

Dimension	Existing challenges (before)	Benefits and improvements (after)
Payment triggers	<ul style="list-style-type: none"> Payments initiated <i>manually</i> by operations or by payment message 	<ul style="list-style-type: none"> Payments triggered <i>automatically</i> (on-chain by smart contract)
Settlement time	<ul style="list-style-type: none"> Cross-boundary payment is not instant; various checks (e.g. quota) required; passes through series of correspondent <i>bank accounts and intermediaries</i> with negative impacts on settlement risk and cost 	<ul style="list-style-type: none"> With on-chain cash, settlement can happen instantaneously, directly between <i>CBDC wallets</i>; checks automatically embedded (e.g. quota)
Regulatory reporting	<ul style="list-style-type: none"> Regulatory reporting requires custom made reports and pipes, to all relevant supervisors; data aggregation happens <i>post-hoc</i> 	<ul style="list-style-type: none"> A customizable set of info is readily available to everyone with (permissioned) ledger access (e.g. supervisors) in <i>real-time</i>
Information and IT integration	<ul style="list-style-type: none"> Multiple copies of product & lifecycle events requires synchronization via <i>manual connections (i.e. between front office and treasury teams), shared spreadsheets and e-mails</i> 	<ul style="list-style-type: none"> Product information & lifecycle events gathered through <i>single connections to both the asset and cash (mBridge) ledgers, via node or API</i>
Cross-boundary products	<ul style="list-style-type: none"> Certain FX derivatives (e.g. referencing HKD-CNY) need to be <i>cash-settled in 3rd currency (e.g. USD)</i> – creating <i>frictions and adding hedging complexity for FX dealers</i> 	<ul style="list-style-type: none"> mBridge traceability could allow regulators to offer dealers new cross border hedging scheme, and develop <i>new cross-boundary FX products (e.g. settled in e-HKD and e-CNY directly) in a risk-controlled way</i>, in line with evolving client needs in the GBA

Market-participant / End-client benefits

Stakeholder	Overall benefits
Distributors and structured product manufacturer	<ul style="list-style-type: none"> Low marginal cost to ramp up product to wider client base (across all sizes) Reduce risk through full B2B trades and synchronized data Smart contract enables automation of legal documentation and settlement process, creating cost efficiency gains, lowering operational risk and time to delivery
Investors / Issuers	<ul style="list-style-type: none"> Efficiency gain allows to increase and diversify the pool of potential note issuers Cost savings passed down from operational efficiencies Low cost of product customization and flexibility due to use of DLT and smart contracts
Supervisors	<ul style="list-style-type: none"> Real-time access and monitoring of mBridge transactions tied to the product Source of funds in the mBridge are clearly identified and traceable – allowing real-time compliance & supervisory checks (FX quotas) Provides risk-controlled way to test new cross-boundary scheme and products, improving hedging channel for dealers

Use case #2: Enhanced Wealth Management Connect

Description of the use case

The wealth management connect (WMC) scheme, officially launched in September 2021, presents a notable step in the opening up of north/southbound capital flows in the GBA for wealth management (WM) purposes. The scope of the program (north and southbound) focuses initially on providing access to lower-risk and non-complex WM products (i.e. select deposits, mutual funds, and bonds) where capital flows between HKD-CNY must be managed in a closed-loop setup⁷. As the WMC program continues to develop to address more sophisticated client-related WM needs (i.e. need for broader product range and potential for increased quotas / volumes to diversify risks), new payment architecture is required to efficiently manage and enforce these requirements.

Through the mBridge, a more sophisticated payment architecture for managing the closed-loop requirement of the current Wealth Management Connect program can be potentially established. By implementing the closed-loop setup through the mBridge architecture, central banks and regulators have the tools to provide more granular and customizable quotas (i.e. at the wallet-level) based on a client's risk / suitability profile. This allows any future scale-up of the WMC program (i.e. currently capped at net-RMB 1 million for southbound flows), while still enabling a scalable pathway for oversight and enforcement.

Design of the use case

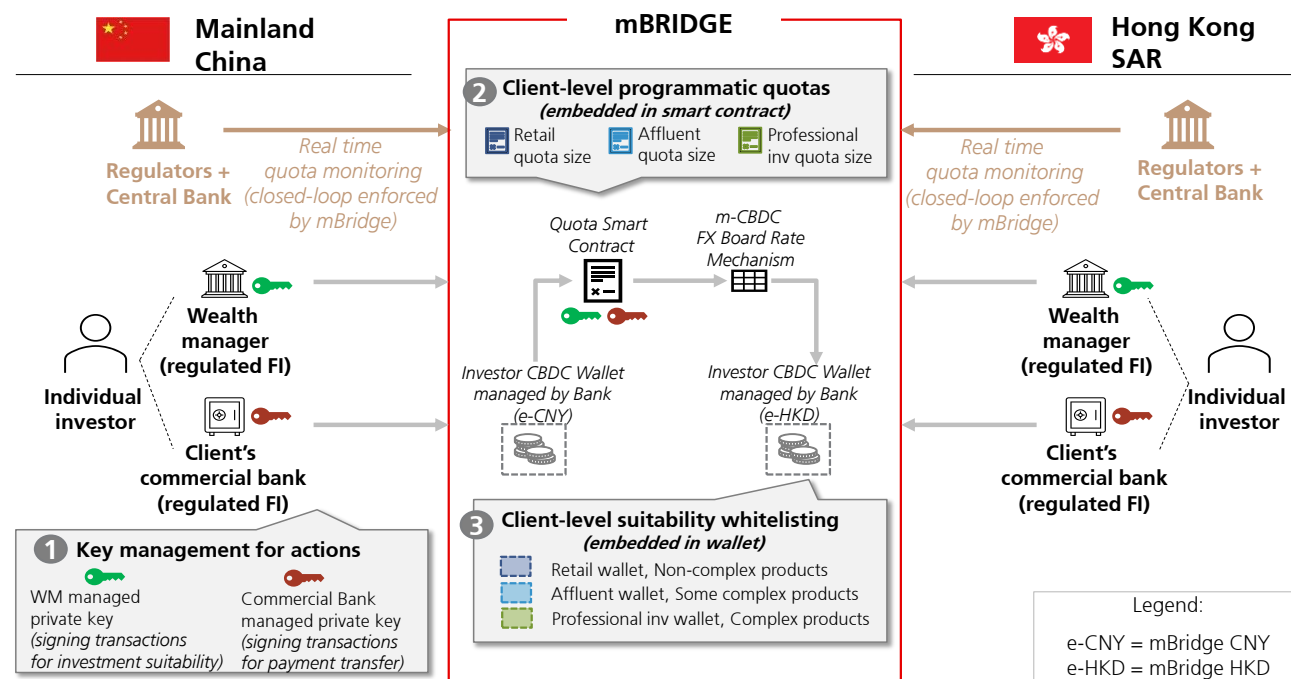


Figure 2: Enhanced WM Connect use case illustration

⁷ Closed loop setup = flow remains in designated accounts, and cannot be used for purposes other than for WMC

Current challenges and benefits

Technology, Operational and Reporting challenges and benefits

Dimension	Existing challenges (before)	Benefits and improvements (after)
Payment operations	<ul style="list-style-type: none"> Payments initiated <i>manually</i> by operations or by payment message 	<ul style="list-style-type: none"> Payments triggered <i>automatically</i> (on-chain by smart contract)
Settlement time	<ul style="list-style-type: none"> Cross-boundary payment is not instant; various checks (e.g. quota) required; passes through series of correspondent <i>bank accounts</i> 	<ul style="list-style-type: none"> With on-chain cash, settlement can happen instantaneously, directly between <i>CBDC wallets</i>; checks automatically embedded (e.g. quota)
Regulatory reporting	<ul style="list-style-type: none"> Regulatory reporting requires custom made reports and pipes, to all relevant supervisors; data aggregation happens <i>post-hoc</i> 	<ul style="list-style-type: none"> A customizable set of info is readily available to everyone with (permissioned) ledger access (e.g. supervisors, service providers) in <i>real-time</i>
Client management	<ul style="list-style-type: none"> Management of client activities (e.g. enforcing closed loop, suitability) <i>manually</i> by series of <i>intermediaries</i> 	<ul style="list-style-type: none"> Client activities / interactions can be programmed into smart contracts, and <i>managed programmatically by role-aligned private keys</i>
Cross-boundary quota management	<ul style="list-style-type: none"> Closed-loop quotas managed / monitored through traditional correspondent systems with <i>multiple data handoffs</i>, which necessitates <i>more rigid design choices</i> 	<ul style="list-style-type: none"> Closed-loop quota managed / monitored via mBridge offers <i>more transparency</i> and supervisor / central bank <i>oversight</i> – enabling <i>risk-adjusted customizations</i> applied at the client (wallet) level

Market-participant / End-client benefits

Stakeholder	Overall benefits
Wealth and asset managers	<ul style="list-style-type: none"> Wallet-based account structure can be used for greater risk control (e.g. wallet suitability tagging, etc) to meet client and regulatory requirements Potential for customized quotas implemented through smart contracts (i.e. flexible quota rules – i.e. as % of net worth etc.)
Investors	<ul style="list-style-type: none"> Greater diversification opportunities through enhanced product shelf More customizable quotas enforced by smart contracts on a risk-adjusted basis
Supervisors	<ul style="list-style-type: none"> Efficient enforcement of closed-loop WMC requirement, which in turn offers greater flexibility to enhance WMC features and access over time (e.g. professional investors, new products, custom quotas) Source of funds in the mBridge are clearly identified and traceable, allowing easy compliance and supervisory checks (FX quotas) in timely manner Provides risk-controlled way to test new WM connect functionality

Conclusion and Future Considerations

The discussions shared in this Project mBridge submission illustrate the broader potential for the mBridge architecture for cross-border / cross-boundary applications. Executing payments in an mBridge architecture would give participants the opportunity to drive with greater operational efficiencies, to streamline reporting, and to monitor and manage their quota(s) in real-time.

The use cases (i.e. FX derivatives / Dual currency deposits and Enhanced Wealth Management Connect) have been further contextualized around payment scenarios in the Greater Bay Area (i.e. between Mainland China and Hong Kong SAR), where traditional settlement often involves the use of a 3rd currency. This adds operational, risk and portfolio management frictions. These can potentially be addressed in the mBridge, where transactions can be directly settled in a risk-controlled mBridge environment (i.e. e-CNY, e-HKD).

The mBridge has the potential to bring new features and functionality to cross-border / cross-boundary payment use cases – uniquely enabled by DLT, Smart Contracts and Wallets. While the current mBridge study focuses largely on the application of new technologies, commercialization of the mBridge architecture will also require further investigation and development with the industry on the impact on existing financial ecosystems. The effective deployment of the mBridge architecture in the GBA would also likely trigger further considerations around currency controls, as well as cross-boundary transaction settlement models, and client data protection policies.

Disclaimer

This material has no regard to the specific investment objectives, financial situation or particular needs of any specific recipient and is published solely for information purposes. No representation or warranty, either express or implied is provided in relation to the accuracy, completeness or reliability of the information contained herein, nor is it intended to be a complete statement or summary of the developments referred to in this material. This material does not constitute an offer to sell or a solicitation to offer to buy or sell any securities or investment instruments, to effect any transactions or to conclude any legal act of any kind whatsoever. Nothing herein shall limit or restrict the particular terms of any specific offering. No offer of any interest in any product will be made in any jurisdiction in which the offer, solicitation or sale is not permitted, or to any person to whom it is unlawful to make such offer, solicitation or sale. Not all products and services are available to citizens or residents of all countries. Any opinions expressed in this material are subject to change without notice and may differ or be contrary to opinions expressed by other business areas or divisions of UBS AG or its affiliates ("**UBS**") as a result of using different assumptions and criteria. UBS is under no obligation to update or keep current the information contained herein. Any charts and scenarios are for illustrative purposes only. Historical performance is no guarantee for and is not an indication of future performance. Neither UBS AG nor any of its affiliates, directors, employees or agents accepts any liability for any loss or damage arising out of the use of all or any part of this material. UBS specifically prohibits the redistribution or reproduction of this material in whole or in part without the prior written permission of UBS, and UBS accepts no liability whatsoever for the actions of third parties in this respect.

All pictures or images ("images") herein are for illustrative, informative or documentary purposes only, in support of subject analysis and research. Images may depict objects or elements which are protected by third party copyright, trademarks and other intellectual property rights. Unless expressly stated, no relationship, association, sponsorship or endorsement is suggested or implied between UBS and these third parties.

© UBS 2021. The key symbol and UBS are among the registered and unregistered trademarks of UBS. All rights reserved.