



LCX Cryptocurrency Reference Price Services

LCX Cryptocurrency Reference Price Services	1
About - LCX Cryptocurrency Reference Price Services	2
Definitions	4
What is the LCX Bitcoin Reference Price (BRP)?	4
What is the LCX Ethereum Reference Price (ERP)?	5
How are the LCX Cryptocurrency Reference Prices calculated?	5
LCX Cryptocurrency Reference Prices Formula	6
LCX Bitcoin Reference Price Parameters	8
LCX Ethereum Reference Price Parameters	9

Risk Warning: Digital assets, such as Cryptocurrencies and Tokens, are subject to a number of risks, including price volatility. Transacting in digital assets could result in significant losses and may not be suitable for some consumers. Digital asset markets and exchanges are not regulated with the same controls or customer protections available with other forms of financial products and are subject to an evolving regulatory environment. Digital assets do not typically have legal tender status and are not covered by deposit protection insurance. The past performance of a digital asset is not a guide to future performance, nor is it a reliable indicator of future results or performance.

Additional disclosures can be found at [Terms of Service](#).



About - LCX Cryptocurrency Reference Price Services

In March 2020, LCX announced the launch of **LCX Cryptocurrency Reference Price Services**, which is a service that became regulated in 2020 by the new Liechtenstein Blockchain Laws as Trustworthy Technology Reference Price Services. Operators of the TT Price Services and other blockchain-based services are supervised by the Liechtenstein Financial Market Authority (FMA).

The pricing services include four different reference prices called the **LCX Bitcoin Reference Price (BRP)** in USD and Euro and the **LCX Ethereum Reference Price (ERP)** in USD and Euro.

The LCX Cryptocurrency Reference Price Service will be providing a credible reference price to the marketplace and enhance market participants' risk management of digital assets. LCX Cryptocurrency Reference Price Services are designed to help accelerate the professionalization of digital asset trading.

On October 3, 2019, the parliament of Liechtenstein unanimously voted for the first-ever Blockchain Act in the world. Officially, the act is referred to as the "Token and Trustworthy Technology Service Providers Act" (TVTG), and the act has become effective on January 1, 2020. The TVTG is a legal framework defining trustworthy technologies (TT) system that regulates service providers in the token economy.

According to Liechtenstein's Blockchain Act (TVTG) the TT price service provider is "A person or entity providing TT system users with aggregated price information based on buy and sell offers or completed transactions."

Effective January 2020, Liechtenstein Blockchain Act came into effect, clearly defining and providing regulatory guidance and framework to blockchain-focused service providers, such as LCX AG, what are providing blockchain-based services, including "Trustworthy Technology Price Services", that is currently supervised and regulated by the Liechtenstein financial regulator, FMA.

Now LCX is introducing additional services that fall into the same category, called "LCX Cryptocurrency Reference Price Services".



The LCX Cryptocurrency Reference Prices are daily reference prices of the U.S. dollar price and Euro price of one bitcoin and one ethereum. Each day, the LCX Reference Price aggregates the trade flow of major bitcoin spot exchanges during a specific one-hour calculation window. The LCX Reference Prices are published and updated daily at 16:00 (4:00 p.m.) Liechtenstein time (Central European time - CET).

The LCX Cryptocurrency Reference Prices is an expansion and improvement of a number of prices referencing features and proprietary solutions that have been developed and offered by the LCX AG as a part of our LCX Terminal platform since 2019: now, following positive feedback and encouragement from our users, we are taking our pricing services to the next level.

As a blockchain-based service provider in Liechtenstein, LCX AG and our services naturally fall within the scope of the new Blockchain Act that came into effect in 2020. As a part of the transitional period, that is applicable to those Liechtenstein-based service providers that commenced their operations prior to 2020, LCX has formally notified FMA about all our existing services, and continues a very productive and positive dialog with our highly esteemed regulatory body to ensure that all our operations, services and activities are conducted in full compliance with applicable regulatory provisions.

Find out more at www.LCX.com/Cryptocurrency-Reference-Price-Services

LCX Cryptocurrency Reference Price Services:

- LCX Bitcoin Reference Price in USD (BRP-USD)
- LCX Bitcoin Reference Price in EUR (BRP-EUR)
- LCX Ethereum Reference Price in USD (ERP-USD)
- LCX Ethereum Reference Price in EUR (ERP-EUR)

The LCX Reference Prices are published every day.



Definitions

- **API:** Application programming interface.¹
- **Effective Time:** The time as of which the LCX Reference Prices is calculated
- **Calculation Day:** Any day for which a LCX Reference Prices are published.
- **Connected Exchange:** A cryptocurrency trading venue connected by LCX to serve as pricing source for the calculation of a LCX Reference Prices.
- **Relevant Pair:** The cryptocurrency versus legal tender pair referenced by a LCX Reference Prices.
- **Relevant Transaction:** Any cryptocurrency versus legal tender spot trade that occurs during the TWAP Period on a Connected Exchange in the Relevant Pair that is reported through its API to the Calculation Agent.
- **Retrieval Time:** One minute after the end of the TWAP Period on a given Calculation Day, as given by the server clock of the Calculation Agent.
- **TWAP:** time-weighted average price.²
- **TWAP Period:** A period of time equal to the TWAP Period Length leading up to the Effective Time.

What is the LCX Bitcoin Reference Price (BRP)?

The LCX BRP is a daily reference price of the U.S. dollar price and Euro price of one bitcoin. Each day, the LCX BRP aggregates the trade flow of major bitcoin spot exchanges during a specific one-hour calculation window. The LCX ERP is published daily at 16:00 (4:00 p.m.) Liechtenstein time (central european time - CET).

LCX Bitcoin Reference Price in U.S. dollar (BRP-USD) is calculated based on the following connected six exchanges: Bittrex, Bitfinex, Kraken, Coinbase Pro, Liquid and Gemini.

LCX Bitcoin Reference Price in Euro (BRP-EUR) is calculated based on the following connected four exchanges: Bitfinex, Kraken, Coinbase Pro, and Liquid.

¹ Source: https://en.wikipedia.org/wiki/Application_programming_interface

² Source: https://en.wikipedia.org/wiki/Time-weighted_average_price



What is the LCX Ethereum Reference Price (ERP)?

The LCX ERP is a daily reference price of the U.S. dollar price and Euro price of one ethereum. Each day, the LCX ERP aggregates the trade flow of major ethereum spot exchanges during a specific one-hour calculation window. The LCX ERP is published daily at 16:00 (4:00 p.m.) Liechtenstein time (central european time - CET).

LCX Ethereum Reference Price in U.S. dollar (ERP-USD) is calculated based on the following connected six exchanges: Bittrex, Bitfinex, Kraken, Coinbase Pro, Liquid and Gemini.

LCX Ethereum Reference Price in Euro (ERP-EUR) is calculated based on the following connected four exchanges: Bitfinex, Kraken, Coinbase Pro, and Liquid.

How are the LCX Cryptocurrency Reference Prices calculated?

LCX Cryptocurrency Reference Prices are calculated based on the relevant Transactions of all Constituent Exchanges. Calculation steps on any given Calculation day is as follows:

1. All Relevant Transactions are added to a joint list, recording the trade price and size for each transaction.
2. The list is partitioned into a number of equally-sized time intervals.
3. For each partition separately, the volume-weighted median trade price is calculated from the trade prices and sizes of all Relevant Transactions, i.e. across all Constituent Exchanges. A volume-weighted median differs from a standard median in that a weighting factor, in this case, trade size, is factored into the calculation.
4. LCX Cryptocurrency Reference Prices are then given by the equally-weighted average of the volume-weighted medians of all partitions.



LCX Cryptocurrency Reference Prices Formula

e = Effective time for the price calculation in minutes

L = Interval length in minutes

Total Intervals I is given by e/L

For each Interval, data is extrapolated from various exchanges and the reference price is given by creating a list of all trades in that interval and calculating their volume-weighted median.

Mathematical Representation

p_i = Price of i^{th} trade in an Interval

s_i = Size of i^{th} trade in an Interval

t = Total number of trades in an Interval

For each Interval,

Weighted Median $M = p_j$, where j satisfies $\sum_{i=1}^{j-1} s_i < \frac{1}{2} \sum_{i=1}^t s_i$ and, $\sum_{i=j+1}^t s_i \leq \frac{1}{2} \sum_{i=1}^t s_i$

If, $s_1 \leq \sum_{i=1}^t s_i$ then, $M = p_1$

If, $\sum_{i=j+1}^t s_i = \frac{1}{2} \sum_{i=1}^t s_i$ then, $M = (p_j + p_{j+1})/2$

The final Reference Price is given by,

$$RP = \frac{\sum_{k=1}^I M_k}{I}$$

Where,

RP = Reference Price

M_k = Weighted Median of k^{th} Interval

I = Total number of Intervals



Timeframe: We calculate the Cryptocurrency Reference Prices between 3:00 PM CET to 4:00 PM Vaduz Time - CET.



LCX Bitcoin Reference Price Parameters

	LCX Bitcoin Reference Price USD
Symbol	BRP-USD
Relevant Pair	BTC-USD
Effective Time	16:00 PM
Calculation Day	Daily
Connected Exchanges	BITTREX, BITFINEX, KRAKEN, COINBASE PRO, LIQUID, GEMINI
TWAP Period	60 minutes
Retrieval Time	16:01 PM

	LCX Bitcoin Reference Price EUR
Symbol	BRP-EUR
Relevant Pair	BTC-EUR
Effective Time	16:00 PM
Calculation Day	Daily
Connected Exchanges	BITFINEX, KRAKEN, COINBASE PRO, LIQUID
TWAP Period	60 minutes
Retrieval Time	16:01 PM



LCX Ethereum Reference Price Parameters

	LCX Ethereum Reference Price USD
Symbol	ERP-USD
Relevant Pair	ETH-USD
Effective Time	16:00 PM
Calculation Day	Daily
Connected Exchanges	BITTREX, BITFINEX, KRAKEN, COINBASE PRO, LIQUID, GEMINI
TWAP Period	60 minutes
Retrieval Time	16:01 PM

	LCX Ethereum Reference Price EUR
Symbol	ERP-EUR
Relevant Pair	ETH-EUR
Effective Time	16:00 PM
Calculation Day	Daily
Connected Exchanges	BITFINEX, KRAKEN, COINBASE PRO, LIQUID
TWAP Period	60 minutes
Retrieval Time	16:01 PM