

Hegic: On-chain Options Trading Protocol on Ethereum Powered by Hedge Contracts and Liquidity Pools

Molly Wintermute

molly.wintermute@protonmail.com

20/02/2020

Abstract

Options are one of the most popular derivatives in the traditional financial markets [1].

Global Options Volume						
Based on the number of contracts traded and/or cleared at 80 exchanges worldwide.						
	Jan-Dec 2019 Vol	Jan-Dec 2018 Vol	Vol % Change	2019 December OI	2018 December OI	OI % Change
Options	15 234 055 390	13 132 378 918	16,0%	652 117 410	599 662 516	8,7%

Source: The Futures Industry Association. <https://fia.org/file/9841/download?token=y22pyill>

A call option contract gives the buyer (**holder**) the right to buy the underlying asset at a specified price for a certain, fixed period. A put option contract gives the buyer (holder) the right to sell the underlying asset at a specified price for a certain, fixed period. The trader who sells an option contract (call or put) to earn premium is a **writer**.

This paper describes the **Hegic protocol** and introduces the concept of a **hedge contract**: a system of Ethereum contracts that accumulate and hold liquidity in a non-custodial way, write (sell) hedge contracts to the holders, accumulate and distribute premiums between the liquidity providers (writers) and conduct on-chain settlement of the contracts. In the traditional financial markets, The Options Clearing Corporation (OCC) [2], the world's largest equity derivatives clearing organization, plays an important role in the options markets. In Hegic protocol, there is no need for a centralized clearing organization. Hedge contracts are created, maintained and settled in a decentralized way. Exercising of hedge contracts is guaranteed by the liquidity allocated and locked on them, timestamps and Ethereum Virtual Machine (EVM) that executes the code.

Holders can potentially benefit from using hedge contracts for protecting their assets' value from the downside during a certain period. A hedge contract is similar to insurance in a way that it protects the owner from the potential price downside of an asset. There is no risk distribution in the options trading on the traditional financial markets; this is why options sellers' (writers') losses are theoretically unlimited [3]. Writers can potentially benefit from the fact that in hedge contracts the risk is transferred from one particular person to the whole group of liquidity providers. Besides, the returns on selling (writing) hedge contracts can potentially beat the on-chain lending returns because the premiums paid by holders should be higher to cover the risk of losses for writers. Both buyers (holders) and sellers (writers) of hedge contracts benefit from the transparency of contract pricing and on-chain settlement. **Therefore, hedge contracts on Hegic can be considered as a non-custodial, trustless and censorship-resistant alternative to options contracts.**

1. Introduction	3
2. How Hegic Works.....	5
3. Hedge Contracts Terms and Parameters.....	6
4. Opening (Buying) a Put Hedge Contract	7
5. Writing (Selling) a Put Hedge Contract	8
6. The Pricing Model for Put Hedge Contracts.....	9
7. Price Comparison: Hedge Contracts on Hegic vs. Options on Deribit.....	12
8. Liquidity Pools.....	21
9. HEGIC Token.....	22
10. Conclusion.....	25
11. References.....	26

1. Introduction

Hegic is a protocol for trustless creating, maintaining and settling of hedge contracts. **Hedge contract is an options*-like on-chain contract that gives the holder (buyer) a right to buy or to sell an asset at a certain price (strike) as well as imposes the obligation on the writer (seller) to buy or to sell an asset during a certain period.** It can be useful for the market participants who want to protect their assets from the price downside and for the liquidity providers who might find the returns on writing hedge contracts attractive enough to allocate some of their capital on the liquidity pool contract. On the traditional (CBOE, CME, etc.) or crypto-assets (Deribit, FTX, etc.) options exchanges holders and writers are individual agents (retail or institutional). It means that while trading options, their capital is exposed to independent risks and returns, and their trading results have nothing do to with the other market participants' profits or losses. On the sellers (writers) side, Hegic liquidity pool contracts accumulate liquidity from many market participants simultaneously. This approach reduces the risks of losing capital (potential downside) while providing liquidity providers with the returns.

Example: a writer sells an option contract and a hedge contract to compare the risks and returns between these two instruments. They sell one put option contract on the options trading platform and one **put hedge contract** on Hegic. The strike (execution) price is the same in both cases: \$200. In other words, the writer now has **an obligation to buy an asset for \$200 at any given moment until the expiration date of an option contract and a hedge contract.** At this stage, the goal is to compare the downside of these two instruments, not the returns. That is why in this example the premium for writing both an option contract and a hedge contract is zero.

After writing a put option contract and a put hedge contract, the price of a hypothetical asset dropped from \$200 to \$150 before the expiration date. Because the writer has an obligation to buy the asset for \$200 and the current price is \$150, they will suffer losses. However, in the case of selling a hedge contract, the writer was one of the twenty independent liquidity providers and the risks were distributed among all of them. The hypothetical results can now be compared:

Writing (Selling) a Put Option Contract vs. Writing (Selling) a Put Hedge Contract		
	Option	Hedge Contract
Writer	Individual	Independent liquidity providers
Number of agents	1	20
Action	Selling a put option contract with a strike price: \$200	Selling a put hedge contract with a strike price: \$200
Current Price	\$150	\$150
Losses	-\$50	-\$2.5 per liquidity provider

Table 1: Comparison of writing a put option contract with writing a put hedge contract.

***Options** are financial instruments that are derivatives based on the value of underlying securities such as stocks. An options contract offers the buyer the opportunity to buy or sell—depending on the type of contract they hold—the underlying asset. Unlike futures, the holder is not required to buy or sell the asset if they choose not to. Source: <https://www.investopedia.com/terms/o/option.asp>

Three more parameters can be added to the example.

Expiration date: the day on which an option contract or a hedge contract becomes void. Hegic uses timestamps for setting the period for a hedge contract.

Rate: predefined cost of opening a hedge contract that influences the premium (the price of a hedge contract). More information on the pricing can be found in the Pricing Model section of this paper.

Premium: the price of an option contract, which the buyer of the option pays to the option writer for the rights conveyed by the option contract. On Hegic, the function of the premium is the same: a financial reward for the hedge contract writers (sellers) for taking the risks.

The hypothetical results of a situation in which the price of an asset goes in a direction that leads to losses for the writer were compared above. Now the potential returns for an option writer and a hedge contract writer with the new parameters included can be compared. The example below is similar to the previous one: a writer sells both a put option contract and a put hedge contract to compare the risks and returns. They sell one put option contract on the options trading platform and one put hedge contract on Hegic. The strike price is the same in both cases: \$200. However, in this example, the price of an asset rises to \$250. The writer will not suffer losses and will earn the premium that was paid by the holder of an option contract and a hedge contract.

Writing (Selling) a Put Option Contract vs. Writing (Selling) a Put Hedge Contract		
	Option	Hedge Contract
Writer	Individual	Independent liquidity providers
Number of agents	1	20
Action	Selling a put option contract with a strike price: \$200	Selling a put hedge contract with a strike price: \$200
Current Price	\$250	\$250
Expiration Date	1 week	1 week
Rate	2%	2%
Premium	\$4	\$4
Net Premium	\$4	\$0.2 per liquidity provider

Table 2: Comparison of writing a put option contract with writing a put hedge contract.

In the case of Hegic, the premium is distributed between all the liquidity providers. This leads to a situation in which their net premium is lower if to compare it to an individual option writer's premium. An important thing to mention is that in contrast to an individual options trader, **liquidity providers' funds can be allocated on many hedge contracts simultaneously**. It diversifies the liquidity allocation and makes capital work in an efficient way. The assumption is that in the long-run, liquidity providers' returns could beat the returns of a solo options writer.

2. How Hegic Works

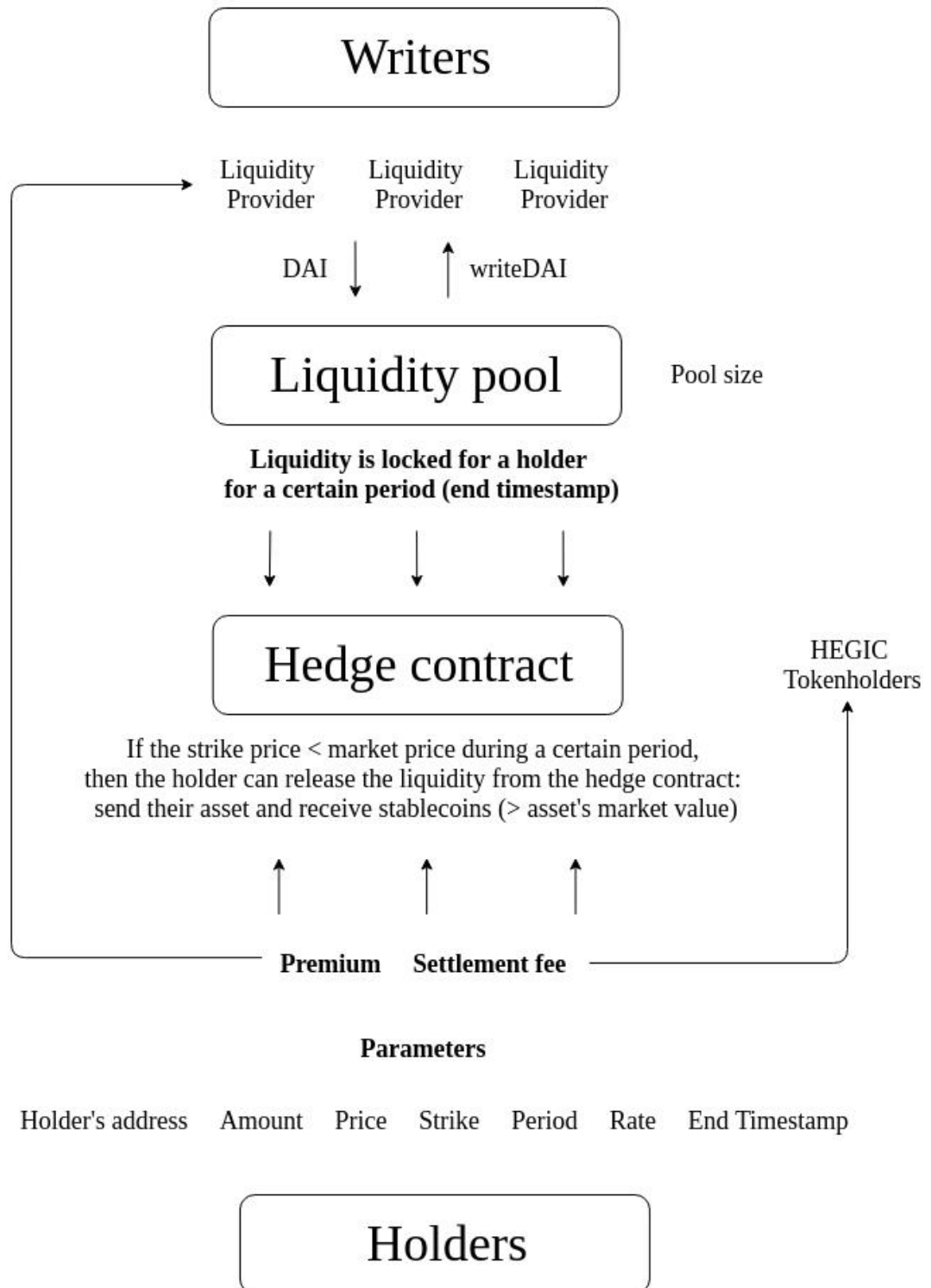


Diagram 1: The initial implementation of the Hegic protocol.

3. Hedge Contracts Terms and Parameters

Holder: the buyer of a hedge contract.

Writer: the seller (or several sellers, in case of Hegic) of a hedge contract.

Holder's Address: Ethereum-address that the buyer uses for activating a hedge contract.

Writer's (s) Address (es): Ethereum-address (es) that is (are) used for writing a hedge contract.

Put Hedge Contract: an on-chain contract that gives the buyer (holder) the right to sell the underlying asset at a specified price for a certain, fixed period, as well as imposes the obligation on the writer (seller) to buy an asset during this period.

Call Hedge Contract: an on-chain contract that gives the buyer (holder) the right to buy the underlying asset at a specified price for a certain, fixed period, as well as imposes the obligation on the writer (seller) to sell an asset during this period.

Amount: the size of a hedge contract (for example, 1 ETH).

Price: current market price of an asset (for example, 1 ETH = \$200).

Strike: the exercise price of a hedge contract (for example, \$200).

Period: the time during which the hedge contract is valid.

Rate: the predefined percent for opening a hedge contract that influences the premium.

Premium: the cost of holding the hedge contract for a certain period.

Settlement Fee: the cost of executing a hedge contract that is paid in advance by the holder.

Break-even Price: the break-even price of a hedge contract.

Pool Size: the total amount of funds available for holding and executing hedge contracts.

End Timestamp: end block of an active hedge contract.

Release: the function that enables the swap of an asset to the liquidity on a hedge contract.

Intrinsic Value: the difference between the underlying asset's price and the strike price.

Time Value: the premium (the cost of a hedge contract) minus its intrinsic value.

4. Opening (Buying) a Put Hedge Contract

In this section, a process of opening a hedge contract is described from a holder's (buyer's) perspective. ETH used as an asset that the holder wishes to hold a hedge contract for. The holder intends to protect their ETH from the price downside for the next two weeks. To have such protection, they could buy a put hedge contract on Hegic. **Buying a put hedge contract provides a holder with a right to swap ETH to DAI [7] stablecoin at a certain price (strike) at any given moment until the expiration.** If the price of ETH falls, the holder will be able to swap ETH to DAI at a strike price (higher) even though the market price of ETH can be lower.

Note that only a put hedge contract's logic is described in this section. Initial implementations of Hegic will allow the opening of put hedge contracts only. Call hedge contracts will be added as well.

To open a hedge contract the holder chooses the desired parameters. In this example, the amount of ETH that they want to buy a hedge contract for is 1 ETH. The desired hedge period is 2 weeks. The current market price of ETH is \$200. Chainlink [6] oracles are used to track ETH/USD pair and use it as a price feed data for evaluating the price of ETH in real-time. Note that this is the only part of the Hegic system that uses oracles to work with the external price feeds. **Maintenance and execution of hedge contracts do not depend on the external price feeds.** Such an approach is used for guaranteeing the security of active hedge contracts and for preventing attacks and exploits of oracles from price attacks. Thus, active hedge contracts are safe from the oracles' manipulations.

For a hedge contract of 1 ETH with a period of 2 weeks, the holder chooses the \$200 strike price (an at-the-money hedge contract; the market price of ETH is \$200). The price of such a hedge contract is \$10. \$8 is a 4% rate of the 2-weeks ETH put hedge contract and \$2 is a 1% settlement fee of the at-the-money put hedge contract. To activate it, the holder should pay \$10 for the hedge contract. The payment is considered as a processed, once miners confirm the transaction.

The holder sends the equivalent of \$10 (the price of a hedge contract with the parameters chosen by the holder) in ETH, as the possible payment method in the initial implementations of Hegic.

In the example, the holder chooses to pay \$10 in ETH and sends 0.05 ETH to activate a hedge contract. After the payment is received, the contract checks the amount. If the price was paid right (\$10), the hedge contract will be activated. If the holder sent a lower amount (<\$10), the transaction will be rejected by the hedge contract and the amount will be returned to the holder's ETH-address. If the amount that was sent is more than it should be (>\$10), then the hedge contract will be activated and the odd money will be returned to the holder's ETH-address.

During the hedge contract activation, an "end timestamp" will be created. In the example, the hedge contract has a period of 2 weeks. It means that the "end timestamp" will be created for 2 weeks after receiving the payment. **Now the holder has a right to swap ETH to 200 DAI before the hedge contract expiration. To do that they need to use the "release" function of the hedge contract: send ETH to the hedge contract and automatically receive 200 DAI. It can be done at any given moment during the hedge period.** A hedge contract cannot be executed partly. To execute it the holder needs to send 1 ETH and they will receive 200 DAI. Note that the ETH-address for executing a hedge contract (swapping ETH to DAI) should be the same that was used for paying to activate it.

5. Writing (Selling) a Put Hedge Contract

In this section, a process of writing a hedge contract is described from a writer's (seller's) perspective. Put hedge contracts writers (sellers) are liquidity providers who allocate DAI, USDC [8], USDT [9] or other stablecoins on the liquidity pool contracts.

Liquidity pools on Hegic are non-custodial. No one has access to writers' funds, but the holders for whom they can be locked by the hedge contract for a certain period. The incentive for the writers to provide liquidity is earning premiums that the holders (buyers) are paying to protect their crypto-assets from the price downside. In the initial implementations of Hegic, the rate for holding a hedge contract varies from 0.5% up to 2.0% per week. **Theoretical yearly returns for hedge contracts writers (sellers) are in between from +27% up to +108% APR on DAI, USDC or USDT.** Rates depend on the hedge contracts period and strike price that each holder chooses individually.

Example: after providing DAI stablecoins to the liquidity pool contract, the writer receives **writeDAI tokens (ERC20)** that are automatically minted and give the writer a share in the liquidity pool premiums that are distributed between all the liquidity providers. When the writer wishes to receive their DAI back, they can send writeDAI tokens to the liquidity pool contract and use the "burn" function. DAI will be automatically sent to the writer's ETH-address.

The example from the previous section can be used to describe the hedge contract writing process. For a put hedge contract of 1 ETH with a period of 2 weeks, the holder chooses the \$200 strike price (at-the-money; market price of ETH is \$200). The price of such a put hedge contract is \$10. In this example, the holder chooses to pay \$10 in ETH and sends 0.05 ETH to activate the hedge contract. **0.05 ETH (premium) will be automatically swapped to DAI stablecoin using the Uniswap [10] decentralized exchange. The returns for writers are denominated in DAI.** The premium in DAI will be added to the liquidity pool after the successful swap. Liquidity providers receive the premium in advance so that they can withdraw it at any given moment. They should not wait for a hedge contract to expire to be able to withdraw the premium in DAI. After the premium is received, the liquidity in DAI will be locked for a period of a hedge contract that the holder has paid for. Some portion of the liquidity should always be unlocked to let the liquidity providers claim their DAI that they have provided to the liquidity pool before. **Initial implementations of Hegic will allow 80% of the total amount of DAI in the pool to be locked in active hedge contracts. The other 20% are always unlocked and can be used by those who would like to withdraw the liquidity from the pool.**

If the amount of unlocked DAI in the liquidity pool is not enough for the writer to swap their writeDAI to DAI, they will have to wait for the active hedge contracts' expiration. If the writer wishes to withdraw the liquidity from the pool, but the amount of unlocked DAI is not enough, they send a request to swap their writeDAI to DAI as soon as the liquidity will be unlocked. Their requests are aggregated in queues. Premiums in DAI will be distributed between the liquidity providers in the proportions of DAI that they have allocated in the liquidity pool.

If four independent liquidity providers have provided 200000 DAI to the pool:

Provider 1: **100000 DAI**; Provider 2: **50000 DAI**; Provider 3: **25000 DAI**; Provider 4: **25000 DAI**; then all the premiums will be distributed in such a way: Provider 1: **50%**; Provider 2: **25%**; Provider 3: **12.5%**; Provider 4: **12.5%**. The same distribution will be for the losses that may occur if the hedge contracts holders swap their ETH to DAI after the price drop. **ETH that the holders send to the liquidity pool while executing a hedge contract will be automatically swapped to DAI using the Uniswap decentralized exchange.** The potential losses for writers are also denominated in DAI.

6. The Pricing Model for Put Hedge Contracts

In this section, the pricing model for put hedge contracts on Hegic will be described. The holder can choose a hedge contract with one of the strike prices that are predefined on Hegic. The strike is the exercise price of a hedge contract. If the holder (buyer) chooses a hedge contract with a \$200 strike price, then during the hedge period they will be able to sell the asset for that price, no matter what is the market price of an asset. The strike prices on Hegic are always differing in a range of 5% (**multiplier**) from the current (market) price of an asset:

Put Hedge Contract		Strike Price
Out-of-the-money	Market Price * Multiplier 0.9	\$180
Out-of-the-money	Market Price * Multiplier 0.95	\$190
At-the-money	Market Price	\$200
In-the-money	Market Price * Multiplier 1.05	\$210
In-the-money	Market Price * Multiplier 1.1	\$220

Table 3: Strike prices and multipliers of put hedge contracts on Hegic.

Similar to a put option contract logic, a put hedge contract is **at-the-money** if the strike price of the contract is equal to the market price of the underlying asset; **in-the-money** if the asset's value is above the strike price; and **out-of-the-money** if the strike price is less than the market price of the underlying asset. Each put hedge contract has a **rate that depends on the strike and period**:

Put Hedge Contract		Hedge Contract Periods and Rates				
	Strike Price	1 week	2 weeks	3 weeks	1 month	2 months
Out-of-the-money	\$180	0.5%	1%	1.5%	2%	4%
Out-of-the-money	\$190	1%	2%	3%	4%	8%
At-the-money	\$200	2%	4%	6%	8%	16%
In-the-money	\$210	1%	2%	3%	4%	8%
In-the-money	\$220	0.5%	1%	1.5%	2%	4%

Table 4: Rates of put hedge contracts with different strike prices and periods on Hegic.

For the sake of simplicity, the pricing model for hedge contracts differs from the traditional financial markets options pricing models such as a Black-Sholes mathematical model [4] for the dynamics of a financial market containing derivative investment instruments. The rate on Hegic is a predefined percent of the asset's value that depends on the period of a hedge contract. **The cost of holding a put hedge contract for a certain period is called the premium.**

Put Hedge Contract		Hedge Contract Periods and Premiums				
	Strike Price	1 week	2 weeks	3 weeks	4 weeks	8 weeks
Out-of-the-money	\$180	\$0.9	\$1.8	\$2.7	\$3.6	\$7.2
Out-of-the-money	\$190	\$1.9	\$3.8	\$5.7	\$7.6	\$15.2
At-the-money	\$200	\$4	\$8	\$12	\$16	\$32
In-the-money	\$210	\$12.1	\$14.2	\$16.3	\$18.4	\$26.8
In-the-money	\$220	\$21.1	\$22.2	\$23.3	\$24.4	\$28.8

Table 5: Calculated premiums for hedge contracts with different strike prices and periods on Hegic.

The formula for calculating the rate of an **at-the-money (ATM)** put hedge contract is:

$$S * R = ATMR,$$

where S – Strike Price; R – Predefined Rate (%); ATMR – ATM Rate (put contract).

For example, the rate for holding a put hedge contract with a strike price of \$200 and a period of 2 weeks is 4%. Using the formula above, we can calculate the rate:

$$\$200 * 4\% = \$8$$

The formula for calculating the rate of an **in-the-money (ITM)** put hedge contract is:

$$S * R + (S - M) = ITMR,$$

where S – Strike Price; R – Predefined Rate (%); M – Market Price; ITMR – ITM Rate (put contract).

For example, the rate for holding a put hedge contract with a strike price of \$220 (in-the-money) and a period of 1 month is 2%. It is lower than in the previous case. However, the rate of an in-the-money hedge contract includes the difference between the strike and market prices. Using the formula above, we can calculate the value of the premium for an ITM hedge contract:

$$\$220 * 2\% + (\$220 - \$200) = \$24.4$$

The formula for calculating the rate of an **out-of-the-money (OTM)** put hedge contract is:

$$S * R = OTMR,$$

where S – Strike Price; R – Predefined Rate (%); OTMR – OTM Rate (put contract).

The value of a put hedge contract consists of both intrinsic value and time value. The greater the amount of time until a put hedge contract expires, the more time value it has. As you have might notice, out-of-the-money and at-the-money rates formulas are the same. However, the in-the-money rate is calculated differently, because OTM and ATM hedge contracts have only a **time-value**, but ITM hedge contracts also have an **intrinsic value**. The holder could exercise its right under the put hedge contract and sell the underlying asset for more than its current value. It means the ITM put hedge contract has intrinsic value. There is also a settlement fee that is should be paid by the holders to activate a hedge contract. The settlement fee can be calculated using these formulas:

$$A * P * 0.5\% = OTMSF,$$

where A – Amount; P – Price; Predefined Rate (0.5%); OTMSF – OTM Settlement Fee (put contract).

$$A * P * 1\% = ATMSF,$$

where A – Amount; P – Price; Predefined Rate (1%); ATMSF – ATM Settlement Fee (put contract).

$$A * P * 0.5\% = ITMSF,$$

where A – Amount; P – Price; Predefined Rate (0.5%); ITMSF – ITM Settlement Fee (put contract).

For example, if the amount of an asset that the holder wishes to buy an ATM hedge contract for is **1** and the market price is **\$200**, then the settlement fee will be **\$2** ($1 * \$200 * 1\% = \2). For opening a hedge contract, the holder should pay the premium (rate plus fee) forward. The formulas are:

$$OTMR + OTMSF = OTMP,$$

where OTMR – OTM Rate; OTMSF — OTM Settlement Fee; OTMP – OTM Premium.

$$ATMR + ATMSF = ATMP,$$

where ATMR – ATM Rate; ATMSF — ATM Settlement Fee; ATMP – ATM Premium.

$$ITMR + ITMSF = ITMP,$$

where ITMR – ITM Rate; ITMSF — ITM Settlement Fee; ITMP – ITM Premium.

7. Price Comparison: Hedge Contracts on Hegic vs. Options on Deribit

In this section, the prices of ETH put options contracts that are traded on the crypto exchange Deribit [5] will be compared with the prices of ETH put hedge contracts on Hegic. This analysis makes sense because the functionality of these two instruments is relatively similar, as well as the value for the holders (buyers) from using them. Hedge contracts on Hegic can be considered as a non-custodial, trustless and censorship-resistant alternative to options contracts.

Options contract prices are volatile. To make this comparison as representative as possible, four different contracts with periods (expirations) of one, two, four and eight weeks will be compared. The strike prices of the two compared contracts (a put option contract and a put hedge contract) should be the same, or at least as close as possible. Reference options contracts used for the price comparison are ETH options contracts on Deribit options exchange.

The first of them is a put option contract on ETH with an expiration date of February 7, 2020. This price analysis was conducted on January 31, 2020, with the expiration of the contract at the time of comparison: 6 days 20 hours 52 minutes. **At the snapshot minute of all the reference contract prices, the market price of ETH was \$180 (\$180.05 - \$180.30).**

ETH-7FEB20 Put Option Contract Prices (Deribit):

Put Option Contract on Deribit		ETH-7FEB20 Contract Period (Expiration) and Prices		
ETH Price: \$180	Strike Price	1 week		
		Bid	Ask	Average
Out-of-the-money	\$160	\$0.90	\$1.27	\$1.08
Out-of-the-money	\$170	\$1.99	\$2.53	\$2.26
At-the-money	\$180	\$5.42	\$6.51	\$5.96
In-the-money	\$190	\$11.57	\$12.84	\$12.20
In-the-money	\$200	\$19.89	\$21.16	\$20.52

Table 6: Put Option Contract (ETH-7FEB20) Prices on Deribit as of January 31, 2020.

1-week ETH Put Hedge Contract Prices (Hegic):

Put Hedge Contract on Hegic		Hedge Contract Period (Expiration) and Prices
ETH Price: \$180	Strike Price	1 week
		Out-of-the-money
Out-of-the-money	\$171	\$1.71
At-the-money	\$180	\$3.60
In-the-money	\$189	\$10.89
In-the-money	\$198	\$18.99

Table 7: 1-week ETH Put Hedge Contract Prices on Hegic as of January 31, 2020.

It is now possible to compare the option contract prices on Deribit with the put hedge contracts prices on Hegic. In this example, the market price of ETH is \$180. **Note that the strikes on Hegic can differ (be higher or lower) from the strikes on Deribit** because on Hegic they differ in a range of 5% (multiplier) from the current (market) price of an asset. The strike prices difference on Deribit for ETH-7FEB20 contract is fixed: \$10.

At-the-money (ATM) is a put option contract or a put hedge contract with a strike price of \$180 (equal to the market price).

Put option contract's (ETH7FEB-2020) strike price is **\$180 (at-the-money)**.

The ATM option contract for 1 ETH with 1-week expiration has a price of **\$5.96** on Deribit

ETH put hedge contract's strike price is **\$180 (at-the-money)**.

The ATM hedge contract for 1 ETH with 1-week expiration has a price of **\$3.60** on Hegic.

In-the-money is a put option contract or a put hedge contract with a strike price greater than \$180 (the asset's value is above the strike price).

Put option contract's (ETH7FEB-2020) strike price is **\$190 (in-the-money)**.

The ITM option contract for 1 ETH with 1-week expiration has a price of **\$12.20** on Deribit.

ETH put hedge contract's strike price is **\$189 (in-the-money)**.

The ITM hedge contract for 1 ETH with 1-week expiration has a price of **\$10.89** on Hegic.

Put option contract's (ETH7FEB-2020) strike price is **\$200 (in-the-money)**.

The ITM option contract for 1 ETH with 1-week expiration has a price of **\$20.52** on Deribit.

ETH put hedge contract's strike price is **\$198 (in-the-money)**.

The ITM hedge contract for 1 ETH with 1-week expiration has a price of **\$18.99** on Hegic.

Out-of-the-money is a put option contract or a put hedge contract with a strike price lower than \$180 (the asset's value is below the strike price).

Put options contract's (ETH7FEB-2020) strike price is **\$170 (out-of-the-money)**.

The OTM option contract for 1 ETH with 1-week expiration has a price of **\$2.26** on Deribit

ETH put hedge contract's strike price is **\$171 (out-of-the-money)**.

The OTM hedge contract for 1 ETH with 1-week expiration has a price of **\$1.71** on Hegic.

Put options contract's (ETH7FEB-2020) strike price is **\$160 (out-of-the-money)**.

The OTM option contract for 1 ETH with 1-week expiration has a price of **\$1.08** on Deribit

ETH put hedge contract's strike price is **\$162 (out-of-the-money)**.

The OTM hedge contract for 1 ETH with 1-week expiration has a price of **\$0.81** on Hegic.

The second reference contract is a put option contract on ETH with an expiration date of February 14, 2020. This price analysis was conducted on January 31, 2020, with the expiration of the contract at the time of comparison: 13 days 20 hours 52 minutes.

ETH-14FEB20 Put Option Contract Prices (Deribit):

Put Option Contract on Deribit		Contract Period (Expiration) and Prices		
ETH Price: \$180	Strike Price	2 weeks		
		Bid	Ask	Average
Out-of-the-money	\$160	\$2.36	\$2.90	\$2.63
Out-of-the-money	\$170	\$4.54	\$5.26	\$4.90
At-the-money	\$180	\$8.35	\$9.44	\$8.89
In-the-money	\$190	\$14.15	\$15.42	\$14.78
In-the-money	\$200	\$21.60	\$22.87	\$22.23

Table 8: Put Option Contract (ETH-14FEB20) Prices on Deribit as of January 31, 2020.

2-weeks ETH Put Hedge Contract Prices (Hegic):

Put Hedge Contract on Hegic		Hedge Contract Period (Expiration) and Prices	
ETH Price: \$180	Strike Price	2 weeks	
		Out-of-the-money	\$162
Out-of-the-money	\$171	\$3.42	
At-the-money	\$180	\$7.20	
In-the-money	\$189	\$12.78	
In-the-money	\$198	\$19.98	

Table 9: 2-weeks ETH Put Hedge Contract Prices on Hegic as of January 31, 2020.

Put options contract's (ETH14FEB-2020) strike price is **\$180 (at-the-money)**.

The ATM option contract for 1 ETH with 2-weeks expiration has a price of **\$8.89** on Deribit.

ETH put hedge contract's strike price is **\$180 (at-the-money)**.

The ATM hedge contract for 1 ETH with 2-weeks expiration has a price of **\$7.20** on Hegic.

Put options contract's (ETH14FEB-2020) strike price is **\$190 (in-the-money)**.

The ITM option contract for 1 ETH with 2-weeks expiration has a price of **\$14.78** on Deribit.

ETH put hedge contract's strike price is **\$189 (in-the-money)**.

The ITM hedge contract for 1 ETH with 2-weeks expiration has a price of **\$12.78** on Hegic.

Put options contract's (ETH14FEB-2020) strike price is **\$200 (in-the-money)**.

The ITM option contract for 1 ETH with 2-weeks expiration has a price of **\$22.23** on Deribit.

ETH put hedge contract's strike price is **\$198 (in-the-money)**.

The ITM hedge contract for 1 ETH with 2-weeks expiration has a price of **\$19.98** on Hegic.

Put options contract's (ETH14FEB-2020) strike price is **\$170 (out-of-the-money)**.

The OTM option contract for 1 ETH with 2-weeks expiration has a price of **\$4.90** on Deribit

ETH put hedge contract's strike price is **\$171 (out-of-the-money)**.

The ITM hedge contract for 1 ETH with 2-weeks expiration has a price of **\$3.42** on Hegic.

Put options contract's (ETH14FEB-2020) strike price is **\$160 (out-of-the-money)**.

The OTM option contract for 1 ETH with 1-week expiration has a price of **\$2.58** on Deribit

ETH put hedge contract's strike price is **\$162 (out-of-the-money)**.

The ITM hedge contract for 1 ETH with 1-week expiration has a price of **\$1.62** on Hegic.

The third reference contract is a put option contract on ETH with an expiration date of February 28, 2020. This price analysis was conducted on January 31, 2020, with the expiration of the contract at the time of comparison: 27 days 20 hours 51 minutes.

ETH-28FEB20 Put Option Contract Prices (Deribit):

Put Option Contract on Deribit		Contract Period (Expiration) and Prices		
ETH Price: \$180	Strike Price	4 weeks		
		Bid	Ask	Average
Out-of-the-money	\$160	\$5.12	\$5.85	\$5.48
Out-of-the-money	\$170	\$8.22	\$9.13	\$8.67
At-the-money	\$180	\$12.60	\$13.70	\$13.15
In-the-money	\$190	\$18.27	\$19.37	\$18.82
In-the-money	\$200	\$25.04	\$26.13	\$25.58

Table 10: Put Option Contract (ETH-28FEB20) Prices on Deribit as of January 31, 2020.

4-weeks ETH Put Hedge Contract Prices (Hegic):

Put Hedge Contract on Hegic		Hedge Contract Period (Expiration) and Prices
ETH Price: \$180	Strike Price	4 weeks
Out-of-the-money	\$162	\$3.24
Out-of-the-money	\$171	\$6.84
At-the-money	\$180	\$14.40
In-the-money	\$189	\$16.56
In-the-money	\$198	\$21.96

Table 11: 4-weeks ETH Put Hedge Contract Prices on Hegic as of January 31, 2020.

Put option contract's (ETH28FEB-2020) strike price is **\$180 (at-the-money)**.

The ATM option contract for 1 ETH with 4-weeks expiration has a price of **\$13.15** on Deribit.

ETH put hedge contract's strike price is **\$180 (at-the-money)**.

The ATM hedge contract for 1 ETH with 4-weeks expiration has a price of **\$14.40** on Hegic.

Put option contract's (ETH28FEB-2020) strike price is **\$190 (in-the-money)**.

The ITM option contract for 1 ETH with 4-weeks expiration has a price of **\$18.82** on Deribit.

ETH put hedge contract's strike price is **\$189 (in-the-money)**.

The ITM hedge contract for 1 ETH with 4-weeks expiration has a price of **\$16.56** on Hegic.

Put options contract's (ETH28FEB-2020) strike price is **\$200 (in-the-money)**.

The ITM option contract for 1 ETH with 4-weeks expiration has a price of **\$25.58** on Deribit.

ETH put hedge contract's strike price is **\$198 (in-the-money)**.

The ITM hedge contract for 1 ETH with 4-weeks expiration has a price of **\$21.96** on Hegic.

Put options contract's (ETH28FEB-2020) strike price is **\$170 (out-of-the-money)**.

The OTM option contract for 1 ETH with 4-weeks expiration has a price of **\$8.67** on Deribit.

ETH put hedge contract's strike price is **\$171 (out-of-the-money)**.

The ITM hedge contract for 1 ETH with 4-weeks expiration has a price of **\$6.84** on Hegic.

Put options contract's (ETH28FEB-2020) strike price is **\$160 (out-of-the-money)**.

The OTM option contract for 1 ETH with 4-weeks expiration has a price of **\$5.48** on Deribit.

ETH put hedge contract's strike price is **\$162 (out-of-the-money)**.

The ITM hedge contract for 1 ETH with 4-weeks expiration has a price of **\$3.24** on Hegic.

The fourth reference contract is an option contract on ETH with an expiration date of March 27, 2020. This price analysis was conducted on January 31, 2020, with the expiration of the contract at the time of comparison: 55 days 20 hours 50 minutes.

ETH-27MAR20 Put Options Contract Prices (Deribit):

Put Option Contract on Deribit		Contract Period (Expiration) and Prices		
ETH Price: \$180	Strike Price	8 weeks		
		Bid	Ask	Average
Out-of-the-money	\$160	\$9.99	\$11.29	\$10.64
At-the-money	\$180	\$18.88	\$20.55	\$19.71
In-the-money	\$200	\$30.72	\$32.76	\$31.74

Table 12: Put Option Contract (ETH-27MAR20) Prices on Deribit as of January 31, 2020.

8-weeks ETH Put Hedge Contract Prices (Hegic):

Put Hedge Contract on Hegic		Hedge Contract Period (Expiration) and Prices
ETH Price: \$180	Strike Price	8 weeks
Out-of-the-money	\$162	\$6.48
At-the-money	\$180	\$28.80
In-the-money	\$198	\$25.92

Table 13: 8-weeks ETH Put Hedge Contract Prices on Hegic as of January 31, 2020.

Put option contract's (ETH27MAR-2020) strike price is **\$180 (at-the-money)**.

The ATM option contract for 1 ETH with 8-weeks expiration has a price of **\$19.71** on Deribit

ETH put hedge contract's strike price is **\$180 (at-the-money)**.

The ATM hedge contract for 1 ETH with 8-weeks expiration has a price of **\$28.80** on Hegic

Put option contract's (ETH28FEB-2020) strike price is **\$200 (in-the-money)**.

The ITM option contract for 1 ETH with 8-weeks expiration has a price of **\$31.74** on Deribit

ETH put hedge contract's strike price is **\$198 (in-the-money)**.

The ITM hedge contract for 1 ETH with 8-weeks expiration has a price of **\$25.92** on Hegic.

Put option contract's (ETH28FEB-2020) strike price is **\$160 (out-of-the-money)**.

The OTM option contract for 1 ETH with 4-weeks expiration has a price of **\$10.64** on Deribit.

ETH put hedge contract's strike price is **\$162 (out-of-the-money)**.

The ITM hedge contract for 1 ETH with 4-weeks expiration has a price of **\$6.48** on Hegic.

In most cases put hedge contracts prices on Hegic are lower than put options contracts prices on Deribit. However, the goal of Hegic is not to offer the cheapest options-like instrument, but to introduce a new kind of a non-custodial, trustless and censorship-resistant contract with on-chain settlement. Hegic uses a dynamic strike price determination approach, which influences the rate and the premium of hedge contracts. Because of that, **market participants might find and use arbitrage opportunities between hedge contracts on Hegic and options contracts on the options exchanges (e.g. Deribit).**

Note that only the premiums were compared in this section. Options fees and delivery (settlement at expiration) on Deribit, as well as the settlement fee on Hegic, were excluded from the final price comparison. Holders should be aware that a put hedge contract or a put option contract both have a break-even price. It can be calculated in such a way:

$$S - P - F = BE,$$

where S – Strike Price; P – Premium Paid; F – Fees Paid; BE – Break-even Price.

For example, if the holder bought a put hedge contract with a \$200 strike that they have paid \$8 in premium and \$2 in settlement fee for, then the break-even price for such a hedge contract is:

$$\$200 - \$8 - \$2 = \$190$$

Break-even price is a level at which the holder can execute the hedge contract and earn profits that cover the premium and settlement fee that have been paid for activating the hedge contract. In the example above, if the strike price of a put hedge contract is \$200 and the market price of an asset is \$190, then executing the hedge contract (selling an asset for \$200 when its market price is \$190) will create \$10 in profits that cover \$8 premium and \$2 settlement fee.

On Hegic, the holder has a right to execute a hedge contract at any time, even if it has not reached the break-even price. However, it is important to understand the basic principles behind put options contracts and put hedge contracts to use these instruments properly.

Initial implementations of Hegic will enable holders to buy hedge contracts without an ability to resell it to other holders before the expiration. Community members and developers can create secondary markets and decentralized exchanges for hedge contracts. **It is planned to add a decentralized exchange functionality and markets for trading hedge contracts on Hegic.**

Early versions of hedge contracts and their pricing model consider the probability that the holders will start using them as insurance from the assets' price downside. With the time and additional functionality, speculating on hedge contracts prices will become possible. Future versions of Hegic will be close to the current implementations of cryptocurrency options exchanges such as Deribit, FTX and others in terms of functionality. However, the development efforts will preserve the goal of creating a trustless, decentralized and non-custodial system of hedge contracts.

To make the price comparison as representative as possible, **the prices of two more put options contracts with other expiration dates will be compared with the prices of put hedge contracts.**

The first of them is an option contract on ETH with an expiration date of February 14, 2020. This price analysis was conducted on February 7, 2020, with the expiration of the contract at the time of comparison: 6 days 23 hours 54 minutes. **At the snapshot minute of all the reference contract prices, the market price of ETH was \$219 (\$218.78 - \$219.05).**

ETH-14FEB20 Put Options Contract Prices (Deribit):

Put Option Contract on Deribit		ETH-14FEB20 Contract Period (Expiration) and Prices		
ETH Price: \$219	Strike Price	1 week		
		Bid	Ask	Average
Out-of-the-money	\$210	\$5.05	\$5.49	\$5.27
At-the-money	\$220	\$9.23	\$10.11	\$9.67
In-the-money	\$230	\$15.38	\$16.92	\$16.15

Table 14: Put Option Contract (ETH-14FEB20) Prices on Deribit as of February 7, 2020.

1-week ETH Put Hedge Contract Prices (Hegic):

Put Hedge Contract on Hegic		Hedge Contract Period (Expiration) and Prices
ETH Price: \$219	Strike Price	1 week
Out-of-the-money	\$209	\$2.09
At-the-money	\$220	\$4.40
In-the-money	\$231	\$13.31

Table 15: 1-week ETH Put Hedge Contract Prices on Hegic as of February 7, 2020.

Put options contract's (ETH14FEB-2020) strike price is **\$220 (at-the-money)**.

The ATM option contract for 1 ETH with 1-week expiration has a price of **\$9.67** on Deribit.

ETH put hedge contract's strike price is **\$220 (at-the-money)**.

The ATM hedge contract for 1 ETH with 1-week expiration has a price of **\$4.40** on Hegic.

Put options contract's (ETH14FEB-2020) strike price is **\$230 (in-the-money)**.

The ITM option contract for 1 ETH with 1-week expiration has a price of **\$16.15** on Deribit.

ETH put hedge contract's strike price is **\$231 (in-the-money)**.

The ITM hedge contract for 1 ETH with 1-week expiration has a price of **\$13.31** on Hegic.

Put options contract's (ETH14FEB-2020) strike price is **\$210 (out-of-the-money)**.

The OTM option contract for 1 ETH with 1-weeks expiration has a price of **\$5.27** on Deribit.

ETH put hedge contract's strike price is **\$209 (out-of-the-money)**.

The OTM hedge contract for 1 ETH with 1-weeks expiration has a price of **\$2.09** on Hegic.

The second reference contract is an option contract on ETH with an expiration date of February 14, 2020. This price analysis was conducted on February 7, 2020, with the expiration of the contract at the time of comparison: 13 days 23 hours 54 minutes.

ETH-21FEB20 Put Options Contract Prices (Deribit):

Put Option Contract on Deribit		ETH-21FEB20 Contract Period (Expiration) and Prices		
ETH Price: \$219	Strike Price	2 weeks		
		Bid	Ask	Average
Out-of-the-money	\$210	\$8.39	\$9.71	\$9.05
At-the-money	\$220	\$12.80	\$14.34	\$13.57
In-the-money	\$230	\$18.77	\$20.31	\$19.54

Table 16: Put Option Contract (ETH-21FEB20) Prices on Deribit as of February 7, 2020.

2-weeks ETH Put Hedge Contract Prices (Hegic):

Put Hedge Contract on Hegic		Hedge Contract Period (Expiration) and Prices
ETH Price: \$219	Strike Price	2 weeks
		Out-of-the-money
At-the-money	\$220	\$8.80
In-the-money	\$231	\$15.62

Table 17: 2-weeks ETH Put Hedge Contract Prices on Hegic as of February 7, 2020.

Put options contract's (ETH14FEB-2020) strike price is **\$220 (at-the-money)**.

The ATM option contract for 1 ETH with 2-weeks expiration has a price of **\$13.57** on Deribit.

ETH put hedge contract strike price is **\$220 (at-the-money)**.

The ATM hedge contract for 1 ETH with 2-weeks expiration has a price of **\$8.80** on Hegic.

Put options contract's (ETH14FEB-2020) strike price is **\$230 (in-the-money)**.

The ITM option contract for 1 ETH with 2-week expiration has a price of **\$19.54** on Deribit.

ETH put hedge contract's strike price is **\$231 (in-the-money)**.

The ITM hedge contract for 1 ETH with 2-week expiration has a price of **\$15.62** on Hegic.

Put options contract's (ETH14FEB-2020) strike price is **\$210 (out-of-the-money)**.

The OTM option contract for 1 ETH with 2-weeks expiration has a price of **\$9.05** on Deribit.

ETH put hedge contract's strike price is **\$209 (out-of-the-money)**.

The OTM hedge contract for 1 ETH with 2-weeks expiration has a price of **\$4.18** on Hegic.

8. Liquidity Pools

After providing DAI, USDC, USDT or other stablecoins to the liquidity pool, **writtenASSET tokens will be minted and sent to the provider's ETH-address**. The formula for minting writeDAI tokens is:

$$\Delta W = \frac{W * \Delta P}{P},$$

where ΔW – the amount of writeDAI tokens that a liquidity provider will receive;

ΔP – the amount of DAI tokens that a liquidity provider provides to the pool;

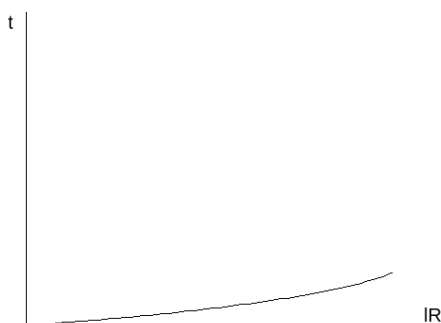
W – the total amount of writeDAI tokens that were already distributed;

P – the total amount of DAI tokens that were provided to the pool.

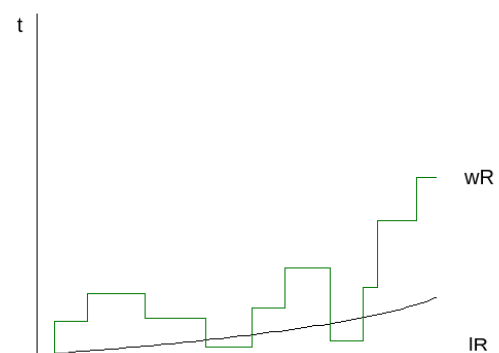
After providing liquidity, the writers will start to receive premiums. After joining the pool, they will start earning the writing returns starting from the next holder who will pay for activating a hedge contract. The premiums or losses from writing hedge contracts that were activated before a new liquidity provider joined a pool will not be distributed to this new liquidity provider. The liquidity that is allocated on the pool contract is automatically converted into CHAI [11]. CHAI is ERC20 token that earns interest on DAI without requiring it to be locked in the contract.

While allocating DAI token in the pool on Hegic, liquidity providers will be simultaneously earning DSR (DAI Savings Rate) [12]. Allocating DAI in the liquidity pool provides writers with the returns on DAI paid by MakerDAO's DSR plus the premiums that are paid by hedge contracts holders.

On-chain lending protocols provide users with the returns that are paid in real-time. Hedge contracts writing returns that liquidity providers are earning on Hegic cannot guarantee the same stability and predictability, because they depend on the market volatility of the assets that the hedge contracts are held for. However, the theoretical returns on writing hedge contracts can be higher than the yields paid by on-chain lending protocols. Writing hedge contracts, as an instrument, has different risk and return profile and cannot be compared with on-chain lending. The differences between these two instruments in terms of expected returns can be plotted. One should remember that it is not a comparison of two competitive instruments, because, as it was described in this section, hedge contracts writers are also earning DSR and these on-chain lending returns should be added to the expected returns of writing hedge contracts.



t – time; IR – lending returns.



t – time; IR – lending returns; wR – writing returns.

9. HEGIC Token [the first liquidity offering is planned for 05/05/2020]

HEGIC is an ERC20 token that is used for distribution of the settlement fees between the token holders as well as in the protocol on-chain governance. Settlement fees that accrue on HEGIC are distributed between all the HEGIC token holders every quarter. Therefore, HEGIC token combines the collective fractional ownership, utility and governance functions.

HEGIC token's value proposition for holders is better rates for holding hedge contracts. To use the discount, holders have to hold HEGIC tokens on their ETH-address that they use to activate hedge contracts. The market value of HEGIC tokens on the holder's ETH-address should be the same or higher than the strike price of the hedge contract to have a lower rate. Initial implementations of HEGIC will give the HEGIC token holders a 30% discount for the rates (excluding a settlement fee).

Example: for a hedge contract of 1 ETH with a period of 2 weeks the holder chooses the \$200 strike price (at-the-money; market price of ETH is \$200). The price of such a hedge contract is \$10. \$8 is a 4% rate of the 2-weeks ETH hedge contract and \$2 is a 1% settlement fee of the at-the-money hedge contract. The holder also holds \$250 in HEGIC tokens on their ETH-address. The value of HEGIC tokens is higher than the strike price of a hedge contract. That gives the holder a right to use a 30% discount on the rate. Instead of \$8, the holder should only pay \$5.6 as a rate for holding a 2-weeks hedge contract plus a \$2 settlement fee. To activate it, the holder should pay \$7.6 in total for holding the hedge contract instead of \$10.

HEGIC token's value proposition for writers is no delay, priority unlocks of their liquidity. To have a priority for liquidity unlock, the writers have to hold HEGIC tokens on their ETH-address that they use to provide the liquidity to the pool. The market value of HEGIC tokens on the writer's ETH-address should be the same or higher than the liquidity provided to the pool to have a no delay, priority unlock.

Example: if the amount of unlocked DAI in the liquidity pool is not enough for the writer to swap their writeDAI to DAI, they will have to wait for the active hedge contract's expiration. If the writer wishes to withdraw the liquidity from the pool, but the amount of unlocked DAI is not enough, they send a request to swap their writeDAI to DAI as soon as the liquidity will be unlocked. Their requests are aggregated in queues. However, if the writer holds HEGIC tokens and their market value is the same or higher than the liquidity that they have provided to the pool, they can send their writeDAI and instantly receive the amount of DAI. Liquidity from the HEGIC Development Fund (HDF) will be used to swap the writer's writeDAI to DAI immediately.

HEGIC token is used in HIPs (Hegic Improvement Proposal) for governance purposes. HEGIC token holders can vote for changing hedge contracts rates, settlement fee size, strike price multipliers, assets supported by hedge contracts and more. The governance mechanism will be implemented as soon as the HEGIC protocol will have the traction and at least 100 monthly active holders and writers. **HEGIC has a fixed supply of 3012009 HEGIC tokens.** Tokens will be unlocked with the time after the particular goals are reached by the HEGIC protocol.

In the First Epoch, 10% of the HEGIC total supply will be unlocked and offered on one of the decentralized exchanges with the purpose of the first liquidity offering of HEGIC tokens. 301200,90 HEGIC tokens will be offered at a fixed price of \$0.332. All the funds from the first liquidity offering will be allocated in the HEGIC Development Fund (HDF). The funds will be proceeded for conducting the security audits of the HEGIC contracts and for continuing the development of the protocol.

The transition to a new epoch will only be activated, if the market capitalization of HEGIC reaches a new milestone. These milestones require a ten-time growth level of the market capitalization. When a new milestone is reached, 15% of the total supply will be offered a fixed price as new liquidity at on one of the decentralized exchanges. The funds attracted during the liquidity offerings will be distributed between all the HEGIC token holders (90% - 95%) and the Hegic Development Fund (HDF) (5% - 10%).

	Amount	Unlock	Price	Capitalization	Distribution	Purpose
First Epoch	301200,90	10%	\$0.332	\$1M	~\$100K	100% - Initial capital allocation in the Hegic Development Fund.
Second Epoch	451801,35	15%	\$3.32	\$10M	~\$1.5M	Liquidity offering; 90% to HEGIC holders, 10% to HDF.
Third Epoch	451801,35	15%	\$33.20	\$100M	~\$15M	Liquidity offering; 91% to HEGIC holders, 9% to HDF.
Fourth Epoch	451801,35	15%	\$332.00	\$1B	~\$150M	Liquidity offering; 92% to HEGIC holders, 8% to HDF.
Fifth Epoch	451801,35	15%	\$3320.00	\$10B	~\$1.5B	Liquidity offering; 93% to HEGIC holders, 7% to HDF.
Sixth Epoch	451801,35	15%	\$33200.00	\$100B	~\$15B	Liquidity offering; 94% to HEGIC holders, 6% to HDF.
Seventh Epoch	451801,35	15%	\$332000.00	\$1T	~\$150B	Liquidity offering; 95% to HEGIC holders, 5% to HDF.
Total Supply	3012009	100%				

Table 18: Planned liquidity offerings and funds distribution between the HEGIC token holders per epoch.

In the First Epoch, 100% of the unlocked HEGIC tokens (301200,90 HEGIC, 10% of total supply) will be offered at a fixed price of \$0.332 / HEGIC. 100% of the funds received (~\$100K) will be used to create the initial Hegic Development Fund (HDF).

In the Second Epoch, 100% of the unlocked HEGIC tokens (451801,35 HEGIC, 15% of total supply) will be offered at a fixed price of \$3.32 / HEGIC. The transition to the Second Epoch will only be activated if the market capitalization of Hegic reaches \$10M. 90% of the funds received from the liquidity offering (~\$1.5M) will be distributed between all the HEGIC token holders (only those who held HEGIC tokens before the Second Epoch snapshot) and 10% of the funds received will be allocated in the Hegic Development Fund.

In the Third Epoch, 100% of the unlocked HEGIC tokens (451801,35 HEGIC, 15% of total supply) will be offered at a fixed price of \$33.20 / HEGIC. The transition to the Third Epoch will only be activated if the market capitalization of Hegic reaches \$100M. 91% of the funds received from the liquidity offering (~\$15M) will be distributed between all the HEGIC token holders (only those who held HEGIC tokens before the Third Epoch snapshot) and 9% of the funds received will be allocated in the Hegic Development Fund.

In the Fourth Epoch, 100% of the unlocked HEGIC tokens (451801,35 HEGIC, 15% of total supply) will be offered at a fixed price of \$332.00 / HEGIC. The transition to the Fourth Epoch will only be activated if the market capitalization of Hegic reaches \$1B. 92% of the funds received from the liquidity offering (~\$150M) will be distributed between all the HEGIC token holders (only those who held HEGIC tokens before the Fourth Epoch snapshot) and 8% of the funds received will be allocated in the Hegic Development Fund.

In the Fifth Epoch, 100% of the unlocked HEGIC tokens (451801,35 HEGIC, 15% of total supply) will be offered at a fixed price of \$3320.00 / HEGIC. The transition to the Fifth Epoch will only be activated if the market capitalization of Hegic reaches \$10B. 93% of the funds received from the liquidity offering (~\$1.5B) will be distributed between all the HEGIC token holders (only those who held HEGIC tokens before the Fifth Epoch snapshot) and 7% of the funds received will be allocated in the Hegic Development Fund.

In the Sixth Epoch, 100% of the unlocked HEGIC tokens (451801,35 HEGIC, 15% of total supply) will be offered at a fixed price of \$33200.00 / HEGIC. The transition to the Sixth Epoch will only be activated if the market capitalization of Hegic reaches \$100B. 94% of the funds received from the liquidity offering (~\$15B) will be distributed between all the HEGIC token holders (only those who held HEGIC tokens before the Sixth Epoch snapshot) and 6% of the funds received will be allocated in the Hegic Development Fund.

In the Seventh Epoch, 100% of the unlocked HEGIC tokens (451801,35 HEGIC, 15% of total supply) will be offered at a fixed price of \$332000.00 / HEGIC. The transition to the Seventh Epoch will only be activated if the market capitalization of Hegic reaches \$1T. 95% of the funds received from the liquidity offering (~\$150B) will be distributed between all the HEGIC token holders (only those who held HEGIC tokens before the Seventh Epoch snapshot) and 5% of the funds received will be allocated in the Hegic Development Fund.

For a transition to a new epoch to be activated, the first requirement is that the historical trading volume of HEGIC token on decentralized exchanges should not be less than 10% of the new capitalization level that has been reached (to eliminate the HEGIC token price manipulations to unlock new tokens). The second requirement is that the total amount of historical turnover of active hedge contracts should not be less than 10% of the new capitalization level (to align the demand for hedge contracts and the adoption pace of the protocol with future liquidity offerings).

	Capitalization	Required Volume	Required Turnover
First Epoch	\$1M	-	-
Second Epoch	\$10M	\$1M+	\$1M+
Third Epoch	\$100M	\$10M+	\$10M+
Fourth Epoch	\$1B	\$100M+	\$100M+
Fifth Epoch	\$10B	\$1B+	\$1B+
Sixth Epoch	\$100B	\$10B+	\$10B+
Seventh Epoch	\$1T	\$100B+	\$100B+

Table 19: Required historical volume of the HEGIC token and turnover of active hedge contracts.

10. Conclusion

In this paper, the Hegic protocol and the concept of a hedge contract were described. Hedge contract is an options-like on-chain contract that gives the holder (buyer) a right to buy or to sell an asset at a certain price (strike) as well as imposes the obligation on the writer (seller) to buy or to sell an asset during a certain period. Hedge contracts can be considered as a non-custodial, trustless and censorship-resistant alternative to options contracts. On Hegic, liquidity providers' (writers') funds can be distributed between many hedge contracts simultaneously. It diversifies the liquidity allocation and makes capital work in an efficient way. The assumption is that in the long-run, liquidity providers' returns could beat the returns of a solo options writer.

The initial implementations of Hegic will enable holders to buy put hedge contracts that will give them a right to swap ETH to DAI stablecoin at a certain price (strike) at any given moment until the expiration. Hegic uses a dynamic strike price determination approach, which influences the rate and the premium of hedge contracts. Maintenance and execution of hedge contracts do not depend on the external price feeds.

Liquidity pools are non-custodial. In the initial implementations of Hegic, the rate for holding a hedge contract varies from 0.5% up to 2.0% per week. Theoretical yearly returns for hedge contracts writers (sellers) are in between from +27% up to +108% APR on DAI, USDC or USDT. While allocating DAI token in the pool on Hegic, liquidity providers will be simultaneously earning DSR (DAI Savings Rate). Allocating DAI in the liquidity pool provides writers with the returns on DAI paid by MakerDAO's DSR plus the premiums that are paid by hedge contracts holders.

HEGIC an ERC20 token that is used for distribution of 100% of the settlement fees between all the token holders and in the protocol on-chain governance purposes. HEGIC token combines the collective fractional ownership, utility and governance functions. HEGIC has a fixed supply of 3012009 HEGIC tokens, which will be unlocked with the time after the particular goals are reached by the Hegic protocol.

Hegic protocol is live on Ethereum mainnet: <https://www.hegic.co>

Open source code of the Hegic protocol: <https://github.com/hegic>

Hegic ETH Put Hedge Contract (Ethereum mainnet):

<https://etherscan.io/address/0x27b6125328ca57d5d96baaa4f9ca8c5edbaf016>

Hegic DAI Liquidity Pool Contract (Ethereum mainnet):

<https://etherscan.io/address/0x009c216b7e86e5c38af14fcd8c07aab3a2e7888e>

Discord: <https://discord.gg/znjdj8q>

Telegram: <https://t.me/HegicOptions>

Twitter: <https://twitter.com/HegicOptions>

Contact: molly.wintermute@protonmail.com

The first liquidity offering of HEGIC tokens is planned for 05/05/2020.

This paper was originally published and uploaded to IPFS on 20/02/2020.

11. References

- [1] The Futures Industry Association. Global Futures and Options Trading Volumes in 2019. <https://fia.org/articles/global-futures-and-options-trading-reaches-record-level-2019>
- [2] OCC. The Options Clearing Corporation Website. <https://www.theocc.com>
- [3] Investopedia. Types of Options Positions That Create Unlimited Liability. <https://www.investopedia.com/ask/answers/050115/what-types-options-positions-create-unlimited-liability.asp>
- [4] Black Fischer and Myron Scholes. The Pricing of Options and Corporate Liabilities: https://www.cs.princeton.edu/courses/archive/fall09/cos323/papers/black_scholes73.pdf
- [5] Deribit. Cryptocurrency Futures and Options Exchange. <https://www.deribit.com>
- [6] Chainlink. Oracle Network for Smart Contracts Real World Data. <https://chain.link>
- [7] Dai (DAI) Stablecoin by MakerDAO. <https://makerdao.com/en>
- [8] USD Coin (USDC) Stablecoin by Circle. <https://www.circle.com/en/usdc>
- [9] Tether (USDT) Stable digital cash. <https://tether.to>
- [10] Uniswap Exchange Protocol Docs. <https://docs.uniswap.io>
- [11] Chai. A simple ERC20 wrapper over the Dai Savings Rate. <https://chai.money/about.html>
- [12] Dai Stability Rate. <https://community-development.makerdao.com/makerdao-mcd-faqs/faqs/dsr>

Proofs of Reference Contracts Used in the Price Comparison Section:

ETH-7FEB20 Put Option Contract Prices (Deribit):

<https://ipfs.io/ipfs/QmZ2QBh93BA9f1m3DKpqjK9JjY5M2jBGbbcGZsyYuAnkDG>

ETH-14FEB20 Put Option Contract Prices (Deribit):

<https://ipfs.io/ipfs/QmQSQpHLNmX9Luea9EuysrkqRA1Af8UbfowJpvY3mNYq8z>

ETH-28FEB20 Put Option Contract Prices (Deribit):

<https://ipfs.io/ipfs/QmPqNKifKRrXLGQ48fTuejPwx7AU4XVoEotzH3SX6hHUyv>

ETH-27MAR20 Put Options Contract Prices (Deribit):

<https://ipfs.io/ipfs/QmUr2C2PMzvYFR6qNnFCjbfCfCfqp2KghVxPDirVXcZMxL>

ETH-14FEB20 Put Options Contract Prices (Deribit):

<https://ipfs.io/ipfs/QmQVt4gvkDeZxCCvVmBLD9T7XBfXSV2B3aamy8AbXZgm87>

ETH-21FEB20 Put Options Contract Prices (Deribit):

<https://ipfs.io/ipfs/QmVnmNZUDcBE3daujm5ubnrPktRQ1Q68uKV5KC3RcgRuFX>