


# SECURITY AUDIT REPORT

## Hatom ush-isolated-lending smart contract

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# Disclaimer

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# Terminology

**Inherent risk:** A risk for users that comes from a behavior inherent to the smart contract design.

Inherent risks only represent the risks inherent to the smart contract design, which are a subset of all the possible risks. **No inherent risk doesn't mean no risk.** It only means that no risk inherent to the smart contract design has been identified. Other kind of risks could still be present. For example, the issues not fixed incur risks for the users, or the smart contracts deployed as upgradeable also incur risks for the users.

**Issue:** A behavior unexpected by the users or by the project, or a practice that increases the chances of unexpected behaviors to appear.

**Critical issue:** An issue intolerable for the users or the project, that must be addressed.

**Major issue:** An issue undesirable for the users or the project, that we strongly recommend to address.

**Medium issue:** An issue uncomfortable for the users or the project, that we recommend to address.

**Minor issue:** An issue imperceptible for the users or the project, that we advise to address for the overall project security.

# Audit Summary

## Scope of initial audit

- **Repository:** <https://github.com/HatomProtocol/hatom-isolated-lending-protocol>
- **Commit:** 6aa9ab9262b20396c342f50750815eb16d8ff3a1
- **Path to Smart contract:** ./

## Scope of final audit

- **Repository:** <https://github.com/HatomProtocol/hatom-isolated-lending-protocol>
- **Commit:** 8ad38d1b85a6707024304fba2455c5f97e0d841b
- **Path to Smart contract:** ./isolated-lending-protocol

## Report objectives

1. Reporting all **inherent risks** of the smart contract.
2. Reporting all **issues** in the smart contract **code**.
3. Reporting all **issues** in the smart contract **test**.
4. Reporting all **issues** in the **other** parts of the smart contract.
5. Proposing **recommendations** to address all issues reported.

## 5 inherent risks in the final commit

### 0 issue in the final commit

41 issues reported from the initial commit and 0 remaining in the final commit:

Severity	Reported			Remaining		
	Code	Test	Other	Code	Test	Other
Critical	5	0	0	0	0	0
Major	6	0	0	0	0	0
Medium	16	2	0	0	0	0
Minor	12	0	0	0	0	0

# Inherent Risks

## **R1: 1 USH minted by an USH isolated lending module might be backed by less than \$1 worth of collateral.**

This is because there is a trust that the oracles providing prices and that the liquidation bots are active and work properly:

- If for any reason the prices returned by the oracles are erroneous, then the real dollar value of the collateral of USH borrowers might be smaller than the amount of borrowed USH.
- If for any reason, while some users are insolvent, there are no sufficiently active liquidators to execute liquidations or liquidations fail to be executed (e.g. because prices fail to be obtained from the oracles), then the amount of borrowed USH might continue to increase and exceed the dollar value of the collateral of USH borrowers.

## **R2: The solvency of a user might be incorrectly assessed, possibly leading to bad debt or to the liquidations of solvent users.**

This is because the solvency of a user depends on the value of his collateral relative to the value of his debt, and the prices of these tokens are obtained from external oracles which might make mistake and return incorrect prices. Consequently:

- Insolvent users might be deemed solvent: This would prevent the liquidations of these users, and would also allow them to borrow assets or withdraw collateral. This could then further lead to bad debt, i.e. a situation where USH is not sufficiently backed by collateral, increasing the risk that the dollar value of USH drops below 1.
- Solvent users might be deemed insolvent: This could result in unexpected liquidations, possibly making borrowers lose funds.

**R3: Even if a user is solvent, his collateral might be seized by an external account who repays the user's debt.**

Namely, in the USH isolated lending modules, there is a so-called "redemption mechanism" allowing anyone to seize the collateral of solvent users by repaying their debt.

Unlike in liquidations, in a redemption the user's loan-to-value is supposed to decrease: the amount of USH debt repaid to him is greater or equal than the dollar value of the seized collateral. However, this is not guaranteed because the dollar value of the collateral is obtained from external oracles which might make mistakes.

Finally, the redemption mechanism is supposed to be activated only in case the price of USH drops below 1. However, the assessment that the dollar value of USH is smaller than 1 depends on external oracles which might make mistakes. Therefore, it is possible that redemptions occur even if the dollar value of USH has not dropped below 1.

**R4: Users who deposit liquid staking tokens or HTokens as collateral stop earning interests from these tokens.**

This is because, when users deposit liquid staking tokens (sEGLD or sTAO) or HTokens (HsEGLD or HsTAO) as collateral in the smart contract, the staking interests and lending interests are redirected to the Hatom protocol.

**R5: Users might not be able to withdraw collateral at all or to withdraw collateral in the deposited form.**

This is because:

1) When a user deposits collateral in base tokens (EGLD or TAO) or liquid staking tokens (sEGLD or sTAO), his tokens are converted to liquid staking

tokens and then to supply tokens in Hatom money markets (HsEGLD or HsTAO).

2) When a user withdraws collateral, he has the following possibilities:

- He can decide to withdraw collateral in supply tokens, which is always possible.
- He can decide to withdraw collateral in liquid staking tokens, but this might be impossible if there is an insufficient supply of liquid staking tokens in the money market.
- He can decide to withdraw collateral in base tokens, but this requires first converting supply tokens to liquid staking tokens, which might be impossible if there is an insufficient supply of liquid staking tokens in the money market. Moreover, in the case of EGLD collateral, the user would not receive EGLD directly, but rather an unstaking NFT from the liquid staking protocol, which can be converted to EGLD only after waiting an unbonding period.

# Code Issues & Recommendations

Since the smart contract code is not open-source, only the remaining issues are published.



# Test Issues & Recommendations

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