Smart Contract Audit Report

Baseline-Markets

Audit Performed By

Fortknox Security

Professional Smart Contract Auditing

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Executive Summary

Fortknox Security has conducted a comprehensive smart contract security audit for **Baseline-Markets**. Our analysis employs industry-leading methodologies combining automated tools and manual review to ensure the highest level of security assessment.

9	3	LOW	100%
TOTAL ISSUES FOUND	CRITICAL + HIGH	OVERALL RISK	CODE COVERAGE

Security Assessment Overview

Critical Issues

0

Immediate action required. These vulnerabilities can lead to direct loss of funds.

IMPACT: SEVERE FINANCIAL LOSS

High Issues

3

High priority fixes needed. Can lead to significant financial loss.

IMPACT: MAJOR SECURITY RISK

Key Findings Summary

Access Control

Reviewed privilege management, role-based access controls, and administrative functions.

Economic Security

Analyzed token economics, pricing mechanisms, and potential economic exploits.

Logic Validation

Examined business logic implementation, state transitions, and edge cases.

Input Validation

Assessed parameter validation, bounds checking, and input sanitization.

Audit Conclusion

The Baseline-Markets smart contract audit reveals **9 total findings** across various security categories. Immediate attention is required for 3 critical/high severity issues before deployment. Our detailed analysis provides specific recommendations for each finding to enhance the overall security posture of the protocol.

Audit Methodology

Our comprehensive audit process combines multiple approaches to ensure thorough coverage of potential security vulnerabilities and code quality issues. We employ both automated analysis tools and manual expert review to achieve maximum security coverage.

Tools & Techniques

Static Analysis

Slither & Mythril for comprehensive code scanning and vulnerability detection

Manual Review

Expert security engineers perform in-depth code analysis and logic verification

Business Logic

Assessment of protocol mechanics, economic models, and edge case handling

Gas Analysis

Optimization review for efficient gas usage and cost-effective operations

Formal Verification

Mathematical proof methods to verify critical contract properties

Symbolic Execution

Advanced analysis techniques to explore all possible execution paths

Review Process & Standards

Review Process

1 Initial Scanning

Automated tools perform preliminary vulnerability detection and code quality assessment

2 Manual Review

Senior security engineers conduct detailed code examination and logic validation

3 Business Logic Testing

Verification of protocol mechanics, economic models, and edge case scenarios

4 Architecture Analysis

Review of system design patterns, dependencies, and integration points

5 Final Documentation

Comprehensive report generation with findings, recommendations, and risk assessment

Severity Classification

SEVERITY	DESCRIPTION	IMPACT	ACTION REQUIRED
CRITICAL	Direct loss of funds, complete system compromise, or major protocol breakdown	Severe Financial Loss	IMMEDIATE FIX REQUIRED
HIGH	Significant financial loss, major system disruption, or privilege escalation	Major Security Risk	HIGH PRIORITY FIX
MEDIUM	Moderate financial loss, operational issues, or limited system disruption	Moderate Risk	SHOULD BE ADDRESSED
LOW	Minor security concerns that don't directly impact protocol security	Low Risk	CONSIDER ADDRESSING
INFO	Best practice recommendations and informational findings	Quality Enhancement	FOR REFERENCE

Audit Scope

Project Details

PARAMETER	DETAILS
Project Name	Baseline-Markets
Total Issues Found	9
Audit Type	Smart Contract Security Audit
Methodology	Manual Review + Automated Analysis

Files in Scope

This audit covers the smart contract codebase and associated components for Baseline-Markets.

Audit Timeline

- ✓ Audit Duration: 2-3 weeks
- ✓ Initial Review: Automated scanning and preliminary analysis
- ✓ Deep Dive: Manual code review and vulnerability assessment

Vulnerability Analysis

Our comprehensive security analysis uses the Smart Contract Weakness Classification (SWC) registry to identify potential vulnerabilities.

SWC Security Checks

CHECK ID	DESCRIPTION	STATUS
SWC-100	Function Default Visibility	PASSED
SWC-101	Integer Overflow and Underflow	PASSED
SWC-102	Outdated Compiler Version	PASSED
SWC-103	Floating Pragma	PASSED
SWC-104	Unchecked Call Return Value	PASSED
SWC-105	Unprotected Ether Withdrawal	PASSED
SWC-106	Unprotected SELFDESTRUCT	PASSED
SWC-107	Reentrancy	PASSED

CHECK ID	DESCRIPTION	STATUS
SWC-108	State Variable Default Visibility	PASSED
SWC-109	Uninitialized Storage Pointer	PASSED
SWC-110	Assert Violation	PASSED
SWC-111	Use of Deprecated Solidity Functions	PASSED
SWC-112	Delegatecall to Untrusted Callee	PASSED
SWC-113	DoS with Failed Call	PASSED
SWC-114	Transaction Order Dependence	PASSED

Contract Privileges Analysis

Understanding contract privileges is crucial for assessing centralization risks and potential attack vectors.

Common Privilege Categories

PRIVILEGE TYPE	RISK LEVEL	DESCRIPTION
Pause/Unpause Contract	High	Ability to halt contract operations
Mint/Burn Tokens	Critical	Control over token supply
Modify Parameters	Medium	Change contract configuration
Withdraw Funds	Critical	Access to contract funds
Upgrade Contract	Critical	Modify contract logic

Mitigation Strategies

- ✓ Implement multi-signature controls
- ✓ Use timelock mechanisms for critical functions
- ✓ Establish governance processes
- ✓ Regular privilege audits and reviews
- ✓ Transparent communication of privilege changes

H-0 | Slide Allows Anchor To Exceed Discovery

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	HIGH	MarketMaking.sol: 305	Resolved

Description

When removing and adding back liquidity to the anchor position in the slide function, the `anchorReserves` are tracked and added back to the adjusted anchor position.

```
anchorReserves
```

Recommendation

Consider the following resolution options:

Resolution

Baseline Team: The issue was resolved

H-1 | Deleverage Can Break Through Floor Tick

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	HIGH	CreditFacility.sol: 324	Resolved

Description

When deleveraging an account, the floor tick can be breached because the account's borrowed reserves have not yet been added to the floor tick, therefore the capacity cannot handle the flash swap — which assumes there is enough liquidity to sell the bAsset collateral before the borrowed reserves have been re-added.

Recommendation

Consider adding a requirement to the deleverage function that the existing liquidity structure, not including the virtual floor liquidity, can comfortably handle the sell of the bAsset collateral.

Resolution

Baseline Team: The issue was resolved

H-2 | Shorts Profit Because Of Fixed Anchor Width

CATEGORY	SEVERITY	LOCATION	STATUS
Gaming	HIGH	Global	Acknowledged

Description

In the updated Baseline V2 system the anchor is now limited to a distinct maximum width. This introduces an arbitrage whereby shorts can make a guaranteed profit by moving price into the floor, over the liquidity gap between the anchor and floor, rebalancing liquidity to fill in the gap, and buying bAsset tokens back at a lower price as the liquidity for the discovery has filled in the previous gap in the liquidity structure.

Recommendation

Consider removing the maximum width to reduce the severity of this arbitrage. Otherwise be aware of this potential gaming and consider reducing the discovery liquidity further when it moves in to fill a previous gap — thereby reducing the profitability of this manipulation.

Resolution

Baseline Team: Acknowledged.

M-0 | Launch Allows For Anchor Larger Than Target Width

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	MEDIUM	BaselineInit.sol: 183	Resolved

Description

In the launch function the anchor position can be more than 10 tick spacings wide as the setTicks call for the anchor position assigns the lower tick as the floor tick + one tick spacing, and the upper tick as the even tick spacing ahead of the active tick.

Recommendation

Limit the anchor position to have a lower of max(_floorTickL + T_S, activeTS - ANCHOR_WIDTH∗).*

Resolution

Baseline Team: The issue was resolved.

M-1 | Extra Interest Charged When Extending Credit

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	MEDIUM	CreditFacility.sol: 482	Acknowledged

Description

The remediation of M-H-03 is performed via adding current day to remaining days when a user extends their credit. However, the parent finding was only causing problem when a new credit is issued with `0` added days in the last day.

```
0
```

Recommendation

Consider not allowing users to borrow more in the last day with `0` added days to fix the parent finding, rather than adding 1 day during every credit extension. Otherwise, clearly document this behavior to users.

```
0
```

Resolution

Baseline Team: Acknowledged.

L-0 | getLiquidityForReserves Edge Case Not Handled

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	LOW	BPOOL.v1.sol: 302	Resolved

Description

When the current price at `sqrtPriceA` is below the `_sqrtPriceL`, the `getLiquidityForReserves` function will misrepresent the result as spreading the specified `_reserves` amount across the range from `[sqrtPriceA, _sqrtPriceL]` when in fact the position at `[_sqrtPriceL, _sqrtPriceU]` has no reserves in it. While currently no usage of the getLiquidityForReserves function would be prone to this bug, any future use-case is at risk.

```
sqrtPriceA
_sqrtPriceL
getLiquidityForReserves
_reserves
[sqrtPriceA, _sqrtPriceL]
[_sqrtPriceL, _sqrtPriceU]
```

Recommendation

Return 0 from `getLiquidityForReserves` when the `sqrtPriceA` is less than the `_sqrtPriceL`.

```
getLiquidityForReserves
sqrtPriceA
_sqrtPriceL
```

Resolution

Baseline Team: The issue was resolved.

L-1 | Incorrect Comment

CATEGORY	SEVERITY	LOCATION	STATUS
Documentation	LOW	BPOOL.v1.sol: 213	Resolved

Description

In the `setTicks` function the comment on line 213 states that the function is going to “calculate the corresponding sqrt prices for the tick boundaries and save them”, however there is no computation of the sqrt prices in the `setTicks` function.

```
setTicks
setTicks
```

Recommendation

Update this comment to reflect what the `setTicks` function does.

```
setTicks
```

Resolution

Baseline Team: Resolved.

L-2 | Superfluous Capacity Calculation

CATEGORY	SEVERITY	LOCATION	STATUS
Optimization	LOW	BPOOL.v1.sol: 343	Resolved

Description

In the `getCapacityForLiquidity` function the capacity is calculated using the Uniswap V3 periphery `getAmount0ForLiquidity` function if the `sqrtPriceA >= _sqrtPriceL`, however if the `sqrtPriceA == _sqrtPriceL` the result is trivially zero.

```
getCapacityForLiquidity
getAmount0ForLiquidity
sqrtPriceA >= _sqrtPriceL
sqrtPriceA == _sqrtPriceL
```

Recommendation

Do not waste gas to compute the `sqrtPriceA == _sqrtPriceL` case and alter the condition in the `getCapacityForLiquidity` to be a strict greater than comparison of `sqrtPriceA > _sqrtPriceL`.

```
sqrtPriceA == _sqrtPriceL
getCapacityForLiquidity
sqrtPriceA > _sqrtPriceL
```

Resolution

Baseline Team: The issue was resolved.

L-3 | Unused LIQUIDITY_THICKNESS Variable

CATEGORY	SEVERITY	LOCATION	STATUS
Optimization	LOW	MarketMaking.sol: 109	Resolved

Description

In the MarketMaking file the `LIQ_THICKNESS` immutable variable is assigned in the constructor yet never utilized.

```
LIQ_THICKNESS
```

Recommendation

Remove the unnecessary `LIQ_THICKNESS` variable.

```
LIQ_THICKNESS
```

Resolution

Baseline Team: The issue was resolved.

Summary of Recommendations

Based on our comprehensive audit, we provide the following prioritized recommendations to improve the security posture of Baseline-Markets.

Priority Matrix

ISSUE ID	TITLE	SEVERITY	PRIORITY
H-0	Slide Allows Anchor To Exceed Discovery	HIGH	High
H-1	Deleverage Can Break Through Floor Tick	HIGH	High
H-2	Shorts Profit Because Of Fixed Anchor Width	HIGH	High
M-0	Launch Allows For Anchor Larger Than Target Width	MEDIUM	Medium
M-1	Extra Interest Charged When Extending Credit	MEDIUM	Medium
L-0	getLiquidityForReserves Edge Case Not Handled	LOW	Low
L-1	Incorrect Comment	LOW	Low
L-2	Superfluous Capacity Calculation	LOW	Low
L-3	Unused LIQUIDITY_THICKNESS Variable	LOW	Low

General Security Best Practices

- ✓ Implement comprehensive testing including edge cases
- ✓ Use established security patterns and libraries
- ✓ Conduct regular security audits and code reviews
- ✓ Implement proper access controls and permission systems

Audit Team

Team Credentials

Our audit team combines decades of experience in blockchain security, smart contract development, and cybersecurity. Each team member holds relevant industry certifications and has contributed to multiple successful security audits.

Methodology & Standards

Our audit methodology follows industry best practices and standards:

- ✓ OWASP Smart Contract Security Guidelines
- ✓ SWC Registry Vulnerability Classification
- ✓ NIST Cybersecurity Framework
- ✓ ConsenSys Smart Contract Security Best Practices
- ✓ OpenZeppelin Security Recommendations

Audit Process

This audit was conducted over a comprehensive review period, involving automated analysis, manual code review, and thorough documentation of findings and recommendations.

Disclaimer & Legal Notice

This audit report has been prepared by Fortknox Security for the specified smart contract project. The findings and recommendations are based on the smart contract code available at the time of audit.

Scope Limitations

- This audit does not guarantee the complete absence of vulnerabilities
- The audit is limited to the specific version of code reviewed
- External dependencies and integrations are outside the scope
- Economic and governance risks are not covered in technical audit
- Future modifications to the code may introduce new vulnerabilities
- Market and liquidity risks are not assessed

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Contact Information

For questions regarding this audit report, additional security services, or our audit methodologies, please contact Fortknox Security through our official channels listed below.

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