METATRUST

Draft
Security Assessment for

193-2022-12-caviar (1Negative-FD) (1Positive-FLP) (1Negative-SP) (StaticFail)

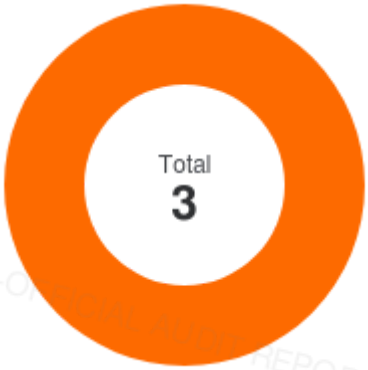
July 23, 2023

Executive Summary

Overview	
Project Name	193-2022-12-caviar (1Negative-FD) (1Positive-FLP) (1Negative-SP) (StaticFail)
Codebase URL	https://github.com/code-423n4/2022-12-caviar
Scan Engine	AI Analyzer
Scan Time	2023/07/23 21:57:48
Commit Id	0212f9d

Total	
Critical Issues	0
High risk Issues	3
Medium risk Issues	0
Low risk Issues	0
Informational Issues	0

Critical Issues	The issue can cause large economic losses, large-scale data disorder, loss of control of authority management, failure of key functions, or indirectly affect the correct operation of other smart contracts interacting with it.
High Risk Issues	The issue puts a large number of users' sensitive information at risk or is reasonably likely to lead to catastrophic impacts on clients' reputations or serious financial implications for clients and users.
Medium Risk Issues	The issue puts a subset of users' sensitive information at risk, would be detrimental to the client's reputation if exploited, or is reasonably likely to lead to moderate financial impact.
Low Risk Issues	The risk is relatively small and could not be exploited on a recurring basis, or is a risk that the client has indicated is low-impact in view of the client's business circumstances.
Informational Issue	The issue does not pose an immediate risk but is relevant to security best practices or Defence in Depth.



Critical Issues	0%	0
High risk Issues	100%	3
Medium risk Issues	0%	0
Low risk Issues	0%	0
Informational Issues	0%	0

Summary of Findings

MetaScan security assessment was performed on **July 23, 2023 21:57:48** on project **193-2022-12-caviar (1Negative-FD) (1Positive-FLP) (1Negative-SP) (StaticFail)** with the repository **https://github.com/code-423n4/2022-12-caviar** on branch **default branch**. The assessment was carried out by scanning the project's codebase using the scan engine **AI Analyzer**. There are in total **3** vulnerabilities / security risks discovered during the scanning session, among which **0** critical vulnerabilities, **3** high risk vulnerabilities, **0** medium risk vulnerabilities, **0** low risk vulnerabilities, **0** informational issues.

ID	Description	Severity
MSA-001	MWE-200: Insecure LP Token Value Calculation	High risk
MSA-002	MWE-200: Insecure LP Token Value Calculation	High risk
MSA-003	MWE-200: Insecure LP Token Value Calculation	High risk

Findings

Critical (0)

No Critical vulnerabilities found here

High risk (3)

1. MWE-200: Insecure LP Token Value Calculation

High risk Security Analyzer

Liquidity token value/price can be manipulated to cause flashloan attacks.

File(s) Affected

src/Pair.sol #417-428

```
417     function addQuote(uint256 baseTokenAmount, uint256 fractionalTokenAmount) public view returns (uint
418         uint256 lpTokenSupply = lpToken.totalSupply();
419         if (lpTokenSupply > 0) {
420             // calculate amount of lp tokens as a fraction of existing reserves
421             uint256 baseTokenShare = (baseTokenAmount * lpTokenSupply) / baseTokenReserves();
422             uint256 fractionalTokenShare = (fractionalTokenAmount * lpTokenSupply) / fractionalTokenRes
423             return Math.min(baseTokenShare, fractionalTokenShare);
424         } else {
425             // if there is no liquidity then init
426             return Math.sqrt(baseTokenAmount * fractionalTokenAmount);
427         }
428     }
```

src/Pair.sol #63-99

```
63      function add(uint256 baseTokenAmount, uint256 fractionalTokenAmount, uint256 minLpTokenAmount)
64          public
65          payable
66          returns (uint256 lpTokenAmount)
67      {
68          // *** Checks *** //
69
70          // check the token amount inputs are not zero
71          require(baseTokenAmount > 0 && fractionalTokenAmount > 0, "Input token amount is zero");
72
73          // check that correct eth input was sent - if the baseToken equals address(0) then native ETH
74          require(baseToken == address(0) ? msg.value == baseTokenAmount : msg.value == 0, "Invalid ethe
75
76          // calculate the lp token shares to mint
77          lpTokenAmount = addQuote(baseTokenAmount, fractionalTokenAmount);
78
79          // check that the amount of lp tokens outputted is greater than the min amount
80          require(lpTokenAmount >= minLpTokenAmount, "Slippage: lp token amount out");
81
82          // *** Effects *** //
83
84          // transfer fractional tokens in
85          _transferFrom(msg.sender, address(this), fractionalTokenAmount);
86
87          // *** Interactions *** //
88
89          // mint lp tokens to sender
90          lpToken.mint(msg.sender, lpTokenAmount);
91
92          // transfer base tokens in if the base token is not ETH
93          if (baseToken != address(0)) {
94              // transfer base tokens in
95              ERC20(baseToken).safeTransferFrom(msg.sender, address(this), baseTokenAmount);
96          }
97
98          emit Add(baseTokenAmount, fractionalTokenAmount, lpTokenAmount);
99      }
```

Recommendation

Do not use AMM pool or custom liquidity calculation to caculate LP token value/price.

2. MWE-200: Insecure LP Token Value Calculation

High risk Security Analyzer

Liquidity token value/price can be manipulated to cause flashloan attacks.

File(s) Affected

src/Pair.sol #435-441

```
435     function removeQuote(uint256 lpTokenAmount) public view returns (uint256, uint256) {
436         uint256 lpTokenSupply = lpToken.totalSupply();
437         uint256 baseTokenOutputAmount = (baseTokenReserves() * lpTokenAmount) / lpTokenSupply;
438         uint256 fractionalTokenOutputAmount = (fractionalTokenReserves() * lpTokenAmount) / lpTokenSupp
439
440         return (baseTokenOutputAmount, fractionalTokenOutputAmount);
441     }
```

Recommendation

Do not use AMM pool or custom liquidity calculation to caculate LP token value/price.

3. MWE-200: Insecure LP Token Value Calculation

High risk Security Analyzer

Liquidity token value/price can be manipulated to cause flashloan attacks.

File(s) Affected

src/Pair.sol #447-459

```
447     function _transferFrom(address from, address to, uint256 amount) internal returns (bool) {
448         balanceOf[from] -= amount;
449 
450         // Cannot overflow because the sum of all user
451         // balances can't exceed the max uint256 value.
452         unchecked {
453             balanceOf[to] += amount;
454         }
455 
456         emit Transfer(from, to, amount);
457 
458         return true;
459     }
```

src/Pair.sol #63-99

```
63      function add(uint256 baseTokenAmount, uint256 fractionalTokenAmount, uint256 minLpTokenAmount)
64          public
65          payable
66          returns (uint256 lpTokenAmount)
67      {
68          // *** Checks *** //
69
70          // check the token amount inputs are not zero
71          require(baseTokenAmount > 0 && fractionalTokenAmount > 0, "Input token amount is zero");
72
73          // check that correct eth input was sent - if the baseToken equals address(0) then native ETH
74          require(baseToken == address(0) ? msg.value == baseTokenAmount : msg.value == 0, "Invalid ethe
75
76          // calculate the lp token shares to mint
77          lpTokenAmount = addQuote(baseTokenAmount, fractionalTokenAmount);
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79          // check that the amount of lp tokens outputted is greater than the min amount
80          require(lpTokenAmount >= minLpTokenAmount, "Slippage: lp token amount out");
81
82          // *** Effects *** //
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84          // transfer fractional tokens in
85          _transferFrom(msg.sender, address(this), fractionalTokenAmount);
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87          // *** Interactions *** //
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89          // mint lp tokens to sender
90          lpToken.mint(msg.sender, lpTokenAmount);
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92          // transfer base tokens in if the base token is not ETH
93          if (baseToken != address(0)) {
94              // transfer base tokens in
95              ERC20(baseToken).safeTransferFrom(msg.sender, address(this), baseTokenAmount);
96          }
97
98          emit Add(baseTokenAmount, fractionalTokenAmount, lpTokenAmount);
99      }
```

Recommendation

Do not use AMM pool or custom liquidity calculation to caculate LP token value/price.

Medium risk (0)

No Medium risk vulnerabilities found here

Low risk (0)

No Low risk vulnerabilities found here

Informational (0)

No Informational vulnerabilities found here

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