```
import requests
import pandas as pd
import time
from sklearn.preprocessing import MinMaxScaler
```

```
wallets = [
"0x0039f22efb07a647557c7c5d17854cfd6d489ef3",
"0x06b51c6882b27cb05e712185531c1f74996dd988",
"0x0795732aacc448030ef374374eaae57d2965c16c",
"0x0aaa79f1a86bc8136cd0d1ca0d51964f4e3766f9",
"0x0fe383e5abc200055a7f391f94a5f5d1f844b9ae",
"0x104ae61d8d487ad689969a17807ddc338b445416",
"0x111c7208a7e2af345d36b6d4aace8740d61a3078",
"0x124853fecb522c57d9bd5c21231058696ca6d596",
"0x13b1c8b0e696aff8b4fee742119b549b605f3cbc",
"0x1656f1886c5ab634ac19568cd571bc72f385fdf7",
"0x1724e16cb8d0e2aa4d08035bc6b5c56b680a3b22",
"0x19df3e87f73c4aaf4809295561465b993e102668",
"0x1ab2ccad4fc97c9968ea87d4435326715be32872",
"0x1c1b30ca93ef57452d53885d97a74f61daf2bf4f",
"0x1e43dacdcf863676a6bec8f7d6896d6252fac669",
"0x22d7510588d90ed5a87e0f838391aaafa707c34b",
"0x24b3460622d835c56d9a4fe352966b9bdc6c20af",
"0x26750f1f4277221bdb5f6991473c6ece8c821f9d",
"0x27f72a000d8e9f324583f3a3491ea66998275b28",
"0x2844658bf341db96aa247259824f42025e3bcec2",
"0x2a2fde3e1beb508fcf7c137a1d5965f13a17825e",
"0x330513970efd9e8dd606275fb4c50378989b3204",
"0x3361bea43c2f5f963f81ac70f64e6fba1f1d2a97",
"0x3867d222ba91236ad4d12c31056626f9e798629c",
"0x3a44be4581137019f83021eeee72b7dc57756069",
"0x3e69ad05716bdc834db72c4d6d44439a7c8a902b",
"0x427f2ac5fdf4245e027d767e7c3ac272a1f40a65",
"0x4814be124d7fe3b240eb46061f7ddfab468fe122",
"0x4839e666e2baf12a51bf004392b35972eeddeabf",
"0x4c4d05fe859279c91b074429b5fc451182cec745",
"0x4d997c89bc659a3e8452038a8101161e7e7e53a7",
"0x4db0a72edb5ea6c55df929f76e7d5bb14e389860",
"0x4e61251336c32e4fe6bfd5fab014846599321389",
"0x4e6e724f4163b24ffc7ffe662b5f6815b18b4210",
"0x507b6c0d950702f066a9a1bd5e85206f87b065ba",
"0x54e19653be9d4143b08994906be0e27555e8834d",
"0x56ba823641bfc317afc8459bf27feed6eb9ff59f",
"0x56cc2bffcb3f86a30c492f9d1a671a1f744d1d2f",
"0x578cea5f899b0dfbf05c7fbcfda1a644b2a47787",
"0x58c2a9099a03750e9842d3e9a7780cdd6aa70b86",
"0x58d68d4bcf9725e40353379cec92b90332561683",
```

"0x5e324b4a564512ea7c93088dba2f8c1bf046a3eb",
"0x612a3500559be7be7703de6dc397afb541a16f7f",
"0x623af911f493747c216ad389c7805a37019c662d",
"0x6a2752a534faacaaa153bffbb973dd84e0e5497b",
"0x6d69ca3711e504658977367e13c300ab198379f1",
"0x6e355417f7f56e7927d1cd971f0b5a1e6d538487",
"0x70c1864282599a762c674dd9d567b37e13bce755",
"0x70d8e4ab175dfe0eab4e9a7f33e0a2d19f44001e",
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"0x767055590c73b7d2aaa6219da13807c493f91a20",
"0x7851bdfb64bbecfb40c030d722a1f147dff5db6a",
"0x7b4636320daa0bc055368a4f9b9d01bd8ac51877",
"0x7b57dbe2f2e4912a29754ff3e412ed9507fd8957",
"0x7be3dfb5b6fcbae542ea85e76cc19916a20f6c1e",
"0x7de76a449cf60ea3e111ff18b28e516d89532152",
"0x7e3eab408b9c76a13305ef34606f17c16f7b33cc",
"0x7f5e6a28afc9fb0aaf4259d4ff69991b88ebea47",
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"0x8441fecef5cc6f697be2c4fc4a36feacede8df67",
"0x854a873b8f9bfac36a5eb9c648e285a095a7478d",
"0x8587d9f794f06d976c2ec1cfd523983b856f5ca9",
"0x880a0af12da55df1197f41697c1a1b61670ed410",
"0x8aaece100580b749a20f8ce30338c4e0770b65ed",
"0x8be38ea2b22b706aef313c2de81f7d179024dd30",
"0x8d900f213db5205c529aaba5d10e71a0ed2646db",
"0x91919344c1dad09772d19ad8ad4f1bcd29c51f27",
"0x93f0891bf71d8abed78e0de0885bd26355bb8b1d",
"0x96479b087cb8f236a5e2dcbfc50ce63b2f421da6",
"0x96bb4447a02b95f1d1e85374cffd565eb22ed2f8",
"0x9a363adc5d382c04d36b09158286328f75672098",
"0x9ad1331c5b6c5a641acffb32719c66a80c6e1a17",
"0x9ba0d85f71e145ccf15225e59631e5a883d5d74a",
"0x9e6ec4e98793970a1307262ba68d37594e58cd78",
"0xa7e94d933eb0c439dda357f61244a485246e97b8",
"0xa7f3c74f0255796fd5d3ddcf88db769f7a6bf46a",
"0xa98dc64bb42575efec7d1e4560c029231ce5da51",
"0xb271ff7090b39028eb6e711c3f89a3453d5861ee",
"0xb475576594ae44e1f75f534f993cbb7673e4c8b6",
"0xb57297c5d02def954794e593db93d0a302e43e5c",
"0xbd4a00764217c13a246f86db58d74541a0c3972a",
"0xc179d55f7e00e789915760f7d260a1bf6285278b",
"0xc22b8e78394ce52e0034609a67ae3c959daa84bc",
"0xcbbd9fe837a14258286bbf2e182cbc4e4518c5a3",
"0xcecf5163bb057c1aff4963d9b9a7d2f0bf591710",
"0xcf0033bf27804640e5339e06443e208db5870dd2",
"0xd0df53e296c1e3115fccc3d7cdf4ba495e593b56",
"0xd1a3888fd8f490367c6104e10b4154427c02dd9c",
"0xd334d18fa6bada9a10f361bae42a019ce88a3c33",
"0xd9d3930ffa343f5a0eec7606d045d0843d3a02b4",

```
    "0xdde73df7bd4d704a89ad8421402701b3a460c6e9",
    "0xde92d70253604fd8c5998c8ee3ed282a41b33b7f",
    "0xded1f838ae6aa5fcd0f13481b37ee88e5bdccb3d",
    "0xebb8629e8a3ec86cf90cb7600264415640834483",
    "0xeded1c8c0a0c532195b8432153f3bfa81dba2a90",
    "0xf10fd8921019615a856c1e95c7cd3632de34edc4",
    "0xf340b9f2098f80b86fbc5ede586c319473aa11f3",
    "0xf54f36bca969800fd7d63a68029561309938c09b",
    "0xf60304b534f74977e159b2e159e135475c245526",
    "0xf67e8e5805835465f7eba988259db882ab726800",
    "0xf7aa5d0752cfcd41b0a5945867d619a80c405e52",
    "0xf80a8b9cfff0febf49914c269fb8aead4a22f847",
    "0xfe5a05c0f8b24fca15a7306f6a4ebb7dcf2186ac"
]
```

In [8]:

```
print(f" Total wallets loaded: {len(wallets)}")
 Total wallets loaded: 103
```

In [10]:

```
SUBGRAPH_URL =
"https://api.thegraph.com/subgraphs/name/graphprotocol/compound-v2"
```

In [12]:

```
def fetch_wallet_data(wallet_id):
    query = f"""
    {{
      account(id: "{wallet_id.lower()}") {{
        deposits {{ amount blockTimestamp }}
        borrows {{ amount blockTimestamp }}
        repays {{ amount blockTimestamp }}
        withdrawals {{ amount blockTimestamp }}
        liquidates {{ amount seizedCollateralAmount blockTimestamp }}
      }}
    }}
    """
    try:
        response = requests.post(SUBGRAPH_URL, json={"query": query})
        if response.status_code == 200:
            return response.json().get("data", {}).get("account", {}) or {}
        else:
            print(f"Error: {wallet_id} | HTTP {response.status_code}")
    except Exception as e:
        print(f"Exception for {wallet_id}: {e}")
    return {}
```

In [14]:

```
def extract_features(wallet, data):
    def sum_amount(tx_list, key="amount"):
        return sum(float(tx.get(key, 0)) for tx in tx_list)

    features = {
        "wallet_id": wallet,
```

```python
        "num_deposits": len(data.get("deposits", [])),
        "num_borrows": len(data.get("borrows", [])),
        "num_repays": len(data.get("repays", [])),
        "num_withdrawals": len(data.get("withdrawals", [])),
        "num_liquidations": len(data.get("liquidates", [])),
        "total_deposited": sum_amount(data.get("deposits", [])),
        "total_borrowed": sum_amount(data.get("borrows", [])),
        "total_repaid": sum_amount(data.get("repays", [])),
        "total_withdrawn": sum_amount(data.get("withdrawals", [])),
    }

    # Derived Metrics
    features["repayment_ratio"] = (
        features["total_repaid"] / features["total_borrowed"]
        if features["total_borrowed"] > 0 else 1.0
    )
    features["net_position"] = features["total_deposited"] -
features["total_borrowed"]
    features["supply_borrow_ratio"] = (
        features["total_deposited"] / (features["total_borrowed"] + 1)
    )

    return features
```

```python
all_features = []

for i, wallet in enumerate(wallets):
    print(f"[{i+1}/{len(wallets)}] Fetching: {wallet}")
    data = fetch_wallet_data(wallet)
    features = extract_features(wallet, data)
    all_features.append(features)
    time.sleep(0.4)  # Delay to avoid rate-limiting

# Convert to DataFrame
df = pd.DataFrame(all_features)
print("\n Feature extraction complete.")
df.head()
```
```
[1/103] Fetching: 0x0039f22efb07a647557c7c5d17854cfd6d489ef3
[2/103] Fetching: 0x06b51c6882b27cb05e712185531c1f74996dd988
[3/103] Fetching: 0x0795732aacc448030ef374374eaae57d2965c16c
[4/103] Fetching: 0x0aaa79f1a86bc8136cd0d1ca0d51964f4e3766f9
[5/103] Fetching: 0x0fe383e5abc200055a7f391f94a5f5d1f844b9ae
[6/103] Fetching: 0x104ae61d8d487ad689969a17807ddc338b445416
[7/103] Fetching: 0x111c7208a7e2af345d36b6d4aace8740d61a3078
[8/103] Fetching: 0x124853fecb522c57d9bd5c21231058696ca6d596
[9/103] Fetching: 0x13b1c8b0e696aff8b4fee742119b549b605f3cbc
[10/103] Fetching: 0x1656f1886c5ab634ac19568cd571bc72f385fdf7
[11/103] Fetching: 0x1724e16cb8d0e2aa4d08035bc6b5c56b680a3b22
[12/103] Fetching: 0x19df3e87f73c4aaf4809295561465b993e102668
```

```
[13/103] Fetching: 0x1ab2ccad4fc97c9968ea87d4435326715be32872
[14/103] Fetching: 0x1c1b30ca93ef57452d53885d97a74f61daf2bf4f
[15/103] Fetching: 0x1e43dacdcf863676a6bec8f7d6896d6252fac669
[16/103] Fetching: 0x22d7510588d90ed5a87e0f838391aaafa707c34b
[17/103] Fetching: 0x24b3460622d835c56d9a4fe352966b9bdc6c20af
[18/103] Fetching: 0x26750f1f4277221bdb5f6991473c6ece8c821f9d
[19/103] Fetching: 0x27f72a000d8e9f324583f3a3491ea66998275b28
[20/103] Fetching: 0x2844658bf341db96aa247259824f42025e3bcec2
[21/103] Fetching: 0x2a2fde3e1beb508fcf7c137a1d5965f13a17825e
[22/103] Fetching: 0x330513970efd9e8dd606275fb4c50378989b3204
[23/103] Fetching: 0x3361bea43c2f5f963f81ac70f64e6fba1f1d2a97
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[25/103] Fetching: 0x3a44be4581137019f83021eeee72b7dc57756069
[26/103] Fetching: 0x3e69ad05716bdc834db72c4d6d44439a7c8a902b
[27/103] Fetching: 0x427f2ac5fdf4245e027d767e7c3ac272a1f40a65
[28/103] Fetching: 0x4814be124d7fe3b240eb46061f7ddfab468fe122
[29/103] Fetching: 0x4839e666e2baf12a51bf004392b35972eeddeabf
[30/103] Fetching: 0x4c4d05fe859279c91b074429b5fc451182cec745
[31/103] Fetching: 0x4d997c89bc659a3e8452038a8101161e7e7e53a7
[32/103] Fetching: 0x4db0a72edb5ea6c55df929f76e7d5bb14e389860
[33/103] Fetching: 0x4e61251336c32e4fe6bfd5fab014846599321389
[34/103] Fetching: 0x4e6e724f4163b24ffc7ffe662b5f6815b18b4210
[35/103] Fetching: 0x507b6c0d950702f066a9a1bd5e85206f87b065ba
[36/103] Fetching: 0x54e19653be9d4143b08994906be0e27555e8834d
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[39/103] Fetching: 0x578cea5f899b0dfbf05c7fbcfda1a644b2a47787
[40/103] Fetching: 0x58c2a9099a03750e9842d3e9a7780cdd6aa70b86
[41/103] Fetching: 0x58d68d4bcf9725e40353379cec92b90332561683
[42/103] Fetching: 0x5e324b4a564512ea7c93088dba2f8c1bf046a3eb
[43/103] Fetching: 0x612a3500559be7be7703de6dc397afb541a16f7f
[44/103] Fetching: 0x623af911f493747c216ad389c7805a37019c662d
[45/103] Fetching: 0x6a2752a534faacaaa153bffbb973dd84e0e5497b
[46/103] Fetching: 0x6d69ca3711e504658977367e13c300ab198379f1
[47/103] Fetching: 0x6e355417f7f56e7927d1cd971f0b5a1e6d538487
[48/103] Fetching: 0x70c1864282599a762c674dd9d567b37e13bce755
[49/103] Fetching: 0x70d8e4ab175dfe0eab4e9a7f33e0a2d19f44001e
[50/103] Fetching: 0x7399dbeebe2f88bc6ac4e3fd7ddb836a4bce322f
[51/103] Fetching: 0x767055590c73b7d2aaa6219da13807c493f91a20
[52/103] Fetching: 0x7851bdfb64bbecfb40c030d722a1f147dff5db6a
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[54/103] Fetching: 0x7b57dbe2f2e4912a29754ff3e412ed9507fd8957
[55/103] Fetching: 0x7be3dfb5b6fcbae542ea85e76cc19916a20f6c1e
[56/103] Fetching: 0x7de76a449cf60ea3e111ff18b28e516d89532152
[57/103] Fetching: 0x7e3eab408b9c76a13305ef34606f17c16f7b33cc
[58/103] Fetching: 0x7f5e6a28afc9fb0aaf4259d4ff69991b88ebea47
[59/103] Fetching: 0x83ea74c67d393c6894c34c464657bda2183a2f1a
[60/103] Fetching: 0x8441fecef5cc6f697be2c4fc4a36feacede8df67
[61/103] Fetching: 0x854a873b8f9bfac36a5eb9c648e285a095a7478d
```

```
[62/103] Fetching: 0x8587d9f794f06d976c2ec1cfd523983b856f5ca9
[63/103] Fetching: 0x880a0af12da55df1197f41697c1a1b61670ed410
[64/103] Fetching: 0x8aaece100580b749a20f8ce30338c4e0770b65ed
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[66/103] Fetching: 0x8d900f213db5205c529aaba5d10e71a0ed2646db
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[68/103] Fetching: 0x93f0891bf71d8abed78e0de0885bd26355bb8b1d
[69/103] Fetching: 0x96479b087cb8f236a5e2dcbfc50ce63b2f421da6
[70/103] Fetching: 0x96bb4447a02b95f1d1e85374cffd565eb22ed2f8
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[73/103] Fetching: 0x9ba0d85f71e145ccf15225e59631e5a883d5d74a
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[78/103] Fetching: 0xb271ff7090b39028eb6e711c3f89a3453d5861ee
[79/103] Fetching: 0xb475576594ae44e1f75f534f993cbb7673e4c8b6
[80/103] Fetching: 0xb57297c5d02def954794e593db93d0a302e43e5c
[81/103] Fetching: 0xbd4a00764217c13a246f86db58d74541a0c3972a
[82/103] Fetching: 0xc179d55f7e00e789915760f7d260a1bf6285278b
[83/103] Fetching: 0xc22b8e78394ce52e0034609a67ae3c959daa84bc
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[86/103] Fetching: 0xcf0033bf27804640e5339e06443e208db5870dd2
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[88/103] Fetching: 0xd1a3888fd8f490367c6104e10b4154427c02dd9c
[89/103] Fetching: 0xd334d18fa6bada9a10f361bae42a019ce88a3c33
[90/103] Fetching: 0xd9d3930ffa343f5a0eec7606d045d0843d3a02b4
[91/103] Fetching: 0xdde73df7bd4d704a89ad8421402701b3a460c6e9
[92/103] Fetching: 0xde92d70253604fd8c5998c8ee3ed282a41b33b7f
[93/103] Fetching: 0xded1f838ae6aa5fcd0f13481b37ee88e5bdccb3d
[94/103] Fetching: 0xebb8629e8a3ec86cf90cb7600264415640834483
[95/103] Fetching: 0xeded1c8c0a0c532195b8432153f3bfa81dba2a90
[96/103] Fetching: 0xf10fd8921019615a856c1e95c7cd3632de34edc4
[97/103] Fetching: 0xf340b9f2098f80b86fbc5ede586c319473aa11f3
[98/103] Fetching: 0xf54f36bca969800fd7d63a68029561309938c09b
[99/103] Fetching: 0xf60304b534f74977e159b2e159e135475c245526
[100/103] Fetching: 0xf67e8e5805835465f7eba988259db882ab726800
[101/103] Fetching: 0xf7aa5d0752cfcd41b0a5945867d619a80c405e52
[102/103] Fetching: 0xf80a8b9cfff0febf49914c269fb8aead4a22f847
[103/103] Fetching: 0xfe5a05c0f8b24fca15a7306f6a4ebb7dcf2186ac

 Feature extraction complete.
```

	wallet_id	num_deposits	num_borrows	num_repays	num_w
0	0x0039f22efb07a647557c7c5d17854cfd6d489ef3	0	0	0	0
1	0x06b51c6882b27cb05e712185531c1f74996dd988	0	0	0	0

	wallet_id	num_deposits	num_borrows	num_repays	num_w
2	0x0795732aacc448030ef374374eaae57d2965c16c	0	0	0	0
3	0x0aaa79f1a86bc8136cd0d1ca0d51964f4e3766f9	0	0	0	0
4	0x0fe383e5abc200055a7f391f94a5f5d1f844b9ae	0	0	0	0

In [17]:

```
for i, wallet in enumerate(wallets):
    print(f"\n Fetching [{i+1}/{len(wallets)}]: {wallet}")
    data = fetch_wallet_data(wallet)

    # Print a quick summary
    for tx_type in ['deposits', 'borrows', 'repays', 'withdrawals',
'liquidates']:
        txs = data.get(tx_type, [])
        print(f"  {tx_type.capitalize()}: {len(txs)} records")

    time.sleep(0.5)  # Sleep to avoid rate limiting
```

```
 Fetching [1/103]: 0x0039f22efb07a647557c7c5d17854cfd6d489ef3
  Deposits: 0 records
  Borrows: 0 records
  Repays: 0 records
  Withdrawals: 0 records
  Liquidates: 0 records

 Fetching [2/103]: 0x06b51c6882b27cb05e712185531c1f74996dd988
  Deposits: 0 records
  Borrows: 0 records
  Repays: 0 records
  Withdrawals: 0 records
  Liquidates: 0 records

 Fetching [3/103]: 0x0795732aacc448030ef374374eaae57d2965c16c
  Deposits: 0 records
  Borrows: 0 records
  Repays: 0 records
  Withdrawals: 0 records
  Liquidates: 0 records

 Fetching [4/103]: 0x0aaa79f1a86bc8136cd0d1ca0d51964f4e3766f9
  Deposits: 0 records
  Borrows: 0 records
  Repays: 0 records
  Withdrawals: 0 records
  Liquidates: 0 records

 Fetching [5/103]: 0x0fe383e5abc200055a7f391f94a5f5d1f844b9ae
  Deposits: 0 records
  Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [6/103]: 0x104ae61d8d487ad689969a17807ddc338b445416
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [7/103]: 0x111c7208a7e2af345d36b6d4aace8740d61a3078
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [8/103]: 0x124853fecb522c57d9bd5c21231058696ca6d596
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [9/103]: 0x13b1c8b0e696aff8b4fee742119b549b605f3cbc
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [10/103]: 0x1656f1886c5ab634ac19568cd571bc72f385fdf7
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [11/103]: 0x1724e16cb8d0e2aa4d08035bc6b5c56b680a3b22
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [12/103]: 0x19df3e87f73c4aaf4809295561465b993e102668
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [13/103]: 0x1ab2ccad4fc97c9968ea87d4435326715be32872
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [14/103]: 0x1c1b30ca93ef57452d53885d97a74f61daf2bf4f
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [15/103]: 0x1e43dacdcf863676a6bec8f7d6896d6252fac669
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [16/103]: 0x22d7510588d90ed5a87e0f838391aaafa707c34b
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [17/103]: 0x24b3460622d835c56d9a4fe352966b9bdc6c20af
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [18/103]: 0x26750f1f4277221bdb5f6991473c6ece8c821f9d
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [19/103]: 0x27f72a000d8e9f324583f3a3491ea66998275b28
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [20/103]: 0x2844658bf341db96aa247259824f42025e3bcec2
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [21/103]: 0x2a2fde3e1beb508fcf7c137a1d5965f13a17825e
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [22/103]: 0x330513970efd9e8dd606275fb4c50378989b3204
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [23/103]: 0x3361bea43c2f5f963f81ac70f64e6fba1f1d2a97
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [24/103]: 0x3867d222ba91236ad4d12c31056626f9e798629c
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [25/103]: 0x3a44be4581137019f83021eeee72b7dc57756069
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [26/103]: 0x3e69ad05716bdc834db72c4d6d44439a7c8a902b
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [27/103]: 0x427f2ac5fdf4245e027d767e7c3ac272a1f40a65
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [28/103]: 0x4814be124d7fe3b240eb46061f7ddfab468fe122
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [29/103]: 0x4839e666e2baf12a51bf004392b35972eeddeabf
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [30/103]: 0x4c4d05fe859279c91b074429b5fc451182cec745
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [31/103]: 0x4d997c89bc659a3e8452038a8101161e7e7e53a7
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [32/103]: 0x4db0a72edb5ea6c55df929f76e7d5bb14e389860
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [33/103]: 0x4e61251336c32e4fe6bfd5fab014846599321389
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [34/103]: 0x4e6e724f4163b24ffc7ffe662b5f6815b18b4210
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [35/103]: 0x507b6c0d950702f066a9a1bd5e85206f87b065ba
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [36/103]: 0x54e19653be9d4143b08994906be0e27555e8834d
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [37/103]: 0x56ba823641bfc317afc8459bf27feed6eb9ff59f
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [38/103]: 0x56cc2bffcb3f86a30c492f9d1a671a1f744d1d2f
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [39/103]: 0x578cea5f899b0dfbf05c7fbcfda1a644b2a47787
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [40/103]: 0x58c2a9099a03750e9842d3e9a7780cdd6aa70b86
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records


Fetching [41/103]: 0x58d68d4bcf9725e40353379cec92b90332561683
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records


Fetching [42/103]: 0x5e324b4a564512ea7c93088dba2f8c1bf046a3eb
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records


Fetching [43/103]: 0x612a3500559be7be7703de6dc397afb541a16f7f
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records


Fetching [44/103]: 0x623af911f493747c216ad389c7805a37019c662d
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records


Fetching [45/103]: 0x6a2752a534faacaaa153bffbb973dd84e0e5497b
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records


Fetching [46/103]: 0x6d69ca3711e504658977367e13c300ab198379f1
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records


Fetching [47/103]: 0x6e355417f7f56e7927d1cd971f0b5a1e6d538487
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [48/103]: 0x70c1864282599a762c674dd9d567b37e13bce755
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [49/103]: 0x70d8e4ab175dfe0eab4e9a7f33e0a2d19f44001e
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [50/103]: 0x7399dbeebe2f88bc6ac4e3fd7ddb836a4bce322f
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [51/103]: 0x767055590c73b7d2aaa6219da13807c493f91a20
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [52/103]: 0x7851bdfb64bbecfb40c030d722a1f147dff5db6a
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [53/103]: 0x7b4636320daa0bc055368a4f9b9d01bd8ac51877
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [54/103]: 0x7b57dbe2f2e4912a29754ff3e412ed9507fd8957
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [55/103]: 0x7be3dfb5b6fcbae542ea85e76cc19916a20f6c1e
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [56/103]: 0x7de76a449cf60ea3e111ff18b28e516d89532152
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [57/103]: 0x7e3eab408b9c76a13305ef34606f17c16f7b33cc
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [58/103]: 0x7f5e6a28afc9fb0aaf4259d4ff69991b88ebea47
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [59/103]: 0x83ea74c67d393c6894c34c464657bda2183a2f1a
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [60/103]: 0x8441fecef5cc6f697be2c4fc4a36feacede8df67
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [61/103]: 0x854a873b8f9bfac36a5eb9c648e285a095a7478d
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [62/103]: 0x8587d9f794f06d976c2ec1cfd523983b856f5ca9
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [63/103]: 0x880a0af12da55df1197f41697c1a1b61670ed410
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [64/103]: 0x8aaece100580b749a20f8ce30338c4e0770b65ed
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [65/103]: 0x8be38ea2b22b706aef313c2de81f7d179024dd30
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [66/103]: 0x8d900f213db5205c529aaba5d10e71a0ed2646db
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [67/103]: 0x91919344c1dad09772d19ad8ad4f1bcd29c51f27
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [68/103]: 0x93f0891bf71d8abed78e0de0885bd26355bb8b1d
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [69/103]: 0x96479b087cb8f236a5e2dcbfc50ce63b2f421da6
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [70/103]: 0x96bb4447a02b95f1d1e85374cffd565eb22ed2f8
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [71/103]: 0x9a363adc5d382c04d36b09158286328f75672098
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [72/103]: 0x9ad1331c5b6c5a641acffb32719c66a80c6e1a17
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [73/103]: 0x9ba0d85f71e145ccf15225e59631e5a883d5d74a
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [74/103]: 0x9e6ec4e98793970a1307262ba68d37594e58cd78
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [75/103]: 0xa7e94d933eb0c439dda357f61244a485246e97b8
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [76/103]: 0xa7f3c74f0255796fd5d3ddcf88db769f7a6bf46a
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [77/103]: 0xa98dc64bb42575efec7d1e4560c029231ce5da51
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [78/103]: 0xb271ff7090b39028eb6e711c3f89a3453d5861ee
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [79/103]: 0xb475576594ae44e1f75f534f993cbb7673e4c8b6
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [80/103]: 0xb57297c5d02def954794e593db93d0a302e43e5c
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [81/103]: 0xbd4a00764217c13a246f86db58d74541a0c3972a
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [82/103]: 0xc179d55f7e00e789915760f7d260a1bf6285278b
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [83/103]: 0xc22b8e78394ce52e0034609a67ae3c959daa84bc
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [84/103]: 0xcbbd9fe837a14258286bbf2e182cbc4e4518c5a3
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [85/103]: 0xcecf5163bb057c1aff4963d9b9a7d2f0bf591710
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [86/103]: 0xcf0033bf27804640e5339e06443e208db5870dd2
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [87/103]: 0xd0df53e296c1e3115fccc3d7cdf4ba495e593b56
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [88/103]: 0xd1a3888fd8f490367c6104e10b4154427c02dd9c
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [89/103]: 0xd334d18fa6bada9a10f361bae42a019ce88a3c33
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [90/103]: 0xd9d3930ffa343f5a0eec7606d045d0843d3a02b4
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [91/103]: 0xdde73df7bd4d704a89ad8421402701b3a460c6e9
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [92/103]: 0xde92d70253604fd8c5998c8ee3ed282a41b33b7f
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [93/103]: 0xded1f838ae6aa5fcd0f13481b37ee88e5bdccb3d
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [94/103]: 0xebb8629e8a3ec86cf90cb7600264415640834483
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [95/103]: 0xeded1c8c0a0c532195b8432153f3bfa81dba2a90
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [96/103]: 0xf10fd8921019615a856c1e95c7cd3632de34edc4
 Deposits: 0 records
 Borrows: 0 records
```

```
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [97/103]: 0xf340b9f2098f80b86fbc5ede586c319473aa11f3
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [98/103]: 0xf54f36bca969800fd7d63a68029561309938c09b
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [99/103]: 0xf60304b534f74977e159b2e159e135475c245526
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [100/103]: 0xf67e8e5805835465f7eba988259db882ab726800
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [101/103]: 0xf7aa5d0752cfcd41b0a5945867d619a80c405e52
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [102/103]: 0xf80a8b9cfff0febf49914c269fb8aead4a22f847
 Deposits: 0 records
 Borrows: 0 records
 Repays: 0 records
 Withdrawals: 0 records
 Liquidates: 0 records

Fetching [103/103]: 0xfe5a05c0f8b24fca15a7306f6a4ebb7dcf2186ac
 Deposits: 0 records
 Borrows: 0 records
```

```
  Repays: 0 records
  Withdrawals: 0 records
  Liquidates: 0 records
```

```python
all_features = []


for i, wallet in enumerate(wallets):
    print(f"[{i+1}/{len(wallets)}] Extracting features for {wallet}")
    data = fetch_wallet_data(wallet)
    features = extract_features(wallet, data)
    all_features.append(features)
    time.sleep(0.5)


# Convert to pandas DataFrame
df = pd.DataFrame(all_features)
print(" Feature matrix created")
df.head()
```
```
[1/103] Extracting features for 0x0039f22efb07a647557c7c5d17854cfd6d489ef3
[2/103] Extracting features for 0x06b51c6882b27cb05e712185531c1f74996dd988
[3/103] Extracting features for 0x0795732aacc448030ef374374eaae57d2965c16c
[4/103] Extracting features for 0x0aaa79f1a86bc8136cd0d1ca0d51964f4e3766f9
[5/103] Extracting features for 0x0fe383e5abc200055a7f391f94a5f5d1f844b9ae
[6/103] Extracting features for 0x104ae61d8d487ad689969a17807ddc338b445416
[7/103] Extracting features for 0x111c7208a7e2af345d36b6d4aace8740d61a3078
[8/103] Extracting features for 0x124853fecb522c57d9bd5c21231058696ca6d596
[9/103] Extracting features for 0x13b1c8b0e696aff8b4fee742119b549b605f3cbc
[10/103] Extracting features for 0x1656f1886c5ab634ac19568cd571bc72f385fdf7
[11/103] Extracting features for 0x1724e16cb8d0e2aa4d08035bc6b5c56b680a3b22
[12/103] Extracting features for 0x19df3e87f73c4aaf4809295561465b993e102668
[13/103] Extracting features for 0x1ab2ccad4fc97c9968ea87d4435326715be32872
[14/103] Extracting features for 0x1c1b30ca93ef57452d53885d97a74f61daf2bf4f
[15/103] Extracting features for 0x1e43dacdcf863676a6bec8f7d6896d6252fac669
[16/103] Extracting features for 0x22d7510588d90ed5a87e0f838391aaafa707c34b
[17/103] Extracting features for 0x24b3460622d835c56d9a4fe352966b9bdc6c20af
[18/103] Extracting features for 0x26750f1f4277221bdb5f6991473c6ece8c821f9d
[19/103] Extracting features for 0x27f72a000d8e9f324583f3a3491ea66998275b28
[20/103] Extracting features for 0x2844658bf341db96aa247259824f42025e3bcec2
[21/103] Extracting features for 0x2a2fde3e1beb508fcf7c137a1d5965f13a17825e
[22/103] Extracting features for 0x330513970efd9e8dd606275fb4c50378989b3204
[23/103] Extracting features for 0x3361bea43c2f5f963f81ac70f64e6fba1f1d2a97
[24/103] Extracting features for 0x3867d222ba91236ad4d12c31056626f9e798629c
[25/103] Extracting features for 0x3a44be4581137019f83021eeee72b7dc57756069
[26/103] Extracting features for 0x3e69ad05716bdc834db72c4d6d44439a7c8a902b
[27/103] Extracting features for 0x427f2ac5fdf4245e027d767e7c3ac272a1f40a65
[28/103] Extracting features for 0x4814be124d7fe3b240eb46061f7ddfab468fe122
[29/103] Extracting features for 0x4839e666e2baf12a51bf004392b35972eeddeabf
[30/103] Extracting features for 0x4c4d05fe859279c91b074429b5fc451182cec745
[31/103] Extracting features for 0x4d997c89bc659a3e8452038a8101161e7e7e53a7
[32/103] Extracting features for 0x4db0a72edb5ea6c55df929f76e7d5bb14e389860
```

```
[33/103] Extracting features for 0x4e61251336c32e4fe6bfd5fab014846599321389
[34/103] Extracting features for 0x4e6e724f4163b24ffc7ffe662b5f6815b18b4210
[35/103] Extracting features for 0x507b6c0d950702f066a9a1bd5e85206f87b065ba
[36/103] Extracting features for 0x54e19653be9d4143b08994906be0e27555e8834d
[37/103] Extracting features for 0x56ba823641bfc317afc8459bf27feed6eb9ff59f
[38/103] Extracting features for 0x56cc2bffcb3f86a30c492f9d1a671a1f744d1d2f
[39/103] Extracting features for 0x578cea5f899b0dfbf05c7fbcfda1a644b2a47787
[40/103] Extracting features for 0x58c2a9099a03750e9842d3e9a7780cdd6aa70b86
[41/103] Extracting features for 0x58d68d4bcf9725e40353379cec92b90332561683
[42/103] Extracting features for 0x5e324b4a564512ea7c93088dba2f8c1bf046a3eb
[43/103] Extracting features for 0x612a3500559be7be7703de6dc397afb541a16f7f
[44/103] Extracting features for 0x623af911f493747c216ad389c7805a37019c662d
[45/103] Extracting features for 0x6a2752a534faacaaa153bffbb973dd84e0e5497b
[46/103] Extracting features for 0x6d69ca3711e504658977367e13c300ab198379f1
[47/103] Extracting features for 0x6e355417f7f56e7927d1cd971f0b5a1e6d538487
[48/103] Extracting features for 0x70c1864282599a762c674dd9d567b37e13bce755
[49/103] Extracting features for 0x70d8e4ab175dfe0eab4e9a7f33e0a2d19f44001e
[50/103] Extracting features for 0x7399dbeebe2f88bc6ac4e3fd7ddb836a4bce322f
[51/103] Extracting features for 0x767055590c73b7d2aaa6219da13807c493f91a20
[52/103] Extracting features for 0x7851bdfb64bbecfb40c030d722a1f147dff5db6a
[53/103] Extracting features for 0x7b4636320daa0bc055368a4f9b9d01bd8ac51877
[54/103] Extracting features for 0x7b57dbe2f2e4912a29754ff3e412ed9507fd8957
[55/103] Extracting features for 0x7be3dfb5b6fcbae542ea85e76cc19916a20f6c1e
[56/103] Extracting features for 0x7de76a449cf60ea3e111ff18b28e516d89532152
[57/103] Extracting features for 0x7e3eab408b9c76a13305ef34606f17c16f7b33cc
[58/103] Extracting features for 0x7f5e6a28afc9fb0aaf4259d4ff69991b88ebea47
[59/103] Extracting features for 0x83ea74c67d393c6894c34c464657bda2183a2f1a
[60/103] Extracting features for 0x8441fecef5cc6f697be2c4fc4a36feacede8df67
[61/103] Extracting features for 0x854a873b8f9bfac36a5eb9c648e285a095a7478d
[62/103] Extracting features for 0x8587d9f794f06d976c2ec1cfd523983b856f5ca9
[63/103] Extracting features for 0x880a0af12da55df1197f41697c1a1b61670ed410
[64/103] Extracting features for 0x8aaece100580b749a20f8ce30338c4e0770b65ed
[65/103] Extracting features for 0x8be38ea2b22b706aef313c2de81f7d179024dd30
[66/103] Extracting features for 0x8d900f213db5205c529aaba5d10e71a0ed2646db
[67/103] Extracting features for 0x91919344c1dad09772d19ad8ad4f1bcd29c51f27
[68/103] Extracting features for 0x93f0891bf71d8abed78e0de0885bd26355bb8b1d
[69/103] Extracting features for 0x96479b087cb8f236a5e2dcbfc50ce63b2f421da6
[70/103] Extracting features for 0x96bb4447a02b95f1d1e85374cffd565eb22ed2f8
[71/103] Extracting features for 0x9a363adc5d382c04d36b09158286328f75672098
[72/103] Extracting features for 0x9ad1331c5b6c5a641acffb32719c66a80c6e1a17
[73/103] Extracting features for 0x9ba0d85f71e145ccf15225e59631e5a883d5d74a
[74/103] Extracting features for 0x9e6ec4e98793970a1307262ba68d37594e58cd78
[75/103] Extracting features for 0xa7e94d933eb0c439dda357f61244a485246e97b8
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[77/103] Extracting features for 0xa98dc64bb42575efec7d1e4560c029231ce5da51
[78/103] Extracting features for 0xb271ff7090b39028eb6e711c3f89a3453d5861ee
[79/103] Extracting features for 0xb475576594ae44e1f75f534f993cbb7673e4c8b6
[80/103] Extracting features for 0xb57297c5d02def954794e593db93d0a302e43e5c
[81/103] Extracting features for 0xbd4a00764217c13a246f86db58d74541a0c3972a
```

```
[82/103] Extracting features for 0xc179d55f7e00e789915760f7d260a1bf6285278b
[83/103] Extracting features for 0xc22b8e78394ce52e0034609a67ae3c959daa84bc
[84/103] Extracting features for 0xcbbd9fe837a14258286bbf2e182cbc4e4518c5a3
[85/103] Extracting features for 0xcecf5163bb057c1aff4963d9b9a7d2f0bf591710
[86/103] Extracting features for 0xcf0033bf27804640e5339e06443e208db5870dd2
[87/103] Extracting features for 0xd0df53e296c1e3115fccc3d7cdf4ba495e593b56
[88/103] Extracting features for 0xd1a3888fd8f490367c6104e10b4154427c02dd9c
[89/103] Extracting features for 0xd334d18fa6bada9a10f361bae42a019ce88a3c33
[90/103] Extracting features for 0xd9d3930ffa343f5a0eec7606d045d0843d3a02b4
[91/103] Extracting features for 0xdde73df7bd4d704a89ad8421402701b3a460c6e9
[92/103] Extracting features for 0xde92d70253604fd8c5998c8ee3ed282a41b33b7f
[93/103] Extracting features for 0xded1f838ae6aa5fcd0f13481b37ee88e5bdccb3d
[94/103] Extracting features for 0xebb8629e8a3ec86cf90cb7600264415640834483
[95/103] Extracting features for 0xeded1c8c0a0c532195b8432153f3bfa81dba2a90
[96/103] Extracting features for 0xf10fd8921019615a856c1e95c7cd3632de34edc4
[97/103] Extracting features for 0xf340b9f2098f80b86fbc5ede586c319473aa11f3
[98/103] Extracting features for 0xf54f36bca969800fd7d63a68029561309938c09b
[99/103] Extracting features for 0xf60304b534f74977e159b2e159e135475c245526
[100/103] Extracting features for
0xf67e8e5805835465f7eba988259db882ab726800
[101/103] Extracting features for
0xf7aa5d0752cfcd41b0a5945867d619a80c405e52
[102/103] Extracting features for
0xf80a8b9cfff0febf49914c269fb8aead4a22f847
[103/103] Extracting features for
0xfe5a05c0f8b24fca15a7306f6a4ebb7dcf2186ac
 Feature matrix created
```

Out[18]:

	wallet_id	num_deposits	num_borrows	num_repays	num_w
0	0x0039f22efb07a647557c7c5d17854cfd6d489ef3	0	0	0	0
1	0x06b51c6882b27cb05e712185531c1f74996dd988	0	0	0	0
2	0x0795732aacc448030ef374374eaae57d2965c16c	0	0	0	0
3	0x0aaa79f1a86bc8136cd0d1ca0d51964f4e3766f9	0	0	0	0
4	0x0fe383e5abc200055a7f391f94a5f5d1f844b9ae	0	0	0	0

In [19]:

```
scaler = MinMaxScaler()
norm_cols = ["repayment_ratio", "supply_borrow_ratio", "net_position",
"num_liquidations"]
df[norm_cols] = scaler.fit_transform(df[norm_cols])

# Risk scoring formula (weighted)
df["score"] = (
    0.3 * df["repayment_ratio"] +
    0.25 * df["supply_borrow_ratio"] +
    0.25 * (1 - df["num_liquidations"]) +
    0.2 * df["net_position"]
) * 1000
```

```
df["score"] = df["score"].round().astype(int)

df[["wallet_id", "score"]].to_csv("wallet_scores.csv", index=False)
print(" Results saved to wallet_scores.csv")

# Show top 10 scores
df_sorted = df.sort_values(by="score", ascending=False)
df_sorted[["wallet_id", "score"]]
 Results saved to wallet_scores.csv
```

	wallet_id	score
0	0x0039f22efb07a647557c7c5d17854cfd6d489ef3	250
1	0x06b51c6882b27cb05e712185531c1f74996dd988	250
2	0x0795732aacc448030ef374374eaae57d2965c16c	250
3	0x0aaa79f1a86bc8136cd0d1ca0d51964f4e3766f9	250
4	0x0fe383e5abc200055a7f391f94a5f5d1f844b9ae	250
...	...	...
98	0xf60304b534f74977e159b2e159e135475c245526	250
99	0xf67e8e5805835465f7eba988259db882ab726800	250
100	0xf7aa5d0752cfcd41b0a5945867d619a80c405e52	250
101	0xf80a8b9cfff0febf49914c269fb8aead4a22f847	250
102	0xfe5a05c0f8b24fca15a7306f6a4ebb7dcf2186ac	250

103 rows × 2 columns

```
import matplotlib.pyplot as plt
import seaborn as sns

# Set visual theme
sns.set(style="whitegrid")

# Plot distribution of wallet scores
plt.figure(figsize=(10, 6))
sns.histplot(df["score"], bins=20, kde=True, color="skyblue",
edgecolor="black")

plt.title("Distribution of Wallet Risk Scores", fontsize=16)
plt.xlabel("Score (0 to 1000)", fontsize=14)
plt.ylabel("Number of Wallets", fontsize=14)
plt.xticks(fontsize=12)
plt.yticks(fontsize=12)
plt.tight_layout()
plt.show()
```

Distribution of Wallet Risk Scores
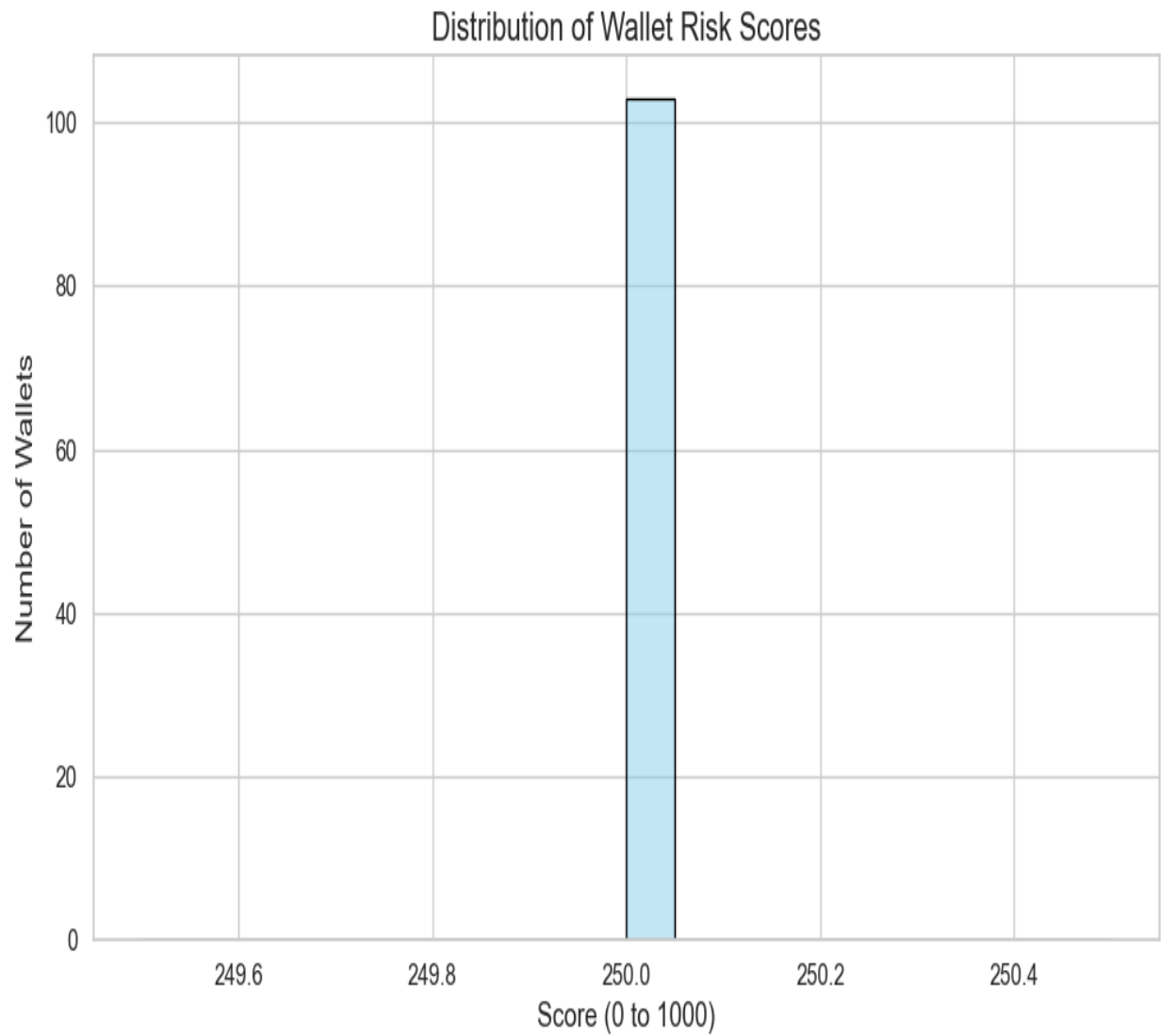
```
import seaborn as sns


all_wallets_sorted = df.sort_values("score", ascending=False)


num_wallets = len(all_wallets_sorted)
plt.figure(figsize=(12, 0.25 * num_wallets))


sns.barplot(data=all_wallets_sorted, x="score", y="wallet_id",
palette="viridis")

# Plot labels
plt.title("All Wallets by Risk Score", fontsize=16)

plt.xlabel("Risk Score", fontsize=14)
plt.ylabel("Wallet Address", fontsize=14)
```

```
plt.xticks(fontsize=12)
plt.yticks(fontsize=7)  # Smaller font for many addresses
plt.tight_layout()
plt.show()
C:\Users\USER\AppData\Local\Temp\ipykernel_49040\2178000491.py:11:
FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed
in v0.14.0. Assign the `y` variable to `hue` and set `legend=False` for the
same effect.

  sns.barplot(data=all_wallets_sorted, x="score", y="wallet_id",
palette="viridis")
```

All Wallets by Risk Score
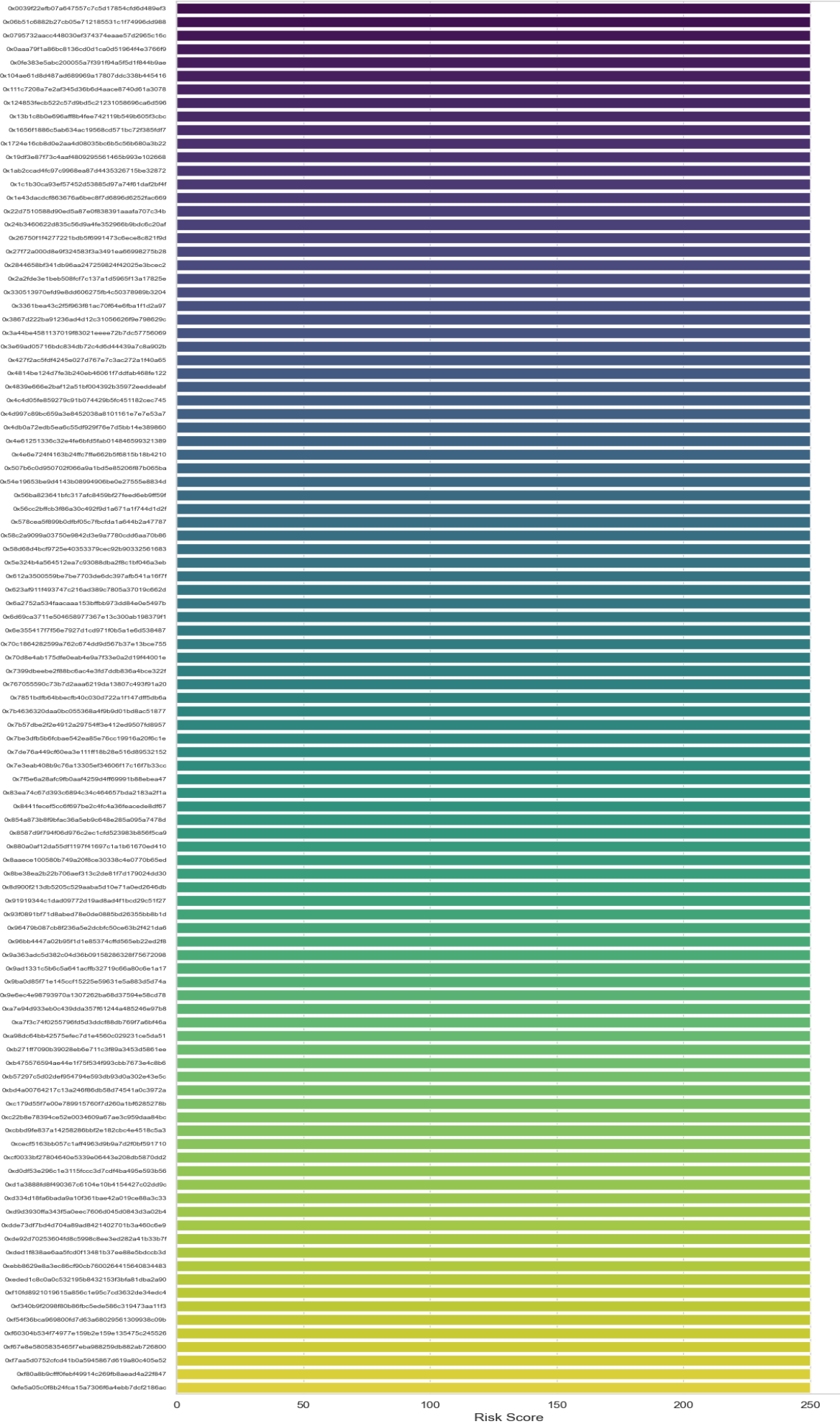
```
# Repayment ratio vs score scatter + trendline
plt.figure(figsize=(8, 6))
sns.scatterplot(data=df, x="repayment_ratio", y="score", color="royalblue",
alpha=0.6)
sns.regplot(data=df, x="repayment_ratio", y="score", scatter=False,
color="darkred", label="Trend")

plt.title("Repayment Ratio vs Risk Score", fontsize=16)
plt.xlabel("Repayment Ratio", fontsize=14)
plt.ylabel("Score", fontsize=14)
plt.legend()
plt.grid(True)
plt.tight_layout()
plt.show()
```
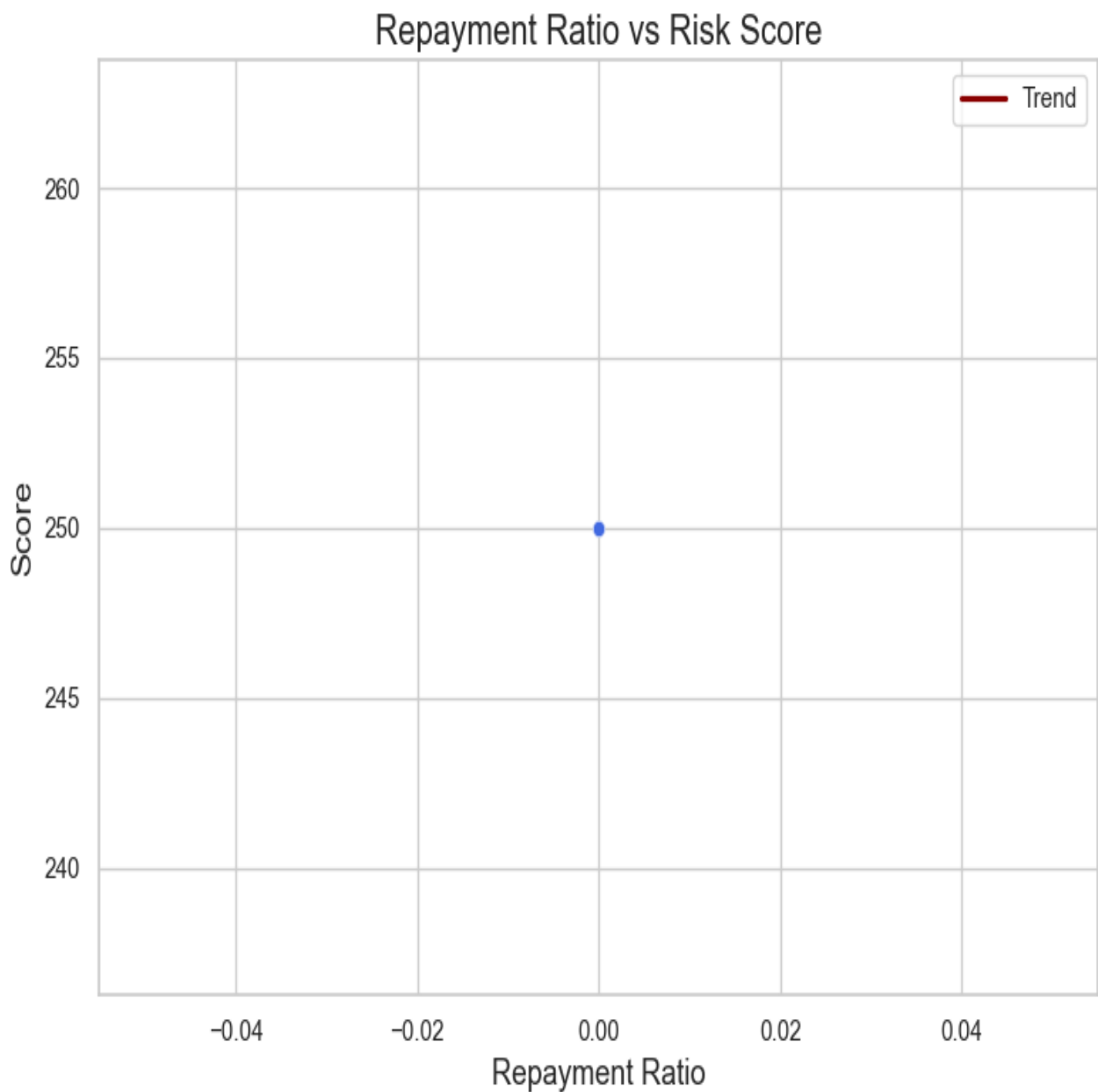
```python
import matplotlib.pyplot as plt
import seaborn as sns

# Define features to compare with score
features_to_plot = ["repayment_ratio", "net_position",
"supply_borrow_ratio", "num_liquidations"]
titles = [
    "Repayment Ratio vs Score",
    "Net Position vs Score",
    "Supply-Borrow Ratio vs Score",
    "Number of Liquidations vs Score"
]

plt.figure(figsize=(16, 10))

for idx, feature in enumerate(features_to_plot, 1):
    plt.subplot(2, 2, idx)
    sns.scatterplot(data=df, x=feature, y="score", alpha=0.6,
color="mediumseagreen")
    sns.regplot(data=df, x=feature, y="score", scatter=False,
color="darkred")
    plt.title(titles[idx - 1], fontsize=14)
    plt.xlabel(feature.replace("_", " ").title(), fontsize=12)
    plt.ylabel("Score", fontsize=12)
    plt.grid(True)

plt.tight_layout()
plt.suptitle("Feature Correlations with Risk Score", fontsize=18, y=1.02)
plt.show()
```
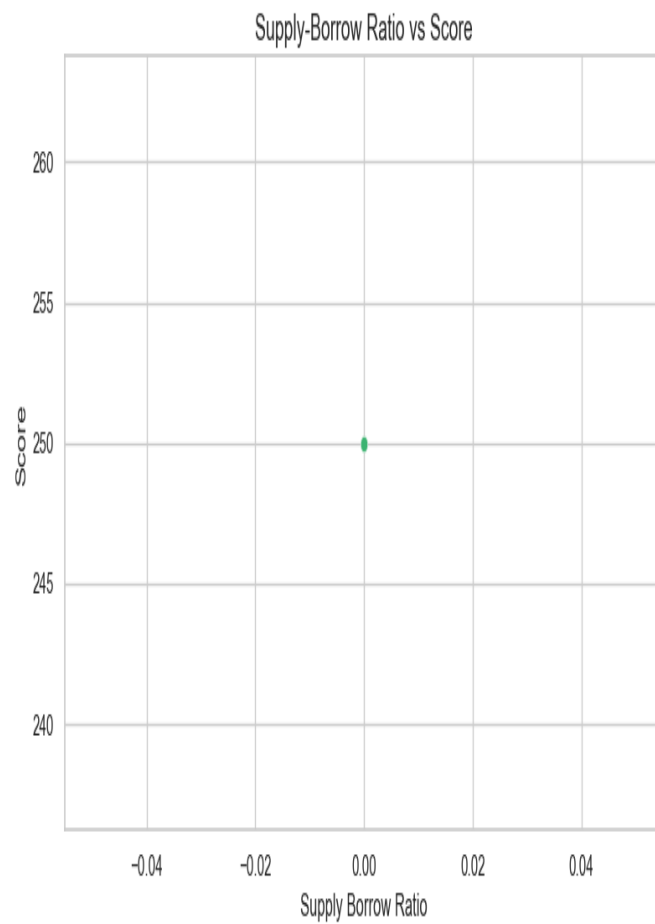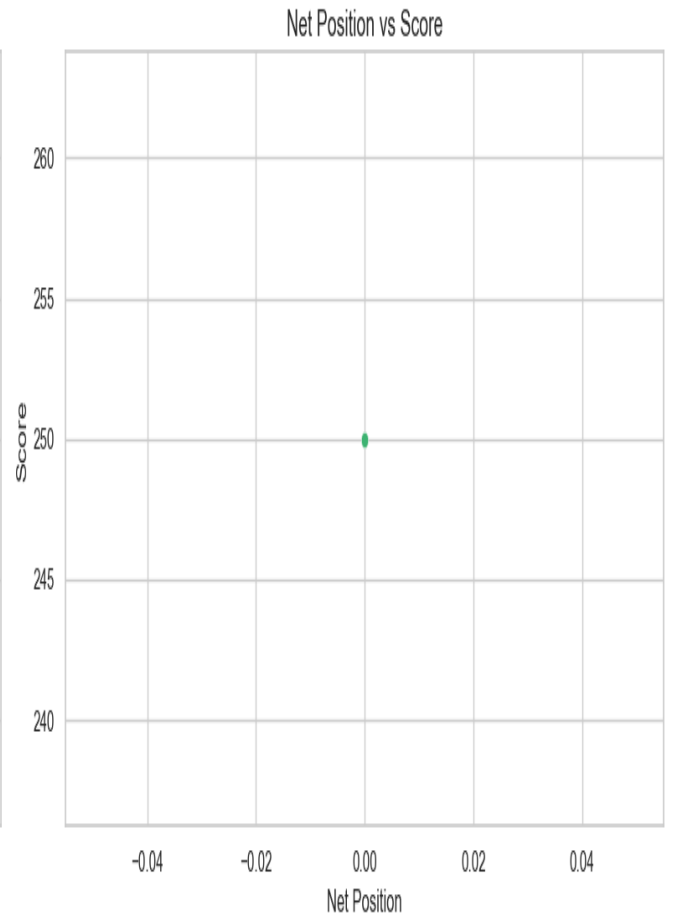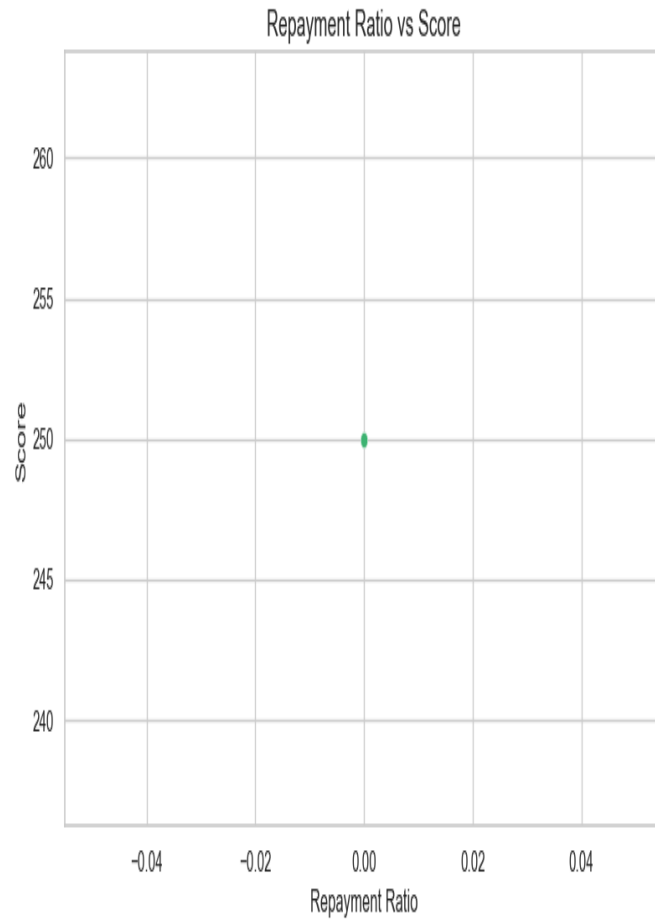
Feature Correlations with Risk Score
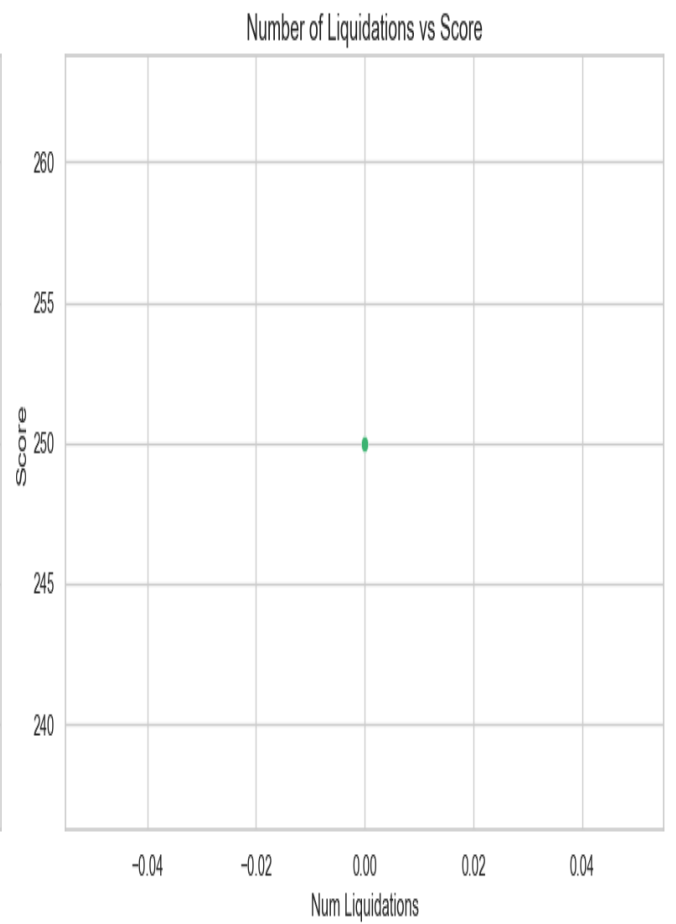
```
plt.figure(figsize=(10, 6))
corr = df[["repayment_ratio", "net_position", "supply_borrow_ratio",
"num_liquidations", "score"]].corr()
sns.heatmap(corr, annot=True, cmap="coolwarm", linewidths=0.5, fmt=".2f")
plt.title("Feature Correlation Heatmap", fontsize=16)
plt.show()
C:\Users\USER\AppData\Local\Programs\Python\Python313\Lib\site-
packages\seaborn\matrix.py:202: RuntimeWarning: All-NaN slice encountered
  vmin = np.nanmin(calc_data)
C:\Users\USER\AppData\Local\Programs\Python\Python313\Lib\site-
packages\seaborn\matrix.py:207: RuntimeWarning: All-NaN slice encountered
  vmax = np.nanmax(calc_data)
```


Feature Correlation Heatmap