Carapace Protection Pool Investor Doc

March 11, 2023

1 Introduction

This document contains detailed description and analytics about the alternate Carapace pool. We qualitatively and quantitatively describe the mechanics and risk for the pool, allowing investors to make choices regarding investing in the pool as protection sellers. The lending pools in this pool have already expired and hence this is just meant to be a guideline to compare the real Carapace pools to. For simulation, we assign 3 Mar 2024 as the expiry dates for all pools.

2 Alternate Pool 1

The alternate pool contains 10 expired pools from the Goldfinch protocol. We describe various constituents in detail.

2.1 Quickcheck

QuickCheck is a Nigerian consumer lender that uses machine learning to provide loans instantly to its customers. Through their mobile app, customers can apply for loans and have them funded within minutes. There are 3 lending pools regarding Quickcheck in Goldfinch - Quickcheck 1, Quickcheck 2 and Quickcheck 3.

2.2 Aspire

Aspire is a modern bank for businesses in Southeast Asia. The company provides businesses with seamless payments, savings products, tools to help teams manage their finances, and a range of credit products to help businesses grow. It operates three lending pools in Goldfinch - Aspire 1, Aspire 2 and Aspire 3.

2.3 Tugende

Tugende is tackling the credit gap for small businesses in Africa by enabling informal entrepreneurs to own income-generating assets and build a verifiable digital credit profile based on real-world earning. The proceeds will be used to fund the growth of Tugende's operations in Kenya by providing asset financing to motorcycle taxi operators in the region.

2.4 Payjoy

PayJoy offers a buy-now-pay-later product that allows consumers to transform the purchases of mobile phones into monthly installment plans. The company has brought credit to millions of under-served consumers in emerging markets worldwide by collateralizing their smartphone to jumpstart them into the modern credit system. Proceeds from this pool will go towards growing Payjoy's lending operations in Mexico.

2.5 Almavest Baskets

We include 2 lending pool run by ALMA Sustainable Finance, which is an investment management firm that creatively deploys capital for sustainable development. The pool names are Almavest Basket 1 and Almavest Basket 2.

- Selfin, an Indian lender that provides small, medium-term loans to MSMEs in India through a distribution network of financial advisors.
- Upwards, a consumer lender which, through its mobile app, offers personal loans to salaried employees in India
- Impact Water which supplies over 30,000 schools across central and eastern Africa with systems that avoid burning fuel to make water safe and potable
- Greenway Appliances, a leading clean cookstove supplier and distributor, with hundreds of thousands of rural customers in India and Africa

3 Correlation Analysis

For a protection seller, the correlation analysis of these pools is important. We try to quantitatively gauge the correlation of default for all the pools. This is done by looking at the end companies they are lending to, and assigning similarity metrics to company pairs based on factor analysis. More details for this can be found in the Appendix. The next pages contains a graphical representation of the correlations, with some observations regarding the correlations. There is one table with correlation of the end borrower companies, with one with the correlation of the lending pools derived from that. We mask the names of the companies in the correlation matrix.

4 Portfolio Modelling

For modelling the probability of capital losses faced by a protection seller, we model the carapace pool consisting of the 10 lending pools. The methodology for modelling the capital loss probabilities is detailed in the appendix, and somebody interested can take a look.

At a high level, we simulate defaults of the pools based on the risk factor we imply from real world financing rates (this means pools with higher interest rates have more rate of default, and pools with same interest rates but lower tenor have more rate of default). For example, if a guy gets a loan at 15% and some guy gets a loan at 12%, a safe bet would be that the first guy is deemed more credit risky by the institution giving the loan. Similarly, if a guy gets a loan at 12% for 6 months and another guy gets a loan at 12% for 6 years, then again it says that the first guy is deemed more risky.

Similarly for simulating correlation of the loans, when one pool defaults we increase the riskiness of all other pools based on the correlation with the defaulted pool. The mathematics behind this can be found in the appendix, but at a high level if pool A and pool B have a correlation of 0.2 and pool A and pool C have a correlation of 0.5, then when pool A defaults pool C will be impacted more.

4.1 Low Risk Regime

The low risk regime corresponds to when we assign 5% financing rates to all the pools, and simulate the portfolio. As we assign the same rate to all of them, the difference in the risk factors come from the tenors of the loans (which here is the same, hence all loans have the same risk factor). In general as the probability of default is low for each pool, the correlation effects do not kick in a lot. However one can still see that the 99 percentile capital loss is still

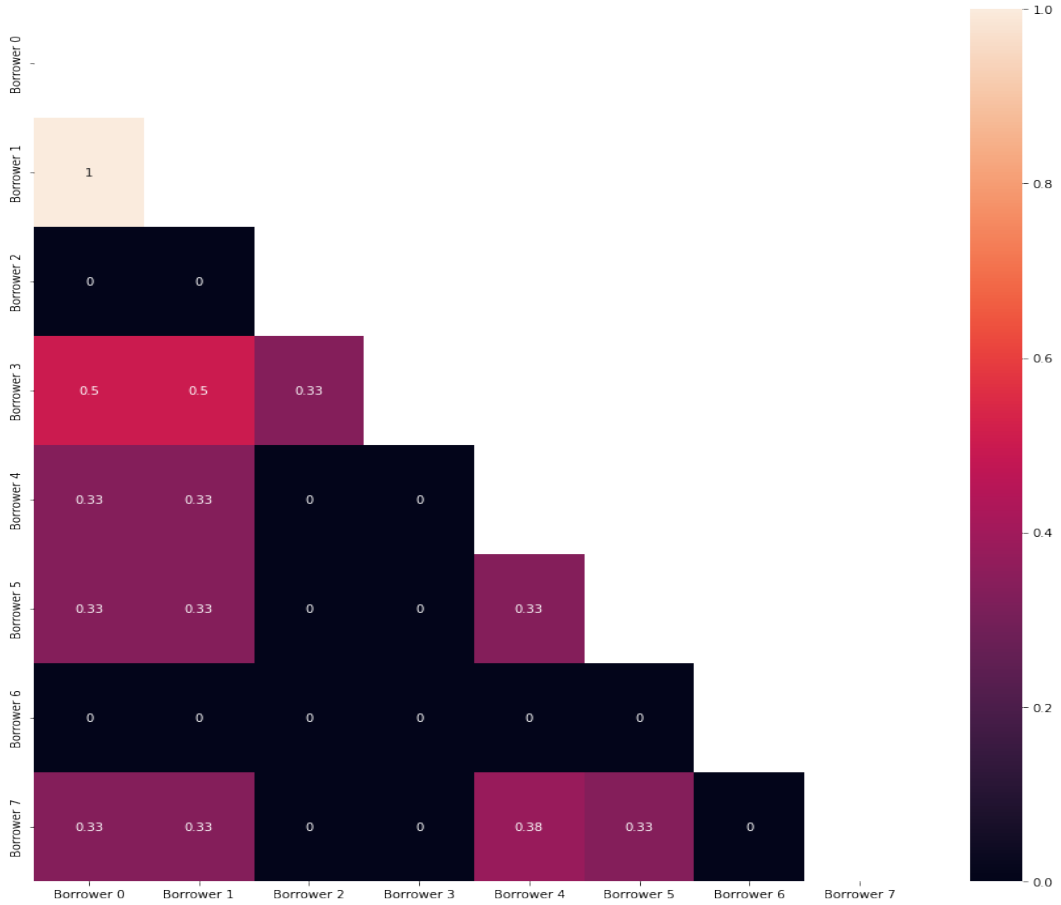

Figure 1: Company Correlation Matrix for Alternate Pool. The end borrowers name is masked due to privacy reason.

not 0. This illustrates that even if an investor believes that the portfolio is low risk, he should still take into account tail risks.

4.2 Normal Risk Regime

The normal risk regime corresponds to when we assign the Goldfinch financing rates to all the pools, and simulate the portfolio. The financing costs for all pools here is the roughly the same 15%, and hence this setting is very similar to the low risk regime, except the riskiness is approximately triple for each pool. One can compare this to the low risk diagram and see that the height at 0 percentile capital loss has decreased, and the heights of bars to the right has increased. One can also see that both 75 percentile, 99 percentile and mean capital loss have changed by a quite a lot. This means that the correlation effects do kick in this picture. As the financing rate here is quite close to the high risk regime (20%), one expects big changes in the the numbers.

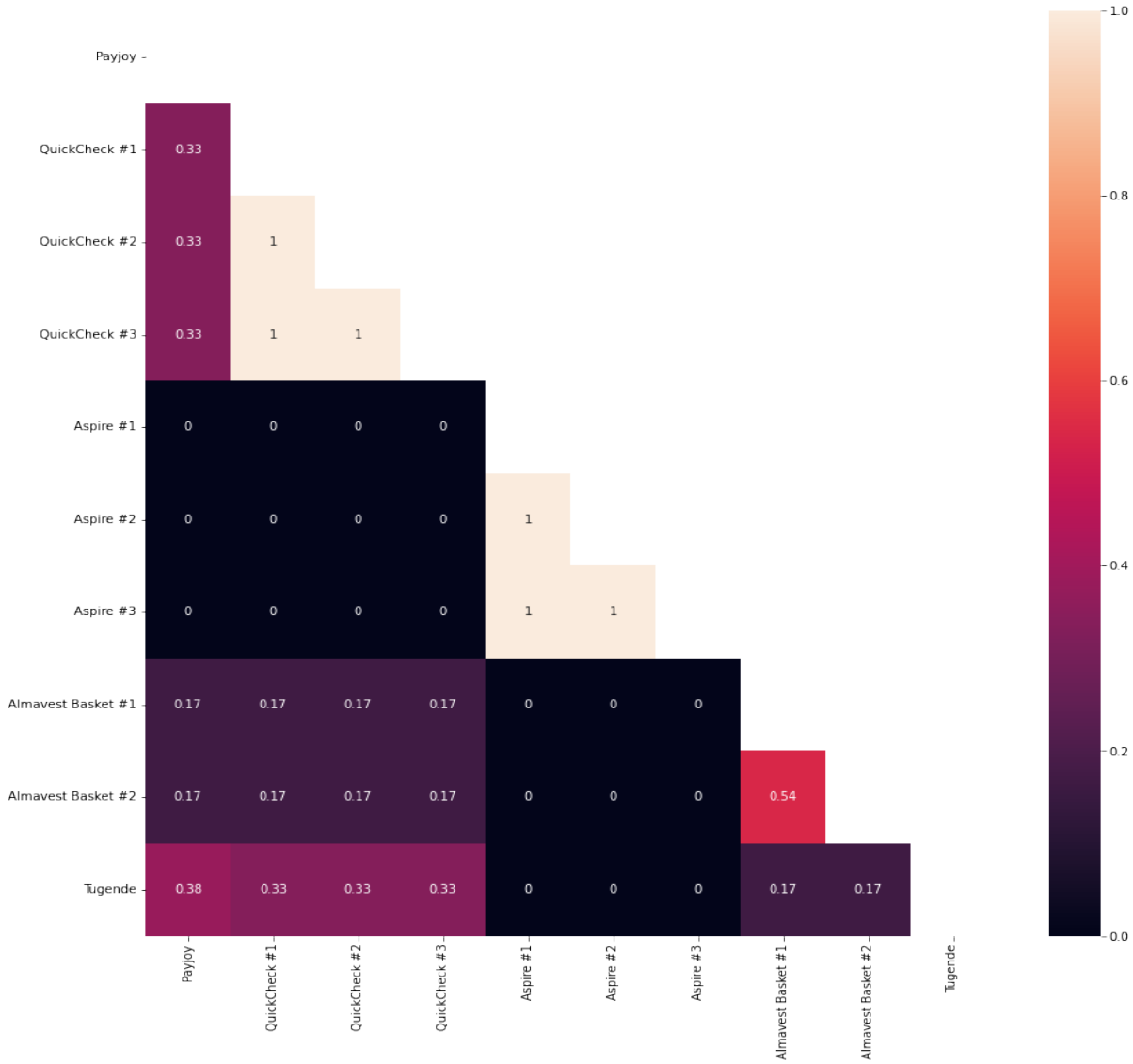

Figure 2: **Alternate Pool Correlation Matrix**. This triangular matrix contains the correlation numbers for each distinct pool pair in the first Carapace pool. These numbers are obtained by factor analysis of the borrowing companies for each pool.
One can identify thre subclusters of high correlation - the Quickcheck lending pools, the Aspire Lending Pools and the Almavest Basket lending pools. This is expected because all of them invest in the same companies as sub cluster constituents. Apart from that, one can see Tugende has significant correlation with Payjoy and the Quickcheck pools.
The methodology for getting the correlation for each lending pool and company wise correlation is explained in Appendix

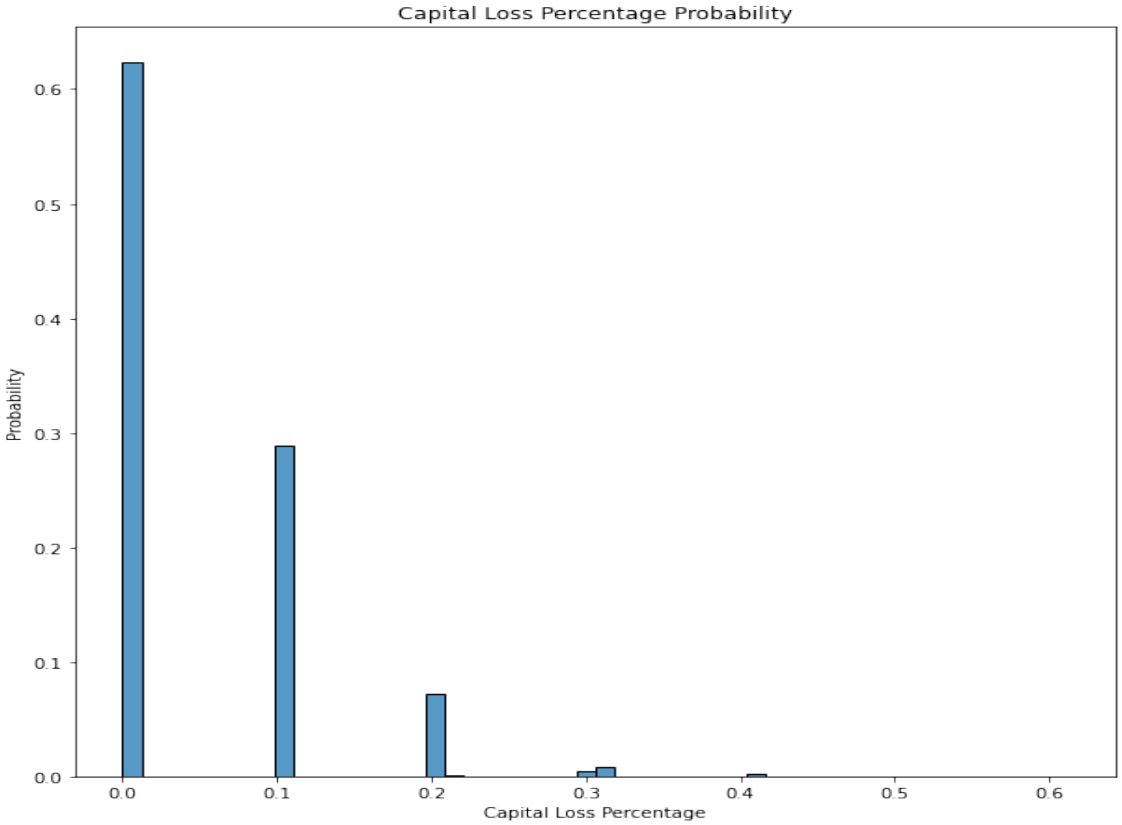

Figure 3: **Low Risk Capital Loss Percentage Probability** The above graph represents the loss of capital for an investor who lends equal money to all the 10 lending pools of the first Carapace Pool. So if an investor invests 1 dollar equally divided into all the 10 lending pools, the probability of losing no money (i.e the probability that none of the pool defaults) is given by the height of the bar at 0 (which is more than 0.7 that is 70% here).
The percentile values for capital loss for an investor giving 1000 dollars equally distributed in the low risk regime are
10 percentile capital loss is 0.0
25 percentile capital loss is 0.0
50 percentile capital loss is 0.0
75 percentile capital loss is 102.06
99 percentile capital loss is 306.61
Mean capital loss is 49.33

4.3 High Risk Regime

The high risk regime corresponds to when we assign 20% financing rates to all the pools, and simulate the portfolio. The financing costs for all pools is the roughly the same (15%), and hence this setting is equal to 1.5x the risk factor from the normal risk regime, and 4 times from the low risk regime. The pools now are quite risky, and one can also see that both 50 percentile, 75 percentile, 99 percentile and mean capital loss have changed by a quite a bit. The correlation effects dominate here, as more pools default the more the risk factor of other pools jump. We do not expect this to be the real life risk profile of the pool, but this shows the case of lending pools become more risky in the future due to some events, how does one expect the portfolio to behave. One can see that the graph is now very

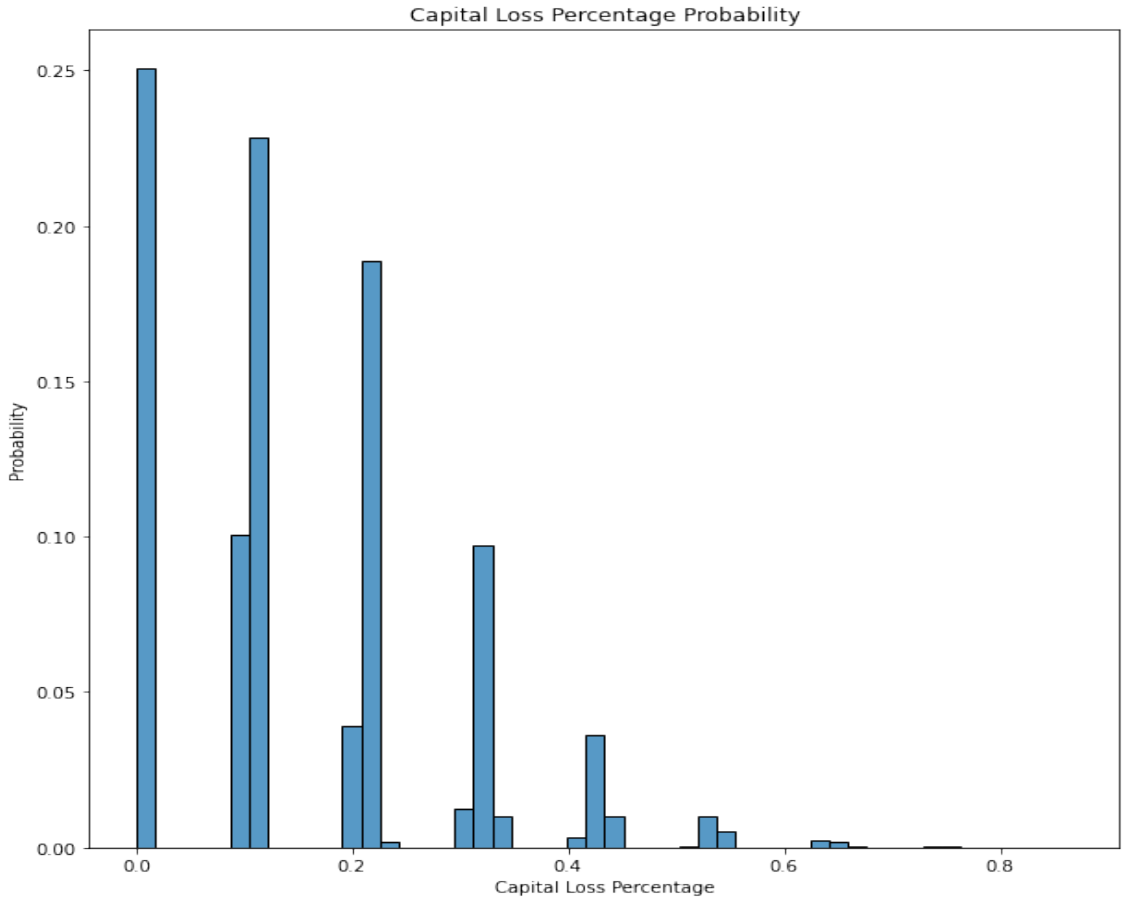

Figure 4: **Normal Risk Capital Loss Percentage Probability** The above graph represents the loss of capital for an investor who lends equal money to all the 10 lending pools of the first Carapace Pool. So if an investor invests 1 dollar equally divided into all the 10 lending pools, the probability of losing no money (i.e the probability that none of the pool defaults) is given by the height of the bar at 0 (which is more than 0.5 that is 50% here).
The percentile values for capital loss for an investor giving 1000 dollars equally distributed in the normal risk regime are -
10 percentile capital loss is 0.0
25 percentile capital loss is 0.0
50 percentile capital loss is 109.91
75 percentile capital loss is 217.35
99 percentile capital loss is 539.91
Mean capital loss is 155.954

right tail dominant, and has a peak not at 0 percent capital loss.

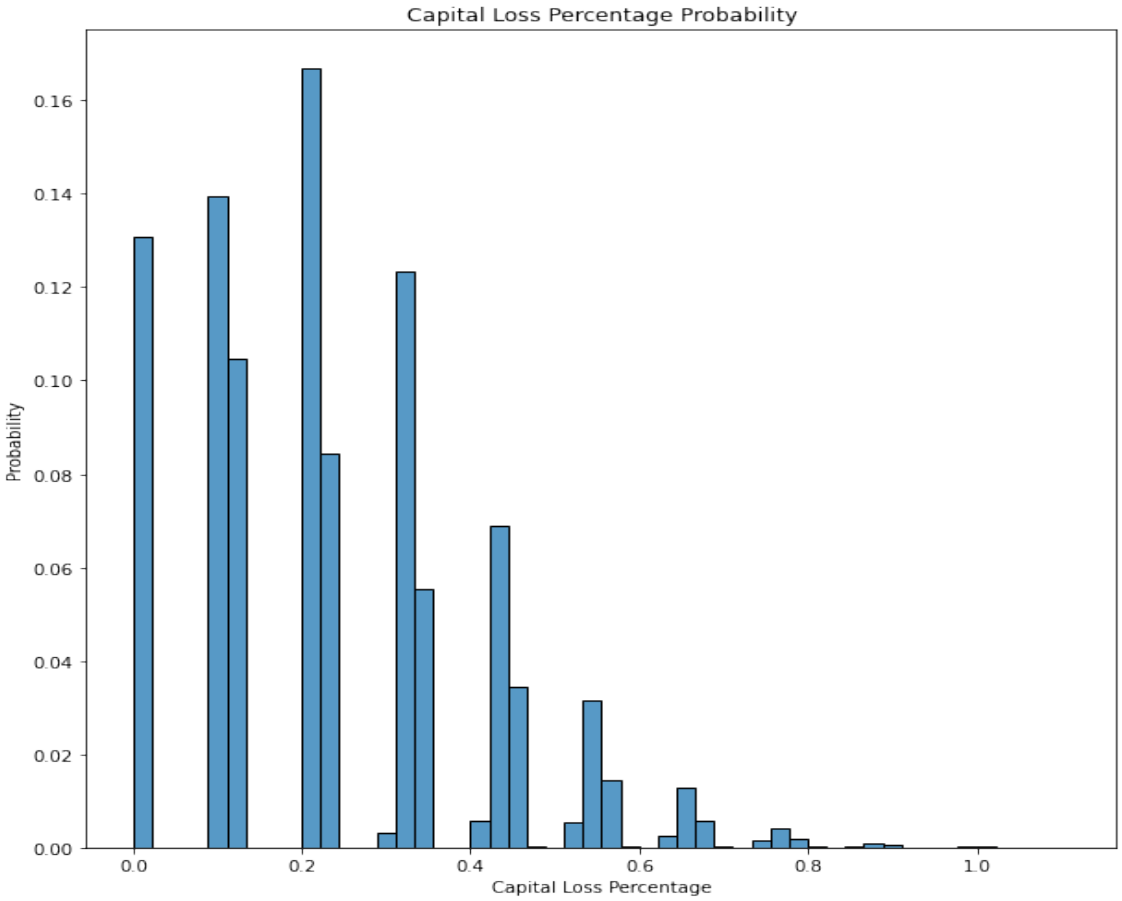

Figure 5: **High Risk Capital Loss Percentage Probability**. The above graph represents the loss of capital for an investor who lends equal money to all the 10 lending pools of the first Carapace Pool. So if an investor invests 1 dollar equally divided into all the 10 lending pools, the probability of losing no money (i.e the probability that none of the pool defaults) is given by the height of the bar at 0 (which is more than 0.25 that is 25% here).
The percentile values for capital loss for an investor giving 1000 dollars equally distributed in the low risk regime are
- 10 percentile capital loss is 0.0
25 percentile capital loss is 109.91
50 percentile capital loss is 219.83
75 percentile capital loss is 333.059
99 percentile capital loss is 687.62
Mean capital loss is 239.76

4.4 High Risk Regime Without Correlation

This regime is the same as the high risk regime, expect all pools are uncorrelated, and hence no pools' riskiness jumps if some other pool defaults. If one compares this risk regime with the high risk regime, then one can see the effects of the correlation clearly, and judge the diversification, as correlation effects come greatly into picture in the high risk regime. We see a decrease in the 75 percentile, 99 percentile and mean capital loss compared to the high

risk regime. The more value is in tail, the more the extent of decrease, illustrating how correlation effects tail values a lot. The extent of the decrease here can be compared with other Carapace pools to see which Carapace pool is more diversified.

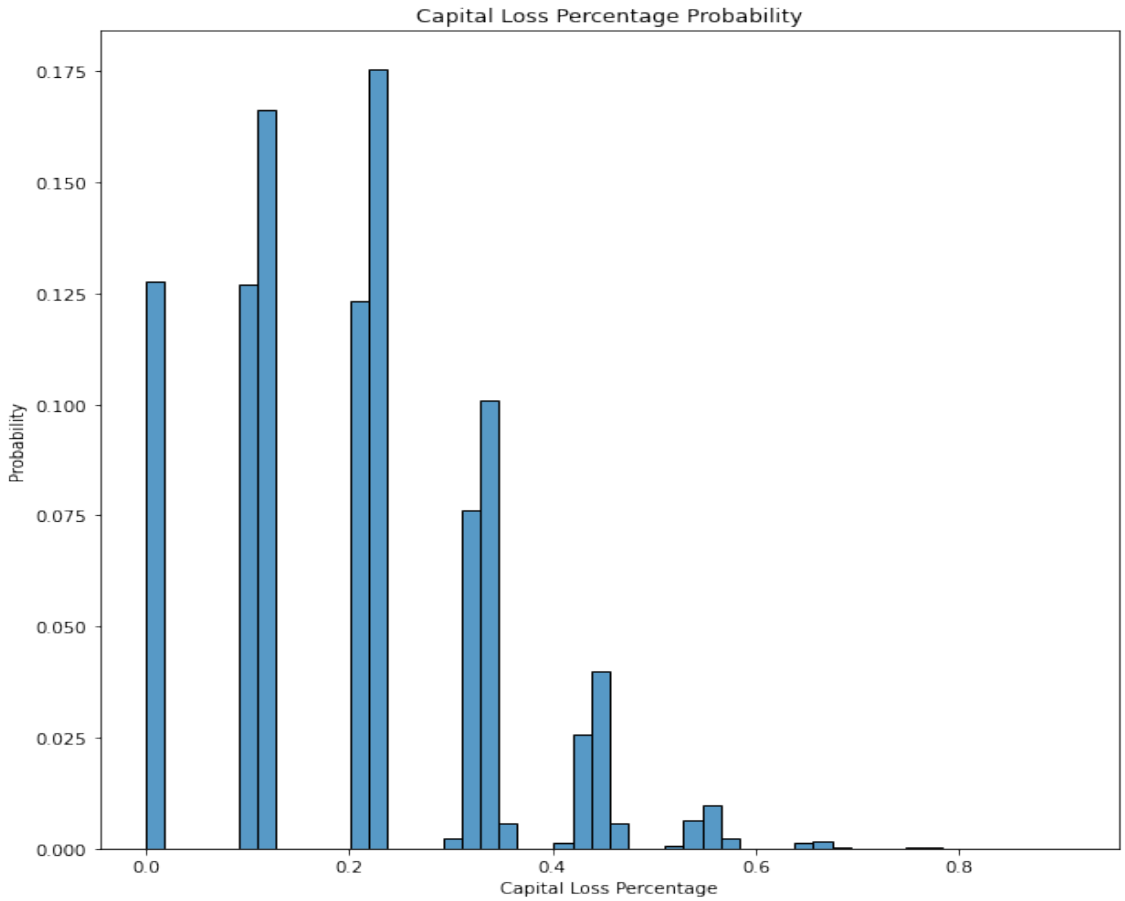

Figure 6: **High Risk Uncorrelated Capital Loss Percentage Probability**. The above graph represents the loss of capital for an investor who lends equal money to all the 10 lending pools of the first Carapace Pool. So if an investor invests 1 dollar equally divided into all the 10 lending pools, the probability of losing no money (i.e the probability that none of the pool defaults) is given by the height of the bar at 0 (which is more than 0.25 that is 25% here).
The percentile values for capital loss for an investor giving 1000 dollars equally distributed in the low risk regime are
- 10 percentile capital loss is 0.0
25 percentile capital loss is 108.24
50 percentile capital loss is 214.83
75 percentile capital loss is 321.42
99 percentile capital loss is 556.04
Mean capital loss is 204.30