Loading the Lookup Table

Commands to load the relevant data in the Lookup Table

- Calculate the Upper Control Limit (UCL), UCL = Moving Average + 3 * (Standard Deviation), We shall first calculate the moving average of card amount for last 10 transactions.
- Create a window over existing dataframe and aggregate the same card_id, the dataframe is grouped by card_id and then order by transaction_date.

```
window = Window.partitionBy(history['card_id']).orderBy(history['transaction_date'].desc())

history_df = history.select('*', f.rank().over(window).alias('rank')).filter(f.col('rank') <= 10)
```

```
history_df.show()
```

```
+---------------+-------+--------+---------------+-------+-----+-------------------+----+
|        card_id| amount|postcode|         pos_id| status|score|   transaction_date|rank|
+---------------+-------+--------+---------------+-------+-----+-------------------+----+
|340379737226464|1784098|   26656|000383013889790|GENUINE|  229|2018-01-27 00:19:47|   1|
|340379737226464|3759577|   61334|016312401940277|GENUINE|  229|2018-01-18 14:26:09|   2|
|340379737226464|4080612|   51338|562082278231631|GENUINE|  229|2018-01-14 20:54:02|   3|
|340379737226464|4242710|   96105|285501971776349|GENUINE|  229|2018-01-11 19:09:55|   4|
|340379737226464|9061517|   40932|232455833079472|GENUINE|  229|2018-01-10 20:20:33|   5|
|340379737226464| 102248|   40932|232455833079472|GENUINE|  229|2018-01-10 15:04:33|   6|
|340379737226464|7445128|   50455|915439934619047|GENUINE|  229|2018-01-07 23:52:27|   7|
|340379737226464|5706163|   50455|915439934619047|GENUINE|  229|2018-01-07 22:07:07|   8|
|340379737226464|8090127|   18626|359283931604637|GENUINE|  229|2017-12-29 13:24:07|   9|
|340379737226464|9282351|   41859|808326141065551|GENUINE|  229|2017-12-28 19:50:46|  10|
```

```
history_df = history_df.groupBy("card_id").agg(f.round(f.avg('amount'),2).alias('moving_avg'), \
                                               f.round(f.stddev('amount'),2).alias('Std_Dev'))
```

```
+---------------+----------+----------+
|         card_id|moving_avg|   Std_Dev|
+---------------+----------+----------+
| 340379737226464| 5355453.1|3107063.55|
| 345406224887566| 5488456.5|3252527.52|
| 348962542187595| 5735629.0|3089916.54|
| 377201318164757| 5742377.7|2768545.84|
| 379321864695232| 4713319.1|3203114.94|
|4389973676463558| 4923904.7| 2306771.9|
|4407230633003235| 4348891.3|3274883.95|
```

- Calculate UCL from the computed standard deviation and moving average:

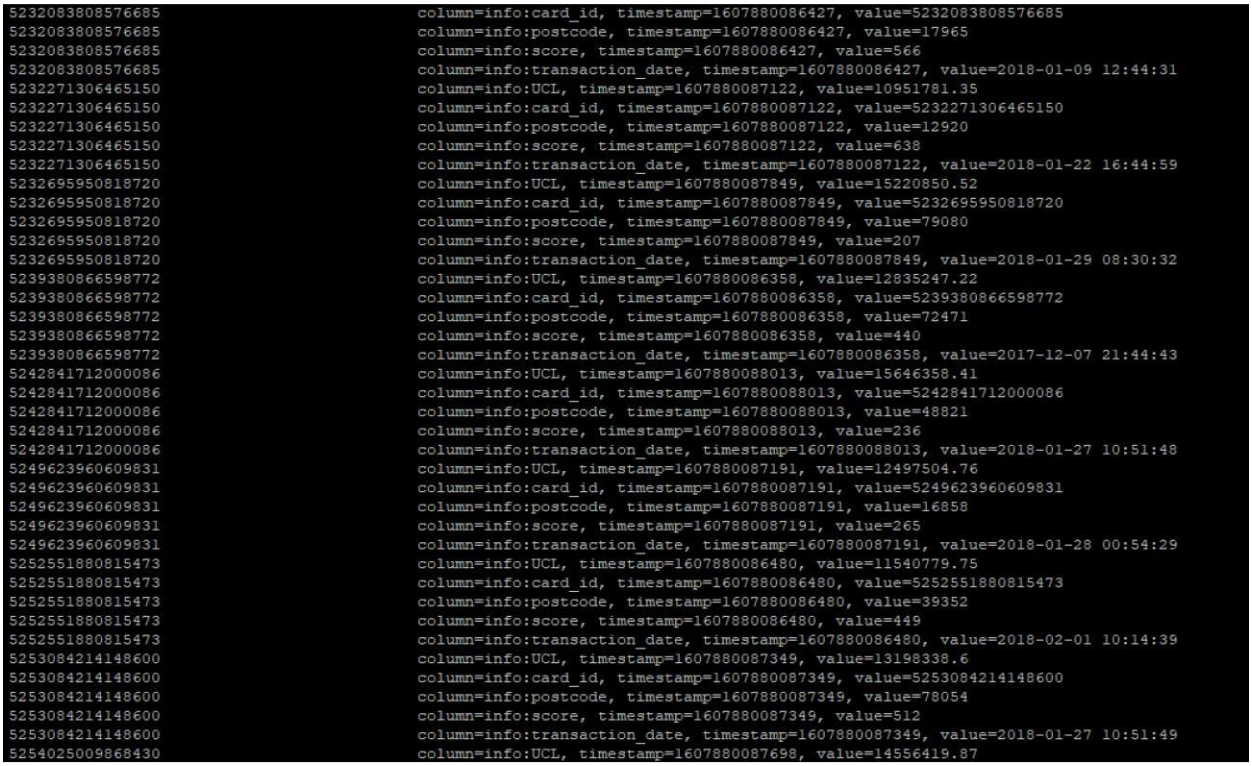
```
history_df = history_df.withColumn('UCL',history_df.moving_avg+3*(history_df.Std_Dev))
```

```
+---------------+----------+----------+--------------------+
|         card_id|moving_avg|   Std_Dev|                 UCL|
+---------------+----------+----------+--------------------+
| 340379737226464| 5355453.1|3107063.55|1.4676643749999998E7|
| 345406224887566| 5488456.5|3252527.52|       1.524603906E7|
| 348962542187595| 5735629.0|3089916.54|1.5005378620000001E7|
| 377201318164757| 5742377.7|2768545.84|1.4048015219999999E7|
| 379321864695232| 4713319.1|3203114.94|       1.432266392E7|
|4389973676463558| 4923904.7| 2306771.9|1.1844220399999999E7|
|4407230633003235| 4348891.3|3274883.95|1.4173543150000002E7|
```

<Command to see the table created and it's content>

- *list* command is used to view the created table
- *scan 'look_up_table'* command to view data inserted into table.

Screenshot of the created table



```
5232083808576685                        column=info:card_id, timestamp=1607880086427, value=5232083808576685
5232083808576685                        column=info:postcode, timestamp=1607880086427, value=17965
5232083808576685                        column=info:score, timestamp=1607880086427, value=566
5232083808576685                        column=info:transaction_date, timestamp=1607880086427, value=2018-01-09 12:44:31
5232271306465150                        column=info:UCL, timestamp=1607880087122, value=10951781.35
5232271306465150                        column=info:card_id, timestamp=1607880087122, value=5232271306465150
5232271306465150                        column=info:postcode, timestamp=1607880087122, value=12920
5232271306465150                        column=info:score, timestamp=1607880087122, value=638
5232271306465150                        column=info:transaction_date, timestamp=1607880087122, value=2018-01-22 16:44:59
5232695950818720                        column=info:UCL, timestamp=1607880087849, value=15220850.52
5232695950818720                        column=info:card_id, timestamp=1607880087849, value=5232695950818720
5232695950818720                        column=info:postcode, timestamp=1607880087849, value=79080
5232695950818720                        column=info:score, timestamp=1607880087849, value=207
5232695950818720                        column=info:transaction_date, timestamp=1607880087849, value=2018-01-29 08:30:32
5239380866598772                        column=info:UCL, timestamp=1607880086358, value=12835247.22
5239380866598772                        column=info:card_id, timestamp=1607880086358, value=5239380866598772
5239380866598772                        column=info:postcode, timestamp=1607880086358, value=72471
5239380866598772                        column=info:score, timestamp=1607880086358, value=440
5239380866598772                        column=info:transaction_date, timestamp=1607880086358, value=2017-12-07 21:44:43
5242841712000086                        column=info:UCL, timestamp=1607880088013, value=15646358.41
5242841712000086                        column=info:card_id, timestamp=1607880088013, value=5242841712000086
5242841712000086                        column=info:postcode, timestamp=1607880088013, value=48821
5242841712000086                        column=info:score, timestamp=1607880088013, value=236
5242841712000086                        column=info:transaction_date, timestamp=1607880088013, value=2018-01-27 10:51:48
5249623960609831                        column=info:UCL, timestamp=1607880087191, value=12497504.76
5249623960609831                        column=info:card_id, timestamp=1607880087191, value=5249623960609831
5249623960609831                        column=info:postcode, timestamp=1607880087191, value=16858
5249623960609831                        column=info:score, timestamp=1607880087191, value=265
5249623960609831                        column=info:transaction_date, timestamp=1607880087191, value=2018-01-28 00:54:29
5252551880815473                        column=info:UCL, timestamp=1607880086480, value=11540779.75
5252551880815473                        column=info:card_id, timestamp=1607880086480, value=5252551880815473
5252551880815473                        column=info:postcode, timestamp=1607880086480, value=39352
5252551880815473                        column=info:score, timestamp=1607880086480, value=449
5252551880815473                        column=info:transaction_date, timestamp=1607880086480, value=2018-02-01 10:14:39
5253084214148600                        column=info:UCL, timestamp=1607880087349, value=13198338.6
5253084214148600                        column=info:card_id, timestamp=1607880087349, value=5253084214148600
5253084214148600                        column=info:postcode, timestamp=1607880087349, value=78054
5253084214148600                        column=info:score, timestamp=1607880087349, value=512
5253084214148600                        column=info:transaction_date, timestamp=1607880087349, value=2018-01-27 10:51:49
5254025009868430                        column=info:UCL, timestamp=1607880087698, value=14556419.87
```