Sync MoM 2022.12.1.

##### Done until now

* **GAMM existing specification analyzed**
* **GAMM TLA spec first version created**
* **GAMM parsing and validation of tx commands arguments are analyzed**
* **GAMM Balancer Swap code analyzed**

##### Questions/topics for discussion

1. TWAP records, when spotPrices could not be calculated? (sp0, sp1 are replaced with zero - why not last spot price value) [code](https://github.com/osmosis-labs/osmosis/blob/94534da031b67a2eca6c24a98a266451130f41e5/x/twap/logic.go#L51-L53) -> There is an open PR for this, check it out - it will be merged. [PR](https://github.com/osmosis-labs/osmosis/pull/2923)

**How to exclude records containing errors from the calculation of arithmetic twap and when getting last spot price?**

* **GetArithmeticTwap()**Would it be good to define a time span parameter to check if there is a record with no errors in it? TWAP record younger <= to time parameter span.  
  Then do the calculations in ComputeArithmeticTwap() functions with values that do not contain errors?  
  Maybe GetInterpolatedRecords() could try and work with twap records without errors from some time span? Last record, closest to the desired time, but with no error?  
  <https://github.com/osmosis-labs/osmosis/blob/b7b4db61f7d8ba15e3680a178092d2c310c77fec/x/twap/logic.go#L205-L212>  
  Commit hash containing PR: b7b4db61f7d8ba15e3680a178092d2c310c77fec
* **getSpotPrices()**This is similar to the possibility to use last spot price without error in cases when getSpotPrices() returns sp0/sp1 f containing error. Currently it is replaced with 0 value.  
  <https://github.com/osmosis-labs/osmosis/blob/42d73f1cc1c52e85561518be1014b730ef6b7a12/x/twap/logic.go#L47-L59>

1. Osmomath - used with stableswap? - Done, covered over Slack.

3. Defines 2 and 8 as constants:<https://github.com/osmosis-labs/osmosis/blob/b7b4db61f7d8ba15e3680a178092d2c310c77fec/x/gamm/pool-models/balancer/pool_asset.go#L72-L78>

4. Part of code that could be before for loop: <https://github.com/osmosis-labs/osmosis/blob/b7b4db61f7d8ba15e3680a178092d2c310c77fec/x/gamm/keeper/multihop.go#L20-L27>

5. Some functions expect Coins as argument and check if this Coins contain only 1 element. Other functions, which call them, have only one Coin from which to make a set:

* applySwap: <https://github.com/osmosis-labs/osmosis/blob/b7b4db61f7d8ba15e3680a178092d2c310c77fec/x/gamm/pool-models/balancer/pool.go#L596-L597>
* CalcOutAmtGivenIn: https://github.com/osmosis-labs/osmosis/blob/b7b4db61f7d8ba15e3680a178092d2c310c77fec/x/gamm/pool-models/balancer/pool.go#L491  
  https://github.com/osmosis-labs/osmosis/blob/b7b4db61f7d8ba15e3680a178092d2c310c77fec/x/gamm/pool-models/stableswap/pool.go#L221-L223
* CalcInAmtGivenOut:   
  https://github.com/osmosis-labs/osmosis/blob/b7b4db61f7d8ba15e3680a178092d2c310c77fec/x/gamm/pool-models/balancer/pool.go#L546

6. Checklist of some test cases on the local testnet:

* Create pool with more elements in SmoothWeightChangeParams.TargetPoolWeights than Weights which could lead to index out of range at:   
  https://github.com/osmosis-labs/osmosis/blob/42d73f1cc1c52e85561518be1014b730ef6b7a12/x/gamm/client/cli/tx.go#L392
* Try to perform a join pool with the same denoms in maxAmountsIn
* Try to perform a exit pool with the same denoms in minAmountsOut
* It looks like the check if Duration is negative for lockTime is missing:   
  https://github.com/osmosis-labs/osmosis/blob/b7b4db61f7d8ba15e3680a178092d2c310c77fec/x/gamm/types/msgs.go#L58-L61

##### Next Steps

* Generating more exhaustive traces with Atomkraft and check them on the live chain
* Tuning the TLA specification
* Analyze the rest of the gamm module code (Create, Join and Exit pool)