Food Balance Sheets

Wheat

For this example, we'll first consider the commodity tree for wheat. We start off with an empty table:

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
0111	0	0	0	0	0	0	0	0	0	0	0
23110	0	0	0	0	0	0	0	0	0	0	0
23140.02	0	0	0	0	0	0	0	0	0	0	0
23140.03	0	0	0	0	0	0	0	0	0	0	0
23220.01	0	0	0	0	0	0	0	0	0	0	0
39120.01	0	0	0	0	0	0	0	0	0	0	0

Production

For production data, we first fill in the table with any available official figures. To impute production, we must also consider yield and area harvested data as yield is defined as production divided by area harvested (and thus with any two elements the third is uniquely defined). Suppose we have the following official data:

Item	Area Harvested	Yield	Production
0111	18496174	0	0
23110	NA	NA	18652048

In this case, the production value is only known for wheat flour (it is missing for wheat), and for wheat we are also missing the yield value. The first step in the imputation process is to impute the yield, using the previously described production imputation methodology.

Item	Area Harvested	Yield	Production
0111	18496174	3	0
23110	NA	NA	18652048

Now, we have enough information to impute the production data:

Item	Area Harvested	Yield	Production
0111	18496174	3	54418808
23110	NA	NA	18652048

Now, we fill in the table with our production values. Production is only imputed for primary products, and so in this case no additional values are filled in.

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
0111	54418808	0	0	0	0	0	0	0	0	0	0
23110	18652048	0	0	0	0	0	0	0	0	0	0
23140.02	NA	0	0	0	0	0	0	0	0	0	0
23140.03	NA	0	0	0	0	0	0	0	0	0	0
23220.01	NA	0	0	0	0	0	0	0	0	0	0
39120.01	NA	0	0	0	0	0	0	0	0	0	0

Trade

For the next example, we'll show how the imputation, mirroring and balancing works. In this case, we just take the country totals and insert into this table.

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
0111	54418808	1984766	2118521	0	0	0	0	0	0	0	0
23110	18652048	259872	365719	0	0	0	0	0	0	0	0
23140.02	NA	377794	128296	0	0	0	0	0	0	0	0
23140.03	NA	521203	689166	0	0	0	0	0	0	0	0
23220.01	NA	658721	145326	0	0	0	0	0	0	0	0
39120.01	NA	203969	339161	0	0	0	0	0	0	0	0

NOTE (Josh): The trade figures I quote here are based on the US data, but not exactly. We have HS6 trade data, and I can map that to CPC. However, some HS6 codes map to many CPC codes. My understanding is that the historical approach has been to not use split factors and to simply map the quantity straight into one of the CPC codes. For this simple example, I map the HS data to CPC and randomly split it.

Stock Changes

We now estimate the stock changes. Note that for most products, we assume that countries do not hold stocks. Generally, stocks will only be held for primary level products, and not even all of these products. The numbers below represent the estimated stock changes (by the stock imputation methodology described previously) for the example country we're considering.

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
0111	54418808	1984766	2118521	-230630	0	0	0	0	0	0	0
23110	18652048	259872	365719	NA	0	0	0	0	0	0	0
23140.02	NA	377794	128296	NA	0	0	0	0	0	0	0
23140.03	NA	521203	689166	NA	0	0	0	0	0	0	0
23220.01	NA	658721	145326	NA	0	0	0	0	0	0	0
39120.01	NA	203969	339161	NA	0	0	0	0	0	0	0

Food

The allocation to food, on the other hand, can potentially be considered at any processing level, although some commodities (such as wheat) are assumed to not be eaten as such. We impute food consumption numbers for the example country and update the FBS table below.

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
0111	54418808	1984766	2118521	-230630	NA	0	0	0	0	0	0
23110	18652048	259872	365719	NA	18539484	0	0	0	0	0	0
23140.02	NA	377794	128296	NA	3684	0	0	0	0	0	0
23140.03	NA	521203	689166	NA	98131	0	0	0	0	0	0
23220.01	NA	658721	145326	NA	NA	0	0	0	0	0	0
39120.01	NA	203969	339161	NA	NA	0	0	0	0	0	0

Losses

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
0111	54418808	1984766	2118521	-230630	NA	0	560306	0	0	0	0
23110	18652048	259872	365719	NA	18539484	0	NA	0	0	0	0
23140.02	NA	377794	128296	NA	3684	0	NA	0	0	0	0
23140.03	NA	521203	689166	NA	98131	0	NA	0	0	0	0
23220.01	NA	658721	145326	NA	NA	0	NA	0	0	0	0

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
39120.01	NA	203969	339161	NA	NA	0	NA	0	0	0	0

Seed

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
0111	54418808	1984766	2118521	-230630	NA	0	560306	1929614	0	0	0
23110	18652048	259872	365719	NA	18539484	0	NA	NA	0	0	0
23140.02	NA	377794	128296	NA	3684	0	NA	NA	0	0	0
23140.03	NA	521203	689166	NA	98131	0	NA	NA	0	0	0
23220.01	NA	658721	145326	NA	NA	0	NA	NA	0	0	0
39120.01	NA	203969	339161	NA	NA	0	NA	NA	0	0	0

Industrial Utilization

Work in progress. . .

Tourist Consumption

The tourist consumption estimation approach uses tourist data from the WTO as well as last year's consumption patterns to estimate the impact of tourism on local consumption. Note that tourist consumption can be negative; as an extreme example consider a case where many nationals travel abroad but no tourists enter. In this case, that country will certainly have a negative "tourist consumption" because more calories will be assumed abroad than locally.

Residual Other Uses

Work in progress. . .

Standardization

Now, suppose we have the following commodity tree:
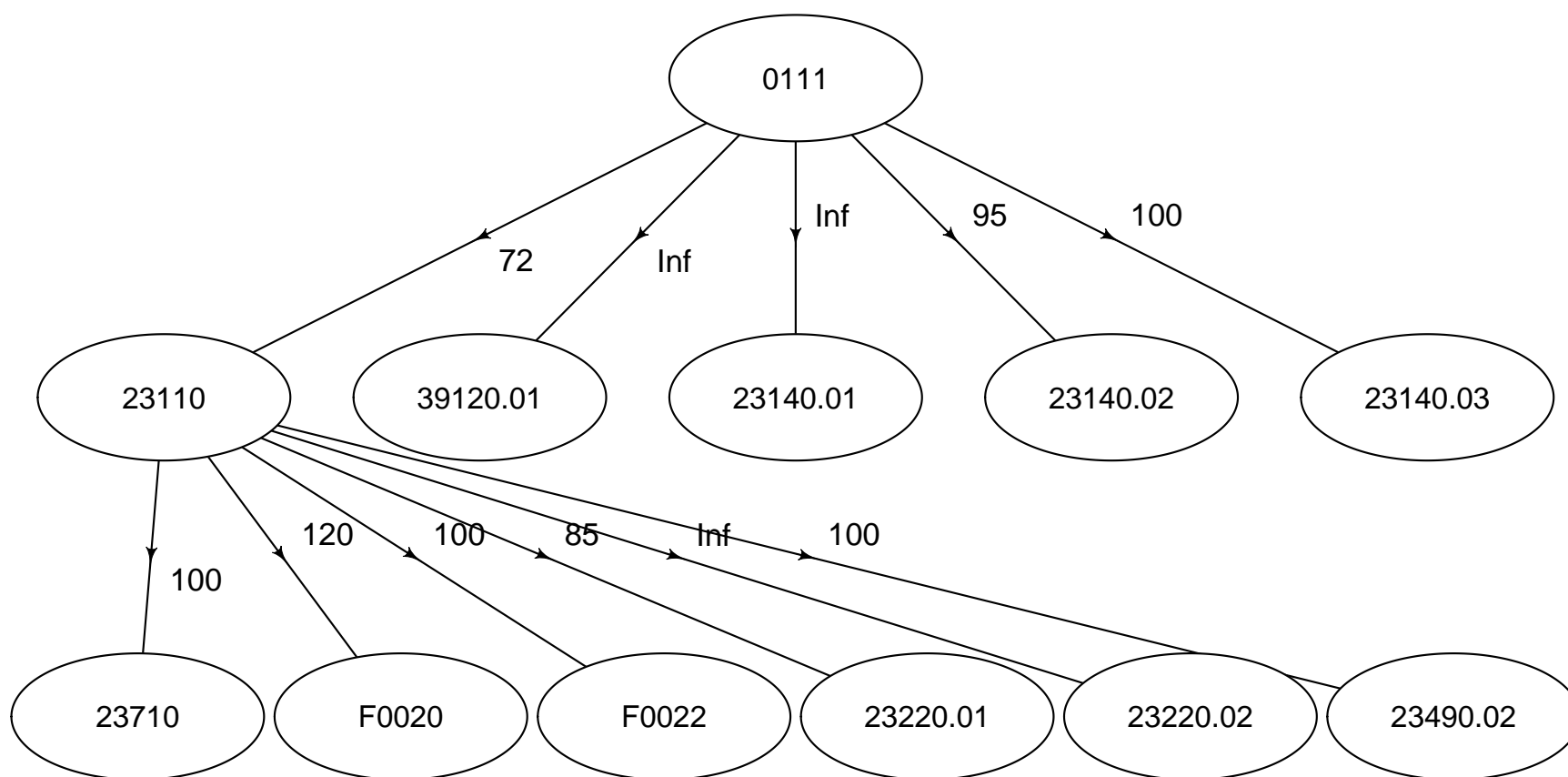
NOTE (Josh): This commodity tree above is derived based on the FCL commodity tree. It will likely need to be updated, but for now I just simply map the FCL elements to their corresponding CPC codes.

NOTE (Josh): At this point, we should also compute calories/proteins/fats.

NOTE (Josh): Need to keep track of the standard deviations as well so that we can balance at the end.

The first step in this process of creating the food balance sheets is to standardize all commodities up or down the commodity tree to the first processing level equivalent. Thus, our table is updated as follows:

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
23110	18652048	940150	1091842	-79048	18539484	0	192045	661375	0	0	0
23140.01	0	0	0	0	0	0	0	0	0	0	0

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
23140.02	5417628	575387	339204	-22960	3684	0	55781	192101	0	0	0
23140.03	22810383	1353145	1577172	-96672	98131	0	234860	808824	0	0	0
39120.01	0	203969	339161	0	0	0	0	0	0	0	0

NOTE (Josh): I'm not 100% confident this is the right approach, but it seems to make sense. We need to process wheat into flour so that we can create bran and germ, but we don't know how much to process down (as we haven't yet balanced the wheat). However, we could just simply standardize each element individually down into first level processing, and I think that should work.

Feed

Feed allocation must be done at this phase in order to ensure that we have reduced the feed demand by the corresponding amounts of feed products (i.e. wheat bran, wheat germ, etc.).

Balancing

Cattle Meat

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
21111.01	11921102	38234	62110	0	0	0	0	0	0	0	0
21111.02	0	14417	115383	0	0	0	0	0	0	0	0
21182	0	NA	NA	0	0	0	0	0	0	0	0
21185	0	NA	NA	0	0	0	0	0	0	0	0
21512.01	0	104	345149	0	0	0	0	0	0	0	0

Production

Trade

Stock Changes

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
21111.01	11921102	38234	62110	-1431	0	0	0	0	0	0	0

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
21111.02	0	14417	115383	NA	0	0	0	0	0	0	0
21182	0	NA	NA	NA	0	0	0	0	0	0	0
21185	0	NA	NA	NA	0	0	0	0	0	0	0
21512.01	0	104	345149	NA	0	0	0	0	0	0	0

Food

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
21111.01	11921102	38234	62110	-1431	NA	0	0	0	0	0	0
21111.02	0	14417	115383	NA	7793721	0	0	0	0	0	0
21182	0	NA	NA	NA	98	0	0	0	0	0	0
21185	0	NA	NA	NA	949	0	0	0	0	0	0
21512.01	0	104	345149	NA	NA	0	0	0	0	0	0

Losses

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
21111.01	11921102	38234	62110	-1431	NA	0	22766	0	0	0	0
21111.02	0	14417	115383	NA	7793721	0	NA	0	0	0	0
21182	0	NA	NA	NA	98	0	NA	0	0	0	0
21185	0	NA	NA	NA	949	0	NA	0	0	0	0
21512.01	0	104	345149	NA	NA	0	NA	0	0	0	0

Seed

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
21111.01	11921102	38234	62110	-1431	NA	0	22766	NA	0	0	0
21111.02	0	14417	115383	NA	7793721	0	NA	NA	0	0	0
21182	0	NA	NA	NA	98	0	NA	NA	0	0	0
21185	0	NA	NA	NA	949	0	NA	NA	0	0	0
21512.01	0	104	345149	NA	NA	0	NA	NA	0	0	0

Industrial Utilization

Work in progress. . .

Tourist Consumption

Work in progress. . .

Residual Other Uses

Work in progress. . .

Standardization
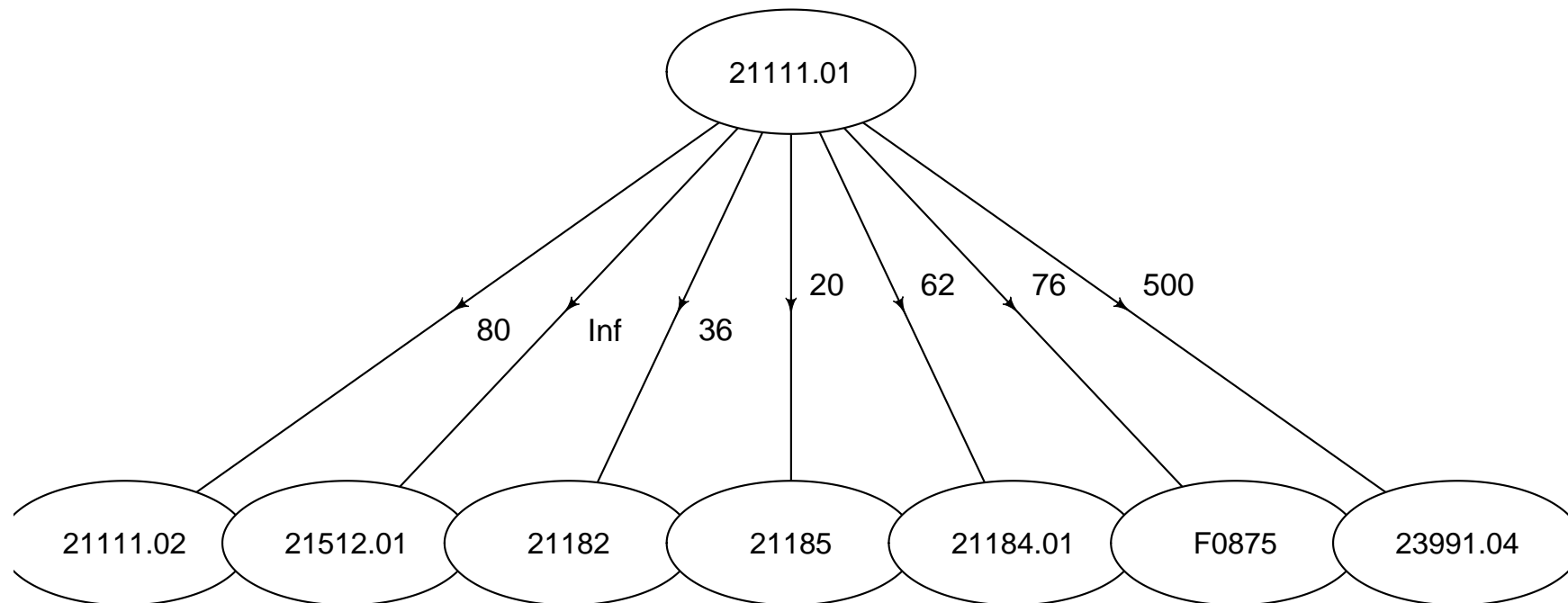
Feed

Balancing

Palm Oil

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
2165	0	NA	NA	0	0	0	0	0	0	0	0
21691.14	0	NA	NA	0	0	0	0	0	0	0	0
21700.02	3714000	NA	NA	0	0	0	0	0	0	0	0
34120	0	NA	NA	0	0	0	0	0	0	0	0
34550	0	NA	NA	0	0	0	0	0	0	0	0
F1243	194125	NA	NA	0	0	0	0	0	0	0	0
F1275	0	NA	NA	0	0	0	0	0	0	0	0

Production

Trade

Stock Changes

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
2165	0	NA	NA	NA	0	0	0	0	0	0	0
21691.14	0	NA	NA	NA	0	0	0	0	0	0	0
21700.02	3714000	NA	NA	3866	0	0	0	0	0	0	0
34120	0	NA	NA	0	0	0	0	0	0	0	0
34550	0	NA	NA	NA	0	0	0	0	0	0	0
F1243	194125	NA	NA	NA	0	0	0	0	0	0	0
F1275	0	NA	NA	NA	0	0	0	0	0	0	0

Food

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
2165	0	NA	NA	NA	0	0	0	0	0	0	0

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
21691.14	0	NA	NA	NA	15000	0	0	0	0	0	0
21700.02	3714000	NA	NA	3866	3729905	0	0	0	0	0	0
34120	0	NA	NA	0	NA	0	0	0	0	0	0
34550	0	NA	NA	NA	NA	0	0	0	0	0	0
F1243	194125	NA	NA	NA	175439	0	0	0	0	0	0
F1275	0	NA	NA	NA	NA	0	0	0	0	0	0

Losses

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
2165	0	NA	NA	NA	0	0	NA	0	0	0	0
21691.14	0	NA	NA	NA	15000	0	NA	0	0	0	0
21700.02	3714000	NA	NA	3866	3729905	0	NA	0	0	0	0
34120	0	NA	NA	0	NA	0	NA	0	0	0	0
34550	0	NA	NA	NA	NA	0	NA	0	0	0	0
F1243	194125	NA	NA	NA	175439	0	NA	0	0	0	0
F1275	0	NA	NA	NA	NA	0	NA	0	0	0	0

Seed

Item	Production	Imports	Exports	StockChange	Food	Feed	Waste	Seed	Industrial	Tourist	Residual
2165	0	NA	NA	NA	0	0	NA	NA	0	0	0
21691.14	0	NA	NA	NA	15000	0	NA	NA	0	0	0
21700.02	3714000	NA	NA	3866	3729905	0	NA	NA	0	0	0
34120	0	NA	NA	0	NA	0	NA	NA	0	0	0
34550	0	NA	NA	NA	NA	0	NA	NA	0	0	0
F1243	194125	NA	NA	NA	175439	0	NA	NA	0	0	0
F1275	0	NA	NA	NA	NA	0	NA	NA	0	0	0

Industrial Utilization
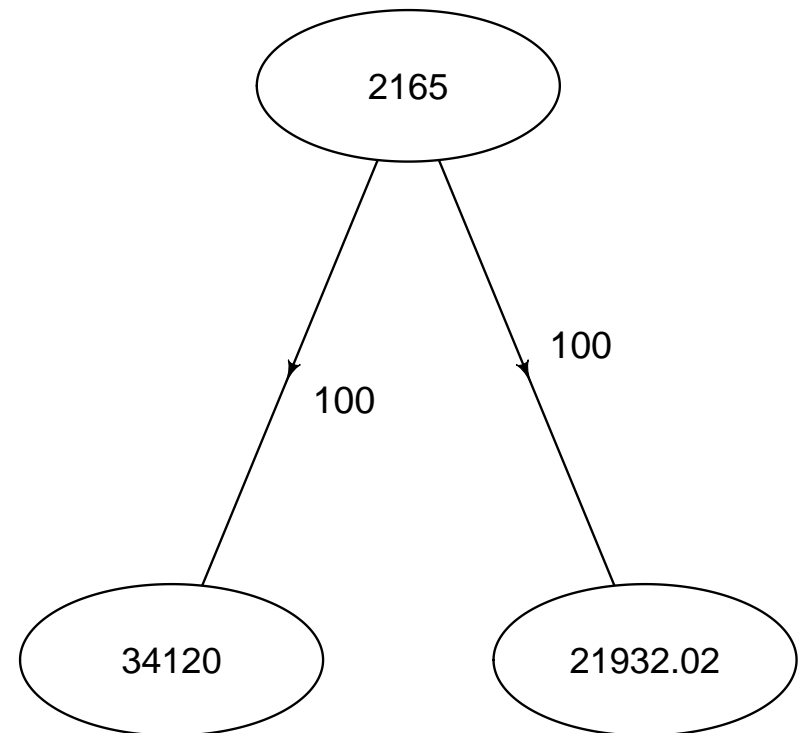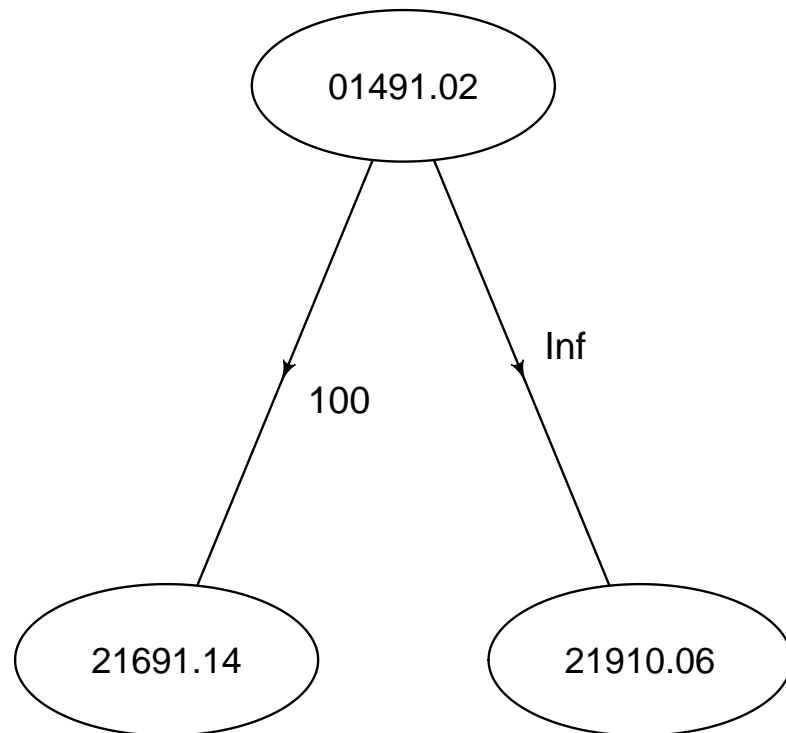
Work in progress. . .

Tourist Consumption

Work in progress. . .

Residual Other Uses

Work in progress. . .

Standardization

NOTE (Josh): This commodity tree looks like two separate trees. But, the two parent nodes can actually be processed into many of the same children. I'm not sure what the logic was for historically rolling up some of the children into one of the parents and some of the children into the other parent, but that would presumably need to be reviewed/revised.

```
        01491.02                                    2165
       /        \                                  /      \
    100          Inf                            100        100
     /            \                            /            \
 21691.14      21910.06                     34120        21932.02
```

Feed

Balancing