Weekly Coal Production Estimation Methodology

Step 1 (Estimate total amount of weekly U.S. coal production)

U.S. coal production for the current week is estimated using a ratio estimation from the given equation below;

$$\widehat{\boldsymbol{P}}_{\boldsymbol{w(t)}} = \boldsymbol{C}_{\boldsymbol{w(t)}} \times \boldsymbol{\mu}_{\boldsymbol{pc_q}} \times \left\{\mathbf{1} + \tfrac{\mathbf{2}}{\mathbf{3}}\left(\boldsymbol{\delta}_{\boldsymbol{pc_q}} - \mathbf{1}\right)\right\} \qquad (1)$$

where

$\widehat{\boldsymbol{P}}_{\boldsymbol{w(t)}} = Estimated\ total\ U.S.\ coal\ production\ for\ the\ current\ week$

$\boldsymbol{C}_{\boldsymbol{w(t)}} = Total\ number\ of\ U.S.\ railcar\ loadings\ of\ coal\ for\ the\ current\ week$

$\boldsymbol{\mu}_{\boldsymbol{pc_q}} = A\ weighted\ average\ of\ the\ ratio\ of\ production\ over\ railcar\ loadings.$
A three-quarter average is used to lessen quarter-to-quarter changes in the estimated ratio. More weight is given to the quarter one year earlier to account for any seasonal fluctuations.

$$i.e.\ \boldsymbol{\mu}_{\boldsymbol{pc_q}} = \tfrac{1}{4}\left(\frac{P_{q(t-3)}}{C_{q(t-3)}}\right) + \tfrac{1}{2}\left(\frac{P_{q(t-4)}}{C_{q(t-4)}}\right) + \tfrac{1}{4}\left(\frac{P_{q(t-5)}}{C_{q(t-5)}}\right)$$

where
$\boldsymbol{P}_{\boldsymbol{q(t)}} = Total\ coal\ production\ for\ the\ current\ quarter\ (U.S.Total)$
$\boldsymbol{C}_{\boldsymbol{q(t)}} = Total\ railcar\ loadings\ of\ coal\ for\ the\ current\ quarter\ (U.S.Total)$

$\boldsymbol{\delta}_{\boldsymbol{pc_q}} = A\ growth\ rate\ to\ allow\ for\ change\ in\ the\ ratio\ of\ production\ tons\ per\ railcar\ loading\ of\ coal.\ This\ computes\ the\ change\ in\ a\ three\text{-}quarter\ average\ over\ the\ course\ of\ one\ year.\ This\ is\ multiplied\ by\ 2/3\ \ to\ moderate\ extreme\ values.\ Unlike\ \boldsymbol{\mu}_{\boldsymbol{pc_q}},\ \ this\ is\ computed\ using\ the\ most\ recent\ data\ available\ from\ MSHA,\ \ which\ is\ usually\ a\ two\text{-}quarter\ lag,\ \ although\ it\ may\ be\ a\ one\text{-}quarter\ lag\ for\ the\ last\ few\ weeks\ of\ a\ quarter.$

$$i.e.\ \boldsymbol{\delta}_{\boldsymbol{pc_q}} = \left(\frac{\Sigma\left(P_{q(j)} + P_{q(j-1)} + P_{q(j-2)}\right) \Big/ \Sigma\left(C_{q(j)} + C_{q(j-1)} + C_{q(j-2)}\right)}{\Sigma\left(P_{q(j-4)} + P_{q(j-5)} + P_{q(j-6)}\right) \Big/ \Sigma\left(C_{q(j-4)} + C_{q(j-5)} + C_{q(j-6)}\right)}\right), \qquad \boldsymbol{\delta}_{\boldsymbol{pc_q}} \in [0.95,\ \ 1.05]$$

where
$\boldsymbol{P}_{\boldsymbol{q(j)}} = Most\ recently\ available\ quarterly\ coal\ production\ (U.S.Total)$
$\boldsymbol{C}_{\boldsymbol{q(j)}} = Total\ railcar\ loadings\ of\ coal\ for\ quarter\ j\ (U.S.Total)$

Step 2 (Allocate to state level)

Allocate weekly U.S. coal production estimated in **Step 1** above to the state level by using state production share of the latest available quarterly coal production data from MSHA. Aggregate state level data to get coal basin and other regional level totals.

The estimated U.S. coal production for the current week in **Step 1** is allocated to the state level by using the following formula;

$$\widehat{\boldsymbol{SP}}_{\boldsymbol{w(t)}} = \widehat{\boldsymbol{P}}_{\boldsymbol{w(t)}} \times \boldsymbol{\mu}_{\boldsymbol{sps_q}} \times \left\{\mathbf{1} + \tfrac{\mathbf{2}}{\mathbf{3}}\left(\boldsymbol{\delta}_{\boldsymbol{sps_q}} - \mathbf{1}\right)\right\} \qquad (2)$$

where

$\widehat{\boldsymbol{SP}}_{\boldsymbol{w(t)}} = Estimated\ coal\ production\ of\ a\ specific\ state\ for\ the\ current\ week$

$\widehat{\boldsymbol{P}}_{\boldsymbol{w(t)}} = Estimated\ total\ U.S.\ coal\ production\ for\ the\ current\ week$

$\boldsymbol{\mu}_{\boldsymbol{sps_q}} = A\ weighted\ average\ of\ the\ coal\ production\ share\ for\ a\ state$

$$i.e.\ \boldsymbol{\mu}_{\boldsymbol{sps_q}} = \tfrac{1}{4}\left(\frac{SP_{q(t-3)}}{P_{q(t-3)}}\right) + \tfrac{1}{2}\left(\frac{SP_{q(t-4)}}{P_{q(t-4)}}\right) + \tfrac{1}{4}\left(\frac{SP_{q(t-5)}}{P_{q(t-5)}}\right)$$

where
$\boldsymbol{SP}_{\boldsymbol{q(t)}} = Total\ coal\ production\ for\ the\ current\ quarter\ (State\ Total)$
$\boldsymbol{P}_{\boldsymbol{q(t)}} = Total\ coal\ production\ for\ the\ current\ quarter\ (U.S.Total)$

$\boldsymbol{\delta}_{\boldsymbol{sps_q}} = A\ growth\ rate\ of\ the\ coal\ production\ share\ for\ a\ state$

$$i.e.\ \boldsymbol{\delta}_{\boldsymbol{sps_q}} = \left(\frac{\sum\left(SP_{q(j)} + SP_{q(j-1)} + SP_{q(j-2)}\right) \Big/ \sum\left(P_{q(j)} + P_{q(j-1)} + P_{q(j-2)}\right)}{\sum\left(SP_{q(j-4)} + SP_{q(j-5)} + SP_{q(j-6)}\right) \Big/ \sum\left(P_{q(j-4)} + P_{q(j-5)} + P_{q(j-6)}\right)}\right), \qquad \boldsymbol{\delta}_{\boldsymbol{sps_q}} \in [0.71,\ 1.41]$$

where
$\boldsymbol{SP}_{\boldsymbol{q(j)}} = Most\ recently\ available\ quarterly\ coal\ production\ (State\ Total)$
$\boldsymbol{P}_{\boldsymbol{q(j)}} = Most\ recently\ available\ quarterly\ coal\ production\ (U.S.Total)$

The subsequent remainder (if any) of the estimated U.S. weekly coal production amount is allocated proportionally to each state using the same methodology as equation (2) above.