Identifying Highly-Correlated Country-Crop Pairs using the World Food Programme Food Prices Database

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Dataset:

- The dataset is maintained by World Food Programme and observations are monthly. It contains food price information ranging from 1990 to 2020 for 99 different countries. There are over 1.3 million observations in the dataset, with each observation denoting a unique date, country, (sub-national) market, and crop.

Discussion of Results:

- To ensure enough observations for the correlations, the data was filtered just to country-crop pairs where both countries had at least 175 months of data for the crop. This resulted in 295 unique pairs.
- Multiple classifications for a single commodity were treated separately, such as “Maize (white) – Wholesale,” “Maize – Retail,” and “Maize (white) – Retail.”
- When “National Average” prices were not given, the price for a specific crop and month was the simple average of prices across subnational markets for a given date.
- The most correlated crops were millets, maize, sorghum, and rice. Highly-correlated returns would imply that the markets for these commodities are more integrated. The majority of highly-correlated pairs are neighboring or nearby countries, and predominantly African countries.
- Country-crop pairs with correlation >= 0.40 are shown below, and return distributions and price charts for selected country-crop pairs are shown on the next page.

Crop	Pair	Minimum Date	Maximum Date	Overlapping Observations	Correlation of Returns
Millet - Retail	Burkina Faso;Mali	Feb 2003	Dec 2019	201	0.651
Maize (white) - Wholesale	Guatemala;El Salvador	Feb 2005	Jun 2019	171	0.641
Maize - Retail	Niger;Burkina Faso	Feb 2003	Dec 2019	201	0.637
Sorghum - Retail	Burkina Faso;Mali	Feb 2003	Dec 2019	201	0.577
Sorghum - Retail	Niger;Burkina Faso	Feb 2003	Dec 2019	200	0.568
Millet - Retail	Niger;Burkina Faso	Feb 1992	Dec 2019	334	0.490
Sorghum - Retail	Niger;Mali	Feb 2003	Dec 2019	198	0.490
Carrots - Retail	Tajikistan;Kyrgyzstan	Feb 2005	May 2019	169	0.488
Rice (imported) - Retail	Somalia;Malawi	Mar 1998	Dec 2019	253	0.486
Wheat flour - Retail	Afghanistan;Pakistan	Feb 2004	Jun 2019	185	0.478
Sorghum - Retail	Niger;Chad	Nov 2003	Dec 2019	189	0.459
Maize - Retail	Niger;Chad	Nov 2003	Dec 2019	190	0.446
Maize (white) - Retail	Mozambique;Zambia	Feb 2003	Nov 2019	194	0.433
Sorghum - Retail	Senegal;Mali	Feb 2003	Dec 2019	201	0.418
Sorghum - Retail	Burkina Faso;Chad	Nov 2003	Dec 2019	192	0.411
Millet - Retail	Burkina Faso;Chad	Nov 2003	Dec 2019	194	0.407
Sorghum - Retail	Mali;Chad	Nov 2003	Dec 2019	190	0.401

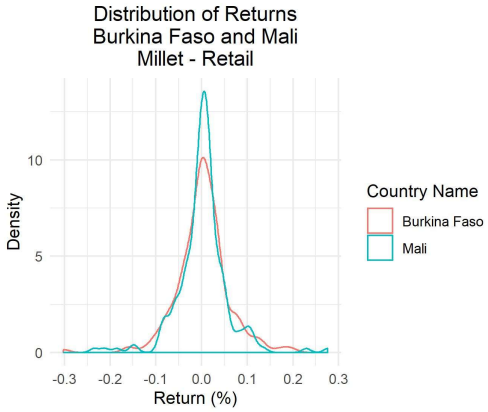
Assumptions:

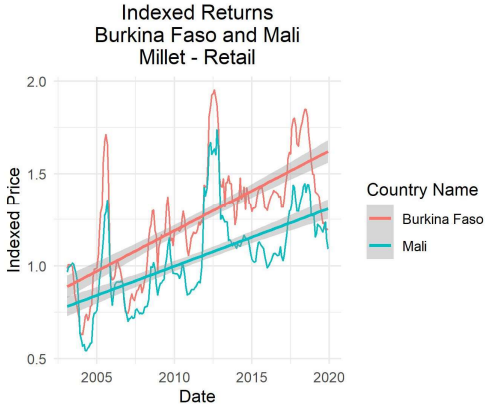
- Prices are listed in local currencies, which means currency movements influence the correlation calculation. This approach therefore already assesses currency risk, important for hedging purposes.
- Units are not always consistent within a crop between countries, and price adjustments were not made based on units. Since returns are in percentages, returns would not change with conversion factors.
- As shown on the next page, the seasonality of agricultural crops leads to significant “peaks” and “valleys” in crop price returns. Also, if harvests for the same crop happen at different times of the year between countries, similar-magnitude returns will be “shifted” in time and will not show correlation. Accounting for this would require smoothing or classifying and comparing “in-season” and “off-season” returns.

Source: Data from World Food Programme and maintained on UN OCHA HDX, available at: https://data.humdata.org/dataset/wfp-food-prices

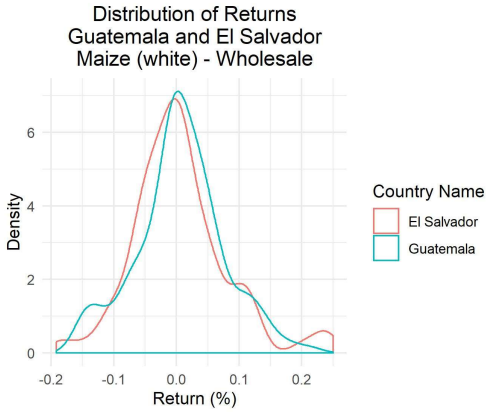
Return Distributions and Indexed Returns for Selected Highly-Correlated County-Crop Pairs

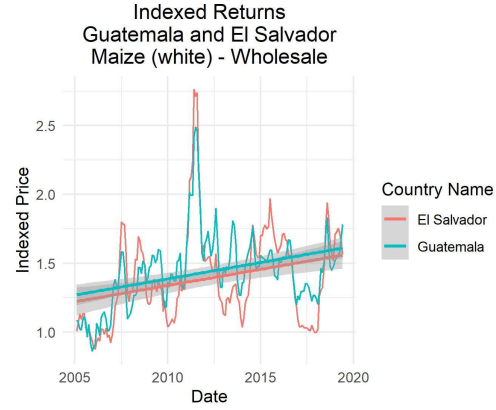
#1 Burkina Faso and Mali Millet - Retail



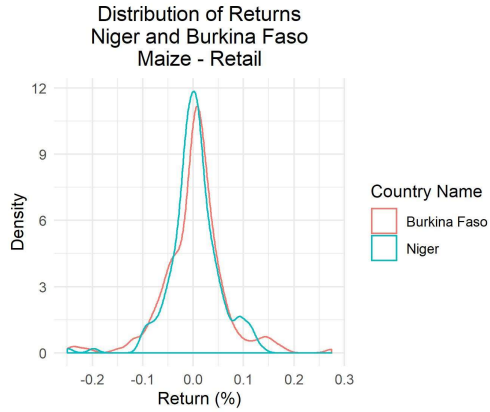


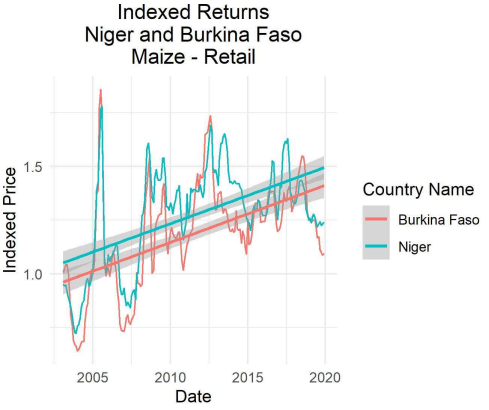
#2 Guatemala and El Salvador Maize (white) - Wholesale



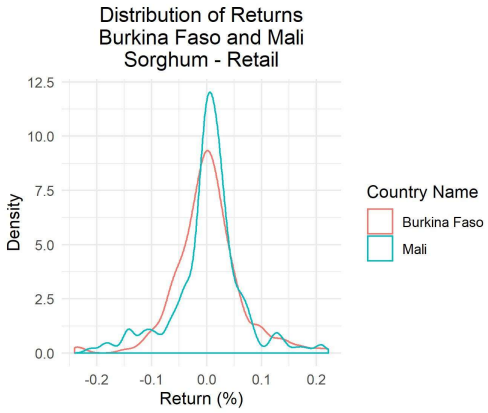


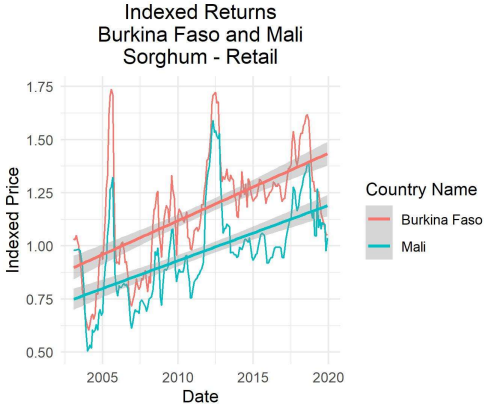
#3 Niger and Burkina Faso Maize - Retail



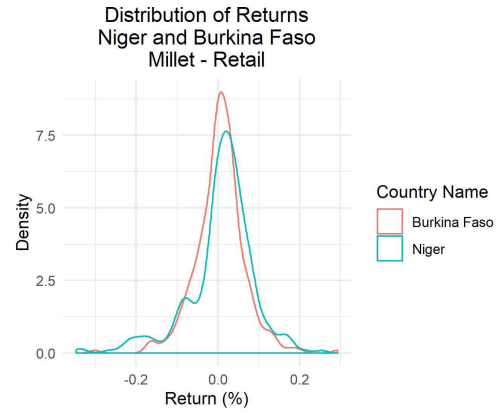


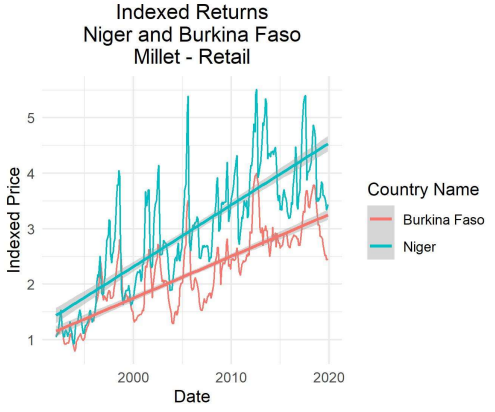
#4 Burkina Faso and Mali Sorghum - Retail





#6 Niger and Burkina Faso Millet - Retail





#8 Tajikistan and Kyrgyzstan Carrots - Retail