**Modelling small open developing economies in a financialized world – Adaptation for Colombian economy.**

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**Consistencia.**

Iniciamos con la identidad de la hoja de balance del Banco Central en su forma flujo:

Reemplazamos la definición del cambio requerido en las reservas bancarias:

Incorporamos las necesidades totales de financiamiento de los bancos:

Simplificando llegamos a:

Sumamos los préstamos en moneda divisa a ambos lados de la ecuación (multiplicados por la tasa de cambio nominal):

Sustraemos la variación de los depósitos en dólares de las firmas (multiplicados por la tasa de cambio nominal):

Sumamos a ambos lados la inversión extranjera directa que llega a las firmas, sabiendo que :

Ahora reemplazamos por el ahorro de las firmas debido a que :

El ahorro de los bancos es igual a los ingresos retenidos , por lo tanto:

Partiendo de que y reorganizando términos, llegamos a que:

Incorporamos

Reemplazamos la identidad de la balanza de pagos

Simplificamos sabiendo que

Tomando la definición de la cuenta corriente, tenemos que:

Finalmente, tomando en cuenta la relación entre el ahorro del sector público y la emisión de deuda, dada por , llegamos a

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Industry | | Households | Banks | | Central Bank | | Government | RoW | ∑ |
| Current | Capital |  | Current | Capital | Current | Capital |
| Consumption  Realized Investment  Government Spending  Imports  Exports  ***[GDP]*** |  |  |  |  |  |  |  |  |  | 0  0  0  0  0 |
| Wages  Taxes on Imports  Taxes on Exports  ***[Gross Operating Surplus]*** |  |  |  |  |  |  |  |  |  | 0  0  0 |
| Interest on Deposits  Interest on Firms Loans  Interest on Households Loans  Interest on Firms FX Loans  Interest on Banks FX Loans  Interest on Bonds  Interest on Advances  Firms Dividends  Banks Dividends  ***[Gross National Income]*** |  |  |  |  |  |  |  |  |  | 0  0  0  0  0  0  0  0  0 |
| Remittances  Central Bank Profits  Taxes on Income and Profits  Welfare Spending  Savings |  |  |  |  |  | 0 | 0 |  |  | 0  0  0  0  0 |
| [Capital]  [Inventories] |  |  |  |  |  |  |  |  |  |  |
| Deposits  Reserves  Firms Loans  Households Loans  Bonds  Advances  FX deposits  FX Reserves  Firms FX Loans  Banks FX Loans  Firms Equities Owned by the RoW  Banks Equities Owned by the RoW |  |  |  |  |  |  |  |  |  | 0  0  0  0  0  0  0  0  0  0  0  0 |
| ∑ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Industry | | Households | Banks | | Central Bank | | Government | RoW | ∑ |
| Current | Capital |  | Current | Capital | Current | Capital |
| Consumption  Realized Investment  Government Spending  Imports  Exports  ***[GDP]*** | 165.7023673 |  |  |  |  |  |  | -20 |  | 0  0  0  0  0 |
| Wages  Taxes on Imports  Taxes on Exports  ***[Gross Operating Surplus]*** |  |  |  |  |  |  |  |  |  | 0  0  0 |
| Interest on Deposits  Interest on Firms Loans  Interest on Households Loans  Interest on Firms FX Loans  Interest on Banks FX Loans  Interest on Bonds  Interest on Advances  Firms Dividends  Banks Dividends  ***[Gross National Income]*** |  |  |  |  |  |  |  |  |  | 0  0  0  0  0  0  0  0  0 |
| Remittances  Central Bank Profits  Taxes on Income and Profits  Welfare Spending  Savings |  |  |  |  |  | 0 | 0 |  |  | 0  0  0  0  0 |
| [Capital]  [Inventories] |  |  |  |  |  |  |  |  |  |  |
| Deposits  Reserves  Firms Loans  Households Loans  Bonds  Advances  FX deposits  FX Reserves  Firms FX Loans  Banks FX Loans  Firms Equities Owned by the RoW  Banks Equities Owned by the RoW |  |  |  |  |  |  |  |  |  | 0  0  0  0  0  0  0  0  0  0  0  0 |
| ∑ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |

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| **Initial Values** | | | |
| Expected Sales |  | Government Bonds Owned by the RoW |  |
| Inventories |  | Greenfield Foreign Direct Investment |  |
| Capital Stock |  | Portfolio Foreign Direct Investment |  |
| Households Deposits | 30 | Firms Equities Owned by the RoW |  |
| Firms Indebtness (Domestic Currency) | 40 | Banks Equities Owned by the RoW |  |
| Liquidity Advances | 70 | Equities Owned by the RoW |  |
| Banks Reserves | 3 | Households Indebtness |  |
| Government Debt |  |  |  |
| Government Debt Owned by the Households |  | Desired Consumption |  |
| Historical Unitary Cost |  | Government Deposits |  |
| Banks Own Funds |  | Public Investment |  |
| Armington Propensity to Import – Exports |  | Nominal wages |  |
| Armington Propensity to Import – Investment |  | Government Bonds Owned by the Banks | 75 |
| Armington Propensity to Import – Consumption | 0.250535535322 |  |  |
| Armington Propensity to Import – Public Spending | 0.1175548075 |  |  |
| Exports Elasticity |  |  |  |
| FX Loans Arbitrage Parameter |  |  |  |
| World GDP |  |  |  |
| Population |  |  |  |
| Output to Labour Ratio |  |  |  |
| Domestic Price Level | 1 |  |  |
| International Price Level |  |  |  |
| Nominal Exchange Rate |  |  |  |
| Expected Nominal Exchange Rate |  |  |  |
| Premium on Loans |  |  |  |
| Interest Rate on Domestic Loans |  |  |  |
| Firms FX Indebtness |  |  |  |
| Banks FX Indebtness |  |  |  |
| FX Deposits |  |  |  |
| Interest Rate on FX Loans |  |  |  |
| FX Reserves |  |  |  |
| FX Reserves Owned by the Central Bank |  |  |  |
| FX Reserves Owned by the Banks |  |  |  |

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| Parameter | **Description** | **Value** | Parameter | **Description** | **Value** |
|  | Population growth rate | 0,015 |  | Proﬁt retention rate | 0,45 |
|  | Labour productivity growth rate | 0,0384 |  | Minimum FX borrowing ratio for ﬁrms | 0 |
|  | Output adjustment speed | 4 |  | Tax rate on proﬁts | 0,253 |
|  | Desired Inventory ratio | 0,25 |  | Arbitrage parameter for ﬁrms | 0 |
|  | Labour productivity | 0,21 |  | Speed of adjustment of ﬁrm debt currency allocation | 0 |
|  | Capital productivity | 0,4 |  | Firm FX deposits ratio to Firm FX debt | 0 |
|  | Elasticity of consumption imports | 0,7 |  | Exogenous share of bank bond demand | 0,7 |
|  | Elasticity of investment imports | 0,22 |  | Elasticity of bank bond demand to relative lending rates | 1 |
|  | Elasticity of export-input imports | 0,3 |  | Scaling parameter for domestic banks’ bond demand | 0,155118 |
|  | Elasticity of government spending imports | 0,2 |  | Scaling parameter for global bank leverage | 0 |
|  | Armington share parameter for consumption bundle | 0,823563 |  | Elasticity of global bank leverage to risk | -4 |
|  | Armington share parameter for investment bundle | 0,943976 |  | Elasticity of global bank leverage to foreign policy rates | -4 |
|  | Armington share parameter for export bundle | 0,990253 |  | Scaling parameter for cross-border lending supply | 0,0426 |
|  | Armington share parameter for government bundle | 0,999957 |  | Ratio of global banks’ own funds to world GDP | 0,1 |
|  | Minimum import intensity thresholds | - |  | Speed of adjustment for cross-border lending rate | 2 |
|  | Tax Rate on Imports | 0,025 |  | Speed of adjustment for premium on lending rates | 2 |
|  | Elasticity of exports to real exchange rate | 0,75 |  | Exogenous parameter in premium on lending rates | 0,005 |
|  | Scaling parameter in export share | 0,0080233 |  | Scaling parameter in premium on lending rates | 0,00096 |
|  | Import adjustment speed | 1 |  | Elasticity of premium to total debt/expected proﬁt ratio | 2 |
|  | Export adjustment speed | 1 |  | Required reserve ratio on domestic currency deposits | 0,1 |
|  | Tariffs on Exports | 0,25 |  | Capital adequacy ratio | 0,12 |
|  | Exógenous mark-up | 0 |  | Speed of adjustment to regulatory CAR ratio | 1 |
|  | Sensitivity of mark-up to inventories | 0 |  | Scaling parameter for markdown on deposit rates | 0,00047868 |
|  | Percentage of price-adjusting firms | 0,2 |  | Elasticity of mark-down on deposit rates to bank liquidity | 0,8 |
|  | Depreciation rate | 0,2 |  | Inverse maturity of domestic currency debt of ﬁrms | 0,2 |
|  | Autonomous investment | 0,23 |  | Tax rate on bank proﬁts | 0,2 |
|  | Sensitivity of investment to expected real proﬁt rate | - |  | Ratio of government spending to total production | 0,2743 |

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| --- | --- | --- | --- | --- | --- |
|  | Ratio of welfare spending per unemployed to wages | 0,08 |  | Speed of exchange rate adjustment | 0,8 |
|  | Tax rate on wages | 0,025 |  | Speed of exchange rate expectations adjustment | 0,9 |
|  | Scaling parameter on government bond interest rate | 0,05 |  | Elasticity of exchange rate expectation to interest diﬀerential | 1 |
|  | Sensitivity of interest on bonds to public debt/GDP ratio | 1 |  | Scaling parameter in exchange rate expectations | 1 |
|  | Exogenous real interest rate in the Taylor Rule | 0,0325 |  | Ratio of remittances to world GDP | 0,0004 |
|  | Sensitivity of Taylor Rule to inﬂation | 1 |  | Scaling parameter for risk | 0,015 |
|  | Target FX reserve/Imports ratio for central bank | - |  | Scaling parameter for risk sigmoid | 5 |
|  | Speed of adjustment of the Phillips curve | 0,9 |  | Sensitivity of risk to net investment position | 300 |
|  | Exogenous nominal wage growth rate | 0,06 |  | Exegenous risk at zero IIP | - |
|  | Sensitivity of nominal wages to employment rate | 0,12 |  | Foreign policy rate | 0,0537032 |
|  | Base employment rate in wage dynamics | 0,8 |  | Foreign bond rate | 0,0505997 |
|  | Sensitivity of nominal wages to inﬂation | 1 |
|  | Scaling parameter for mpc out of wages | 1,15768 |
|  | Scaling parameter for mpc out of capital income | 0,902923 |
|  | Scaling parameter for mpc out of wealth | 1,14086 |
|  | Elasticity of mpc out of wages to real deposit rates | 0 |
|  | Elasticity of mpc out of capital income to real deposit rates | 0 |
|  | Elasticity of mpc out of capital income to real deposit rates | 0 |
|  | Adjustment speed of consumption to target | 4 |
|  | Exogenous share of household bond holdings | 0 |
|  | Scaling parameter for household bond holdings | - |
|  | Elasticity of household bond holding to relative returns | 0 |
|  | Ratio of global portfolio ﬂows to world GDP | - |
|  | Scaling coeﬃcient for foreign portfolio ﬂows | 0,1 |
|  | Arbitrage parameter for portfolio ﬂows | 0 |
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| --- | --- | --- |
|  | Autonomous Exports | 12 |
|  |  |  |
|  |  |  |