Asian Economic and Financial Review

journal homepage: http://aessweb.com/journal-detail.php?id=5002

COMOVEMENTS AND STRUCTURAL FACTORS OF MACROECONOMIC VOLATILITY IN DEVELOPING AND TRANSITION ECONOMIES: A DYNAMIC PANEL DATA APPROACH

Ichraf OUECHTATI

Applied Microeconomics Research Laboratory (LARMA) PhD Scholar, Faculty of Economic Sciences and Management of Tunis University of Tunis ElManar, Tunisia

Amira ZAOUALI

PhD Scholar, Faculty of Economic Sciences and Management of Tunis University of Tunis ElManar, Tunisia

ABSTRACT

This study examines the comovements of some economic variables and explores the structural factors of macroeconomic volatility in developing and transition economies, using dynamic panel technique. According to an analysis of variance and covariance, we conclude that macroeconomic volatilities are higher in these countries compared to developed economies and consumption volatilities exceed those of production in developing and transition economies. This finding shows that these countries don't maintain their behaviour of consumption smoothing. This, consequently, implies a proof of failure of their financial markets. Using data for 44 countries during 1960- 2010, our GMM estimation results indicate that government expenditures, consumption and GDP volatilities are the major determinants of macroeconomic volatility. The most influential external factors on macroeconomic fluctuations are terms of trade and commercial opening volatilities.

Keywords: Macroeconomic volatility, Structural factors, Dynamic panel.

JEL Codes: E32, C33, O43.

1. INTRODUCTION

The last years have seen several important advances in the empirical works on macroeconomic volatility. Some authors argue that an excessive volatility of output could have negative effects on long term growth and welfare (Aizenman and Pinto, 2005; Kose *et al*., 2005). Others consider that the empirical connection between macroeconomic volatility and lack of development are undeniable, making volatility a fundamental development concern Loayza (2007). Hakura (2007) declares that, over the past three decades, output volatility and the size of output drops have declined across all countries, but remain considerably higher in developing countries than in developed economies. He suggests that the key determinants of volatility and output drops are

fiscal spending and terms of trade volatilities and exchange rate flexibility. Other researchers argue that imports are more volatile than exports in developing countries (Fanelli, 2005a) and that output volatility produced by the increase of consumption fluctuations could generate a significant welfare costs (Wolf, 2005). According to this literature, it is necessary to identify the sources of macroeconomic volatility if we aim to find the way to smooth it. In the light of these considerations, we choose to examine the comovements of some macroeconomic variables and to determine the different domestic and external structural factors which can explain macroeconomic volatility in developing and transition economies. The remainder of the paper is organized as follows: section 2 presents the analysis of the excessive volatility in developing and transition economies and the study of comovements of some macroeconomic variables. Section 3 investigates empirically the domestic and external structural factors of macroeconomic volatility in developing and transition countries. Section 4 concludes.

1.1. Comovements

We try to demonstrate, in this section, if an excess volatility exists in developing and transition economies by examining the comovements of some macroeconomic variables.

1.2. Excess Volatility

In this section, we try to estimate and to compare some macroeconomic volatilities between a sample of developing and transition economies and some OECD countries. Macroeconomic volatility is measured by a standard deviation over a centered rolling seven year- period, based on a sample of 16 developing and transition countries and four OECD countries (see tables 1 and 2 in the Appendix). Our analysis of macroeconomic volatility is focused on the examination of the growth rate volatilities of four macroeconomic variables (GDP, household final consumption expenditure, investment, general government final consumption expenditure) over the period 1960-2010, which data is obtained from the World Development Indicators (2007) and the website www.worldbank.org. The comparison of different values of macroeconomic volatilities indicates generally that those of developing and transition countries are higher than those of OECD countries. The GDP growth rates volatilities in these last ones vary from 0.864 to 2.9. However, they reach a maximum of 8.357% in the first category of countries. Idem for the volatilities of household consumption and government expenditure growth rates which their values don't exceed 3.1% for OECD countries and they fluctuate between 0.679% and 18.650% in developing and transition economies. In this context, Fagernas and Singh (2006) examine the question of differences in terms of volatilities between developing countries and developed economies. They argue that there are four different approaches in the literature which study economic instability and its variation between countries. The first one refers to the literature on the globalization, in particular the financial globalization which can increase not only economic growth but also makes it more unstable Ito (2004), IMF outlook (1999). This conclusion was not supported by Stiglitz (2000), Easterly *et al.* (2000) which show that volatility increased in developing countries without

contributing inevitably to a faster economic growth. According to our calculations, this first assertion is verified in the case of Egypt, India, South Africa and Venezuela. Indeed, the average growth rates GDP in five decades reported in table 3 (Appendix) show well the increase of growth rates in nine countries (Ecuador, Egypt, India, Jordan, Morocco, Philippines, South Africa, Peru and Venezuela) during the last two decades which were characterized by the appearance of financial globalization. However, growth rate GDP volatility decreased only in five countries (Ecuador, Jordan, Morocco, Philippines and Peru). The second assertion is confirmed, in particular, in the case of Uruguay and Venezuela. Indeed, growth rate GDP volatility largely increased in these two countries (the rate varied from 4.856 between 1991 and 2000 to 8.357 between 2001 and 2010 in Venezuela and varied from 3.989 to 5.394 in Uruguay and from 2.186 to 3.734 in Venezuela).

The second approach is based on globalization in terms of growth and economic instabilities. It supports that the majority of developing countries is characterized by a lower growth and a bigger volatility during 1980's and 1990's by comparison to the previous period. This is generally valid for the growth rate of almost selected countries but this is not confirmed for the volatility (only six countries of our sample have an increase of their volatilities). The third approach discusses the social problems of developing countries such as unemployment generated by economic instability. The fourth approach is interested by the cycles in the economic analysis. We, also, note that the comparison of different volatilities within our group of developing countries generally seems to indicate that Tunisia, South Africa, Philippines, Thailand, India, Egypt and Ecuador are in a better position compared to the other countries.

1.3. Comovements of Output and Consumption

The permanent income and life cycle hypotheses of Friedman (1957) and Modigliani and Brumberg (1954) stipulate that individuals save and accumulate wealth in order to smooth their cycle of consumption. The household consumption should be less volatile and not correlated to the domestic income to support the idea that financial market can generate behaviour of consumption smoothing. According to calculations of volatilities reported in table 2 of the Appendix, we conclude that the volatilities of consumption exceed those of production in particular those of Ivory Coast, Jordan and Venezuela. This finding shows that these economies don't maintain their behaviour of consumption smoothing. This, hence, indicates that their financial markets are underdeveloped. We find, over the last two decades, that Tunisia and Peru were able to smooth their consumption during this period. Thailand, Argentina and Turkey have a less volatile level of consumption compared to production only in the last decades. Figures in the Appendix, presenting the superimposing between the volatilities of GDP and private consumption growth rates (measured by the variance of twelve observations), indicate that consumption volatilities are higher than those of GDP. Interested by the evolution in 2000's, we can note that Thailand, Tunisia, South Africa, Argentina, Peru and Turkey have a stable financial systems compared to the other countries. For example, Tunisian consumption growth rate volatility was 5.061 between 1960 and 1970 and

4.214 between 1971 and 1980 while GDP growth rate volatility was 4.458 during the sixties and 4.033 during the seventies. These values changed gradually the next decades. Consumption growth volatility decreases by 0.68 approximately between 2001 and 2010 and GDP growth rate volatility is 1.416 during this period. This implies, consequently, the improvement of Tunisian financial system.

1.4. Comovements of output, consumption, investment and trade balance

Investment and consumption volatilities must be considered optimal in absence of market imperfections. Therefore, the comovements of production, investment and consumption have to satisfy some conditions at the aggregate level in order to reach the optimality. According to the strategy of Fanelli (2008), we are going to specify such conditions and to verify their validity in the case of our selected developing and transition countries.

Consumption can be expressed as: $C = Y - S$, where S is the total savings. The consumption growth rate is: $C = w_Y g - w_S s$ (1)

The weights w_Y and w_S are determined respectively by the ratios Y/C and S/C. w_Y is upper to 1 and w_S is positive and lower than 1; c, s and g are respectively the growth rates of the consumption, the total savings and the GDP.

According to the equation (1), to smooth consumption the output growth rates shocks should lead to a variation of total savings growth rates rather than changes of consumption growth rates. For example, if a positive and sudden shock to g occurs and domestic agents considered this shock as temporary, they should temporarily save more to stabilize consumption. Consequently, if consumption smoothing is confirmed, we expect a close degree of comovement between g and s to exist. The non consumed portion of output is: $S = I + B$ with I and B are respectively the investment and the trade balance. So, variation of S must be inevitably followed by variation of I and B. Consequently, the savings growth rate (s) can be decomposed into the contributions of investment (i) and the trade balance (b).

$$s = i + b \qquad (2)$$

Where: $i = \Delta I / s$ and $b = \Delta(X - M)/s$, we note that X and M are respectively exports and imports. Domestic agents can increase the balance by increasing the payments abroad or by buying financial assets abroad.

The consumption variance can, so, be expressed as:

$$Var(c) = {w_Y}^2 \operatorname{var}(g) + {w_S}^2 \operatorname{var}(s) - 2 w_Y w_S \operatorname{cov}(g; s) \qquad (3)$$

From the equation (2), the variance of total savings growth rate can be decomposed as:

$$Var(s) = Var(i) + \text{var}(b) + 2\,\text{cov}(i;b) \quad (4)$$

And the covariance of production and savings growth rates is as follows:

$$Cov(g;s) = \text{cov}(g;i) + \text{cov}(g,b) \quad (5)$$

If the consumption is less volatile than production, as predicted by the complete market theory, we should have:

$$\left(w_Y{}^2 - 1\right)\text{var}(g) + w_S{}^2\,\text{var}(s) < 2w_Y w_S\,\text{cov}(g;s) \quad (6)$$

If we divide this expression by $\left(\sqrt{\text{var}(g)} \times \sqrt{\text{var}(s)}\right)$, we obtain:

$$\left[\left(w_Y{}^2 - 1\right)\frac{\sqrt{\text{var}(g)}}{\sqrt{\text{var}(s)}} + w_S{}^2\,\frac{\sqrt{\text{var}(s)}}{\sqrt{\text{var}(g)}}\right] / 2w_Y w_S < \rho(g;s) \quad (7)$$

Since the left part of the inequation is positive, so that consumption fluctuates less than production, the correlation between production and total savings growth rates must be positive. Let us apply this structure to check the presence of an excessive volatility in the sixteen selected developing countries, we make figures linking GDP and total savings growth rates volatilities to their covariances (Appendix). We draw to close that total savings growth rate fluctuations are large compared to GDP growth rate instability and the covariance (this last one is almost null compared to the first one). Although covariance is characterized by peaks rather high in some countries, its variation is almost unimportant compared to the variance of savings in the other countries. To clear up the evolution of GDP growth rate volatility and the covariance, we chose to stack them on the same graphs (see Appendix). We can note that there are some periods which covariances between total savings and GDP growth rates volatilities are negative, as well as periods characterized by positive covariances. The negative covariances show that positive shocks of production can generate a decrease of savings growth rates and an increase of consumption volatility. Whereas, the positive covariances cannot imply an increase of the savings further to a positive shock of production because the positive comovement degree is very low compared to the savings variation and cannot consequently stabilize consumption. GDP growth rate volatility is considered as an important structural factor for developing countries according to the literature. This assertion was well verified in our case when we compare the GDP growth rate volatility of our selected developing and transition countries with the OECD economies.

1.5. Structural Factors of Macroeconomic Volatility

This section presents our empirical essay which aims at determining the domestic and external structural factors of macroeconomic volatility in developing and transition economies.

2. ECONOMETRIC METHOD

Our study applies a dynamic panel data which is based on a sample of 44 countries during 1960- 2010. The method of GMM system will be used. Its consistency depends on the validity of the instruments. Two specification tests are considered to study this question. The first one is the test of overidentifying restrictions (Sargan/ Hansen tests). The second one is the AR(2) Arellano-Bond test of absence of second order serial correlation.

The dynamic model, used at determining at first domestic structural factors and second external structural factors of macroeconomic volatility is presented as follows:

$$\sigma_{yit} = \alpha_j + \sum_{j=1}^{m} \mu_j \sigma_{yit-j} + \sum_{j=1}^{m} \beta_j \sigma_{Xit-j} + \delta_i + \varepsilon_{it} \quad (8)$$

Where σ_{yit} is our economic volatility indicator in country i at time t: We use GDP and household consumption growth rates volatilities as dependent variables.

σ_{Xit-j} represents our explanatory variables.

Domestic structural factors are: Consumption, Investment, Government expenditures, Exports, Imports and GDP volatilities.

External structural factors are: terms of trade, commercial opening, Net capital account, capital inflow and capital outflow volatilities.

All volatilities are calculated as the standard deviation of a seven year rolling window.

δ_i is a country specific effect. The final term ε_{it} is an error term and m is the appropriate lag length.

2.1. Domestic Structural Factors

Some works conclude that volatilities of GDP components can be considered as determinants of GDP volatility. For example, McConnell and Perez-Quiros (2000) examine changes of growth rate volatility by referring to the major components of aggregated GDP, which include household final consumption expenditure, investment, government expenditures and international trade since the beginning of 1980's in the United States. They conclude that investment, exports and imports generate the largest decreases of growth rate volatility. However, government expenditures and household consumption are the determinants of the lowest reduction of volatility. Blanchard and Simon (2001) consider that the decline of the output volatility in the United States during the 1980's and 1990's can be explained by the decrease of consumption and investment volatilities.

In the same context, we choose to examine the volatilities of GDP components in order to identify their contributions in explaining GDP growth rate volatility in developing and transition countries.

To do it, we estimate an equation which GDP and consumption growth rates volatilities are the dependent variables and GDP, consumption, investment, government expenditures, exports and imports growth rates volatilities are the explanatory variables.

Table-1. Domestic Structural Factors of GDP and Consumption Growth Rates Volatilities

	Dependent Variables	
Growth Rates Volatilities	GDP Growth Rate Volatility	Consumption Growth Rate Volatility
Consumption	0.281**	___
	(0.147)	
Consumption t-1	___	-0.163**
		(0.060)
Investment	-0.051**	0.041*
	(0.024)	(0.012)
Government expenditures	0.155***	0.120*
	(0.090)	(0.042)
Exports	0.064	0.102*
	(0.066)	(0.034)
Imports	-0.044	-0.014
	(0.080)	(0.037)
GDP	___	0.340*
		(0.093)
GDP t-1	-0.261**	___
	(0.105)	
Constant	2.976*	1.611*
	(0.599)	(0.493)
Diagnostics		
Observ.	1275	1223
Wald Test	12.93	28.87
Wald Test P value	0.000	0.000
AR(2) test	-1.01	-1.44
AR(2) test P value	0.311	0.150
Hansen Test	23.38	36.16
Hansen Test P value	0.497	1.000

Standard errors in parentheses. Statistical significance: *p<0.01 ; **p<0.05 ; ***p<0.10.
Source: Author's Computation

The table above reports the various estimation results of the volatilities of GDP household consumption growth rates on the different components volatilities of GDP growth rate. It seems that growth rates volatilities of household consumption, investment and government spending are the explanatory factors of GDP growth rate volatility. Indeed, the volatility of consumption growth rate has the largest impact. It generates a positive and significant effect at the 5% level (0.281). The impact of investment growth rate volatility is negative and significant at the 5% level (-0.051) and government spending growth rate volatility has a positive and significant impact at the 10% level (0.155). The results also show that domestic determinants of consumption growth rate volatility are the volatilities of investment, government spending, exports and GDP growth rates. Indeed, all the coefficients of these last variables are positive and statistically significant at the 1% level.

Volatility of GDP growth rate has the largest impact (its coefficient is 0.340). We conclude that the Wald test confirms the global significance of the model at the 1% level. The Hansen test

accepts the hypothesis of validity of instruments in the both estimation cases. The AR (2) Arellano-Bond test also accepts the null hypothesis of absence of second order serial correlation.

2.2. External Structural Factors

The research path which examines the different determinants of the behaviour of GDP growth rate volatility in developing and transition countries emphasizes not only domestic structural factors in this category of countries but also external structural factors. The lack of diversification of the production and exports constitutes one of the interest factors studied in the literature. Park and Wang (2008), for example, argue that Chile, Russia, South Africa, Nigeria and Argentina have relatively high parts of exports of primary products compared to industrial products. In the same case, interesting by MENA countries which we have four of them in our sample, Hirata (2006) notes that countries of this region suffer from a restricted production capacity which is provided by a reduced number of sectors (tourism incomes represent the major part of foreign exchange reserves in Egypt, Israel, Morocco and Tunisia (El-Erian *et al.*, 1996).

Also, Tamberi (2005) argues that the scale of specialization of MENA countries is not rather large because these countries generally seem to have a comparative advantage in the production of "traditional" goods.

The table 4 (in the Appendix) reports the number of exported products of the countries of our sample as well as the indexes of diversification and concentration in 1995 and 2006. We generally note that exports diversification indexes are high for the majority of selected countries in 1995 and 2006, which indicates that there is a divergence between the exported products structure of each country and the world structure. However, concentration indexes are generally low and vary from 0.07 to 0.415, indicating that there is no concentration on specific markets of exported products (with the exception Nigeria and Venezuela which have a very high concentration (their exports are based on petroleum products) and Equator, Jamaica and Kazakhstan which concentration is average). The comparison of time evolution of the various values shows that the number of exported products increased considerably between 1995 and 2006 for all countries. However, the evolution of diversification indexes is rather low compared to that of concentration indexes.

Following the regressions of GDP and consumption growth rates volatilities on the different components of GDP volatilities, we examine the effect of external factors on macroeconomic volatilities. Results of GMM system estimations about the regressions of GDP and consumption growth volatilities on the volatilities of terms of trade, commercial opening, capital inflow and capital outflow are reported in the table below.

Table-2. External Structural Factors of GDP and Consumption Growth Rates Volatilities

	Dependent Variables	
Volatilities	GDP Growth Rate Volatility	Consumption Growth rate Volatility
GDP t-1	0.279***	___
	(0.142)	
terms of trade	0.055	-0.039***
	(0.077)	(0.021)
commercial opening	0.208***	0.198**
	(0.096)	(0.072)
Net capital account	-5.11 e-11**	-3.09 e-11
	(2.01 e-11)	(1.50 e-11)
capital inflow	-0.264	-0.153
	(0.340)	(0.548)
capital outflow	0.076	-1.486**
	(0.670)	(0.685)
Consumption t-1	___	0.284**
		(0.112)
Constant	0.700	2.775*
	(2.441)	(0.970)
Diagnostics		
Observ.	460	449
Wald Test	6.10	6.18
Wald Test P value	0.000	0.000
AR(2) test	0.27	-0.87
AR(2) test P value	0.785	0.382
Hansen Test	2.39	5.13
Hansen Test P value	0.881	0.527

Standard errors in parentheses. Statistical significance: *p<0.01 ; **p<0.05 ; ***p<0.10.
Source: Author's Computation

The global observation of different estimations indicates that volatilities of the terms of trade and commercial opening are the most influential variables on macroeconomic volatilities. Volatility of terms of trade has a low negative effect on the consumption growth rate volatility. Indeed, an increase of terms of trade volatility of 1% generates a reduction of the consumption growth rate volatility of 0.039%. The impact of commercial opening volatility is positive and statistically significant at the 10% level for GDP growth rate volatility and 5% for that of consumption. This significance can be explained by the higher volatility of the sectors opened to international trade and by trade accompanied by specializations and lack of diversification of exports in the most of countries.

3. CONCLUSION

The objective of this study was to examine the comovements of some macroeconomic variables and to determine the different internal and external structural factors, which can explain macroeconomic volatility in developing and transition countries. The analysis of comovements focused on the examination of growth rates volatilities of four macroeconomic variables (GDP, household consumption, government expenditures and investment) over the period 1960- 2010. The comparison of different values of macroeconomic volatilities indicates, generally, that those of

developing and transition countries are higher than those of OECD economies. Besides, we conclude that consumption volatilities in developing and transition countries exceed those of production. This finding shows that these economies don't maintain their behaviour of consumption smoothing, implying consequently a proof of failure of their financial markets.

The analysis of figures linking GDP and total savings growth rates volatilities to their covariances indicates that:

- The negative covariances imply that production positive shocks can generate a decrease of savings growth rates and increase of consumption volatility.
- The positive covariances cannot imply an increase of the savings further to a positive shock of production because the positive comovement degree is very low compared to the savings variation and cannot consequently stabilize consumption.

The examination of different domestic structural factors of macroeconomic volatilities shows that government expenditures, consumption and GDP volatilities are the major determinants of macroeconomic volatility. The most influential external factors on macroeconomic fluctuations are terms of trade and commercial opening volatilities.

REFERENCES

Aizenman, J. and B. Pinto, 2005. Managing economic volatility and crises: A practitioner's guide. Cambridge: Cambridge University Press.

Blanchard, O. and J. Simon, 2001. The long and large decline in U.S. output volatility. Brookings Papers on Economic Activity, 1: 135-164.

Easterly, W., R. Islam and J.E. Stiglitz, 2000. Shaken and Stirred: Explaining Growth Volatility. The World Bank. Available from http://www.worldbank.org/research/growth/growth%20volatility%20jan%202000.html.

El-Erian, M.A., S. Eken, S. Fennell and J.P. Chauffour, 1996. Growth and Stability in the Middle East and North Africa. Washington, DC: International Monetary Fund.

Fagernas, S. and A. Singh, 2006. Globalisation, instabilité et insécurité economique. Revue Tiers Monde, 186(2): 391-420.

Fanelli, J.M., 2005a. Notes on International Volatility for the Country Studies. mimeo, CEDES.

Fanelli, J.M., 2008. Macro Volatility and Financial Institutions. CEDES (Centro de Estudios de Estado y Sociedad).

Friedman, M., 1957. A theory of consumption function. Princeton. NJ: Princeton University Press.

Hakura, D.S., 2007. Output Volatility in Emerging and Developing Countries. World Economic Outlook, Washington, DC: International Monetary Fund.

Hirata, H., 2006. Sources of fluctuations: The case of mena. Available from http://webcas.cas.suffolk.edu/hkim/paper/mena2.pdf.

IMF outlook, 1999. Safeguarding macroeconomic stability at low inflation. World Economic and Financial Surveys.

Ito, T., 2004. Promoting asian basket currency bonds.Developing asian bond markets. The Australian National University: Asia Pacific Press.

Kose, M.A., C. Otrok and E.S. Prasad, 2005. Regionalization vs. Globalization: Explaining North-South Business Cycle Dynamics. IMF Working Paper, Washington, DC: International Monetary Fund.

Loayza, N.V., 2007. Macroeconomic volatility and welfare in developing countries: An introduction. The world Bank Economic Review, 21(3): 343-357.

McConnell, M. and G. Perez-Quiros, 2000. Output fluctuations in the united states: What has changed since the 1980s? American Economic Review, 90(5): 1464-1476.

Modigliani, F. and R. Brumberg, 1954. Utility analysis and the consumption function: An interpretation of cross- section data. In k. K. Kurihara (ed.), post keynesian economics, new brunswick. NJ: Rutgers University Press.

Park, Y.C. and Y. Wang, 2008. Regional and multilateral efforts: Institution- Building. in macroeconomic volatility, Institutions and financial architectures: the developing world experience. Edited by José Maria Fanelli, Palgrave Macmillan.

Stiglitz, J., 2000. Capital market liberalization, economic growth, and instability. World Development, 28(6): 1075-1086.

Tamberi, M., 2005. Specialization and Growth Perspectives in the mediterranean countries. Paper presented in the conference: Middle East and North African Economies.

Wolf, H., 2005. Volatility: Definitions and consequences. In j. Aizenman and b. Pinto, eds. Managing economic volatility and crises. Cambridge, Mass: Cambridge University Press.

World Development Indicators, 2007. Cd- rom Available from http://publications.worldbank.org/index.php?main_page=product_info&cPath=&products_id=22580.

Appendix

Table-1. Macroeconomic Volatility in selected OECD countries

Periods	France	Japan	Australia	United States
GDP				
1960-1970	0.864	2.455	2.394	1.577
1971-1980	1.594	2.9	1.57	2.723
1981-1990	0.999	1.529	2.318	2.231
1991-2000	1.335	1.683	1.316	1.231
2001-2010	1.410	2.084	0.892	1.670
1960-2010	1.230	2.145	1.718	1.899
Consumption				
1960-1970	0.910	1.803	1.313	1.323
1971-1980	1.392	2.781	1.413	2.221
1981-1990	1.143	1.193	1.583	1.685
1991-2000	1.208	1.104	1.284	1.075
2001-2010	0.655	0.549	0.855	0.619
1960-2010	1.055	1.499	1.289	1.389
Government Expenditure				
1960-1970	0.836	1.866	2.886	3.324
1971-1980	1.148	3.082	2.532	1.266
1981-1990	0.747	1.129	1.534	1.607
1991-2000	1.288	0.959	1.059	1.162
2001-2010	0.498	0.947	0.58	1.023
1960-2010	0.893	1.614	1.754	1.719
Investment				
1960-1970	----	9.17	----	5.129
1971-1980	5.387	10.438	7.212	10.514
1981-1990	5.376	8.223	7.891	9.289
1991-2000	6.766	11.097	6.650	5.053
2001-2010	2.993	8.301	4.297	4.083
1960-2010	4.887	9.407	6.503	6.815

Source: Author's Computation

Table-2. Macroeconomic Volatility in selected developing countries

	Ivory Coast	Ecuador	Egypt	India	Jordan	Morocco	Philippines	Thaïland
GDP								
1960-1970	6.434	2.887	2.91	3.509	___	5.144	1.093	1.850
1971-1980	5.010	3.533	4.151	3.951	___	3.185	1.801	2.692
1981-1990	3.486	3.281	2.166	2.535	6.490	4.671	4.890	2.250
1991-2000	3.416	2.868	1.224	1.857	4.310	6.301	2.420	4.893
2001-2010	1.645	2.692	1.389	2.053	2.063	2.288	1.877	2.737
1960-2010	3.998	3.053	2.398	2.781	5.242	4.375	2.416	2.885
Consumption								
1960-1970	6.556	2.651	2.785	___	___	___	4.244	3.163
1971-1980	7.423	4.387	4.726	4.626	___	5.181	2.370	4.103
1981-1990	5.662	2.493	3.540	3.700	8.472	4.420	3.830	4.209
1991-2000	5.708	2.729	2.226	2.168	9.365	5.598	3.348	5.005
2001-2010	5.605	2.975	1.437	2.765	6.939	2.383	4.512	2.170
1960-2010	6.190	3.047	2.970	3.315	8.461	4.391	3.661	3.730

Government expenditure								
1960-1970	10.240	7.154	___	7.154	___	4.602	3.140	4.207
1971-1980	9.999	15.693	___	15.693	___	15.02	4.283	6.360
1981-1990	9.058	4.516	6.542	4.516	12.262	4.597	6.048	4.083
1991-2000	7.488	4.927	2.887	7.927	7.652	2.240	3.917	3.551
2001-2010	2.779	3.216	8.491	3.216	8.650	1.869	4.787	3.620
1960-2010	7.913	7.101	7.943	7.101	11.586	5.722	4.435	4.364
Investment								
1960-1970	22.861	7.753	10.109	7.753	___	___	6.369	12.122
1971-1980	18.972	11.587	19.636	11.587	___	21.582	8.345	14.304
1981-1990	36.390	7.441	9.771	7.441	20.560	9.214	19.726	12.064
1991-2000	18.388	18.398	11.135	18.398	15.566	6.083	11.865	18.212
2001-2010	22.886	15.374	___	15.374	13.602	5.724	8.569	11.435
1960-2010	23.899	12.111	11.842	12.111	17.327	13.955	10.975	13.627

Source: Author's Computation

Table-2. (Continued)

	Tunisia	**South Africa**	**Argentina**	**Botswana**	**Peru**	**Turkey**	**Uruguay**	**Venezuela**
GDP								
1960-1970	4.458	1.797	5.237	3.513	2.245	___	2.516	3.426
1971-1980	4.033	2.158	4.534	4.861	3.153	3.119	3.217	3.355
1981-1990	3.266	2.738	6.457	3.820	7.745	3.268	5.697	4.463
1991-2000	2.092	1.776	5.911	3.131	5.040	5.634	3.989	4.856
2001-2010	1.416	1.932	5.827	2.337	2.886	5.259	5.394	8.357
1960-2010	3.114	2.080	5.593	3.532	4.214	4.320	4.163	4.891
Consumption								
1960-1970	5.601	2.596	4.734	___	4.701	___	4.992	___
1971-1980	4.214	6.326	7.174	___	3.356	___	3.776	___
1981-1990	2.648	5.694	7.004	5.955	6.658	___	7.956	3.921
1991-2000	1.355	1.952	6.242	2.841	4.463	5.759	5.557	5.742
2001-2010	0.679	2.576	5.588	5.584	1.959	4.817	6.010	8.560
1960-2010	2.998	3.829	5.748	4.794	4.227	5.288	5.658	6.075
Government expenditure								
1960-1970	3.570	3.150	2.578	___	5.323	___	4.865	___
1971-1980	3.907	3.608	2.819	___	8.500	___	9.069	___
1981-1990	2.718	1.926	___	6.101	10.737	___	4.368	4.770
1991-2000	1.194	2.924	___	2.381	4.657	5.268	2.524	18.650
2001-2010	0.765	1.228	2.938	5.070	3.617	4.505	3.969	4.102
1960-2010	2.487	2.567	2.778	4.517				
Investment								
1960-1970	11.420	18.409	13.729	___	15.702	___	11.866	17.608
1971-1980	11.589	15.126	11.072	___	28.086	___	14.643	17.935
1981-1990	13.746	14.382	14.852	38.898	25.276	___	17.429	31.488
1991-2000	9.473	9.917	17.310	20.184	13.990	22.394	11.749	45.925
2001-2010	6.085	6.068	21.297	19.803	13.225	19.432	17.715	37.145
1960-2010	10.569	12.780	15.652	26.295	19.256	20.913	14.681	30.020

Source: Author's Computation

Table-3. GDP Growth rate

	Ivory Coast	Ecuador	Egypt	India	Jordan	Morocco	Philippines	Thaïland
1960-1970	8.880	4.325	5.449	4.112	888	4.965	4.928	8.175
1971-1980	5.479	7.033	6.689	3.077	15.991	5.228	5.929	6.886
1981-1990	0.750	2.098	5.489	5.807	2.175	3.952	1.802	7.895
1991-2000	2.359	1.853	4.302	5.519	5.233	2.417	3.077	4.634
2001-2010	0.971	4.592	4.970	7.410	6.502	4.674	4.377	3.940
	Tunisia	**South Africa**	**Argentina**	**Botswana**	**Peru**	**Turkey**	**Uruguay**	**Venezuela**
1960-1970	5.309	5.981	4.005	8.666	5.311	3.658	1.407	5.102
1971-1980	7.459	3.390	3.039	15.186	3.660	4.133	3.051	2.753
1981-1990	3.612	1.542	-1.382	10.939	-0.477	5.247	0.154	0.925
1991-2000	4.755	1.842	4.683	6.209	4.053	3.697	3.084	2.186
2001-2010	4.678	3.527	4.072	4.279	5.360	3.351	3.260	3.734

Source: Author's Computation

I. GDP and Consumption Growth Rates Volatilities in Selected Developing Countries

Fig 1. GDP and Consumption Growth Rates Volatilities in Ivory Coast

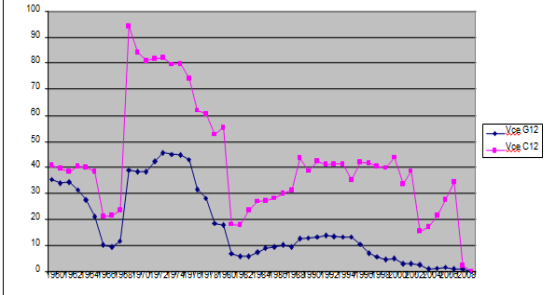


Fig 2. GDP and Consumption Growth Rates Volatilities in Ecuador

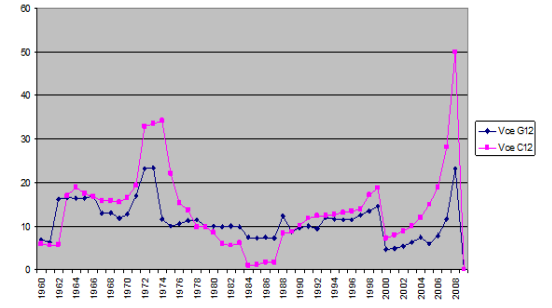


Fig 3. GDP and Consumption Growth Rates Volatilities in Egypt

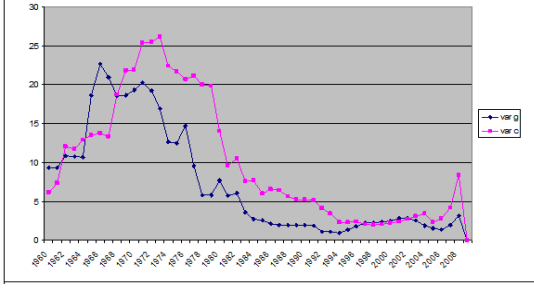


Fig 4. GDP and Consumption Growth Rates Volatilities in India

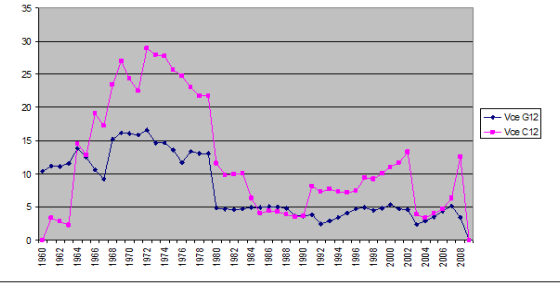


Fig 5. GDP and Consumption Growth Rates Volatilities in Jordan

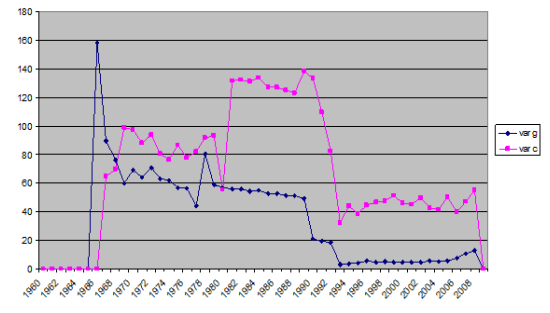


Fig 6. GDP and Consumption Growth Rates Volatilities in Morocco

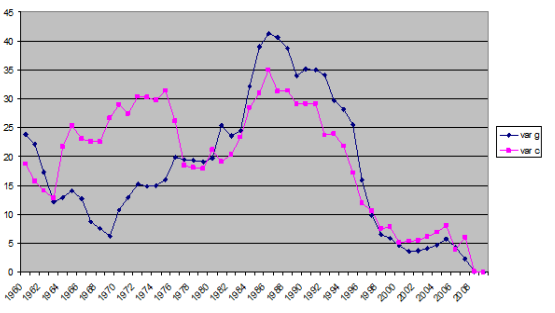


Fig 7. GDP and Consumption Growth Rates Volatilities in Philippines

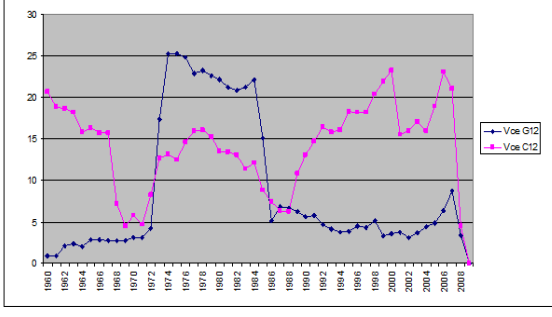


Fig 8. GDP and Consumption Growth Rates Volatilities in Thailand

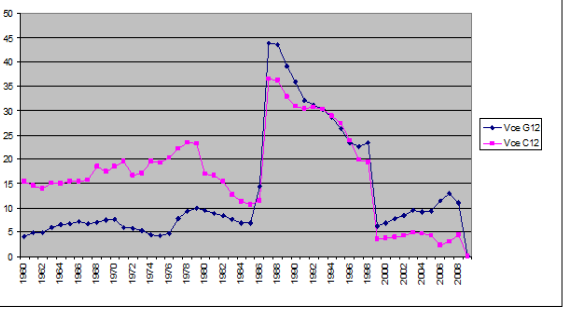


Fig 9. GDP and Consumption Growth Rates Volatilities in Tunisia

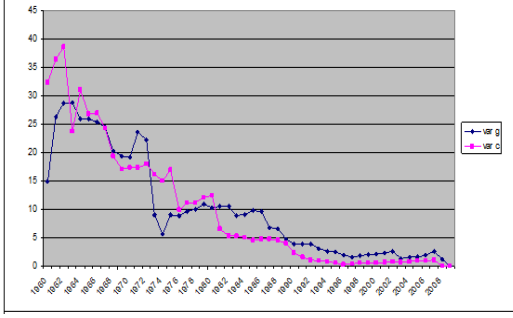


Fig 10. GDP and Consumption Growth Rates Volatilities in South Africa

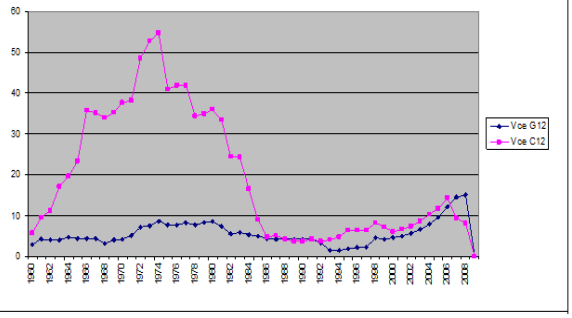


Fig 11. GDP and Consumption Growth Rates Volatilities in Argentina

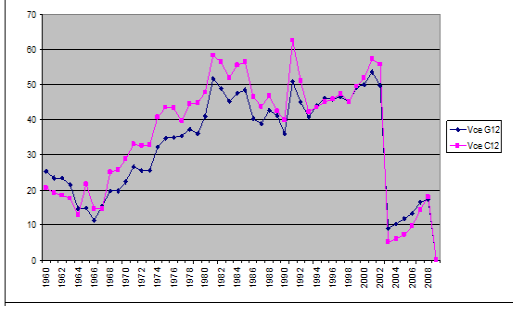


Fig 12. GDP and Consumption Growth Rates Volatilities in Botswana

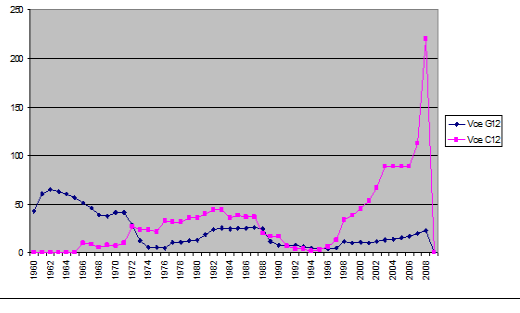


Fig 13. GDP and Consumption Growth Rates Volatilities in Peru

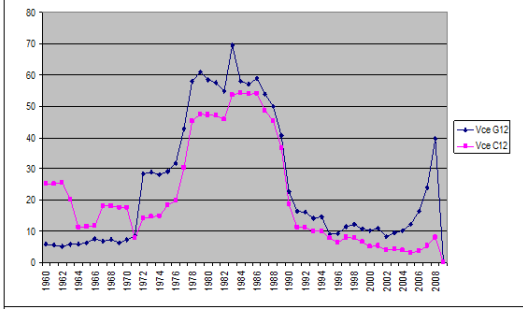


Fig 14. GDP and Consumption Growth Rates Volatilities in Turkey

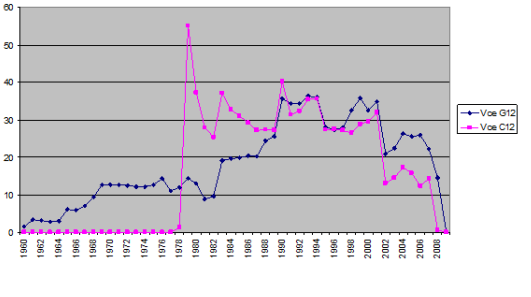


Fig 15. GDP and Consumption Growth Rates Volatilities in Uruguay

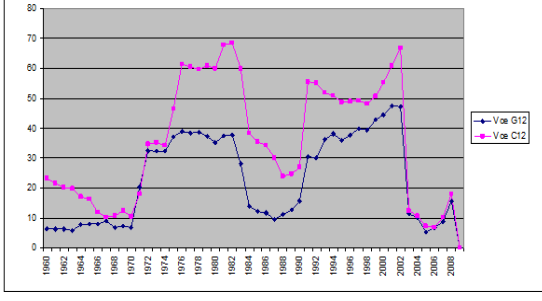
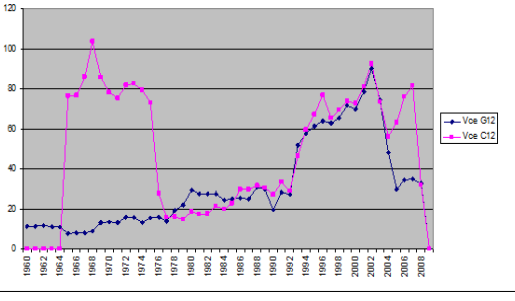


Fig 16. GDP and Consumption Growth Rates Volatilities in Venezuela



II. GDP and total savings growth rates volatilities and the covariance between growth and savings in selected developing countries

Fig 1. GDP and total savings growth rates volatilities and their covariance in Ivory Coast

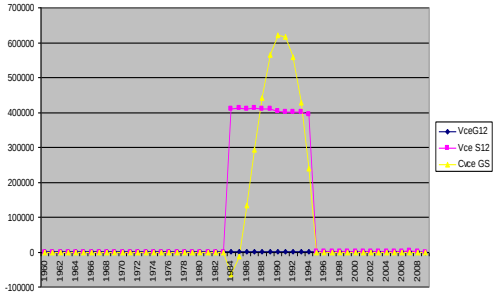


Fig 2. GDP and total savings growth rates volatilities and their covariance in Ecuador

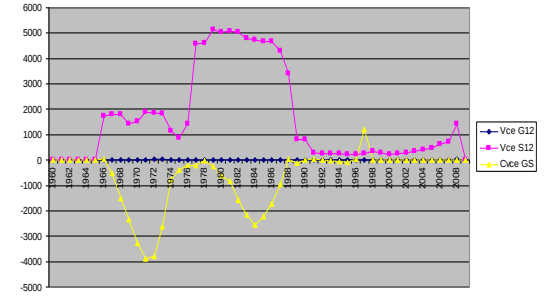


Fig 3. GDP and total savings growth rates volatilities and their covariance in Egypt

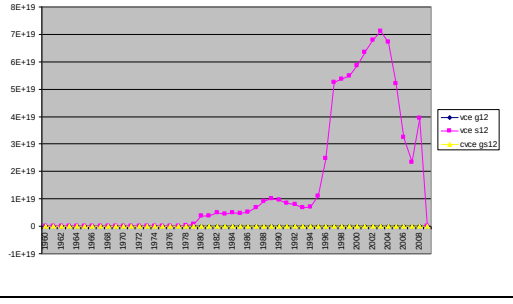


Fig 4. GDP and total savings growth rates volatilities and their covariance in India

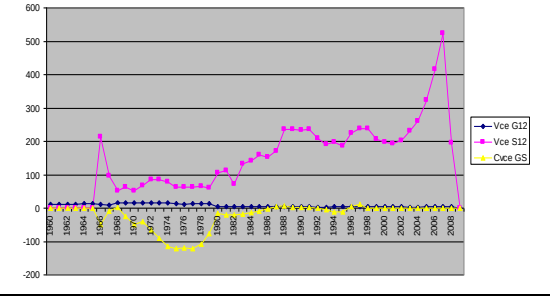


Fig 5. GDP and total savings growth rates volatilities and their covariance in Jordan

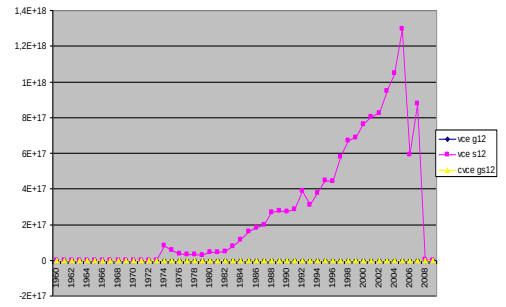


Fig 6. GDP and total savings growth rates volatilities and their covariance in Morocco

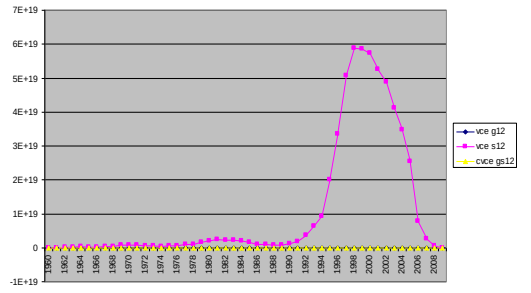


Fig 7. GDP and total savings growth rates volatilities and their covariance in Philippines

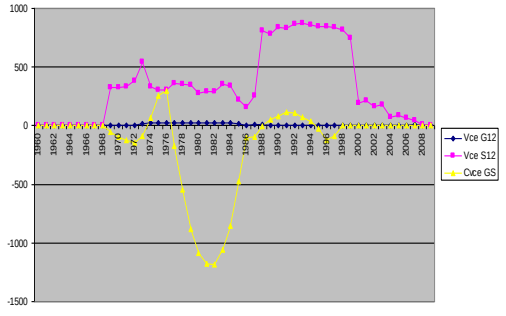


Fig 8. GDP and total savings growth rates volatilities and their covariance in Thaïland

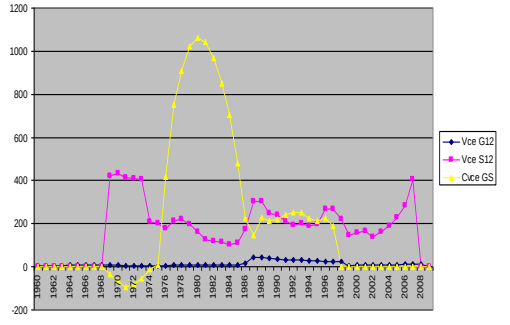


Fig 9. GDP and total savings growth rates volatilities and their covariance in Tunisia

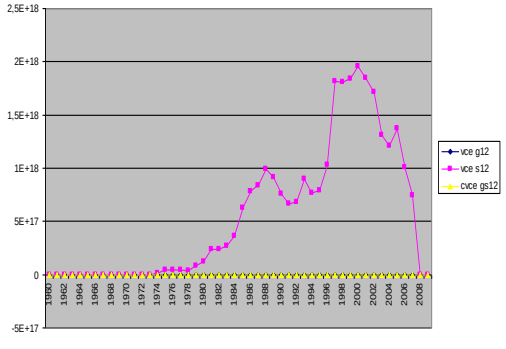


Fig 10. GDP and total savings growth rates volatilities and their covariance in South Africa

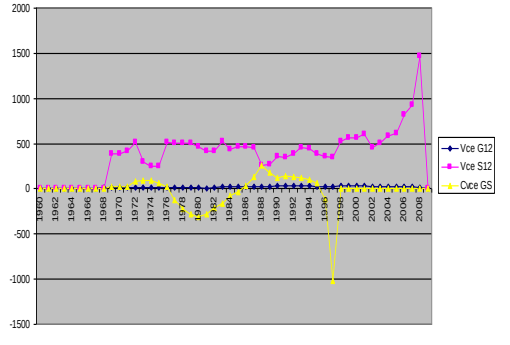


Fig 11. GDP and total savings growth rates volatilities and their covariance in Argentina

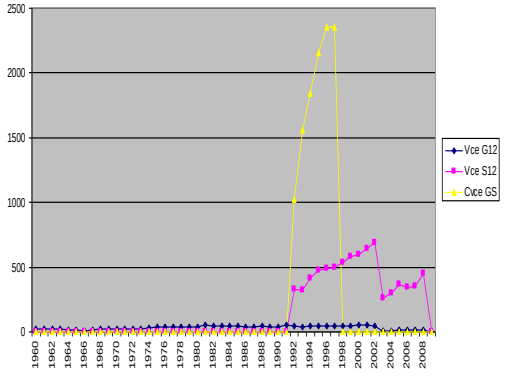


Fig 12. GDP and total savings growth rates volatilities and their covariance in Botswana

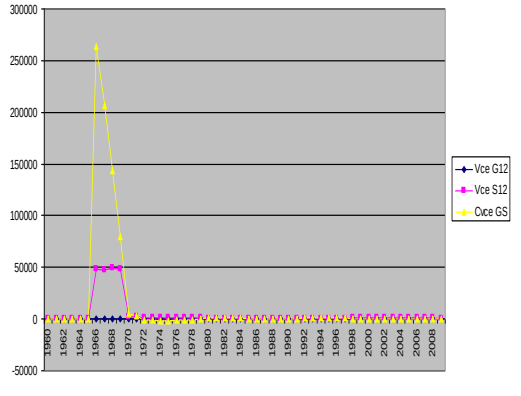


Fig 13. GDP and total savings growth rates volatilities and their covariance in Peru

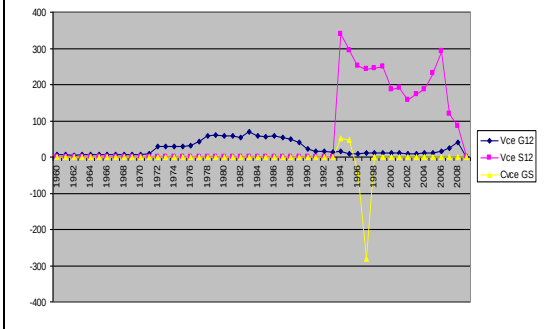


Fig 14. GDP and total savings growth rates volatilities and their covariance in Turkey

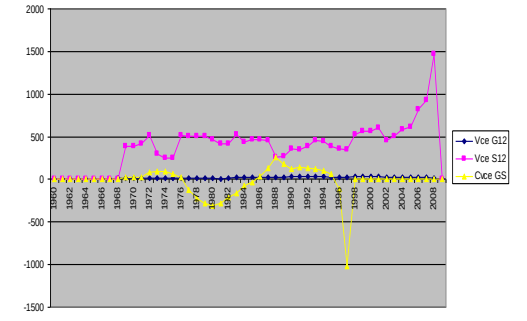


Fig 15. GDP and total savings growth rates volatilities and their covariance in Uruguay

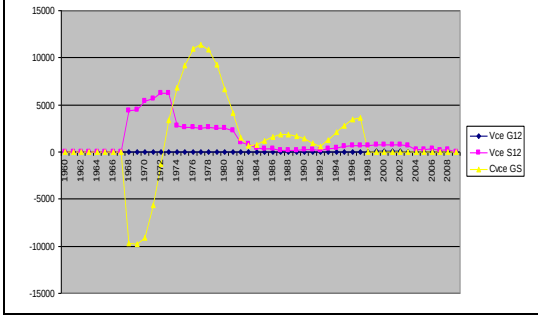
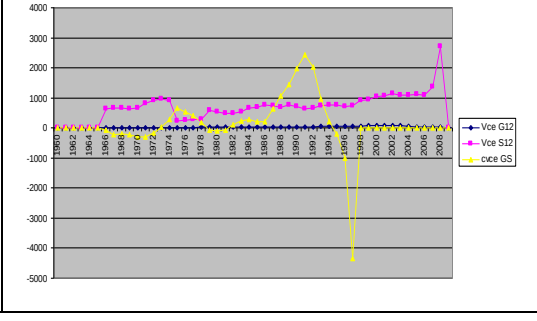


Fig 16. GDP and total savings growth rates volatilities and their covariance in Venezuela



III. GDP growth rate volatility an the covariance between growth rate rates GDP and total savings

Fig 1. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Ivory Coast

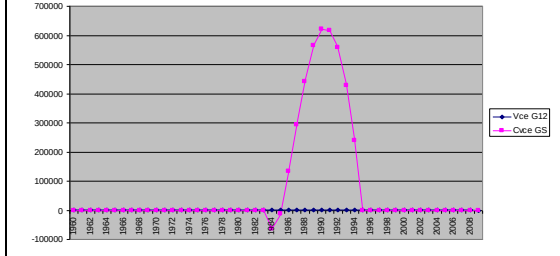


Fig 2. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Ecuador

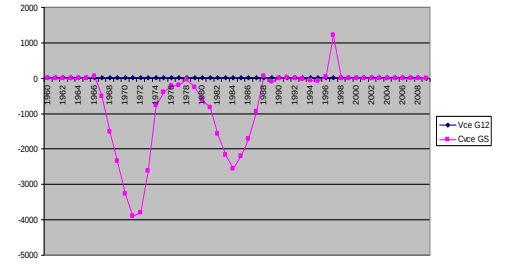


Fig 3. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Egypt

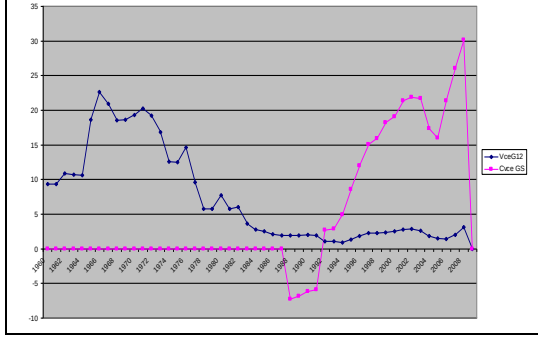


Fig 4. GDP growth rate volatility an the covariance between growth rates GDP and total savings in India

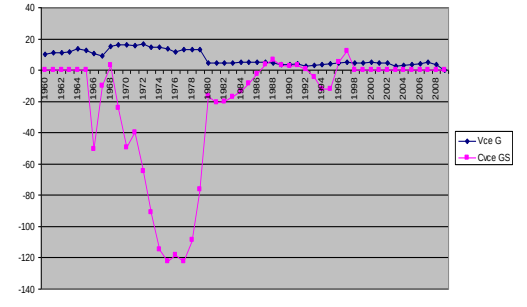


Fig 5. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Jordan

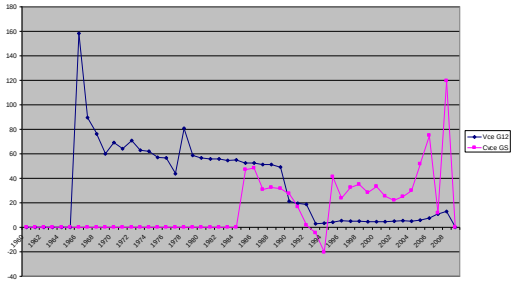


Fig 6. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Morocco

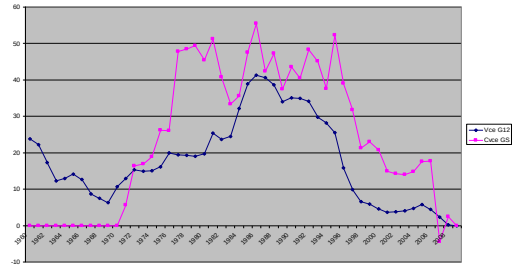


Fig 7. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Philippines

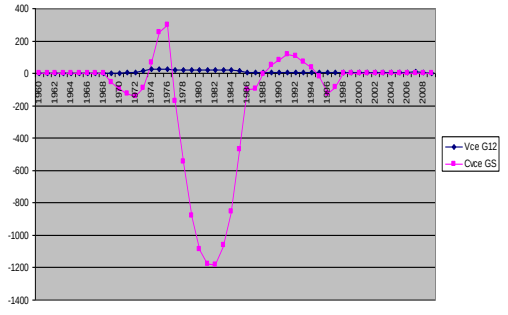


Fig 8. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Thaïland

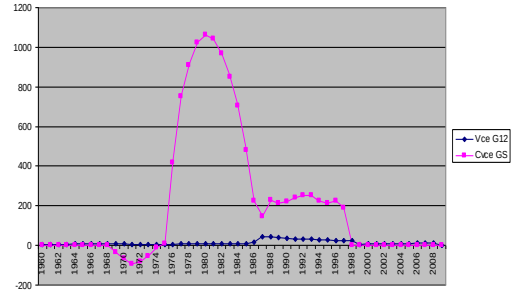


Fig 9. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Tunisia

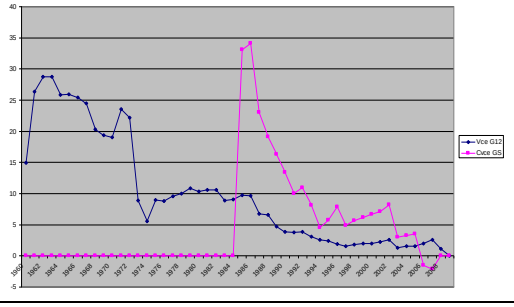


Fig 10. GDP growth rate volatility an the covariance between growth rates GDP and total savings in South Africa

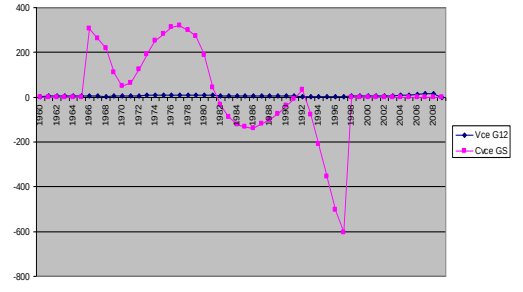


Fig 11. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Argentina

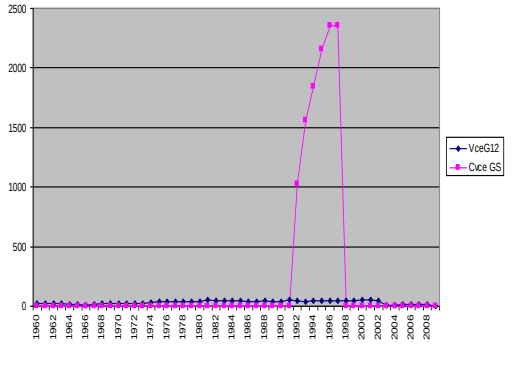


Fig 12. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Botswana

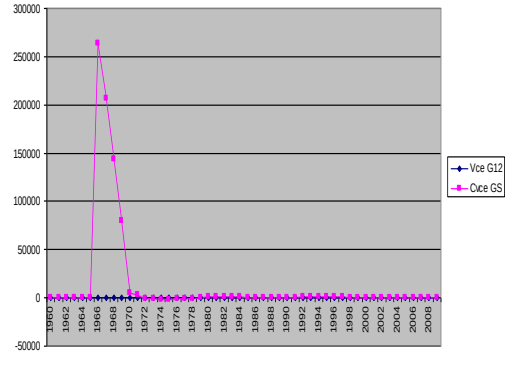


Fig 13. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Peru

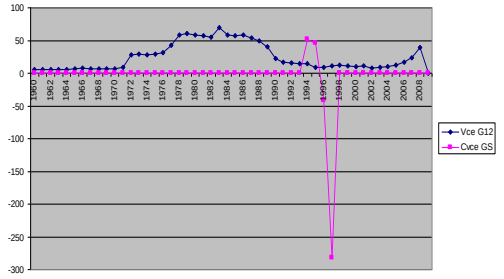


Fig 14. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Turkey

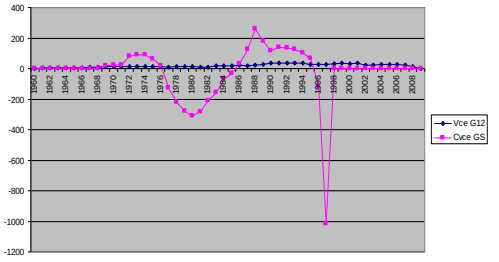


Fig 15. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Uruguay

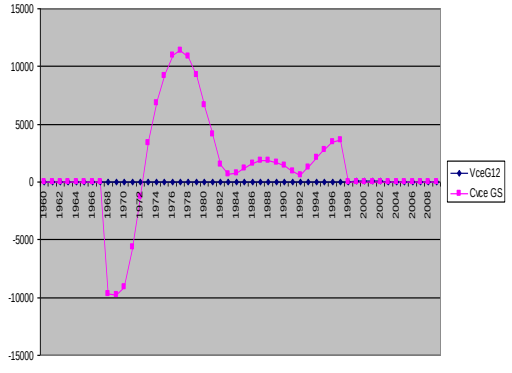


Fig 16. GDP growth rate volatility an the covariance between growth rates GDP and total savings in Venezuela

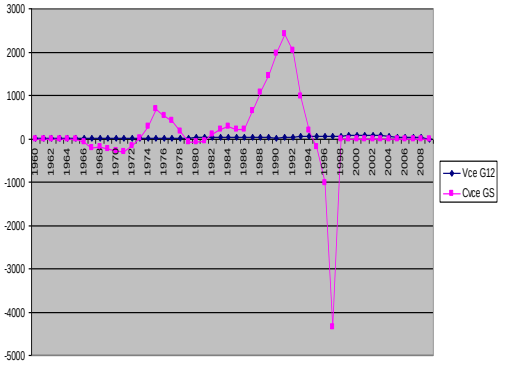


Table-4. Number of products exported, Diversification Index and Concentration Index

	1995			2006		
Exportations	**Number of exported products**	**diversification Index HHI**	**Concentration Index**	**Number of exported products**	**diversification Index HHI**	**Concentration Index**
Bolivia	104	0.728	0.218	145	0.760	0.403
China	254	0.472	0.070	255	0.442	0.110
Ivory Coast	150	0.821	0.347	147	0.725	0.322
Ecuador	160	0.781	0.376	184	0.736	0.532
Egypt	164	0.669	0.247	196	0.684	0.356
El Salvador	130	0.682	0.354	181	0.600	0.150
Indonesia	230	0.596	0.144	245	0.489	0.129
India	240	0.589	0.142	254	0.538	0.142
Jordan	191	0.641	0.217	202	0.597	0.145
Moldova	160	0.736	0.229	155	0.674	0.177
Morocco	168	0.746	0.179	199	0.678	0.159
Nigeria	149	0.892	0.853	174	0.855	0.857
Pakistan	138	0.781	0.245	204	0.733	0.230
Paraguay	98	0.710	0.337	123	0.771	0.320
Philippines	203	0.566	0.156	225	0.611	0.348
Sri Lanka	172	0.751	0.221	181	0.766	0.223

Swaziland	___	___	___	162	0.182	0.415
Thaïland	241	0.478	0.091	244	0.390	0.095
Tunisia	193	0.670	0.216	209	0.608	0.187
Ukraine	233	0.576	0.109	247	0.596	0.145
Argentina	239	0.565	0.126	243	0.561	0.132
Botswana	___	___	___	139	0.903	0.725
Brazil	240	0.524	0.089	248	0.475	0.092
Bulgaria	228	0.498	0.091	230	0.502	0.158
Colombia	216	0.654	0.244	230	0.571	0.207
Chile	216	0.788	0.311	228	0.782	0.402
Costa Rica	162	0.698	0.319	228	0.782	0.402
Fiji	70	0.799	0.385	133	0.764	0.295
Jamaica	107	0.769	0.481	114	0.796	0.576
Kazakhstan	206	0.740	0.206	199	0.760	0.600
Lebanon	180	0.600	0.102	200	0.658	0.125
Lithuania	225	0.528	0.089	236	0.502	0.191
Malaysia	247	0520	0.182	254	0.454	0.186
Mauritius	109	0.800	0.363	165	0.696	0.283
Mexico	248	0.380	0.123	249	0.386	0.154
Namibie	____	____	____	____	____	____
Panama	78	0.557	0.364	124	0.739	0.360
Peru	175	0.799	0.245	216	0.787	0.256
Romania	214	0.579	0.128	242	0.480	0.115
Russia	250	0.667	0.260	248	0.665	0.381
South Africa	252	0.570	0.124	253	0.569	0.156
Turkey	233	0.629	0.112	213	0.619	0.129
Uruguay	162	0.638	0.166	185	0.671	0.228
Venezuela	209	0.767	0.517	174	0.844	0.911

Source : UNCTAD Handbook of statistics 2008