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Accounting for Consumption Volatility Differences

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In the wake of emerging market turmoil, the role and welfare consequences of volatility have attracted renewed attention. An emerging consensus points to various types of volatility being both a consequence and a determinant of longer-term growth performance. The linkages appear to be context dependent. This paper employs classification tree analysis to explore determinants of consumption volatility taking account of context dependence. The results suggest output volatility, measures of input volatility, and measures of economic development are best able to differentiate between countries with high and low consumption volatility.
[JEL E21, E32]

Following the recent spate of emerging market turmoil, the role and welfare consequences of volatility have attracted renewed attention. While it may be too early to draw firm conclusions, an emerging consensus points to various types of volatility being both a consequence and a determinant of longer-term growth performance and of income distribution.

The academic and policy research has, with some exceptions, divided along this demarcation. A sizable literature, briefly summarized in Box 1, explores the role of volatility as a determinant of a variety of outcomes.[1]

A smaller literature, to which this papers belongs, examines the determinants of volatility in cross-country perspective. Among the core questions explored here are the impacts of economic development, increased trade, and financial integra-

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[1]See Aizenman and Pinto (2004), Buch (2002), and Prasad, Rogoff, Wei, and Kose (2003) for in-depth critical analyses.

Box 1. Volatility As a Determinant of Growth

Early postwar macroeconomics, aiming to better understand business cycle fluctuations, treated (trend) growth and (business cycle) volatility as largely distinct fields of study (exceptions apply, as always). The distinction slowly softened over time to the extent that recent macro models treat both features as jointly determined.

A variety of channels potentially give rise to a growth-volatility linkage. Some of these suggest a positive relation. Thus a simple aggregation of project-specific risk-return tradeoffs leads to a prediction of positive association between average return (growth) and average risk (volatility). Dynamically, Schumpeterian "cleansing recessions" may generate faster growth following recessions, be it due to increased R&D or greater survival chances of stronger firms.

Other channels suggest a negative link, notably in emerging markets. In the absence of complete markets, notably for long-term domestic currency debt, recessions can lead to lower investment in physical and human capital and reduced long-term growth, or a preference toward less specialized (and lower return) investments. A different line of argument treats volatility as a proxy for uncertainty which, under some assumptions, maps into lower investment and thus, ceteris paribus, growth.

Theory thus does not provide a clear overall prediction on the link between (growth) volatility and growth itself. On the empirical side, a rich literature, invigorated by an influential paper by Ramey and Ramey (1995), has fairly consistently pointed to a negative and causal link between the volatility of GDP growth and the mean GDP growth rate in broad cross-country studies. The result may be specific, however, to the cross-country perspective: across sectors within countries, the positive risk-return association suggested by investment theory appears to emerge (Imbs, 2002). The elasticity of growth with respect to volatility also appears to vary across country groups; in particular the link appears to be much weaker for mature economies. The relative importance of alternative (likely complementary) explanations for such differences—ranging from structural characteristics, such as financial market development and international integration, to active policy measures and the role of the political system in aggravating or offsetting shocks—remains an active research agenda.

tion on volatility. Theory does not provide a clear answer to these questions as far as output volatility is concerned, though predictions for consumption volatility are clearer. On the empirical side, only few robust results have emerged. One possible explanation is the presence of nonlinearities in many of these linkages. This paper, focusing on consumption volatility, employs a classification tree methodology, particularly suited to detecting both context dependence and threshold effects, to explore these nonlinearities in depth.

I. A Capsule Literature Review

While the evidence increasingly points to a two-sided causality linking volatility and growth, and thus to the need for an integrative treatment, from a conceptual perspective it is useful to split the literature into studies using volatility as, respectively, an explanatory and as the dependent variable. The first literature was briefly summarized in Box 1 (above); the following analysis concentrates on some core issues explored in the literature on the determinants of volatility.

A Framework

On the level of the individual household, the volatility of income depends on the size of shocks to which the economy or local area is exposed, on the steps the household has taken in anticipation of such shocks, and on public policies affecting the impact of shocks on household income, primarily the existence and structure of the social safety net. While all of these can be treated as given at a point in time, they become endogenous over time. Moving from household income to household consumption introduces another layer. Whether temporary income shocks map into consumption shocks depends on the ability and on the willingness of households to smooth consumption, and thus on a set of features ranging from private choices such as precautionary savings to public in-kind assistance programs.

The volatility of private consumption is thus driven by a complex array of factors. On a first level are the shocks influencing the national economy. On a second level are the determinants of the elasticity of household income to these shocks, and on a third level the determinants of the elasticity of household consumption with respect to household income shocks. Cross-country differences in aggregate consumption volatility can thus alternatively arise from differences in the size and frequency of shocks and from differences in the availability and usage of coping mechanisms, reflected in different elasticities of income and of consumption with respect to given shocks. The following paragraphs review some of the national features that have attracted particular attention in this context.

Economic Size

Large economies with diverse sectoral structures are more immune to both sector-specific shocks and—reflecting the negative association between size and openness—to external shocks, reducing aggregate output volatility. Domestic sectoral diversification also provides individuals with good domestic diversification options, potentially reducing consumption volatility even in the absence of international integration. Exploring this avenue, Crucini (1997) compares a sample of 68 smaller economies with the G-7 countries, finding the standard deviation of consumption rates to be significantly higher in the former group. Head (1995) and Kose and Prasad (2003) likewise detect a negative link between volatility and economic size.

Financial Deepening

Theory is ambiguous as to the linkage between financial development and output volatility. Empirical work (Denizer, Iyigun, Owen, 2002; and Buch and Pierdzioch, 2003) suggests that domestic financial development is associated with reduced output volatility. The link appears to be strongest for high-income countries and may depend on the extent of international financial integration. The link between financial development and consumption volatility is clearer: expanded diversification options suggest a negative link.

Fiscal Policy

Fiscal policy can be used to offset shocks, smoothing aggregate consumption. Whether it is used in this manner in practice remains an active area of inquiry (Kose, Prasad, and Terrones, 2003; and Agénor, McDermott, and Prasad, 2000). While there is some evidence for a smoothing use of fiscal policy in mature economies, fiscal policy in some emerging markets appears to be procyclical, possibly reflecting a procyclical access to borrowing.

International Aspects

Theory suggests that the effect of shocks on macroeconomic volatility depends on the extent to which participation in international goods and asset markets allows for specialization and for risk diversification. Alas, this is where theoretical clarity ends; the exact nature of the linkages, and indeed their sign, are far from obvious, motivating a very active literature exploring these linkages (Kose, Prasad, and Terrones, 2003).

Financial linkages

The recent spate of emerging market crises renewed interest in the nexus between international financial integration and macroeconomic volatility. On the output side, theory suffers from an embarrassment of riches. Apart from its ambiguous effects on sectoral concentration—and thus exposure to sectoral shocks—integration creates new transition channels for external shocks and may, depending on the exact structure of financial markets, magnify or reduce the effect of domestic distortions.[2] The net effect likely depends on both country characteristics and on the nature of shocks.

As was the case with domestic financial development, the predictions for consumption volatility are clearer: enhanced diversification opportunities should permit a reduction of consumption volatility following financial integration. In line with the arguments discussed above, the effect should be most pronounced in smaller and in more specialized economies with fewer domestic diversification options.

To date, empirical evidence supporting the strong theoretical implication for consumption volatility across diverse country samples remains scarce, though some evidence points to the predicted negative link for higher-income countries. The unconditional correlation of consumption growth rates across countries does not appear to substantially exceed the correlation of output growth rates. The volatility of consumption growth does not appear to be substantially smaller than the volatility of output growth in a sizable number of countries.[3] Regression analysis has yielded diverse results: while some authors do not detect a stable link,

[2]Recent work in this field includes Sutherland (1996), Faia (2001), and Buch and Pierzioch (2003).

[3]See Kose, Prasad, and Terrones (2003) and Hnatkovska and Loayza (2003). Imbs (2003) shows that for financially integrated economies consumption patterns are more correlated; however, so are GDPs.

others have found financial integration to be an important determinant of volatility.[4] The sample composition appears to matter. In particular, the predicted negative link appears to be stronger among OECD economies than among emerging markets.[5]

Trade linkages

The literature on trade openness and volatility likewise combines theoretical ambiguity with varied empirical findings. Enhanced real integration can lead to greater sectoral specialization but also provides greater diversification across demand sources.[6] On the empirical side, while a higher volatility of the terms of trade appears to be robustly linked to a higher volatility of output,[7] the relationship between generic measures of openness and output volatility is less settled.

Assessment

The brief review reveals that factors robustly linked to volatility across country samples are the exception rather than the rule; the most notable exception is country size. A number of studies have detected apparent breaks in the linkages. In particular, it appears that mature economies find it easiest to avail themselves of the diversification opportunities theory suggests will arise from greater financial development and international integration.

In principle, context dependence can be accommodated in the framework of regression analysis, in particular if theory yields guideposts as to the likely nature of such nonlinearities (Hnatkovska and Loayza, 2003). The challenge is, however, hard. There are rarely exact empirical guideposts even for first-level splits[8] while the ordering of splits for deep context dependence is often even outside the scope of educated guesses.

This paper sidesteps these problems, instead using classification tree analysis to explore patterns in consumption volatility. The results—essentially an in-depth description of the pattern linking the independent variables in the data set with the dependent variable—provide a complementary perspective to regression analysis. The next section briefly introduces the technique; the following sections present the results and conclude.

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[4]Among the studies exploring these aspects are Razin and Rose (1994), O'Donnell (2001), Bekaert, Harvey, and Lundblad (2002), Kose, Prasad, and Terrones (2003), and Buch and Pierdzioch (2003).

[5]O'Donnell (2001), Bekaert, Harvey, and Lundblad (2002), Kose, Prasad, and Terrones (2003).

[6]See for example Krugman (1993), Razin and Rose (1994), Kraay and Ventura (2001), and Kose, Prasad, and Terrones (2003).

[7]See for example Mendoza, 1995; and Agénor, McDermott, and Prasad, 2000. One exception is Buch and Pierdzioch (2003), who find no significant effect though they employ real exchange rate variability as a proxy for the terms of trade.

[8]At what level does a country become a member of the "mature economy" club? If its GDP per capita (or output per worker) places it in the top 10/20/X percent of all countries? If its manufacturing share in GDP exceeds X percent? If more than X percent of its trade is intra-industry? If it becomes a member of the OECD? Each of these criteria is reasonable, yet yields different groupings.

II. Methodology, Data and Caveats

A binary classification tree consists of a sequence of rules for allocating a binary dependent variable y to its two value-classes on the basis of a vector of explanatory variables x_j, $j = 1, \ldots, J$. In this application, the binary split is based on the recorded consumption volatility. Starting with a sample of 103 countries, the 35 countries with the highest consumption volatility are classified as belonging to the "high volatility" group ($VOL = 1$), while the 35 countries with the lowest volatility are classified as belonging to the "low volatility" group ($VOL = 0$). The middle 33 countries are discarded in order to create a discrete difference between the two groups. The binary dependent variable is thus given by VOL, taking the values of 0 and 1 respectively for "low" and "high" volatility observations.

A rule consists of an explanatory variable and a threshold. The rules are applied sequentially. The initial application generates the first rule, splitting the original sample into two subsamples. The algorithm is then applied separately to the two subsamples, and so on, resulting in a decision tree with multiple branches, each defined by an allocation rule. Specifically, a rule takes the following form:

> If, for a particular observation of the dependent variable y, the explanatory variable x is above threshold z, allocate the observation for the dependent variable y to the first binary class; otherwise allocate it to the second binary class.

At each node, there exists a large set of feasible rules, composed of all variables and all values each variable takes in the sample. The selection of the preferred rule among this set is based on the rule's ability to allocate observations correctly to the two classes. Rarely, particularly at the deeper nodes, a perfect rule may correctly allocate all observations to the correct value class. More typically, all candidate rules misallocate some observations. The rule chosen at a particular node is the candidate rule with the smallest error.[9] In principle, the process can continue until each observation is correctly classified, at the cost of highly complex trees. For the trees reported below, a depth of five to seven branches was used.[10]

The algorithm is particularly well suited to detecting both threshold effects and context dependence. As regards the former, the algorithm searches for the numerical value that, applied as a rule, minimizes the allocation error; it thus avoids the need to define groups such as high/low income a priori. The algorithm by construction also allows for a variable to become an important explanatory factor only once a number of prior conditions on other variables have been met, and thus automatically incorporates deep context dependence.

As the algorithm searches across all variables, it generates a ranking of each variable at each node in terms of its ability to split the observations at that node into the two groups. These rankings can in turn be used to compute an overall measure of the explanatory power of variables for the entire tree. This global

[9]Depending upon the question examined, different weights can be attached to type I versus type II errors. No such asymmetry arises in the present application; the errors are hence weighted equally.

[10]Alternatively, automatic termination rules based on a trade-off between the number of nodes and the fit can be selected.

importance rank, which takes full account of context dependencies, will be the main empirical focus of the analysis reported below.[11] The classification trees were calculated using the CART® program of Salford Systems.

Data[12]

The private consumption data used to compute the dependent variable are taken from the Penn World Tables.[13] Countries are included if a complete data series from 1960/61 to 1999 is available.[14] The volatility measure, $VOL(C)$, is calculated as the standard deviation of the growth rate of real per capita consumption.[15] A number of studies suggest that volatility patterns may have changed over time.[16] To allow for time variation, the data, covering the period 1960 to 1999, are split into four equal-sized decade groups.

As the algorithm disregards variables that are not helpful in allocating observations to one of the two groups, a broad set of potential explanatory variables can be included. These divide into several broad categories. The first comprises a set of (relatively) time invariant "structural" features such as location, the export orientation of the economy, and the quality of institutions. A second group contains features with a somewhat faster rate of change, such as GDP per capita, enrollment ratios, the size of the labor force, life expectancy, and the urbanization rate; as a group, these variables aim to capture the broadly defined development level of the economy. The third group encompasses measures of openness to trade and finance, of financial development and monetary policy, and of the role of government spending. On the trade/external finance side, the group includes openness relative to the world and to the OECD, the presence of current and capital account restrictions, the level of external debt, the concentration of exports, the exchange rate regime, and the level of real overvaluation. On the financial side, it includes the ratio of M2 to GDP, the mean inflation rate, and the central banker turnover rate.

The fourth group comprises measures of the political system: the type of regime, a proxy for political instability, and the Freedom House measures for political rights and civil liberties. Finally, a fifth group contains direct proxies for volatility in inputs and output. Apart from the volatility of GDP per capita growth, this group includes the exposure of countries to banking and currency crisis and

[11]As the ranking takes account of the set of discriminants at all nodes, a variable that never appears as part of a rule may still rank high in terms of overall importance.

[12]See also the detailed data appendix.

[13]Alan Heston, Robert Summers, and Bettina Aten, Penn World Table Version 6.1, Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002.

[14]Data availability for the year 2000 remains spotty; hence, the sample was ended in 1999.

[15]Some authors (Agénor, McDermott, and Prasad, 2000) have used alternative detrending mechanisms. While different methods yield different numerical values, they do not in most cases appear to affect the ranking of countries substantially (Razin and Rose, 1994; and Hnatkovska and Loayza, 2003). As the volatility measure used in this paper takes just two values—high and low, with the middle group being dropped—the detrending method used is likely to be of secondary importance.

[16]Hnatkovska and Loayza (2003), Kose, Prasad, and Terrones (2003), and Buch (2002).

the volatility of the terms of trade, of the real exchange rate, of the black market premium, of inflation, and of the government current expenditure share.

Caveats

The data and methodology are subject to several caveats. First, the focus is on aggregate private consumption in cross-country comparison. The mappings obtained will likely differ, possibly sharply, among groups within each country, a feature not captured here. Second, the results do not directly link to welfare. As the focus is on private consumption, no attention is given to the potential smoothing role played by public consumption (Kose, Prasad, and Terrones, 2003). Also ignored are consumption-leisure trade-offs and any issues arising from the distinction between durable and nondurable expenditures; furthermore, no distinction is made between consumption movements reflecting permanent shocks to income, and changes reflecting an inability (or unwillingness) to smooth in the face of temporary shocks.[17]

III. Results

For each of the four decades, two trees were calculated. The first tree is based on the full set of explanatory variables, including the various volatility measures. The second tree excludes all volatility measures. Trees were capped at five to seven branches unless a complete allocation was achieved with fewer nodes. Table 1 reports the ten explanatory variables with the highest explanatory power for the full data set.[18]

The volatility of GDP p.c. growth is the best discriminant for the volatility of consumption growth, placing in the top two for all decades. The result confirms prior findings. Despite the apparently much greater scope for domestic and international diversification provided by financial development and increasing financial integration, the volatility of consumption continues to be very closely associated with the volatility of national output.

Table 2 reports the number of times that each variable has appeared in the top five and top ten for the four decades (only variables with at least two appearances in the top ten are reported). Overall, the best explanatory variable for consumption growth volatility is output growth volatility, appearing three times at the first rank, once at second rank. Two measures of input volatility, the volatility of the terms of trade and of the black market premium, together enter a further six times.

Measures of economic development are also useful in distinguishing between high and low consumption volatility observations. GDP per capita and output per worker together appear seven times among the top ten; life expectancy and

[17]The problem can be partly addressed by looking at the volatility of consumption relative to income Kose, Prasad, and Terrones, 2003.

[18]As mentioned above, the coverage in terms of variables is comparable for the last three decades, while for 1960 several variables do not exist; differences between the 1960s and the other decades are thus less meaningful.

Table 1. Ranking of Variables by Explanatory Power, All Variables

	1960s	1970s	1980s	1990s
1	Volatility (GDP Growth)	Volatility (GDP Growth)	Life Expectancy	Volatility (GDP Growth)
2	Urbanization	Vol. (Black Market Premium)	Volatility (GDP Growth)	Life Expectancy
3	Primary Enrollment	Urbanization	Vol. (Black Market Premium)	GDP p.c.
4	GDP p.c.	Volatility (ToT)	Gini Coefficient	Volatility (ToT)
5	Output per Worker	Vol. of Gov. Current Exp.	Political Rights	M2/GDP
6	Vol. (Black Market Premium)	Overvaluation	Civil Liberties	Vol. of REER
7	OECD Trade	Life Expectancy	GDP p.c.	Vol. (Black Market Premium)
8	Secondary Enrollment	Volatility of Inflation	Output per Worker	Banking Crisis
9	Labor Force Size	GDP p.c.	Debt to GDP	Exchange Rate Crisis
10	—	Output per Worker	—	Civil Liberties

urbanization another five times. Civil liberties rounds out the list, though at a low rank. Measures of the extent of trade and financial integration do not play an important role, though they are, of course, correlated with economic development.

Dropping the volatility indicators permits an assessment of the relative importance of structural factors. Tables 3 and 4 report, respectively, the ten most important discriminants for each of the four decades and the most frequently appearing discriminants across all four decades, analogous to Tables 1 and 2.

The tables are dominated by indicators of the development level: GDP p.c., life expectancy, output per worker, urbanization, and the enrollment ratios all appear repeatedly among the top ten. Measures of trade integration appear

Table 2. Frequency Among Top Five and Top Ten, All Variables

Discriminant	Occurrences in Top Five	Occurrences in Top Ten
Volatility (GDP p.c. Growth)	4	4
Volatility (Black Market Premium)	2	4
Volatility (Terms of Trade)	2	2
GDP per Capita	2	4
Output per Worker	1	3
Life Expectancy	2	3
Urbanization	2	2
Civil Liberties	0	2

Table 3. Ranking of Variables by Explanatory Power, Tree 2

	1960s	1970s	1980s	1990s
1	Output/Worker	Avg. Gov. Cur. Exp.	Life Expectancy	Life Expectancy
2	GDP p.c.	Political Rights	GDP p.c.	M2/GDP
3	Life Expectancy	Military/Population	Output/Worker	Average Inflation
4	Secondary Enrollment	Life Expectancy	Civil Liberties	Political Rights
5	Primary Enrollment	Secondary Enrollment	Urbanization	GDP p.c.
6	Urbanization	Urbanization	Avg. Gov. Current Exp.	Overvaluation
7	Labor Force Size	Primary Enrollment	Political Rights	OECD Trade
8	OECD Trade	Overvaluation	Overvaluation	Debt/GDP
9	Openness	GDP p.c.	Linguistic Fragmentation	Capital Account Restrictions
10	Military/ Population	Output/Worker	Labor Force Size	Openness

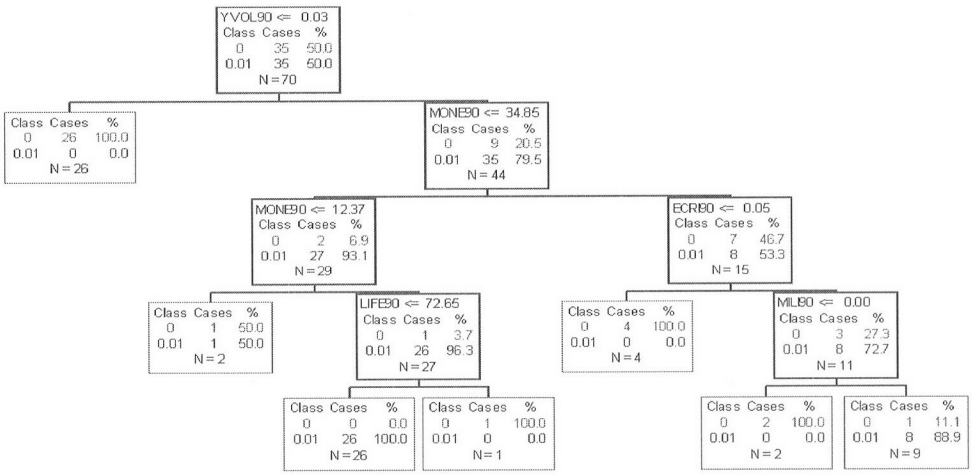
somewhat useful, while measures of financial integration and crisis do not enter systematically.

In conjunction, the results point to the primary importance of output and input volatility in explaining consumption volatility in cross section, consistent with the prior literature. Beyond output volatility, the development level emerges as the second important discriminant between countries with high and low consumption

Table 4. Frequency Among Top Five and Top Ten, Excluding Volatility Measures

Discriminant	Occurrences in Top Five	Occurrences in Top Ten
Life Expectancy	4	4
GDP per Capita	3	4
Output/Worker	2	3
Urbanization	1	3
Secondary Enrollment	2	2
Primary Enrollment	1	2
Overvaluation	0	3
OECD Trade	0	2
Openness	0	2
Political Rights	2	3
Military/Population	1	2
Labor Force Size	0	2
Average Current Expenditure	1	1

Figure 1. Tree for the Full 1990s Dataset



volatility.[19] Other features, notably real and financial openness, while of course correlated with development, appear to be of only secondary direct importance for the distinction between high and low consumption growth volatility.

Classification Trees

In terms of an aggregate measure of importance, the "top ten" lists presented above convey the most accurate impression, as they evaluate the relative importance of the variable at each node. While the trees themselves focus only on the best discriminant at each node, they convey additional information about the precise value of the threshold, and the sign of linkage. Space constraints prevent complete discussion of all eight trees. Figure 1 depicts the tree for the full data set for the 1990s.

The original sample divides equally into 35 high volatility (class = 0.01) and 35 low volatility (class 0) observations. The top box reports this split, with the number of observations as well as the percentages (here trivially 50 percent and 50 percent) and the total number of remaining observations (here $N = 70$). The first splitting rule is reported at the top of the box. In this case, the 26 observations ($N = 26$) for which the volatility of output growth is equal to or less than 0.03 are allocated to the left node; the 44 remaining observations ($N = 44$) are allocated to the right node.

Within the left node, the fit is perfect: all 26 observations are correctly classified as low volatility; the branch consequently ends at this node, yielding the first (unconditional) result: low output growth volatility is strongly associated with low

[19]As mentioned above, the first and second moment of output growth are themselves negatively related across broad country sets, with at least part of the causality apparently running from higher output volatility to lower output growth.

consumption growth volatility, where the threshold for low output growth volatility is a standard deviation of output growth of 0.03 or less.

Within the right node, 35 out of the 44 observations fall into the high consumption growth volatility group, the remaining 9 observations into the low volatility group. While high output volatility is thus associated with a greater likelihood of high consumption volatility (almost 80 percent versus 50 percent for the full sample), the link is not perfect. Pushing the search one level deeper reveals that within the group of countries with high output growth volatility, the degree of monetization matters for allocating observations to the high versus the low consumption volatility group. Specifically, observations fulfilling the dual condition of output growth volatility above the threshold of 0.03 and monetization ratios below the threshold of 35 percent fall overwhelmingly into the high volatility group (27 of 29 observations).

The 15 countries characterized by output growth volatility above 0.03 and monetization ratios above 34.85 percent divide roughly equally into high and low volatility observations. Within this subgroup, all countries without exchange rate crisis experienced low volatility, versus only 27 percent of countries with at least some incidence of an exchange rate crisis. This finding illustrates the benefit of the context dependent search: based on the overall usefulness of the discriminants, the presence of an exchange rate crisis is an also-run, yet within the (sizable) subgroup of countries defined by relatively high output volatility and a relatively developed monetary system, it becomes an important discriminant.

IV. Conclusions and Outlook

The literature on the determinants of volatility suggests that linkages between particular variables and volatility may depend on other country characteristics. This paper employed classification tree analysis to delve more deeply into such context dependence. The results indeed suggest important context dependence; they also clearly establish output volatility and measures of input volatility, followed by measures of economic development, as the variables best able to account for the presence of high versus low consumption growth volatility. In contrast, financial development and integration, which on theoretical grounds might be expected to drive a wedge between income and consumption volatility, do not appear to play a prominent role beyond their link to the development level.

APPENDIX
Data

Main Sources

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2. Atish R. Ghosh, Anne-Marie Gulde, and Holger Wolf, 2002, *Exchange Rate Regimes* (Cambridge, Massachusetts: MIT Press). Data are from CD enclosed with book. Abbreviated as GGW.

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5. POLITY IV. Variable used: POLITY2. Defined as ranging from –10 to +10. Data available via the Internet at: *http://www.cidcm.umd.edu/inscr/polity/refuselicense.asp.* (Data for the successor states of the Soviet Union and Yugoslavia prior to their dissolution were set equal to values of the Soviet Union and Yugoslavia. Values for Czech Republic and Slovakia prior to their split set equal to the value for Czechoslovakia.)
6. UNU/WIDER–UNDP World Income Inequality Database. Data available via the Internet at: *http://www.wider.unu.edu/wiid/dowm/pad.htm.* (For Gini coefficient. The Gini coefficient used in the data set is the median of all values reported for a particular country.)

Fixed Factors

Variable	Source		Note
Transition Country	ES	TRAN	0–1 dummy
Landlocked Countries	ES	LAND	0–1 dummy
Export Focus: Manufacturing	ES	EMAN	0–1 dummy
Export Focus: Non Fuel Primary	ES	ENFP	0–1 dummy
Export Focus: Fuels	ES	EFUE	0–1 dummy
Export Focus: Services	ES	ESER	0–1 dummy
Export Focus: Diversified	ES	EDIV	0–1 dummy
Ethnic Fractionalization	A	EFRA	0–1 range
Language Fractionalization	A	LFRA	0–1 range
Religious Fractionalization	A	RFRA	0–1 range
Institutional Quality	SW	IQUA	
Location: Tropical	ES		0–1 dummy

Time-Varying Factors

Variable	Source	Name	Notes
Primary Enrollment	ES	PRIMxx[1]	1960, 1970, 1980, 1990, Year
Secondary Enrollment	ES	SECOxx	1960, 1970, 1980, 1990, Year
Life Expectancy at Birth	ES	LIFExx	1962, 1970, 1980, 1990, Year
Military/Population	ES	MILIxx	1960, 1970, 1980, 1980 data also used for 1990
Real GDP per Capita, Real U.S. Dollars, U.S. = 1	ES	GDPRxx	1960, 1970, 1980, 1990, Year
Workers (China = 1)	ES	WORKxx	1960, 1970, 1980, 1990, Year
Output per Worker, US$ U.S. = 1	ES	LRPOxx	1960, 1970, 1980, 1990, Year
Urbanization Rate	ES	URBAxx	1960, 1970, 1980, 1990, Year
Non-OECD Trade (percent of GDP)	ES	TRAAxx	1960, 1970, 1980, 1990, Year
Openness Total (percent of GDP)	ES	OPENxx	Decadal average 1960s, 1970s, 1980s, 1990s
External Debt (percent of GDP)	ES	DEBTxx	Decadal average 1970s, 1980s, 1990s (1960s: all NA)
Current Account Restrictions	GGW	CURRxx	Decadal average of dummy variable (0–1), 1970s, 1980s, 1990s only
Capital Account Restrictions	GGW	CAPRxx	Decadal average of dummy variable (0–1), 1970s, 1980s, 1990s only
Export Concentration (top 3)	GGW	TCONxx	Decadal average (2 obs/decade), 70s, 80s, and 90s
Fixed Exchange Rate Regime	GGW	PEGGxx	Fraction of decade spent under pegged regime
Intermediate Exchange Rate Regime	GGW	INTMxx	Fraction of decade spent under intermediate regime
Floating Exchange Rate Regime	GGW	FLOAxx	Fraction of decade spent under floating regime
Real Overvaluation	ES	OVERxx	Decadal average
M2/GDP	ES	MONExx	Decadal average
Average CPI Inflation	ES	MINFxx	Decadal average

Central Bank Turnover Ratio	GGW	TURNxx	Decadal average
Government Current Exp. on Goods/Services (percent of GDP): Mean (82n)	ES	MGOVxx	Decadal average (1960s missing)
Regime Type 1: Civilian, 2: Military-Civilian, 3: Military, 4: Other	ES	REGIxx	1960, 1970, 1980, 1988 (used for 1990)
Political Instability X = Sum of # of coups, # of revolutions # of riots, # of purges, # of assassinations, # of gu. warfare activities	ES	PINSxx	= 0 if X = 0 = 1 if X = 1 or X = 2 = 2 if X = 3 or X = 4 or X = 5 = 3 if X > 5 1960, 1970, 1980, 1988 (used for 1990)
Political Rights 1 (lowest) to 7	FH	PRIGxx	Mid-decade, no data for 1960s
Civil Liberties 1 (lowest) to 7	FH	CLIBxx	Mid-decade, no data for 1960s
Volatility of Terms of Trade	ES	VTOTxx	Decadal SDEV, 1960s, 1970s, 1980s, 1990s
Volatility of Black Market Premium	ES	BLMKxx	Decadal SDEV, 1960s, 1970s, 1980s, 1990s
SD of REER	GGW	REERxx	Decadal average of the annual SDEVs of monthly obs.
Currency Crisis	GGW	ECRIxx	Fraction of decade with currency crisis
Volatility of CPI Inflation	ES	VINFxxx	By decade
Government Current Exp. on Goods/Services (percent of GDP): SDEV (82n)	ES	VGOVxx	By decade (1960s missing)
Banking Crisis	GGW	BCRIxx	Number of years in decade with banking crisis

[1]"xx" refers to the decade.

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