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# A three-regime business cycle model for an emerging economy

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A three-regime business cycle model is proposed based on Minsky financial instability hypothesis. Using this framework and a Markov switching autoregressive model Mexico's business cycle turning points are identified published by the Economic Cycle Research Institute (ECRI).

## I. Introduction

Three regimes Markov-switching autoregressive (MS-AR, hereafter) business cycle models have gained popularity over the last years. This is because, as Öcal and Osborn (2000, p. 27) have pointed out, 'there is growing evidence that at least three regimes are required to represent adequately business cycles movements'. See for example, Krolzig (1997a, b) and Clements and Krolzig (1998) for empirical evidence. These studies (that focused exclusively on developed economies) have shown that a three-regime business cycle model spots better expansion and contractions that correspond fairly closely to traditionally dated turning points published *inter alia* by the NBER. However, contrary to a two regime model, where the characterization of the model follows definitions *à la* Burns and Mitchell (1946), the three-regime model is supported exclusively by statistical evidence, indicating a shortcoming in terms of economic theory.

The aims of this paper are two-fold. First, to provide a theoretical base for a three-regime business

cycle model following both Minsky (1982, 1986) seminal financial instability hypothesis (FIH) and, further, its development in the FIH for open, developing economies (see Arestis and Glickman, 2002). Second, using Mexico's quarterly seasonally adjusted industrial production index (IPI) from 1980q1 to 2000q4, apply a MS-AR model to evaluate whether it adequately spots the business cycle turning points published by the ECRI.<sup>1</sup>

## II. The Three-Regime Business Cycle Model

Minsky's FIH states that the process from financial robustness to fragility involves passing through two regimes of increasing (optimistic) expectations associated with economic expansion, namely medium and high growth, to operate finally in a regime of (financial) crisis. In other words, the expansion phase is separated in two regimes, mild recovery (medium growth) followed by one of high growth, meanwhile the regime of recession is related to (financial) crisis.<sup>2</sup>

<sup>1</sup> There are few studies drawing inferences regarding the business cycles movements in emerging economies and they also assume two regimes (see, for example, Mejia-Reyes, 2000).

<sup>2</sup> There is, however, a debate on how and which regime should be divided. For example, Öcal and Osborn (2000, p. 27) propose that the upswing should typically consist 'of a period of rapid recovery followed by one of slower growth'. Meanwhile, Ferrara (2003, p. 375) suggests that 'the contraction phase can be separated into a slowdown phase and a recession phase'.

During the upswing each regime is related to a firm's margin of safety.<sup>3</sup> Large margins of safety prevailing will indicate the economy is in the *tranquil* or *prosperity* regime (medium growth), with the majority of the firms classified as hedge units. As the economy evolves, with optimistic expectations increasing along with the investing financing process, the margins of safety will decrease, speculative and/or Ponzi units will predominate and the economy will be identified as being in the *boom* regime (high growth). As can be noted, the degree of financial fragility evolves in a parallel fashion and hence it is possible to recognize if the economy is close to moving into the crisis regime.

Nevertheless, in financially liberalized emerging economies, where the lack of capital controls and credit-based financial systems are characteristics, despite the existence of the above regimes, the classification of units is not so straightforward. A firm can resemble hedge and speculative at the same time. This is basically because, in this context, units are propelled to embark on long term gestation projects issuing debts repayable in foreign currency. If the firm expects to be able to meet adequately its financial commitments it can be considered, then, a hedge unit. However, the same firm can be classified as a speculative unit, since it is now more vulnerable to both domestic and external shocks, increasing the likelihood of the economy of suffering a financial crisis (or to shift abruptly from expansion to recession).

In sum, a unit that 'borrowed *short-term* in foreign currency to finance domestic long-term assets would also be speculatively financing itself under both of Minsky's criteria: as well as needing continually to roll debts over, it will also be vulnerable to changes in interest rates . . . [and] to exchange-rate movements' (Arestis and Glickman, 2002, p. 242). The resultant *superspeculative* financing unit will be the sort of firm that will predominate and therefore the regime in which the economy is operating cannot be inferred from the firms' margins of safety in a direct fashion. Consequently, the degree of financial fragility is no longer so evident either.

### III. An Application of the MS-AR Model to an Emerging Economy

In this section, a three-regime MS-AR model (see Hamilton, 1989, 1994) is applied using Mexico's rate of growth of the quarterly seasonally adjusted

IPI (IMF-International Financial Statistics, 2002, CD-Rom) from 1980q1 to 2000q4.

An adequate three-regime model was found to be an MSIH(3)-AR(2). The specification has a shifting intercept and variance terms (MSIntercept-Heteroscedastic). And according to the Akaike Information Criteria the number of lags is two. The model representation is:

$$y_t = \delta_{s_t} + \sum_{k=1}^2 \phi_k y_{t-k} + \varepsilon_t$$

where  $\varepsilon_t \sim \text{NID}(\sigma_{s_t}^2)$  and  $s_t \in \{1,2,3\}$  is generated by a first-order Markov chain. For a first order Markov chain the probability the  $s_t$  equals some particular value  $j$  depends on the past only through the most recent value  $s_{t-1}$ :  $P\{s_t = j | s_{t-1} = i\} = p_{ij}$ . Such a process is described as an  $N$ -state Markov chain with transition probabilities  $\{p_{ij}\}_{i,j=1,2,\dots,N}$ . The transition probabilities  $p_{ij}$  give the probability that state  $i$  will be followed by state  $j$ . Note that  $\sum_{j=1}^N p_{ij} = 1$ . The estimations reported herein were carried with the MSVAR class for Ox (see Krolzig, 1998).

Figure 1 depicts the filtered and smoothed probabilities of the crisis, 'C', the medium, 'M', and high growth, 'H', regimes. As can be seen, the model corresponds fairly closely to dated business cycle turning points reported by the ECRI (see Table 1). However the model fails to capture the trough on October 1993, but the contribution of the Markov chain to the business cycle (not depicted here) shows that it is not reflected in the quarterly IPI growth rate, and hence not detected by the model.

Additionally, the evolution and movements of the estimated probabilities of regimes M and H seems to be consistent with the FIH framework. First, during the whole period after operating in the C regime the economy begins to operate in the M state, to shift later to the H regime. Second, from the early 1980s until 1986, that is, prior to financial and trade liberalization the economy shifts smoothly from one regime to another, suggesting the regime in which the economy is operating and its degree of financial fragility are likely to be identified in a direct fashion. Finally, a different evolution is clear once the economy is fully liberalized (markedly since 1990). In this context, and given the absence of capital controls, the economy shifts abruptly between the H and the M regime, suggesting difficulties to recognise when the economy is close to collapse and in which regime is operating.

<sup>3</sup> The margin of safety represents a cushion which absorbs any unforeseen changes in the cash inflows and outflows of economic agents (units or firms) (Kregel, 2001, p. 196).

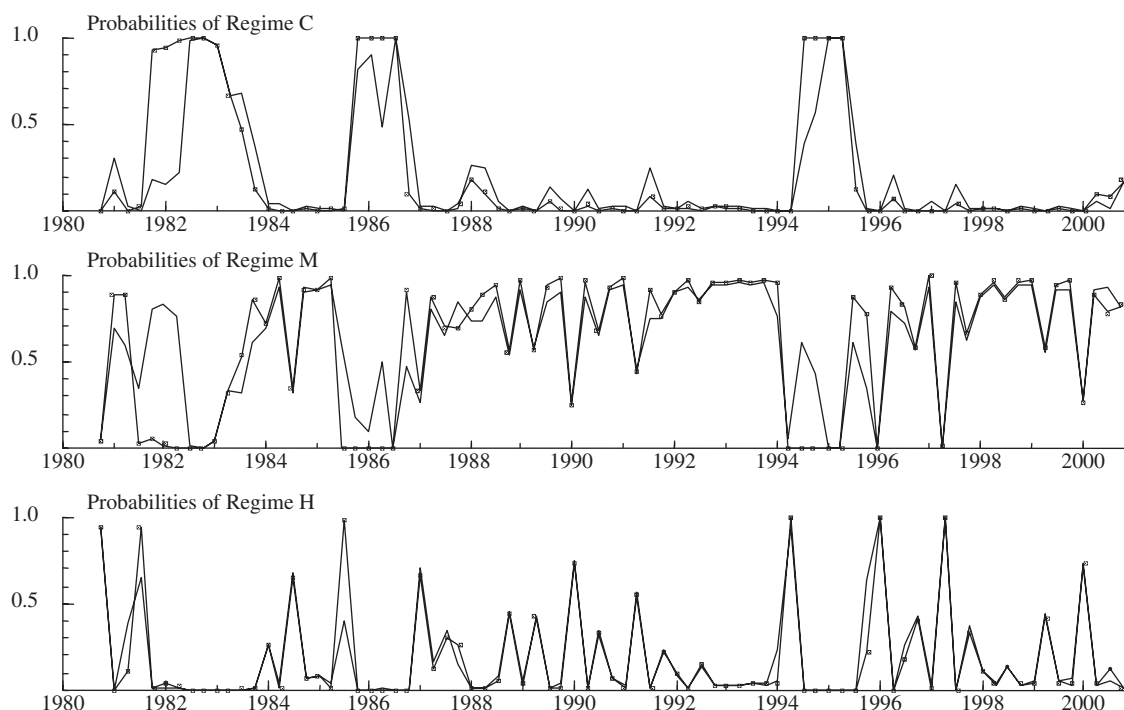


Fig. 1. Smoothed and filtered probabilities of regimes C, H and M: (—) filtered, (---) smoothed

Table 1. ECRI business cycle chronologies, 1980–2000

Peak	Trough
March 1982	August 1983
October 1985	November 1986
October 1992	October 1993
November 1994	July 1995
June 2000	

Source: www.businesscycle.com.

Table 2. Estimated transition probabilities of the MSIH(3)-AR(2)

	$P_{iC}$	$P_{iM}$	$P_{iH}$	Duration
C regime	0.7733	0.2249	0.0017	4.51
M regime	0.0006	0.7259	0.2735	3.65
H regime	0.2617	0.6960	0.0423	1.04

The estimated transition probabilities support the above evidence (see Table 2). The transition probability from the C regime to the H regime is quasi-null, indicating that after each crisis the economy has followed a mild process of recovery before shifting to the H regime. The transition probability from the H regime to the M regime is high (and vice

versa), reflecting the instability of the upswing. Finally, the transition probability from the H regime to the C regime is high, suggesting that, before it goes into crisis, the economy does not decelerate. This may be the result of its increased vulnerability to shocks.

The persistence of each regime is relatively high, except the H regime. This is in accordance with the poor economic performance of Mexico over the last 20 years. However, the average duration of the business cycle (9.1 quarters) is in line with the average length of the business cycle in emerging economies (generally between 7.7 and 12 quarters) reported by Rand and Tarp (2002, p. 2076). This evidence indicates that Mexico's business cycle length has not been altered by the implementation of the openness strategy.

#### IV. Conclusions

In this paper the Minsky FIH is proposed as a theoretical basis for analysing and drawing inferences from a three-regime business cycle model, trying to fill the theoretical gap existing in this literature. The application of the MS-AR model to the Mexican economy showed that this model corresponds fairly closely to the business cycle turning points published by the ECRI. Furthermore, the estimated

probabilities supported the view that the upswing of Mexico's business cycle has been unstable and vulnerable, particularly since the early 1990s.

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### References

- Arestis, P. and Glickman, M. (2002) Financial crisis in Southeast Asia: dispelling illusion in the Minskyan way, *Cambridge Journal of Economics*, **26**, 237–60.
- Burns, A. and Mitchell, W. (1946) *Measuring Business Cycles*, Cambridge University Press, Cambridge, MA.
- Clements, M. and Krolzig, H.-M. (1998) A comparison of the forecast performance of Markov-switching and the threshold autoregressive models of US GNP, *Econometrics Journal*, **1**, C47–C75.
- Ferrara, L. (2003) A three-regime real-time indicator for the US economy, *Economics Letters*, **81**, 373–78.
- Hamilton, J. (1990) Analysis of time series subject to changes in regime, *Journal of Econometrics*, **45**, 39–70.
- Hamilton, J. (1994) *Time Series Analysis*, Princeton University Press, Princeton, NJ.
- Kregel, J. (2001) Yes 'it' did happen again. The Minsky crisis in Asia, in *Financial Fragility and the Investment in the Capitalist Economy, The Legacy of Hyman Minsky*, Vol. II (Eds) R. Bellofiore and P. Ferri, Edward Elgar, Aldershot, pp. 195–212.
- Krolzig, H.-M. (1997a) Markov-switching vector autoregressions. Modeling statistical inference, an application to the business cycle analysis, in *Lecture Notes in Economics and Mathematical Systems* 454, Springer-Verlag, Berlin.
- Krolzig, H.-M. (1997b) International business cycles: regime shifts in the stochastic process of economic growth, Applied Economics Discussion Paper no. 194, Institute of Economics and Statistics and Nuffield College, Oxford University.
- Krolzig, H.-M. (1998) Econometric modelling of Markov-switching vector autoregressions using MSVAR for Ox, Institute of Economics and Statistics and Nuffield College, Oxford University.
- Mejia-Reyes, P. (2000) Essays on business cycles in Latin America, PhD thesis, University of Manchester.
- Minsky, H. (1982) *Inflation, Recession and Economy Policy*, Wheatsheaf Books, Brighton.
- Minsky, H. (1986) *Stabilizing an Unstable Economy*, Columbia University Press, New York.
- Öcal, N. and Osborn, D. (2000) Business cycle nonlinearities in UK consumption and production, *Journal of Applied Econometrics*, **15**, 27–43.
- Rand, J. and Tarp, F. (2002) Business cycles in developing countries: are they different?, *World Development*, **30**, 2071–88.
- Ros, J. (2001) From the capital surge to the financial crisis and beyond: the Mexican economy in the 1990's, in *Financial Crises in "Successful" Emerging Economies* (Ed.) R. Ffrench-Davis, ECLAC-Brookings Institutions Press, DC, pp. 107–40.
- Sichel, D. (1994) Inventories and the three phases of the business of the cycles, *Journal of Business and Economics Statistics*, **12**, 269–77.