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Herding and the shifting determinants of exchange rate regime choice

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It is difficult to pin down the factors that determine states' choice of exchange rate regime because those very factors present a moving target. Many scholars have taken on the same question: what are the determinants of exchange rate regime choice? But as a group they have been unable to identify a stable answer. The reason for this is that the factors that best predict exchange rate regime vary dramatically across time. An explanation for this variation is offered: rational herding, or information cascades, can explain why one factor becomes prominent for a period of time then suddenly drops off and is replaced by a better predictor.

Keywords: exchange rate regimes; herding; information cascades; economic behaviour

JEL Classification: F31; F33; P16

I. Introduction

It is difficult to pin down or define the factors that determine states' choices of exchange rate regime when those very factors present a moving and elusive target. The ideas that influence exchange rate regime choice are not stable over time because states herd toward one factor then another. Thus variables that are related to exchange rate regime choice in one time period tend not to be related to exchange rate regime choice in another period.

Many scholars have taken on the same question: what are the determinants of exchange rate regime choice? But as a group they have been unable to identify a stable answer. In spite of the vast literature, the effort to discover stable determinants of exchange rate choice has been frustrating. Some have responded to this by seeking out new and more sophisticated methods to uncover the stable answer. However, the problem might not be determining the right method to find a stable answer, but rather that a stable explanation does not exist. The underlying real world factors that drive exchange rate regime choice are not stable over time, consternating the literature on the topic.

There is clear diversity over time among the factors that relate to exchange rate regime choice. In some years inflation appears to be the best predictor of exchange rate regime choice. In other years inflation seems not to matter at all while foreign currency reserves, economic growth or capital account openness seem to be better predictors.

Herding, or 'information cascades', among governments offer significant insights as to why these factors shift. Herding occurs when states have some private information about the best option to choose, but rather than act on that information they follow the paths already chosen by those who went before. When actors rely upon the information revealed by those they observe rather than their own private

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information, this is referred to as an information cascade. A couple of first movers with even a little information can set many followers down a single path.

This article proceeds as follows: first a review of the background and literature on exchange rate regime choice; second a look at the theory of herding and information cascades; third an empirical look at exchange rate choices from 1985 to 2004; finally some discussion and conclusions are offered.

II. Exchange Rate Regime Choice

Perhaps because 'Few issues are more controversial in international economics than the choice of the exchange rate regime' (Carmignani *et al*., 2006, p. 2), there are so many papers written on exchange rate regime choice. Since the end of the Bretton-Woods System of exchange rates, countries have been free to choose flexible or fixed exchange rates and scholars have been interested in how countries might make that choice.

One of the first analysts to take an empirical look at exchange rate regime choice was Jacob Dreyer (1978) who focused on optimum currency area factors, such as size and economic openness as determinants (Mundell, 1961; for a more complete review of empirical studies, see Juhn and Mauro (2002), von Hagen and Zhou (2007) or Alvarez *et al*. (2007). See Tavlas (1994) for a survey of theoretical arguments of exchange rate regime determinants). Looking at developing countries in the post-Bretton Woods period, he concludes that his results are promising, but other factors, such as internal stability, would need to be incorporated in further research. In that same year Robert Heller proposed that 'The choice of an appropriate exchange rate system for a country depends on the economic characteristics of that country' (Heller, 1978, p. 309). He similarly focused on optimum currency area factors in determining exchange rate regime choice. Slightly later were Holden *et al*. who followed similar suit (Holden *et al*., 1979). Melvin built upon these earlier works but suggested that newer theoretical ideas needed to be incorporated into the empirical tests (Melvin, 1985). From there through the 1980s (*inter alia* Melvin, 1985; Bosc, 1987), into the 1990s (*inter alia* Cuddington and Otoo, 1990; Savvides, 1990; Edwards, 1996; Leblang, 1999), and 2000s (*inter alia* Corden, 2002; Jin, 2003; Li, 2003; Magud, 2004), empirical papers on exchange rate regime proliferated.

Alvarez *et al*. examine 41 studies on the determinants of exchange rate regime and state that: 'the main conclusion of our survey is the lack of a consensus with regard to the factors that affect the choice of a certain [exchange rate regime]' (Alvarez *et al*., 2008, p. 1). The authors argue that there are 'several reasons that may explain this failure' (Alvarez *et al*., 2008, p. 1). They cite differences in the classification of exchange rate regimes, differences in proxies for independent variables such as stability, multicollinearity between regressors, the state-dependence effect, nonstationary time series, the simultaneous estimation of long-term and short-term variables and differences in the employed econometric techniques (Alvarez *et al*., 2008, pp. 1–2).

This echoes the prominent paper by Grace Juhn and Paolo Mauro, who conclude from their sensitivity analysis that 'very little is known about the positive determinants of exchange rate regime choice' (Juhn and Mauro, 2002, p. 27). And moreover, 'the existing empirical literature is inconclusive' (Juhn and Mauro, 2002, p. 27). They further state:

> neither the variables identified by old theories, including optimum currency area theory, nor other economic or political variables identified by newer theories . . . are robust predictors of exchange rate regimes in cross sections of countries. (Juhn and Mauro, 2002, p. 27)

Similarly, von Hagen and Zhou point out the inconsistencies of the findings across the literature and argue that 'the empirical results of these studies seem to be sensitive to the sample composition, data construction, and model specification' (von Hagen and Zhou, 2007, p. 1072).

Even earlier than that, Honkapohja and Pikkarainen argue that characteristics that were previously argued to be important, such as trade openness, development level, geographical diversification of trade and terms of trade shocks, were not in fact very powerful predictors of exchange rate regime choice (Honkapohja and Pikkarainen, 1992). Thus, in spite of the volume of this literature, it appears that there is a real frustration in identifying any consistent or stable explanation of the factors that determine exchange rate regime choice. The empirical results from one study to the other are simply inconsistent.

Some recent papers take novel approaches to coding the dependent variable, such as Carmignani *et al*. (2006). They argue that their analysis goes 'beyond the standard de jure and de facto dichotomy and [analyzes] a taxonomy of regimes (de jure-non-de facto pegs, de facto-non-de jure pegs, de facto-de jure

pegs, fear of floating etc.)' (Carmignani *et al*., 2006, p. 3). Other recent papers take more sophisticated statistical routes (e.g. Jin, 2003; von Hagen and Zhou, 2007; Alvarez *et al*., 2008; Russell, 2011). Jin (2003) uses nonstationary panel analysis; von Hagen and Zhou (2007) use static and dynamic random-effects multinomial panel models and simulation-based techniques; Alvarez *et al*. (2008) employ panel mixed multinomial logit model; and Russell (2011) uses a nonparametric classification tree model. Still others look at geographical sub-samples (e.g. Papaioannou, 2003; Piragic and Jameson, 2005; Agbola and Kunanopparat, 2005; Alvarez *et al*., 2008), and look for new sets of independent variables (e.g. Li, 2003; Simmons and Hainmueller, 2004).

The problem in the literature is the disparate results. This cacophony of analyses is in general disagreement about which factors matter, when they matter, and how they matter.

Simmons and Hainmueller review several prominent international political economy papers that rely upon domestic political factors for explanations of exchange rate regime choice. They argue that these papers share a common flaw: that domestic considerations 'are fragile, and do not hold up when replicated using the best-available data on actual exchange rate practices. Moreover, the domestic arguments weaken considerably in the face of strong external influences on exchange rate regime choice' (Simmons and Hainmueller, 2004, p. 5). Simmons and Hainmueller argue further that, 'a domestic political economy of exchange rate regime choice can never be adequate. Exchange rates and by logical extension the choice of an exchange rate regime are *necessarily* influenced by the policies taken by foreign actors' (Simmons and Hainmueller, 2004, p. 5).

The gist of their argument is that governments observe other governments taking exchange rate regime actions and then learn from those observations. 'These foreign lessons are then incorporated into national exchange rate regime choice (Simmons and Hainmueller, 2004, p. 7). They formulate a model of this learning process based upon Bayesian updating. From this they expect, and find, strong diffusion effects. The bottom line is that they expect trending in exchange rate regime choice across countries based upon this learning experience.

This Bayesian trending experience is similar to, but different from the herding suggested in this article. This article suggests that governments follow each other, or herd, in the factors used to make an exchange rate regime choice – the inputs into exchange rate regime choice. Simmons and Hainmueller argue that states follow the choices of other governments based upon their policy success – the outputs of exchange rate regime policy.

III. Theoretical Expectation of Herding

This rise and fall of factors over time is consistent with a herding hypothesis. The herding hypothesis would suggest that as a few countries tend to move in one exchange rate choice direction, others follow. But a herding trend would be fragile: as soon as any countries get a sense that the underlying factors have changed, they move in the new direction as well.

Herding is often thought to be irrational, but rational herding or informational cascades have been the focus of much recent literature. Herding occurs when an individual makes a choice based on the choices of those who went before him rather than on his own information. One prominent paper explains, 'An informational cascade occurs when it is optimal for an individual, having observed the actions of those ahead of him, to follow the behaviour of the preceding individual without regard to his own information' (Bikhchandani *et al*., 1992, p. 992). Herding in this sense is rational and optimal. It is rational to follow the herd because of the private information other actors may have and may be revealing through their choices. Banerjee explains, '…paying heed to what everyone else is doing is rational because their decisions may reflect information that they have and we do not. It then turns out that a likely consequence of people trying to use this information is what we call herd behaviour – everyone doing what everyone else is doing' (Banerjee, 1992, p. 798).

The idea of rational herding has become a key concept in analysing how agents learn through observation in groups (Park and Sgroi, 2008). A simple example drawn from Sushil Bikhchandani, David Hirshleifer and Ivo Welch's website might help here.[1] This example tells the story of people coming to a crossroads and having to choose either the right or left path. You have a private information signal that tells you that the best path to take is the right one with a probability of two-thirds. Assume everyone has a similar private signal. The signals are helpful, but not perfect – they have a one-third chance of being wrong. Assume that you are the third person to come to the crossroads and have to choose and that

[1] See www.info-cascades.info, also Bikhchandani *et al*. (1992).

you saw the prior two people choose. If you saw the previous two people both go left, then you should go left and ignore your own private information. This is true because the first person must have had a signal saying that the left path was better. The second person saw the first go left. She would have figured out that the first person's signal was left. If her private signal was also left, she would have certainly gone left. If her private signal was right, she would have known about one left signal and one right signal and could have gone either way.

On your turn, since you saw both the man and the woman walk left, you know the first person had a left signal and the second person had a better than even chance of having a left signal as well. This means that you have seen more than one left signal, combined with your right signal, the balance is still tipped to the left. Even with your private information to go right, the net says you should rationally choose left anyway. And now that you have gone left, everyone who comes after you and saw the first three people go left, they will go left as well. You could have millions of people going left just because the first two people went left. This will happen even if the best choice was right, which would be with more than a one in nine probability if the first two people got incorrect left signals.

Thus, herding and information cascades occur when agents ignore their own private information and follow the lead of others based on their supposed private information (Gale, 1996). In this way, individuals act upon some, but very little, information to create large herding effects. These effects, however, can be very unstable. Because the information cascade is based on so little information, new information, or a suspicion that the underlying conditions have changed, can rapidly send the herd in another direction. Bikhchandani *et al.* again explain:

> If even a little new information arrives, suggesting that a different course of action is optimal, or if people even suspect that underlying circumstances have changed (whether or not they really have), the social equilibrium may radically shift. . . .informational cascades [explain] not only conformity but also rapid and short-lived fluctuations such as fads, fashions, booms and crashes. (Bikhchandani *et al.*, 1992, p. 994)

Other theories of group behaviour that may lead to herding cannot explain the shifting nature of herding. They can explain why herding in one direction may occur, but not why that direction can be so easily changed. Theories built upon payoff externalities, sanctions on deviants or reputational considerations cannot explain the fragility of mass behaviour (Bikhchandani *et al.*, 1992, p. 993).

Much of this literature is focused on economic behaviour like herding in markets (e.g. Cipriani and Guarino, 2007) or among investment fund managers (Wermers, 1999). But the same mechanism applies to government activity as well. Governmental leaders have some private information, some signals as to the best course of action. And they can also observe the choices and behaviours of other states.

This is certainly true in the case of the factors that determine exchange rate regime choice. Each state has to make a choice about its own exchange rate regime and has some information about how to best make that choice. And each state can observe those that chose before and the factors that went into that choice. If one factor or specific group of factors appeared to be the basis of the choice, then the state would have an incentive to follow that lead and choose an exchange rate regime based on those factors.

For example, if you were in Argentina in 1991 and were choosing an exchange rate regime, you might look to the factors that seem to be determining exchange rate regime choice among other countries at that time. Looking around you would see that high inflation countries were tending to move toward fixed exchange rates. Regardless of any intuition, analysis, or private information you had, you would be rational to follow that lead and choose a regime based on your inflation status as well.

On the other hand, if you were in Argentina in 2004, you would look around and see that foreign currency reserves were the primary factor relating to exchange rate regime choice. It would be rational to consider your reserve status in choosing a currency regime regardless of any other private information you might have on how to best make the exchange rate regime choice.

This would suggest that states would tend to herd in that kind of direction. If inflation appeared to be the best way to determine a proper exchange rate regime choice, then more states would make a choice on that basis. But the trend would be fragile and any new information, or a couple of different choices based on states choosing another way, would lead to a new herding effect and a new informational cascade. The expectation would be that the factors most related to exchange rate regime choice would be very trendy and faddish. One factor, or combination of particular factors, would rise in prominence, remain high for a period of time, then would drop quickly off and be replaced by a new herding trend.

Note that herding in this sense is different from policy diffusion as explained by Simmons and Elkins (2004). For Simmons and Elkins, similar policies spread among clusters of countries and in concentrations of time because of altered payoffs to follow those policies. One mechanism that drives diffusion is competition – to attract more economic activity. The other mechanism is through the pressures of prevailing norms. In both cases, states have an incentive to follow policies similar to their neighbours. Simmons and Elkins also hypothesize that new information might influence policy diffusion. They suggest that learning from the success of others or learning from analogous experiences of other countries. The herding argument made here, however, is different. It argues not that states have incentives to follow similar policies, but that states have incentives to use similar criteria in making policy choices. The trend is not in actual policies, the trend is in the determinants of those policies.

Moreover, the expectations of the two models are different. The herding models suggest that trends will be faddish, unsustainable and fragile. One is also not likely to see a trend in policy outcomes since each country matches up with the trend in policy determinants in a different way. For example, if inflation were the primary determinant in exchange rate the governments were following, then some (low inflation) countries would react to this by choosing a fixed exchange rate regime and other (high inflation) countries would react by choosing a flexible exchange rate regime.

IV. Empirical Trends

Empirical trends in the determinants of exchange rate regime choice from 1985 to 2004 were investigated with a dichotomous dependent variable of flexible or fixed exchange rate regime. The data for this variable are taken from the Reinhart and Rogoff *de facto* measure of exchange rate regimes (Reinhart and Rogoff, 2004). Their measure is a scale from 1 to 6; 1 being most fixed and 6 being most flexible. This scale is collapsed into a dichotomous fixed/flex variable by combining the no separate legal tender, the pegged currencies and the moving pegs together and combining the floating and falling currencies together.

A *de facto* measure is used here rather than a *de jure* measure so that actual policy choices can be observed. *De jure* measures are more indicators of intent while *de facto* measures capture how states actually behave with their exchange rates.

Based on a review of the literature, an effort was made to include variables or indicators that were used in previous studies. The full list of variables is given in Table 1. While there are a large number of variables available, most have very little predictive power for most of the time.

Prediction capacity is estimated with a Gini calculation for goodness-of-fit. (The same calculations were done with the information criteria for goodness-of-fit and similar results were achieved.) Here the Gini coefficient acts as a goodness-of-fit function to estimate which factors are the best predictors of exchange rate regime choice.

To calculate the Gini coefficient for each variable,[2] the data are fed through an algorithm using the statistical programming language R to find the best possible prediction capacity of each variable based upon the maximum homogeneity of the predicted classes (here fixed or flexible exchange rate regime). The algorithm makes a prediction for each case in the dataset. The prediction is based upon a split point (each possible value of the independent variable is considered in turn to be the splitting point). It thus divides all the cases into two groups – one group predicted to have a flexible regime and the other group predicted to have a fixed regime. The algorithm then uses the Gini coefficient to judge how homogenous each group is. It does this for each possible value that the independent variable can take and then reports which independent variable has the capability to make the best improvement in prediction of the dependent variable. The methodology is thus based upon determining which variables are the most *efficient* predictors of exchange rate regime.

Each year is run separately through the algorithm. For a given year, the program calculates the Gini coefficient for each point along each variable's scale and reports back the best split point for each variable. An analysis can then be done on all the Gini coefficients to see which variables are the most powerful predictors for each given year of data. Then, we can see trends over time in the predictive capability of any one variable.

Given this algorithm to find the variables with the most predictive power, we can see which independent variables are most powerful as predictors at what time. What we see is that inflation, based up on the consumer price index, is the best predictor of exchange rate regime from 1985 to 1999. In 2000,

[2] The Gini index can be understood as one minus the sum of the square of the relative frequencies of each class (flexible or fixed).

Table 1. Variables

Variable	Source
Capital account openness	Chinn and Ito (2008)
Consumer price index	International Financial Statistics, International Monetary Fund
Current account balance	UNData, United Nations Statistics Division
Democracy (POLITY score)	Polity IV, Marshall *et al.* (2010)
Domestic credit growth	World Development Indicators, World Bank
Export growth variance (coefficient of variance of export growth)	UNData, United Nations Statistics Division
Exports per GDP	UNData, United Nations Statistics Division
Financial globalization index	KOF Index of Globalization, Dreher (2006)
Foreign exchange reserves	UNData, United Nations Statistics Division
GDP growth	UNData, United Nations Statistics Division
GDP per capita	UNData, United Nations Statistics Division
Government consumption per GDP	UNData, United Nations Statistics Division
Government fiscal balance per GDP	UNData, United Nations Statistics Division
Government fractionalization (the probability that two deputies picked at random from among the government parties will be of different parties)	Database of Political Institutions, Beck *et al.* (2001)
Gross domestic product	UNData, United Nations Statistics Division
Imports per GDP (total imports divided by GDP)	UNData, United Nations Statistics Division
Majoritarian/proportional (type of electoral system)	Database of Political Institutions
Margin of majority party (fraction of seats held by the government party)	Database of Political Institutions
National debt	UNData, United Nations Statistics Division
Original sin (ratio of debt issued in home currency to all international debt)	Bank for International Settlements
Political stability (percent of veto players who drop from the government in any given year)	Database of Political Institutions
Real exchange rate variance (coefficient of variance of real exchange rate)	ERS International Macroeconomic Data Set, United Stated Department of Agriculture, http://www.ers.usda.gov/data/exchangerates/
Trade openness (total imports plus exports divided by GDP)	United Nations Statistics Division
Year of independence (year county became independent nation, truncated at 1800)	CIA Word Factbook

however, it drops to being the third best predictor of exchange rate regime and in 2001 to sixth.

Table 2 shows the top five predictors of exchange rate regime for each year from 1985 to 2004. Over this 20-year period, variables ebb and flow in terms of their predictive capacity. The values in the table represent the increase in prediction possible when that independent variable is in taken into account. For example, if there were no independent variable considered, then the best guess in most cases is about 50/50 since the numbers of flexible and fixed currencies in the sample are about even most years. In 1985 the prediction capacity increases from 50% accurate by 14.95 percentage points to 64.95% accurate if inflation (and inflation alone) is used as a predictor of exchange rate regime.

We can see the changing role of inflation over time in Fig. 1. The predictive capacity of inflation clearly fluctuates. For the period, the average prediction power of inflation is 12.12%. For most years in the sample, inflation is well above 12%, but toward the end of the period, inflation loses most of its prediction power, with a low of 4.76%. The possible herding trend was toward inflation, a good metric by which to determine exchange rate regime for a number of years, but it switched abruptly away from inflation in 2000.

The trend in the predictive power of inflation can be compared to that of capital account openness, seen in Fig. 2. Capital account openness is the second most powerful predictor of exchange rate regime for several years beginning in 1985. Toward the beginning of the sample it has a predictive power of over 14%, but then drops down to 0.47% – hardly any predictive power at all. Again, the herding trend was toward seeing capital account openness as a good way to determine exchange rate regime, but this ended suddenly in 1990.

Table 2. Increases in prediction capacity, top five variables each year

1985		1986		1987		1988		1989	
Inflation	14.95	Inflation	14.59	Inflation	15.63	Inflation	17.69	Inflation	19.51
Capital account openness (KA)	12.89	KA	14.04	KA	13.83	KA	12.93	KA	8.85
Government debt	6.45	Government consumption	5.81	Export shocks	7.10	Government consumption	7.72	Government consumption	8.38
Exports as percentage of GDP	4.8	Government debt	5.12	Government consumption	7.00	Government fractionalization	6.18	Government fractionalization	5.65
Government fiscal balance as percentage of GDP	4.07	Government fiscal balance	4.82	Government fractionalization	6.57	GDP growth	4.01	GDP growth	5.13
1990		1991		1992		1993		1994	
Inflation	15.8	Inflation	14.32	Inflation	19.45	Inflation	19.26	Inflation	17.99
Government consumption	6.35	Current account	5.78	GDP growth	9.41	GDP growth	6.30	GDP growth	12.74
Domestic credit growth	6.02	Export shocks	4.57	KA	8.80	National debt	5.56	Government fiscal balance	4.48
Government fractionalization	5.09	KA	3.71	Domestic credit growth	5.23	Domestic credit growth	4.12	KA	4.07
Current account balance	4.67	Government fiscal balance	3.69	Government consumption	5.11	KA	4.03	Year gained independence	3.32
1995		1996		1997		1998		1999	
Inflation	10.32	Inflation	10.04	Inflation	8.02	Inflation	10.09	Inflation	6.83
GDP growth	7.33	GDP growth	4.26	KA	4.68	GDP growth	6.93	KA	6.03
KA	3.62	Government consumption	3.15	GDP growth	2.51	Domestic credit growth	6.00	Domestic credit growth	5.49
Government fiscal balance	3.58	KA	2.99	Political stability	2.38	Exports	5.45	Reserves	4.86
Export shocks	2.33	Government fiscal balance	2.86	Exports	2.17	Imports	4.95	Exports	4.39
2000		2001		2002		2003		2004	
Domestic credit growth	8.82	Reserves	8.02	Reserves	9.16	Reserves	10.38	Reserves	9.44
Reserves	6.67	Domestic credit growth	7.35	Domestic credit growth	6.78	GDP	7.04	Inflation	7.78
Inflation	5.67	Exports	5.95	GDP	6.78	Inflation	5.86	GDP	7.49
Exports	4.764	Imports	4.88	Original sin	5.98	Year of independence	5.83	Exports	6.16
GDP	4.22	GDP	4.77	Inflation	5.36	Exports	5.71	Year of independence	5.66

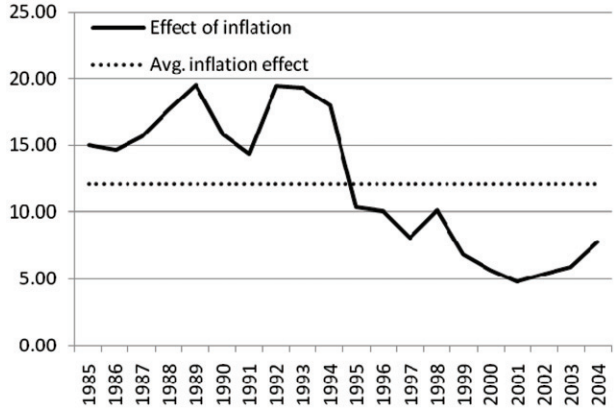

Fig. 1. Prediction power of *inflation* over time

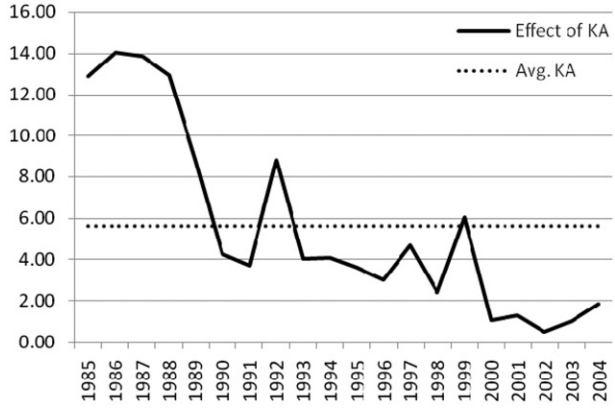

Fig. 2. Prediction power of *capital account openness* over time

The reverse story can be told for the effect of reserves. The trend in predictive power for foreign exchange reserves is shown in Fig. 3. Toward the beginning of the sample years, reserve levels have a predictive power of around 3% and drops to 0.87% in 1996 – not a very good predictor of exchange rate regime. But starting in 1997 it climbs, all the way to 10.38% in 2003 – now a very good predictor of exchange rate regime. The herding trend built upon itself and rose dramatically to be the best predictor of exchange rate regime choice.

Other variables come and go over the sample period as well. Government consumption has a few years as a good predictor of exchange rate regime, and then fades away. Gross Domestic Product (GDP) growth is a nonfactor for many years, then pops up to be a good predictor, then becomes a nonfactor again. The same is true for domestic credit growth. Original sin (Hausmann, 1999) – a measure of a country's ability to borrow in its own currency – never shows a substantial effect, but rises steadily over the period. Most of the variables that do show up as good predictors of exchange rate regime choice do so only for a few years, and then fade back away to their unimportant predictor status.

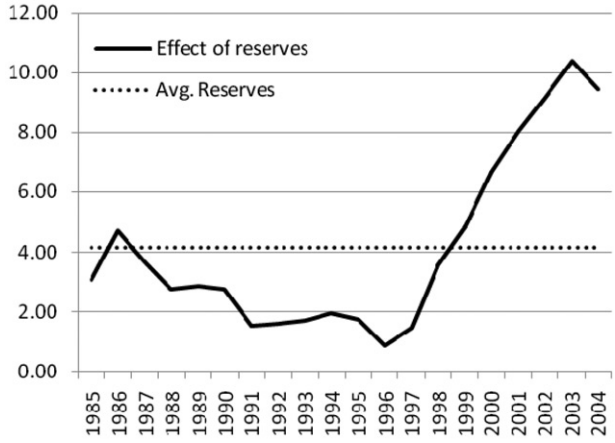

Fig. 3. Prediction power of *reserves* over time

Inflation and capital account openness were the herding trend for a time, but once capital account openness stopped being a main factor in exchange rate regime choice, the trend was over and something else took its place. Domestic credit growth displaced inflation as the top predictor of exchange rate regime choice, but it was not stable, and was quickly replaced by foreign currency reserves.

One variable, foreign reserves level, appeared to be a less important predictor then suddenly took on importance in a few countries and then spread elsewhere through herding. As part of the Asian financial crisis, in the period from 1997 to 1998 several Asian nations shifted from a fixed to a flexible exchange rate regime (Thailand, South Korea, the Philippines, Malaysia and Indonesia). These five countries had reserve levels significantly higher than the world average (27.3 billion on average for the five countries versus 9.7 billion for the world average). From that point on, reserves became a more powerful predictor of exchange rate regime choice every year until 2003 – increasing from a prediction power coefficient of 1.45 in 1997 to 10.38 in 2003. These five countries signalled their private information that reserve levels were related to choice of exchange rate regime. Once they had made their move other countries could observe the relationship between reserve levels and exchange rate choice. Because of the private information signal and the fact that others had based in part their decision on reserve levels, they now had an incentive to follow a similar path.

As more countries seemed to include reserve levels in their exchange rate regime choice calculus, other countries herded along and reserve levels became an important predictor of exchange rate regime choice.

Overall, the pattern we see is a shift of the importance of factors over time. As one factor becomes important for predicting exchange rate regime choice, another fades away. Variables rise and fall in importance suddenly and often. Ultimately, the factors that are related to exchange rate regime choice are not stable. This accounts for why the literature on exchange rate regimes is so inconsistent – the underlying factors being studied are inconsistent themselves.

As a robustness check, the analysis was also carried out with an alternative measure of exchange rate regime from Shambaugh (2004). Shambaugh's measure of exchange rate regime focuses on the *de facto* volatility of the exchange rate regime to establish a classification between countries with pegs or nonpegs. The results of the analysis using this measure differ somewhat from those above, but overall are remarkably similar. For example, the results for 2003 above found that inflation was the strongest predictor of exchange rate regime, followed by GDP growth, national debt, domestic credit growth and capital account openness. With the alternative measure of exchange rate regime from Shambaugh, the results follow the identical pattern: the order of prediction capability was first inflation, then GDP growth, national debt, domestic credit growth and capital account openness. However, the coefficients themselves are not identical. For 2003, the coefficient for inflation was 19.26, and with the alternative measure it is 18.97. In general, inflation follows a similar path for both measures – inflation is a top predictor of exchange rate regime until 2000 when domestic credit growth takes the top spot.

As another check, Granger causality tests were run for the variables that were most prominent in the results. In general, Granger causality tests determine whether lagged observations of one variable have forecasting power when added to a univariate autoregressive linear model of another variable. In this way, the tests can suggest whether one variable might causally precede another. Of course, these tests must be used with caution, as in the classic example a rooster could 'Granger cause' the sunrise (see Lütkepohl for a full consideration of strengths and weaknesses of Granger causality tests). Of the Granger tests run, only the coefficients over time of inflation appear to have a causal relationship with the coefficients of reserves. This may not be surprising given the trends visible in Table 2: as the prediction power of inflation faded over time, the prediction power of reserves rose.

V. Discussion and Conclusions

It is no wonder that there is such disagreement among empirical studies of exchange rate regime choice given the shifting nature of the factors that best predict exchange rate regime choice. If the panels or years of two studies vary at all, they are likely to get different results. One study might cover the 1985 to 1995 and find that inflation is a strong predictor of exchange rate regime choice. Another study might cover the years of 2000 to 2004 and find the opposing result. Or one study might find that GDP growth is a significant factor if it focuses on the mid-1990s, but another time period would not show the same thing. Thus it is hardly a cause for surprise that different studies find different results. The factors that determine exchange rate regime choice are a moving target; they are elusive and difficult to pin down.

Two scholars studying economic growth found the same phenomenon. They suggested that 'if the yearly cross-sectional parameters are not stable, then drawing any long-run inference may be problematic' (Edwards and Kasibhatla, 2009, p. 445). And further, 'Since many studies tend to use data sets that range over different periods, one can easily see that the estimated long-run value could actually be relatively low or high depending on whether the data set covers more of the earlier years, or the latter years' (Edwards and Kasibhatla, 2009, p. 445). Though they are looking at a different topic, the dynamic is the same: if the long-run parameters are not stable, then it is problematic to make inferences based upon the assumption of stability.

It is difficult to identify the stable factors that determine states' choices of exchange rate regime when those factors are constantly shifting. The variables that influence exchange rate regime choice are not stable over time because states herd toward one factor and then another. Because of herding, the relevant factors that are related to exchange rate regime choice wax and wane over time.

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